# 3

# The Broad World Price Band

To calculate the potential static benefits of approaching (but certainly not reaching) the Law of One Price, we used a detailed price data set collected by the Economist Intelligence Unit (EIU).[1] The dataset includes prices of 157 narrowly defined consumer goods and services in 109 cities located in 70 countries around the world (see table A.1, appendix A). We group the items into eight sectors of predominantly tradable consumer goods, and seven sectors of predominantly nontradable services. Table A.1 in appendix A lists the items within each sector (shown in boldface type), and identifies the items that are excluded from our benefit calculations. One excluded category is nontradable services, identified by the letter N. The other excluded category comprises items that are highly and differentially taxed (cigarettes, whiskey, and gasoline), identified by the letter H. Both categories are excluded from the benefit calculations, because trade and investment barriers and cartels may not be the main reason for price divergence.

We should add a further remark on the distinction between tradable and nontradable products. In reality, no sharp line separates the two. Every item sold at retail embodies a large amount of nontradable inputs, namely the costs of wholesale and retail distribution. On the other hand, most nontradable services embody significant tradable inputs. Electricity, for example, requires fuel (such as coal or oil), power plants, transmission lines, and transformers, which are all tradable goods. Ideally, we would compare prices after stripping out the nontradable component, either at the front end or back end of the production process. Instead, we have simply

1. We scrubbed the data set provided by the Economist Intelligence Unit for obvious anomalies (mainly problems with exchange rate conversions) before doing the benefit calculations.

applied a crude distinction between tradable and nontradable products, and then excluded nontradable items from our calculations. Likewise, instead of stripping out high excise taxes from items such as cigarettes, we have simply excluded high-tax items from our main calculations.

The regression analysis that we present later suggests, however, that extreme price divergence among nontradable items and highly taxed items is explained by essentially the same forces as extreme divergence among tradable items. Also, table D.1 in appendix D presents the potential static benefits from "total" price convergence, including high-tax items and some service sectors, but excluding domestic help, entertainment, and housing. (We excluded these three sectors from our "total" price convergence calculations because they are dominated by labor and real estate costs.) The research of Parsely and Wei (1996) shows that service prices within the United States converge, though at a slower rate than goods prices. Hence, we believe the potential benefits calculation presented in tables 1.1, 1.2, and 1.3 are understated by the exclusion of nontradable products from the calculations. However, as a practical matter, the calculated benefits increase only marginally by adding service sectors and high-tax items in making the "total" price convergence calculations (compare tables 1.1 and D.1).

Since the early 1980s, the EIU has collected detailed consumer price data annually in order to calculate cost-of-living indexes for MNEs that move their professionals and executives from place to place around the world. The price figures are collected by EIU survey teams working in designated cities. The teams are instructed to find local prices of tightly specified consumer goods and services. We used the price set for 1999 to calculate the benefits of price convergence.

Based on US experience, only about 30 percent of merchandise trade consists of final consumer goods. Approximately 15 percent of merchandise trade is capital goods, while the remaining 55 percent is intermediate goods (Huether and Richardson 2000). Our dataset is limited to final consumer products, and does not cover intermediate or capital goods. In the analysis that follows, we boldly assume that the items in the EIU dataset represent the extent of price divergence for all final consumer goods in each country. We do not make an explicit assumption about price divergence among intermediate or capital goods. However, our calculations for price convergence in consumer goods indirectly presuppose an unknown degree of price convergence among intermediate and capital goods, because these are input costs in the production of consumer goods.

Other datasets are available that could be used for this analysis. One prominent alternative is the price data on 150 final products (consumer goods and capital goods) in 60 countries, collected by the OECD and the United Nations. This dataset was pioneered by Kravis, Heston, and Summers (1978) for the purpose of calculating PPP exchange rates, and has subsequently been updated by the two institutions. We hope that our

study will provoke other researchers to improve upon the analysis by examining the OECD/UN datasets (among others), using more sophisticated models.[2]

That said, our analysis is based on the EIU dataset for consumer goods. We calculate the potential benefits of price convergence city by city, and then aggregate the results to illustrate the impact on a country, regional, and world basis. To repeat, in these calculations, we excluded the designated nontradable services and highly taxed items in table A.1 (appendix A). We then assumed that the remaining 105 products in the EIU dataset are, in a very limited sense, representative of tradable consumer goods.

In the interest of clarity, we shall restate our assumption about the representative character of EIU price data. We assumed that all consumer goods in each country exhibit roughly the same extent of price divergence as the 105 tradable items in the dataset. The EIU products are chosen based on an executive's lifestyle, which obviously differs from the average person's consumption pattern. Moreover, the number of products in the EIU dataset is far smaller than the number of products consumed in the real world. However, the EIU dataset covers a decent range, from basic products (e.g., spaghetti and laundry detergent) to luxury products and consumer durables (e.g., wine and compact cars). Our core assumption is that the extent of cross-city divergence in these prices roughly represents the extent of cross-city divergence in prices of the much larger range of tradable goods consumed by the entire population.

For the purpose of our calculations, we first computed the consumption weights as a percentage of GDP for each boldface sector in table A.1 (appendix A). These sector weights appear in table 3.1 for three countries: the United States, Mexico, and India. We assume that the sector weights for the United States apply to all rich countries, the sector weights for Mexico apply to all middle-income countries, and the sector weights for India apply to all poor countries. Within each sector, we assign an equal weight to each of the items in the EIU dataset. In other words, within the processed foods sector, we give equal weights to bread, butter, cheese, corn flakes, and all the other items. We do not suppose that expenditure on olive oil, for example, is as large as expenditure on bread. However, we assume that the price divergence for olive oil is as representative of price divergence within the overall processed foods sector as the price divergence for bread.

As the next step in the calculation, we make a speculative guess as to the extent of "natural" price divergence in a world economy that is free of policy barriers, highly competitive, and integrated by global corporations and e-commerce, but still separated by country-specific and city-specific forces and frictions. We postulate that dismantling all policy barriers,

2. Lawrence and Bradford (forthcoming), for example, are analyzing the price data underlying OECD purchasing power parity estimates to simulate the impact of wholesale price convergence across major economies.

**Table 3.1 Consumption patterns** (percent of GDP)

| Sector | Consumption share of GDP (percent) | | | | | | Average coefficients of price variations in sector | |
|---|---|---|---|---|---|---|---|---|
| | High-income countries[a] | | Middle-income countries[b] | | Low-income countries[c] | | | |
| | Total group share | Share per item | Total group share | Share per item | Total group share | Share per item | Market exchange rate | PPP exchange rate |
| Processed foods | 2.7 | 0.2 | 6.5 | 0.4 | 13.4 | 0.8 | 1.98 | 1.09 |
| Fresh vegetables and fruit | 1.7 | 0.2 | 4.2 | 0.4 | 8.7 | 0.8 | 2.08 | 0.90 |
| Meat and fish (fresh or frozen) | 3.0 | 0.2 | 7.2 | 0.4 | 15.0 | 0.8 | 1.91 | 0.76 |
| Beverages | 3.0 | 0.2 | 3.7 | 0.2 | 2.8 | 0.1 | 2.09 | 1.14 |
| Household items | 11.6 | 0.6 | 9.1 | 0.5 | 5.5 | 0.3 | 2.83 | 0.91 |
| Cigarettes and tobacco | 0.8 | 0.3 | 0.6 | 0.2 | 4.5 | 1.5 | 1.16 | 0.65 |
| Clothing | 3.6 | 0.2 | 3.2 | 0.2 | 5.0 | 0.3 | 1.19 | 0.74 |
| Automobiles | 3.8 | 0.9 | 1.3 | 0.3 | 0.2 | 0.1 | 1.70 | 1.06 |
| Books and newspapers | 2.6 | 0.7 | 1.3 | 0.3 | 0.5 | 0.1 | 0.53 | 0.77 |
| Dry cleaning, haircut, and other services | 4.6 | 0.7 | 2.0 | 0.3 | 1.5 | 0.2 | 0.83 | 0.69 |
| Domestic help | 2.0 | 0.7 | 0.9 | 0.3 | 0.8 | 0.3 | 0.90 | 0.58 |
| Entertainment, meal, and hotel | 7.2 | 0.7 | 3.5 | 0.3 | 2.1 | 0.2 | 1.43 | 0.79 |
| Transportation | 6.0 | 0.7 | 3.1 | 0.3 | 1.6 | 0.2 | 1.77 | 0.99 |
| Housing | 11.4 | 1.4 | 10.3 | 1.3 | 1.0 | 0.1 | 1.16 | 1.52 |
| Utilities | 3.9 | 0.6 | 8.2 | 1.4 | 11.3 | 1.9 | 1.58 | 1.00 |
| **Total for calculated sectors** | 29.5 | 2.4 | 35.2 | 2.3 | 50.7 | 3.2 | | |

PPP = purchasing power parity

a. Based on the United States.
b. Based on Mexico.
c. Based on India.

*Source:* Authors' calculations based on UN national accounts data.

accompanied by a high degree of competition and the spread of global corporations, would establish a broad world price band (BWPB) for each product. In free and competitive markets, the width of the BWPB would reflect the persistent country-specific and city-specific forces and frictions.

Appendix B explains our calculation of the BWPB in detail, and table A.1 in appendix A presents the BWPB for each product. In short, we define the BWPB for product *i* as the average price for product *i* in 17 US cities in the EIU dataset plus or minus two standard deviations of the prices observed among those 17 US cities.[3] A glance at table A.1 in appendix A shows that the upper margin of the band is often two to four times the lower margin. Moreover, the upper (lower) margins of the BWPB are often higher (lower) than the extreme prices observed in the 17 US cities. Only 4.3 percent of observed values in the 17 US cities exceed the upper or lower margin of the BWPB. These comparisons underscore the fundamental point that our working hypothesis—convergence to the BWPB in a world of free trade, free investment, and e-commerce—is not an extreme proposition. This degree of convergence simply corresponds to the extent of convergence already experienced within the United States.[4]

Centering the BWPB on US experience implies that, in a competitive and free world economy, prices elsewhere that are above or below the BWPB would converge toward the upper and lower margins of US experience, rather than, for example, to the upper and lower margins of Indian experience. To restate this proposition, when the dollar price of product *i* in city *n* is above or below the BWPB, we presume that the price in question will fall or rise to the margins of a band centered on average US prices. This simplistic assumption is debatable. However, given the size of the US economy, together with the size of European and Canadian economies that have somewhat similar price structures, constructing the BWPB around US experience positions the hypothetical price band at the economic center of gravity in the world economy. Essentially we are saying two things. First, liberalization will affect prices elsewhere more than in the United States, Canada, or the European Union. Second, the extent of price divergence found among 17 US cities defines the extent of price divergence that would prevail worldwide if barriers were eliminated and a reasonable degree of competition prevailed.

3. For a few items, the average US price minus two standard deviations produces a negative number. In those few cases, we made an adjustment by deleting extreme prices from the data, such as the rental rate on a two-bedroom apartment in New York City. These anomalous items are concentrated in nontradable services, which in any event are excluded from our benefit calculations. See appendix A for the list of products for which adjustments were made.

4. As a matter of reference, table A.2 provides the broad world price band values constructed around the European price experience (EU-11). As might be expected, the EU-based BWPB is usually wider than the US-based BWPB.

## Appropriate Exchange Rates

In order to compare local prices to the BWPB, the local price must first be converted into US dollars. For this part of the calculation, we use two different exchange rates. The market exchange rate is taken from the *Financial Times* during the week of the EIU price survey. In addition, we have PPP exchange rates, calculated and supplied by the EIU (table 3.2). (The correlation between EIU PPP rates and World Bank PPP rates is 0.99.)[5] The reason for using PPP rates is to "wash out" the extent of price divergence between countries that corresponds to the difference between market exchange rates and PPP rates.

Table 3.3 presents the two different exchange rates for 1999: the market exchange rates and the EIU PPP rates for the 73 covered countries.[6] The last column of table 3.3 shows the type of exchange rate regime each country adopts: fixed, limited flexible, managed flexible (e.g., crawling peg), and independent float.

Simple regression analysis suggests that the difference between market exchange rates and EIU PPP rates is largely determined by a country's income level. This familiar finding can be traced to Balassa (1964) and Samuelson (1964).[7] A choice of exchange rate system (floating, fixed, etc.) does not appear to affect the wedge between market rates and PPP rates (see appendix C).[8]

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5. Using the famous "Big Mac" index, we also computed the implied Big Mac PPP exchange rates for 36 countries (see table 3.2). The foot of table 3.2 shows correlation coefficients between market exchange rates, EIU PPP rates, and Big Mac PPP rates. The correlation between market exchange rates and Big Mac PPP rates is 0.97. The correlation between EIU PPP rates and Big Mac PPP rates is 0.76 (see table 3.2). The comparison suggests that the Big Mac index reflects market exchange rates to a greater extent than it reflects EIU PPP rates. Cumby(1996), in fact, found that the half-life of market exchange rate deviations from Big Mac parity is about one year, shorter than the four- to five-year half-life of deviations from purchasing power parity.

6. All exchange rates are expressed in local currency units per US dollar. A higher figure, therefore, indicates a less valuable local currency.

7. See Pelkmans, Gros, and Ferrer (2000, annex 1) for an exposition of the Balassa-Samuelson effect. The basic argument has three parts: (1) labor productivity is low in poor countries; (2) hence, money wages translated at the market exchange rate are low; and (3) nontraded goods are far more labor intensive than traded goods. Consequently, prices at market exchange rates for nontraded goods are far below PPP prices. Since nontraded goods are a big part of the consumption basket, the PPP exchange rate has a higher value than the market exchange rate.

8. This finding implies that the adoption of an alternative exchange rate system (such as the system of target zones advocated by Williamson [2000]) would not significantly impel market exchange rates to approach PPP levels.

## Table 3.2 Big Mac Index and the Economist Intelligence Unit PPP rates

| Country | Market exchange rate (local currency per US dollar) | Price of Big Mac | | Implied Big Mac rate (local currency per US dollar) | EIU PPP rate (local currency per US dollar) |
|---|---|---|---|---|---|
| | | In US dollars | In local currency | | |
| **High-income countries** | | | | | |
| Austria | 13.3 | 2.6 | 35.1 | 14.4 | 13.7 |
| Belgium | 39.1 | 2.6 | 102.9 | 42.2 | 36.8 |
| China (Hong Kong) | 7.8 | 1.3 | 10.2 | 4.2 | 7.1 |
| Denmark | 7.2 | 2.6 | 19.0 | 7.8 | 8.3 |
| France | 6.4 | 2.6 | 16.7 | 6.9 | 6.4 |
| Germany | 1.9 | 2.6 | 5.0 | 2.0 | 2.0 |
| Greece | 320.0 | 2.0 | 649.6 | 266.2 | 264.9 |
| Israel | 4.2 | 3.5 | 14.5 | 6.0 | 3.5 |
| Italy | 1,877.9 | 2.6 | 4,938.9 | 2,024.2 | 1,623.1 |
| Japan | 104.0 | 2.9 | 296.4 | 121.5 | 159.6 |
| Netherlands | 2.1 | 2.6 | 5.6 | 2.3 | 2.1 |
| Singapore | 1.7 | 1.9 | 3.2 | 1.3 | 2.0 |
| Spain | 161.0 | 2.6 | 423.5 | 173.6 | 127.5 |
| Sweden | 8.4 | 2.6 | 22.0 | 9.0 | 9.5 |
| Switzerland | 1.6 | 2.6 | 4.1 | 1.7 | 2.0 |
| Taiwan | 30.7 | 2.3 | 70.3 | 28.8 | 20.0 |
| United Kingdom | 0.6 | 3.1 | 1.9 | 0.8 | 0.7 |
| United States | 1.0 | 2.4 | 2.4 | 1.0 | 1.0 |
| **Middle-income countries** | | | | | |
| Argentina | 1.0 | 2.5 | 2.5 | 1.0 | 0.7 |
| Brazil | 1.9 | 1.6 | 3.0 | 1.2 | 0.9 |
| Chile | 529.0 | 2.4 | 1,259.0 | 516.0 | 175.6 |
| Colombia | 1,919.0 | 2.2 | 4,241.0 | 1,738.1 | 577.9 |
| Czech Republic | 35.1 | 1.6 | 54.4 | 22.3 | 16.9 |
| Egypt | 3.4 | 1.9 | 6.5 | 2.7 | 1.5 |
| Hungary | 246.0 | 1.2 | 292.7 | 120.0 | 136.5 |
| Korea | 1,135.0 | 1.8 | 2,020.3 | 828.0 | 667.3 |
| Malaysia | 3.8 | 1.2 | 4.5 | 1.9 | 1.2 |
| Mexico | 9.6 | 2.1 | 20.2 | 8.3 | 5.1 |
| Philippines | 40.2 | 1.4 | 54.7 | 22.4 | 10.8 |
| Poland | 4.1 | 1.3 | 5.5 | 2.3 | 2.2 |
| Russia | 27.3 | 1.2 | 33.3 | 13.7 | 7.0 |
| South Africa | 6.1 | 1.5 | 8.9 | 3.7 | 2.5 |
| Thailand | 37.2 | 1.5 | 55.1 | 22.6 | 11.6 |
| Turkey | 536.7 | 1.2 | 649.4 | 266.2 | 216.5 |
| **Low-income countries** | | | | | |
| China | 8.3 | 1.2 | 9.9 | 4.1 | 1.5 |
| Indonesia | 7,195.0 | 2.1 | 14,749.8 | 6,045.0 | 1,908.4 |

PPP = purchasing power parity

Note: Correlation between market exchange rates and Big Mac PPP = 0.97; correlation between EIU PPP rates and Big Mac PPP rates = 0.76 (both significant at the 95 percent level of confidence).

*Sources: For Big Mac Index: The Economist,* 8 January 2000, 100; *for market exchange rate:* various issues of *Financial Times; for EIU PPP rate:* Economist Intelligence Unit; *for implied Big Mac rate:* authors' calculations.

**Table 3.3 Exchange rate comparisons**
(local currency units per US dollar, 1999)

| Country[a] | Market rate[b] | EIU PPP rate[c] | Exchange rate regime[d] |
|---|---|---|---|
| **High-income countries** | | | |
| Australia | 1.6 | 1.4 | IFL |
| Austria | 12.7 | 13.7 | FX |
| Belgium | 37.2 | 36.8 | FX |
| Canada | 1.5 | 1.2 | IFL |
| China (Hong Kong) | 7.8 | 7.1 | FX |
| Denmark | 6.9 | 8.3 | LF |
| Finland | 5.5 | 6.0 | FX |
| France | 6.1 | 6.4 | FX |
| Germany | 1.8 | 2.0 | FX |
| Greece | 296.6 | 264.9 | LF |
| Ireland | 0.7 | 0.7 | FX |
| Israel | 4.0 | 3.5 | MF |
| Italy | 1,784.5 | 1,623.1 | FX |
| Japan | 122.3 | 159.6 | IFL |
| Kuwait | 305.3 | 173.5[e] | FX |
| Luxembourg | 37.2 | 38.8 | FX |
| Netherlands | 2.0 | 2.1 | FX |
| New Zealand | 1.9 | 1.4 | IFL |
| Norway | 7.9 | 9.5 | MF |
| Portugal | 184.8 | 125.3 | FX |
| Singapore | 1.7 | 2.0 | MF |
| Spain | 153.3 | 127.5 | FX |
| Sweden | 8.2 | 9.5 | IFL |
| Switzerland | 1.5 | 2.0 | IFL |
| Taiwan | 33.2 | 20.0 | IFL |
| United Arab Emirates | 3.7 | 3.7 | LF |
| United Kingdom | 0.6 | 0.7 | IFL |
| United States | 1.0 | 1.0 | IFL |
| **Middle-income countries** | | | |
| Algeria | n.a. | 19.8 | MF |
| Argentina | 1.0 | 0.7 | FX |
| Bahrain | 377.0 | 233.3[e] | LF |
| Brazil | 2.0 | 0.9 | IFL |
| Chile | 499.1 | 175.6 | MF |
| Colombia | 1,550.3 | 577.9 | MF |
| Costa Rica | 272.6 | 115.6 | MF |
| Czech Republic | 34.5 | 16.9 | MF |
| Ecuador | 12,000.0 | 2,720.0 | MF |
| Egypt | 3.4 | 1.5 | FX |
| Guatemala | 6.8 | 2.7 | IFL |
| Hungary | 233.4 | 136.5 | MF |
| Iran | 3,000.0 | 1,035.5 | FX |
| Jordan | 711.5 | 324.4[e] | FX |
| Korea | 1,241.8 | 667.3 | IFL |
| Malaysia | 3.8 | 1.2 | FX |
| Mexico | 9.9 | 5.1 | IFL |
| Panama | 1.0 | 0.4 | FX |
| Paraguay | 2,902.5 | 1,338.0 | MF |
| Peru | 3.4 | 1.5 | IFL |
| Philippines | 39.2 | 10.8 | IFL |
| Poland | 3.9 | 2.2 | MF |
| Romania | 13,335.0 | 5,602.1 | MF |

*(table continues next page)*

**Table 3.3** *(continued)*

| Country[a] | Market rate[b] | EIU PPP rate[c] | Exchange rate regime[d] |
|---|---|---|---|
| Russia | 1.0 | 0.7[e] | MF |
| Saudi Arabia | 3.8 | 2.4 | LF |
| Serbia | 10.7 | n.a. | LF |
| South Africa | 6.2 | 2.5 | IFL |
| Sri Lanka | 69.7 | 21.4 | MF |
| Thailand | 37.5 | 11.6 | IFL |
| Tunisia | 1.2 | 0.5 | MF |
| Turkey | 359.9 | 216.5[e] | MF |
| Uruguay | 11.1 | 8.4 | MF |
| Venezuela | 576.4 | 329.2 | MF |
| **Low-income countries** | | | |
| Bangladesh | 48.5 | 13.9 | FX |
| Cameroon | 604.5 | 178.1 | FX |
| China | 8.3 | 1.5 | FX |
| India | 42.5 | 9.9 | IFL |
| Indonesia | 8,885.0 | 1,908.4 | IFL |
| Kenya | 63.6 | 20.1 | MF |
| Nigeria | 87.8 | 35.5 | MF |
| Pakistan | 49.9 | 13.4 | MF |
| Vietnam | 13,898.0 | 2,612.2 | LF |
| Zimbabwe | n.a. | 7.1 | IFL |

n.a. = not available

a. Countries are organized alphabetically within income groups. Income groups are determined by per capita GDP, using World Bank PPP rates.
b. Market rates used by the Economist Intelligence Unit (EIU) for translating the 1999 survey results into dollar prices.
c. EIU PPP rates were calculated by EIU.
d. Exchange rate regimes are divided into four types: IFL (independently floating), the most flexible exchange rate system; MF (managed floating), including (a) crawling peg, (b) exchange rates within crawling bands, and (c) managed floats with no preannounced path; LF (limited flexibility), pegged exchange rates within bands that do not change (or crawl) over time; and FX (fixed), including (a) exchange arrangements with no separate legal tender (dollarization), (b) currency board arrangements, and (c) conventional fixed pegs.
e. For consistency with the market exchange rates, the EIU PPP exchange rates are expressed with the same degree of digit accuracy.

Note: Correlation coefficient for market exchange rates and EIU PPP rates = 0.92 (significant at 95 percent level of confidence).

*Sources:* World Bank; Economist Intelligence Unit (for PPP rates); International Monetary Fund (for exchange rate regimes); various issues of *Financial Times*; and authors' calculations.

In addition to exchange rate disparity (market exchange rates compared with PPP rates), other barriers and practices are also at work to increase price dispersion. Among these are visible trade barriers, such as tariffs and quotas, and an array of regulatory and private monopolistic advantages that serve to limit entry by new competitors. E-commerce and other new technology forces are just beginning to attack the entrenched advantages of established firms.