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5 Cities in Brazil: An Interarea Price Comparison

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The geographic diversity and physical size of countries such as Brazil have generated much interest in regional and interarea comparisons. However, regional comparisons of state product, gross incomes, and salaries, for example, often do not take into account differences in the cost of living, which are likely to be substantial in large countries. Aside from differential costs incurred in transporting goods to physically remote areas, the relative prices of goods will tend to vary from region to region, as they do from country to country. This is even more likely in countries with historically different regional patterns of development, such as the United States, India, China, and Brazil. A recent study of regional incomes in the United Kingdom suggests that this is also true for a relatively small country. In terms of levels, nominal incomes in Southeast England were 25 percent above the national average in 1988 but, when put in real terms, were only 2 percent above the average. Further, the changes over time were not consistent: between 1988 and 1993, the Southeast declined in nominal terms from 25 to 17 percent above the national average and rose from 2 to 6 percent above the average in real terms (Kern 1995).

Unfortunately, Brazilian price statistics have been politicized because of inflation rates that have reached 30 percent a month in recent years.[1] As a consequence, regional price statistics are not widely available, and there have been few studies of interarea prices in Brazil. How different are relative prices

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1. In 1989, the annual inflation rate reached 1,783 percent a year, topped only by Argentina's rate of 3,079 percent for the same period.

among Brazil's cities and regions, and how much effect do the differences have on comparisons of regional income levels? This paper examines three issues related to price differences of food products within Brazil: (1) whether there are substantial differences in price levels between the more prosperous South and Southeastern regions and the poorer areas in the North and Northeast;[2] (2) whether differentials are more pronounced during periods of very rapid price increase; and (3) which methods for estimating regional parities are more robust given the character of price collection in a large country like Brazil. In order to illustrate the price differences, I compare the changes in nominal and in real income levels between cities during the period and test the sensitivity of the food price–level estimates to consumer budget levels and to the inclusion of nonservice headings as well as to the choice of estimating method.

5.1 Background to Price Collection Practices in Brazil: Consumer Price Indexes and Inflation Rates, 1984–87

Until 1985, Brazil's inflation rate was estimated by the Fundação Getulio Vargas using a weighted average of wholesale price indexes, consumer prices in Rio de Janeiro, and a national construction cost index. In November 1985, the official index was changed to the Broad National Consumer Price Index (IPCA), estimated by the IBGE (Instituto Brasileiro de Geografia e Estatística). The main difference lay in the scope of price collection and in the weighting system, which had previously been based on urban populations rather than household expenditures.[3] Also, the expenditures surveys sampled households earning between one and thirty times the minimum salary. However, in November 1986, the government once more decreed a change in the indexing system: the new official inflation measure (INPC) would use the consumer price index as before, but the weights would be restricted to expenditure surveys of households earning only one to five times the minimum salary.

Despite the multiplicity of methodologies, the IBGE publishes time series for the various indexes at the national level from 1979 to February 1986 and from March 1986 to 1988. A break in the series occurs on 28 February 1986, when the Cruzado Plan took effect and a new vector of prices was created.[4] The levels relative to base periods for the end-of-the-year broad consumer price indexes (IPCA) are shown in table 5.1. December 1979 is the base period

2. The per capita GDP in the Northeast was 44.5 percent of Brazil's per capita GDP in nominal terms, rising to about 53 percent in 1985. Total product was 13 percent of Brazil's total nominal GDP in 1970 and 15 percent in 1985 (SUDENE 1987).

3. Population estimates up to May 1983 are based on 1975 data, where later estimates use the 1980 census results. Also, with the exception of São Paulo, which uses more current results from a 1981–82 survey, expenditure weights for this period are based on a 1975 survey.

4. Instead of 15 February–15 March variation, the first indexes computed subsequent to the plan refer to a fifteen-day period from 1 March to 15 March.

Table 5.1 **Consumer Price Index (December 1979 = 100, March 1986 = 100)**

1983	2,017	1986	133
1984	6,324	1987	617
1985	20,795		

Source: IBGE (1990a).

Table 5.2 **Annual Inflation Rates: IPCA (%)**

1984	213	1986	33
1985	229	1987	363

Table 5.3 **Metropolitan Areas and 1987 Economically Active Population**

North		South	
Belem	446,000	Brasilia	767,000
Fortaleza	806,000	Curitiba	873,500
Salvador	854,000	Porto Alegre	1,249,000
Recife	1,005,000	Belo Horizonte	1,391,000
		Rio de Janeiro	4,553,000
		São Paulo	7,082,000

Source: IBGE (1988b).

until 1986, and March 1986 is the base for 1986 and 1987. The annual inflation rates are shown in table 5.2.[5]

The IPCA is the benchmark for estimating the differences in rates among ten metropolitan areas since this survey is more inclusive of consumers at all income levels. These areas are Belem, Fortaleza, Recife, and Salvador in the North and Northeast, Rio de Janeiro, São Paulo, Belo Horizonte, Curitiba, and Porto Alegre in the Southeast and South, and Brasilia in the geographic center of Brazil. Table 5.3 shows the regional classification of these areas and their approximate 1987 economically active populations.

The North and Northeast are geographically distant from the main industrial centers of the Southeast. Belem is located at the mouth of the Amazon River, approximately sixteen hundred miles north of São Paulo. The distance between the northernmost city, Belem, and the southernmost, Porto Alegre, is about two thousand miles, while the most easterly city, Recife, is about one thousand miles from Belem. Brasilia is in the Central West region, but, when a North-South dichotomy is used, it is considered part of the South. In this paper, the same convention is followed, although, if the effect of its regional classification

5. These rates are slightly lower than the official rates since the official index uses the restricted consumer price index (INPC) for households earning between one and five times the minimum salary.

is large enough to change the results of an analysis significantly, both results are discussed.

5.2 Interarea Price Levels

5.2.1 Estimating Method

The IPCA measures consumer price changes relative to a base period, without accounting for differences in relative prices across areas. In this section, I look at whether these differences are substantial and whether one can observe any regional pattern with respect to the inflation rates and the changes in income levels. The published price sample (IBGE 1986, 1988a) used in this paper is neither comprehensive nor representative of all consumption goods, but its primary goal is to provide a rough estimate of the magnitude of differences in the relative price levels in each metropolitan area.

A second important caveat with respect to the results, other than sample size, is the existence of control mechanisms. During the years 1984–87, not only was there a major currency reform, but two smaller shocks followed within the next twenty-four months: the Cruzado Plan II and the Bresser Plan. The period was one of severe instability,[6] and, although consumption rose and inflation rates were low for a brief period in 1986, by the end of the year inflation had begun soaring to pre–Cruzado Plan levels, and minimum wage increases were well below inflation (dos Santos 1990).

5.2.2 Data and Method

The original sample consists of thirty-five item prices within detailed headings for food products, household utility rates, and transport goods and services. The appendix lists the mean expenditure weights for each of them. Item prices are themselves derived from approximately 460 subitems and products,[7] but expenditure weights by area are available only for items, so area price levels are calculated only at this or at higher aggregation levels. The expenditure weights for the priced items correspond to approximately 20 percent of average household expenditures. These proportions are normalized so that ex-

6. In his five years in office (1985–89), President Sarney appointed four different finance ministers, who issued five different economic programs. In addition, businesses used various strategies to protect themselves from price controls, including withholding products, reducing the contents of packages, and charging black market prices (Payne 1995, 22).

7. At the lowest level, the IBGE calculates product prices (e.g., butter brand A, two hundred grams in Recife) as the arithmetic average of all the butters of that brand and size surveyed in Recife. At the item level (butter), brand and packaging differences are averaged out using, again, a simple arithmetic mean of all the products. It is only at the heading level that weights are introduced. For example, some seasonal headings, such as vegetables, use current-period weights and item prices, while others, such as butter, milk, and eggs, use previous-period weights. One of the indexes, the cost of living index for São Paulo (Indice de Preços ao Consumidor/Fundação Instituto de Pesquisas Economicas), uses a weighted geometric average at the heading level (IBGE 1990b, 173).

penditures in all cities total 100 percent. The weights reflect households earning one to forty times the minimum wage. In a later section, the price levels are reestimated using a set of expenditures that reflect only lower-income-household consumption patterns.

The prices are retail prices and, in many cases, linked to previously subsidized agricultural products such as wheat, whose internal demand has historically exceeded local supply. However, subsidies are generally implemented at a national level, and the variation in metropolitan retail prices will reflect how local prices adjust to federal policies. The effects of such policies on some of the major staples, such as rice and wheat, are discussed in more detail below.

Beginning in 1980, the government began reducing the wheat subsidies as part of an IMF agreement,[8] and, consequently, the prices of wheat-based products such as flour, bread, and pastas increased. Rice, on the other hand, remained subsidized, and the government paid higher-than-market prices in 1985, resulting in a large surplus and below-market prices at the retail level. This, in turn, led to scarcity by the end of the year, fostering another round of government purchases of rice, this time imported from Thailand (IBGE 1986). Other staples such as beans and coffee were also heavily controlled by government mechanisms. For example, a ceiling for retail profit margins was instituted in 1985 for a number of products, including meats and meat products, and imports were authorized for corn and soybean oil when prices began escalating owing to expected shortages (IBGE 1986). In addition, droughts in many Southern agricultural regions, such as São Paulo, Paraná, and Mato Grosso do Sul, led to losses in the coffee, bean, sugarcane, and orange harvests and further fueled increasing inflation rates (IBGE 1986). The government reacted by importing many of these goods in large quantities. But, because it was impossible to measure the actual extent of harvest loss or predict the resulting increase in demand, there were even larger distortions in market prices. For example, in 1987, the increase in the price of many of the agricultural products was due to an increase in distribution costs rather than scarcity (IBGE 1987).

Some service headings, such as urban bus fares and taxi fares, were also under regulatory price controls at various periods, most notably in 1986. This was also true of other years, such as the 1984 removal of a tax on automobiles purchased for public transport services, which in turn led to an oversupply and to a fall in taxi fares. In 1987, a fixed tariff on all cars was removed in an effort to boost demand in what had become an overheated economy following the Cruzado Plan, but this did not increase demand, and most of the automobile manufacturers suffered losses during the period (IBGE 1987). Other service headings in the sample (e.g., electricity, water, and sewer taxes) were also subject to some form of regulation but generally at the state or municipal level, so

8. Demand for wheat was approximately 7 million tons per year. The government bought national production and imported the remainder. The suppliers were paid an average of the internal market prices and those in effect for the imports. The wheat was then sold to the grain mills at a fifth of this price (IBGE 1988a, 35).

area differences were likely to remain. For the purposes of this study, the price levels are estimated first without the service headings; that is, only food products enter the sample. In the latter part of the study, the differences arising out of the price levels owing to the inclusion of the service headings are discussed in more detail.

As a first estimate of the general price level in each metropolitan area, I use a model based on the work of Summers (1973) and Kravis et al. (1975) for international comparisons: the country-product-dummy method, or CPD. The CPD consists of weighted least squares parameter estimates that calculate the countries' departure from the mean product prices; in this study, regions and areas are substituted for countries. Alternative estimators to the CPD are discussed in a later section.

The prices, in natural logarithms, for each item and each of the ten metropolitan areas are regressed on a set of dummy variables corresponding to the item headings and to one region:

$$\ln P_{ij} = \sum_{i=1}^{m} \beta_i X_i + \gamma_{\text{South}} Y_j + \varepsilon_{ij}, \tag{1}$$

where i (items) $= 1, 2, \ldots, 31$ and j (areas) $= 1, 2, \ldots, 10$. P_{ij} are the prices of each item at each location, and X_i are dummy variables such that $X_i = 1$ for observations on prices of items i and $X_i = 0$ for observations on prices of items other than i. The regional dummy Y_j is equal to one for observations on cities in the South ($j \in$ South) and zero for observations on cities in the base region, the North. For any one observation P_{ij}, only one X_i, and only one Y_j, is different from zero.

The observations are weighted by the expenditures on that item for a typical consumer in the area. These expenditure weights are derived from area weights published at the detailed level for approximately four hundred item headings (IBGE 1994).[9] The β's capture the expected average log price of the items for the base region, while γ reflects the regional effect. Thus, a negative coefficient on Y indicates that, on average, prices in the South are lower than those in the North. The antilog of the estimated coefficients gives us the expected item prices in cruzeiros (prior to 1986) and in cruzados (after 1986). For example, in 1986, the dummy coefficients for rice are $\beta_1 = 2.017$ and $\gamma = -0.087$, so the expected price of rice in the North is Cz$7.52, and prices in cities in the South are on average lower, by a factor of 0.92, or 8 percent.

Table 5.4 shows the ordinary least squares parameter estimate for the regional dummy variable for each year, with the corresponding t-value. The number of observations, n, is 230 (10 cities times 26 items minus missing values, which vary in number across cities).

The regional effect was negative in all years, indicating lower price levels in

9. The item's share of expenditures for each area is standardized so that the sample share totals 100.

Table 5.4 Parameter Estimates Equation (1), 1984–87

	1984	1985	1986	1987
γ_{South}	−.009	−.043	−.087**	−.043*
t-values	−.52	−1.91	−4.18	−2.32

*Significant at the 5 percent level.
**Significant at the 1 percent level.

the South. Also, the largest estimated difference between regions is in 1986, with price levels in the North exceeding those in the South by 8 percent on average. These results are somewhat surprising in that price levels in international studies tend to rise with increasing incomes, whereas, here, the higher price levels are associated with the poorer Northern region and the largest difference in price levels is 1986, the year of the price freeze. One factor that may contribute to the estimates of high price levels in poorer areas such as Belem and Salvador is that there are no service items included in the sample. Heston and Summers (1992) have shown that the price level of services at the country level tends to increase with higher real incomes. If this is true within Brazil, the inclusion of service headings should lower these differentials, and this is examined in the final section of the paper.

Another possibility is that the methodology of price collection and reporting may be such that the results reflect institutional bias or differences in data quality among the regional reporting agencies. But, if that is the case, one might expect the results to be conservative, that is, to show smaller differences in price levels between rich and poor regions and smaller variations immediately following the Cruzado Plan. On the other hand, given that wage adjustments are based on changes in the price indexes, it is hard to second-guess the possible direction of any bias. One obvious step toward a better sense of the overall interarea consumption price levels would be to obtain more detailed price data since the more detailed expenditure surveys are already available.

What is the pattern at the level of individual cities? Metropolitan area dummies are substituted for the regional dummy variable. The omitted area, São Paulo, is the base, and the coefficients indicate the approximate percentage difference in prices for each city from prices in São Paulo. These coefficients reflect the average difference in prices regardless of item. The estimating equation is rewritten as

$$\ln P_{ij} = \sum_{i=1}^{m} \beta_i X_i + \sum_{j=1}^{n} \gamma_j Y_j + \varepsilon_{ij}, \tag{2}$$

where j refers to areas or locations, as in equation (1), but $Y_i = 0$ for j equal to São Paulo and $Y_i = 1$ for all other areas. São Paulo was chosen as the base because it is the largest and most industrialized city in Brazil, located in the South. Recalling that the regional dummy coefficient previously estimated was negative for the Southern region, one would expect positive coefficients for the

Table 5.5 Parameter Estimates, Equation (2), 1987

	γ_j (*t*-values)	Price Level		γ_j (*t*-values)	Price Level
Brasilia (S)	.086*	109	Rio de Janeiro (S)	.014	101
	(2.30)			(.38)	
Salvador (N)	.076*	108	São Paulo (S)	0	100
	(2.00)				
Fortaleza (N)	.077*	108	Belem (N)	.0002	100
	(2.07)			(.00)	
Recife (N)	.071	107	Belo Horizonte (S)	−.010	99
	(1.87)			(−.26)	
Porto Alegre (S)	.034	103	Curitiba (S)	−.047	95
	(.91)			(−1.26)	
			Range (high-low) (%)		14

Note: S = South. N = North.

*Significant at the 5 percent level.

**Significant at the 1 percent level.

Northern cities in equation (2)—that is, unless São Paulo has relatively high prices compared to the average prices in the other Southern regions.

Table 5.5 shows the estimated γ_j parameters and their *t*-statistics as well as the corresponding antilogs (multiplied by 100) for 1987, the latest year available. Note that the β_i's are not given since they are simply the expected item prices in the base city. The cities are listed in decreasing-price-level order.

Brasilia's level is high, as expected, and three of the four cities in the North also have high levels. Conversely, the cities with the two lowest price levels are in the South: Belo Horizonte and Curitiba have an average level of 95, or 5 percent below that of São Paulo. The range of levels is 14 percent. Although the *t*-values are low for many of the cities, the estimated parameters are consistent with the regional results: high in the North, lower in the South.

The estimates for other years are shown in table 5.6, converted so that Brazil is the base with a price level of 100. The cities are listed by decreasing 1987 price levels.

Some of the causes of the fluctuating price levels were alluded to earlier, varying from federal control of the retail profit margins for meat products to IMF-related wheat subsidies. Broadly speaking, the only patterns that are constant for the four years are lower-than-average price levels for Belo Horizonte and Curitiba in the South and higher-than-average levels for Salvador and Recife in the North. This is consistent with the negative coefficients for the Southern regional dummy shown in table 5.4 above. Belem, also in the North, has the highest levels during 1985 and 1986, while Brasilia is highest in 1984 and 1987. The geographic isolation of both Brasilia and Belem may partially account for their higher food price levels. The largest increases over the period are also in the Northern cities: Fortaleza with 6 percent, followed by Salvador and Recife, each with 3 percent, and then Brasilia with 2 percent. These results suggest that the poorer areas are relatively more expensive, at least for basic

Table 5.6 **Area Food Price Levels (Brazil = 100)**

	Plan Year				
	1984	1985	1986	1987	1984–87
Brasilia (S)	104	99	101	106	+2
Fortaleza (N)	99	97	100	105	+6
Salvador (N)	101	103	109	104	+3
Recife (N)	101	102	101	104	+3
Porto Alegre (S)	101	95	93	100	−1
Rio de Janeiro (S)	102	99	96	98	−4
Belem (N)	101	109	111	97	−4
São Paulo (S)	98	100	103	97	−1
Belo Horizonte (S)	96	97	95	96	0
Curitiba (S)	96	99	91	92	−4
Brazil	100	100	100	100	
Range (%)	8	14	20	14	

Note: N = North. S = South.

Table 5.7 **1987 Nominal and Real Incomes**

	Nominal Income (Cz$)	Real Income (Cz$)	Real Rank
São Paulo (S)	14,509	14,968	1
Brasilia (S)	13,633	12,907	2
Curitiba (S)	11,881	12,849	3
Porto Alegre (S)	10,990	10,948	4
Rio de Janeiro (S)	10,227	10,402	5
Salvador (N)	10,880	10,401	6
Belo Horizonte (S)	9,878	10,290	7
Belem (N)	8,971	9,253	8
Recife (N)	7,996	7,682	9
Fortaleza (N)	7,170	6,846	10
Range	7,339	8,122	

Note: N = North. S = South.

food products, and that the Cruzado Plan did little to alleviate the differences in price levels between regions: for three of four cities (Fortaleza, Salvador, and Recife) it appears to have exacerbated the differential.

5.2.3 Interarea Income Differences

Do the higher food price levels imply that income differentials between regions are even greater than one would expect from examining the nominal income levels? That is, do the price levels lead to a greater range in real incomes than the range in nominal terms? Table 5.7 shows the 1987 mean monthly incomes in nominal and in real terms (adjusted by the food price levels).

The real income range increases by 10.7 percent, from Cz$7,339 to Cz$8,122, but, with the exception of Salvador and Rio de Janeiro, the relative rankings of the cities do not change. The differences are slightly more dramatic in 1985 and 1986: Belem's high price level in 1985 (109) results in a drop from a rank of sixth in nominal terms to a rank of eighth in real income terms. A similar drop occurs for Salvador in 1986, when its price level is also nearly 10 percent higher than the national average. Note that three of the four highest price levels were in the North and that the richest five cities are in the South.

5.3 Alternative Price-Level Calculations

5.3.1 Multilateral Methods

The CPD method essentially estimates the weighted mean difference between each area's weighted prices and those of a base area. Three alternative index number methods, the Geary method, the EKS method, and the Fisher averages,[10] are discussed below. The Geary method is the one used by the International Comparison Program at levels above the basic item heading, that is, for all aggregation levels, including total GDP. It consists of the solution for a set of $m + n$ equations as follows:

$$\pi_i = \frac{\sum_{j=1}^{n} \frac{p_{ij}}{\mathrm{PPP}_j} q_{ij}}{\sum_{j=1}^{n} q_{ij}}, \quad \mathrm{PPP}_j = \frac{\sum_{i=1}^{m} p_{ij} q_{ij}}{\sum_{i=1}^{m} \pi_i q_{ij}},$$

where m is the number of items and n the number of cities. The quantities q for each city are the value shares of expenditure—that is, the expenditure shares $(pq)_{ij}$ divided by the corresponding prices, p_{ij}. The resulting π_i's correspond to the price parameters β_i in the CPD method and the PPP_j's to the area dummy variables γ_j.

The second set of indexes are the Fisher indexes, constructed for each pair of cities as follows:

$$F_{jk} = \sqrt{\left(\frac{\sum_{i=1}^{m} p_{ij} q_{ik}}{\sum_{i=1}^{m} p_{ik} q_{ik}}\right) \times \left(\frac{\sum_{i=1}^{m} p_{ij} q_{ij}}{\sum_{i=1}^{m} p_{ik} q_{ij}}\right)},$$

where the summation is over the m items for which there are both price and expenditure data in both cities, and j, k denote cities. This results in an $n \times n$ matrix of binary price ratios between all possible pairs of cities. The elements of this matrix are used in the EKS comparison:

10. For a discussion of the CPD and the EKS, see Kravis, Heston, and Summers (1982, 88–89).

Table 5.8 1987 Price Levels—CPD, Geary, Fisher, and EKS

	CPD	Geary	Fisher	EKS	Range (%)
Brasilia (S)	106	105	106	106	1
Fortaleza (N)	105	105	107	105	2
Salvador (N)	104	105	102	103	3
Recife (N)	104	104	101	103	4
Porto Alegre (S)	100	100	100	100	0
Rio de Janeiro (S)	98	99	98	98	1
Belem (N)	97	97	101	101	4
São Paulo (S)	97	97	97	97	0
Belo Horizonte (S)	96	96	96	95	1
Curitiba (S)	92	92	92	93	1
Brazil	100	100	100	100	
Range (%)	14	13	15	13	

Note: N = North. S = South.

$$\mathrm{EKS}_{jk} = \left(\prod_{i=1}^{n} F_{ji} \times F_{ik}\right)^{1/n}.$$

The EKS comparison of city j relative to city k is the geometric average of all the possible binary indexes between j and k, with greater weight given to the direct j/k binary. Table 5.8 shows the 1987 indexes for all cities. They are normalized so that Brazil is one and are listed by decreasing CPD price-level estimates.

The estimates are fairly consistent for all cities, and the largest difference is 4 percent in Belem. In general, the larger differences are between the Fisher and the EKS methods and between the CPD and the Geary methods. This is because the Fisher and the EKS methods are based on binary price ratios, and, if there is a missing value in at least one city for one of the elements, the ratio is not computed. Thus, cities with more missing values are apt to have greater differences in their estimates.

5.3.2 Alternative Samples

The price levels discussed above were for food products in the sample. If services are included, will they affect the price levels in any systematic manner? For example, will they raise the levels in the higher-income cities and lower the price levels in the poorer regions? Data on prices and expenditures in the ten cities are available for four service headings, and they are added to the food item list. The headings are urban bus fares and taxi fares, water and sewage taxes, and electricity charges.

An additional three headings—bottled gas, gasoline, and cigarettes—were added to the food and service categories. Their prices were federally controlled and remained uniform across all cities. However, local expenditures on these items were not necessarily uniform, and, by including these weights in the

estimated price levels, we can see if their effect varies across the cities' consumption levels.

A final set of price-level estimates was obtained by applying a different expenditure survey to the initial food prices samples. This budget survey is based on households earning only one to five times the minimum salary, in contrast to the previous estimates, which were based on households earning one to thirty times the minimum salary. One reason for looking at this survey is to see how sensitive price levels are to the expenditure weights and also to see whether differences in prices are reflected in the consumption levels of a specific income group. Since price levels appear to be high in the poorer areas, do we expect them to be even higher for poorer households in poor areas, or will price-level differences be more marked in the larger and more wealthy cities? The estimates are shown in table 5.9 for 1987.

The two wealthiest cities, São Paulo and Brasilia, show a marked increase in price levels with the inclusion of the service headings (col. 1) and with the uniformly priced headings (col. 2). The two poorest areas, Fortaleza and Recife, have a corresponding decrease in price levels from about 5 percent above average to 3 percent below the national average. The only change that is not in the expected direction is for Curitiba, a city that is relatively wealthy but whose price level drops when services are included. The range in levels rises from 14 percent for food to 26 percent with services and to 33 percent with the additional controlled prices, but, if the two outliers in the South—Brasilia and Curitiba—are removed, the range does not vary so dramatically. Curitiba has a world-renowned public bus transport system, one that is both cheap and efficient (World Resources Institute 1996, 120). Brasilia, on the other hand, was planned on a scale that is not conducive to pedestrians or to transport modes other than the private automobile. In addition, the large influx of rural migrants in the 1980s led to inadequate and costly provision of public utilities such as water, sewage facilities, and electric power. For the other cities, the results

Table 5.9 **1987 Expanded Samples and Low-Income Budget**

	Food Plus Services	Food Plus Uniform Prices	Low-Income Budget Weights	Food Price Levels
Brasilia (S)	120	115	106	106
Salvador (N)	100	100	105	105
Fortaleza (N)	96	97	104	105
Recife (N)	97	97	105	104
Porto Alegre (S)	102	102	100	100
Rio de Janeiro (S)	101	101	99	98
Belem (N)	98	99	96	97
São Paulo (S)	104	104	97	97
Belo Horizonte (S)	95	96	96	96
Curitiba (S)	87	89	93	92
Range (%)	33	26	13	14

Note: N = North. S = South.

suggest that disparities between the North and the South remain but that the higher service prices in the wealthier cities and the lower service prices in poorer cities lead to smaller overall price-level differences, a result that is consistent with international price-level studies.

With respect to the low-income budget survey, the largest differences in expenditures are in the following headings: rice, potatoes, *chã-de-dentro* (a choice cut of meat), dried meat, chicken, and pasteurized milk. The lower-income households showed an increase in rice, dried meat, and chicken consumption for most of the cities and an across-the-board decrease in the proportion spent on prime beef such as *chã-de-dentro* and on pasteurized milk. The maximum difference was almost 4 percent less on choice cuts, especially in the North, and increases between 2 and 3 percent in the consumption of chicken. The total proportion of the household budget spent on food averaged about 20 percent.

Although the differences in consumption levels between the two samples are not trivial, differentials between the two price levels are much smaller, not exceeding 1 percent. The direction of change is positive, that is, higher, for one of the poorer cities, Recife, but lower for another poor city, Fortaleza. In other words, in Recife, expenditures of low-income groups on staples such as chicken and rice outweighed those on products such as prime beef. But the reverse was true of another relatively poor area, Fortaleza. There is no apparent change in Brasilia or São Paulo and only a slight increase in levels for Curitiba.

5.4 Conclusion

The first part of this paper discussed the motivation for examining price levels in a country such as Brazil and some of the reasons why price-level changes might be particularly interesting to study during the period 1984–87. It also raised the issue of North-South differentials and whether regional income differences might be understated if price levels are not taken into account. However, since the data are predominantly for food prices and the sample is not very large, the price levels were estimated using alternative aggregation methods and an expanded set of headings and expenditure weights.

Brazil is a geographically large and diverse country, and its economic history has included a widening gap between Northern and Southern regions. The changeover from a military dictatorship to a civil regime in the early 1980s led to changes in federal policies and subsidies, many of them in the agricultural sector. Since prices were highly politicized, there have been few studies of the internal price structure of large cities within Brazil. The period was also one in which inflation rates rose and some drastic measures were instituted in an effort to contain prices. The first major one was the 1986 Cruzado Plan. The effects of the plan varied. For example, lower financing costs and interest rates and a decrease in risk with respect to agricultural loans positively affected many rural production areas. But the price freeze led to lower margins between the prices received by producers and those charged to consumers, resulting in

conflicts between different sectors of the market. The price freeze also increased the demand for food products, and the inelasticity of the short-run supply caused tremendous pressure on the prices, culminating in the hyperinflation of the late 1980s (IBGE 1987).

One of the interesting findings of this paper was that poorer cities did tend to have higher food price levels, on average, than the cities in the wealthier Southern regions. Thus, real income differentials were greater and the North-South income gap wider when adjusted for relative food prices. This finding was true of all the years, but the differential was higher in the period of escalating inflation rates. In addition, the highest overall change between 1984 and 1987 occurred in the Northern cities of Fortaleza, Salvador, and Recife, all of which saw increases of at least 3 percent in the overall food price level. In contrast, most of the wealthy Southern cities experienced a decrease in their food prices.

Although the small sample size and missing values possibly affected the results, different aggregation methods did not produce substantively different results, with a generally higher range among the Northern cities. The price levels for food were then compared to a set of price levels from an expanded set of items and to price levels based on the consumption patterns of a low-income population group. The first set of expanded items included nonfood items and service headings, such as utilities and public transport, and it raised the price level significantly in the high-income areas, most notably in São Paulo and Brasilia. The second set added items that were uniformly priced (but consumed at different quantities), such as bottled gas and cigarettes. The effect of these uniform prices varied, increasing price levels in the poorer cities and lowering them marginally in the wealthier areas. Finally, a set of estimates based on a lower-income-household survey showed that, although expenditures varied by about 4 percent for some items, this did not translate into a visible pattern with respect to average incomes and the price levels. There was no a priori expectation, but a higher low-income food price level for poorer areas would indicate greater disparities in income levels within a city. However, there was both an increase in food price levels in some of the wealthier areas, Curitiba and Rio de Janeiro (suggesting that the poor are worse off than the average population), and a decrease in some of the poorer cities, such as Fortaleza.

International price-level studies have also found a correlation between service price levels and incomes, one that may lead to a convergence of overall price levels in the long run. In some cities in the United States, low-income consumers faced higher food costs than middle-income shoppers, 9 percent in New York City and up to 28 percent in Los Angeles (Alwitt and Donley 1996, 127), in part due to the existence of fewer large retail outlets in poorer neighborhoods. With respect to low-income expenditures, the results for Brazil are not sensitive to within-area differences in consumption patterns, but they do suggest that, in the very poor cities, the cost of purchasing basic food products may be even higher than expected. Another reason for these differences may

be due to higher distribution and transportation costs in the Northeast and Northern regions. Given these preliminary findings, it would be interesting to examine price differentials further using a more comprehensive list of items as well as explicitly modeling some of the locational effects, for example, to see whether distance or transport costs directly affect the price-level estimates.

Appendix

Table 5A.1 **Expenditure Weights**

Item	Weight (average)
1 Cereals	6.52
2 Sugars	1.49
3 Vegetables	2.05
4 Fruits	1.45
5 Fish	2.23
6 Meats	7.62
7 Poultry	2.95
8 Milk products	2.22
9 Breads	1.68
10 Oils	.65
11 Beverages	1.92
12 Canned goods	.97
13 Meals	8.16
14 Rents	4.01
15 Household supplies	1.71
16 Gas & electricity	1.17
17 Furniture	1.81
18 Household furnishings	2.41
19 Household appliances	1.94
20 Electronic equipment	1.17
21 Clothing	9.12
22 Shoes & miscellaneous	3.35
23 Accessories	1.28
24 Public transport	3.39
25 Private transport	6.19
26 Fuel	2.13
27 Postage	.63
28 Pharmaceutical products	2.16
29 Medical: doctors & labs	1.65
30 Hospitals	1.47
31 Personal hygiene	1.85
32 Personal services	3.97
33 Recreation	3.95
34 Cigarettes	1.21
35 Educational materials	3.49
Total	100.00

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Comment

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It has been unfortunate that, over the years, very little attention has been given to price differences among different areas of the same country. This is even

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more so if developing countries are considered. This is why price comparisons for various regional concepts in one of the major developing nations, namely, Brazil, are a welcome addition to the literature, particularly when a paper of the general quality of that commented on here comes along.

Notwithstanding the above, major limitations still affect this research subject. The first and foremost limitation is data availability and quality. No empirical study can rise above the quality of the basic statistics collected. When the information concerns developing countries and is of a weaker quality, it is incumbent on the researcher to explain fully the sources used. Aten does not do so adequately in her succinct contribution. The figures are manipulated to obtain many kinds of results based on small baskets of commodities, for subsets of goods and services and various index number formulas. This is a heavy burden to place on statistics that are not considered reliable by Brazilian regional economists and are gathered for time-series price index calculations, not interregional comparisons.

The first of the detailed results presented by the author is that the prices for food products are higher in the poorer regions of Brazil, the North and Northeast, than in the South. This goes against the grain of international and interregional research (see Food and Agriculture Organization 1988). This finding is predicated on the specification of more or less similar-quality goods across space. From the information provided, it is not possible to determine whether incomparability in specifications is the source of the incongruence, but this is likely since the objective of the price collection is to trail the trending of prices over time. Another explanation of this *contrario sensu* behavior of the interarea food comparisons in Brazil is the paucity of information provided for twenty-six items with practically no identification except quantities and weights. The small number of products comes with a practically unexplained weighting system (see the appendix). The weighting patterns are depicted sometimes as covering families earning from one to thirty (or forty) times the minimum wage, but it is unclear whether the same weights apply to those with incomes ranging between one and five times the minimum wage.

In addition, it is found that there are significant differences in the results over the four-year period considered. The intercept-dummy variables used to measure average price differences have a range that is a multiple of ten (see table 5.4). How can such discrepancies in regional differentials exist without exchange rate distortions during a three-year time span? If comparisons are made with strictly designed interspatial price indexes,[1] it is found that there is substantial stability in the results.

The parameter estimates on which the interregion and city price differences are based (the intercept dummies) are seldom significant at the 5 percent level (see table 5.5). Moreover, they show a remarkable variability over the four years. And why are we not given the four-year information for the estimates at

1. Consult comparisons reported for Florida in Simmons (1988).

the city level, rather than only the one year shown in table 5.5? This was done for the North-South differentials shown in table 5.4.

It would have been useful to carry out both analyses jointly by combining the city and the region differences into a measurement of both intercept and slope dummies. In this fashion, the interactions between urban and geographic areas could have been more clearly spelled out. It may have been possible to determine which cities contributed to the regional differentials the most and how the two variables interacted with one another. Perhaps there were not enough degrees of freedom for this type of flexible pooling, but, again, no information is given by the author on this matter. On this point, as on many others, no details are available about the different procedures presented in the chapter and about the estimates obtained[2] in it. This makes it practically impossible to validate or replicate the study.

One of the major results that the research emphasizes is that the price levels widen the income discrepancies across cities.[3] But how can a set of price-adjustment factors for food reflecting less than 20 percent of family expenditures be used to express interspatial income differences in real terms? Such interarea price deflators should be applied only to food expenses in the various cities and regions. Thus, the conclusion is flawed *ab initio,* and this would calm the fears of the reader that evidence has been found, contrary to what is usually reported in the literature, with respect to international and interregional comparisons.

Perhaps the most enlightening table of the nine presented is table 5.9. It uses weights from low-income families in contrast to previous results (i.e., families earning just up to five times the minimum salary rather than thirty or forty times). As expected, with the inclusion of services, the rich Southern cities become the more expensive ones. If the weights had encompassed the richer families, at least similar results would have been expected because they consume as many or more services than the lower classes in both quantities and expenditures, according to national surveys (see Salazar-Carrillo 1990). (It is unclear from table 5.9 and the accompanying text which weights are used; conflicting relative intercity price ranges are also reported.) But it is important that services consist of only four items, and those tend to be regulated because they constitute public services. With the major changes obtained with just a slight expansion of the basket, it could be expected that very different results would be forthcoming if other goods and services were to be included.

A result that the author should have stressed more is that, at least between the years 1984 and 1987 inclusive (however special these years were because of the Cruzado Plan and its descendants and the existing political instability in Brazil), there is no convergence of income and price levels among the cities

2. Most egregious, is the Brazil base in table 5.8 a simple or a weighted mean?

3. Presumably, this would also happen for the two regions distinguished since the cities are classified as belonging to either the North or the South. This assures that the two results must be consistent and thus cannot be used to validate one another, as is alleged.

Table 5C.1 **Items Originating in the South**

1. Rice	7. Lettuce	13. Chicken
2. Pastas	8. Refined sugar	14. French rolls
3. Corn meal	9. Pork (boneless)	15. Butter, margarine
4. Potatoes	10. Meat (*pa*)	16. Ground coffee
5. Tomatoes	11. Sardines	17. Gasoline
6. Onions	12. Salted meat	18. Cigarettes

examined. But, again, this may just be a reflection of the fact that the data at hand were designed, not to measure this phenomena, but rather to track intertemporal movements of prices. This is particularly evident if the source of the food items is considered: a great majority are Southern Brazilian products transported to the Northern cities (this is also true of about half the remaining services and nondurable goods). In table 5C.1, these products are identified. Therefore, what the differentials across cities in the North and South are probably measuring is transportation cost, very partially compensated for by the opposite effect with respect to services.

In a country like Brazil, one that does not have regional product and income accounts, little could have been expected to result from an interarea price comparisons exercise. As Aten admits, the data are predominantly for food prices, and the sample is not very large. However, this paper represents a good beginning, and it may prompt the national statistical institute (IBGE) to improve its collection efforts in this regard. However, the paper falls far short of what could have been expected in the description and explanation of the information utilized for the reader of this volume—and even more so if validation and replication are considered. Sophisticated estimation cannot rise above the weakness of the figures used.

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