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Fragmentation among OECD Countries

In this chapter we analyze three measures of international prices. The first are the final goods prices as provided in the purchasing power parity (PPP) data. (We refer to these as consumer prices, but they also include capital goods.) The second are measures of ex factory prices, which reflect the re-moval of distribution margins and indirect taxes from the final goods prices. We refer to these as producer prices. The third are measures of fragmentation. These incorporate estimates of arbitrage costs due to transportation and shipping. All three measures are reported as ratios to the lowest in the sample.

Data Issues

In the previous chapter we reported the considerable evidence of global fragmentation that is suggested by the price data. However, this evidence may also be questioned. First, there are concerns that some of the studies of the law of one price may not be using prices of products that are strictly comparable. One reason may lie in the fact that data gathered at the retail level may include distribution margins and transportation costs. As Knetter and Goldberg (1996, 8) have noted, "Goods sold in different locations will have different amounts of transportation, distribution and retail-value-added underlying them." A second concern is that even goods with the same name may vary greatly in quality. This is particularly a problem when surveyors have not tried to ensure comparability, or when unit values rather than price data are used.[1]

1. See the discussion of Sazanami, Urata, and Kawai (1995) below.

A second issue relates to the comprehensiveness of coverage. Samples of a few products gathered at selected retail outlets may not represent the full array of goods or the modes of distribution through which goods are sold. In particular, many surveys appear to focus heavily on consumer products sold at supermarkets and generally neglect to include capital and intermediate goods. Many international surveys were undertaken to establish differences in the cost of living experienced by business executives and their families in different cities. These naturally focused on a set of products that are not the most appropriate for gauging overall standards of living.

A third issue relates to the use in many studies of price indexes rather than prices of individual goods. Here one concern is that indexes can be used only for testing changes in prices rather than measuring price levels. Another is that indexes taken from different sources may include different products and use different weights in aggregating them. Still another is that indexes may contain both tradable and nontradable goods.

Our Approach

In the analysis that follows, we try to deal with each of these problems. We use data in whose collection every effort has been made to ensure comprehensive coverage and comparability. In addition, we analyze the data at a fairly disaggregated level, to mitigate weighting problems, and we try to eliminate the effects of distribution margins.[2]

We use data on carefully matched retail prices that the OECD collects on a regular basis in order to calculate PPP estimates. With the cooperation of member governments, OECD researchers collect prices on a sample of over 3,000 final goods. The researchers make every effort to ensure that products of the same quality are compared across countries. For most manufactured goods, the same make and model are compared, or comparisons are made from a list of two or more models when each item on that list is thought to be equivalent. For other manufactured goods and food items, researchers rely on exact descriptions of the items to be priced. For example, one description reads, "Fresh chicken eggs, large (weighing at least 680.4 grams per dozen), white or brown shell. Not the best quality but close to it." When they cannot find appropriate matches based on model identification or on descriptions, researchers from the countries involved travel to other countries in order to examine which items would be most appropriate matches for the items in their country. This has occurred with grain, some vegetables, tobacco, textiles, footwear, stationery, and small housewares. The researchers also call upon the expertise of buyers for large stores, manufacturers, and trade associations in order to determine appropriate matches. On occasion, different goods that were deemed "equivalent in use" have been

2. See Bradford (2003a) for further discussion and a detailed analysis of the 1993 data.

compared. For instance, 220-volt light bulbs in Europe have been matched with 120-volt bulbs in the United States. Perhaps harder to accept, Japanese noodles have been considered comparable to US spaghetti.

Prices are collected from many markets and outlets at different times during the year in order to obtain a single annual, national average (World Bank 1993, 10). Also, prices of the average-size purchase for the country in question are compared. For example, if milk is bought most frequently by the gallon in country A, and by the half-gallon in country B, the price of a gallon in country A would be compared with the price of two half-gallons in country B. After the data have been collected, apparent mismatches in quality are dealt with by either refining the specifications or discarding the data (OECD 1995, 5). This method does not completely resolve the problem of comparing items of differing quality, but the scale of resources expended on accurate matching indicates that these are excellent measures of price differences for equivalent products.

The researchers aggregate the most detailed price data into categories called "basic headings." A basic heading is defined as "a group of similar well-defined commodities for which a sample of products can be selected that are both representative of their type and of the purchases made in participating countries" (OECD 1995, 5). Thus a basic heading should be neither too broad nor too narrow: it should not be so broad that it results in very different products being compared; it should not be so narrow that few countries in the sample sell it. For instance, seaweed would be too narrow a heading, and food too broad.

In multilateral comparisons, one usually cannot find products that are both representative of the category and typical of what is bought in every country, because consumers in different countries buy different mixes of products. Instead, for each basic heading, each country nominates one or more "representative products," each of which accounts for a large share of that country's expenditure on goods within that basic heading. For instance, cheddar is a representative product for the basic heading "cheese" in France, the Netherlands, and the United Kingdom, but not in Italy. To be included in the survey, each product must be accepted for pricing by at least one other country. It does not have to be nominated as a representative product by another country; it just has to be sold in large enough quantities in another country to be priceable. For instance, cheddar cheese may be priceable in Italy even though it is not representative. Thus not every product is priced in each country. But as long as countries price their own nominated products and a share of all other products nominated, relative prices for each product and country can be calculated indirectly as well as directly. (For details on how the prices are combined into one average price for each country, see Eurostat-OECD PPP Programme 1996.) There are about 200 basic headings. We obtained unpublished basic heading price data from four years—1990, 1993, 1996, and 1999—and trimmed the sample to include just traded goods. The product categories varied somewhat over time, leading to

Box 3.1 Product categories included in sample

Food

Rice	Other animal and vegetable fats
Flour and other cereals	Fresh fruit
Bread	Dried fruit and nuts
Other bakery products	Frozen and preserved fruit and juices
Pasta products	Fresh vegetables
Other cereal products	Dried vegetables
Fresh, frozen, and chilled beef	Frozen vegetables
Fresh, frozen, and chilled veal	Preserved vegetables, juices, soups
Fresh, frozen, and chilled pork	Potatoes and other tuber vegetables
Fresh, frozen, and chilled lamb, mutton, and goat	Potato products
	Raw and refined sugar
Fresh, frozen, and chilled poultry	Coffee and instant coffee
Delicatessen	Tea and other infusions
Other meat preparations, extracts	Cocoa excluding cocoa preparations
Other fresh, frozen, chilled meat	Jams, jellies, honey, and syrups
Fresh, frozen, or deep-frozen fish	Chocolate and cocoa preparations
Dried, smoked, or salted fish	Confectionery
Fresh, frozen, deep-frozen seafood	Edible ice and ice cream
Preserved or processed fish and seafood	Salt, spices, sauces, condiments
	Mineral water
Fresh, pasteurized, sterilized milk	Other soft drinks n.e.c.
Condensed, powdered milk	Spirits and liqueurs
Other milk products excluding cheese	Wine (not fortified or sparkling)
Processed and unprocessed cheese	Beer
Eggs and egg products	Other wines and alcoholic beverages
Butter	Cigarettes
Margarine	Other tobacco products
Edible oils	

Manufactured household goods

Men's clothing	Ladies' footwear
Ladies' clothing	Children's and infants' footwear
Children's clothing	Furniture and fixtures
Infants' clothing	Carpets and other floor coverings
Materials, yarns, accessories, etc.	Household textiles, other furnishings
Men's footwear	Refrigerators and freezers
Washing machines, driers, dishwashers	Television sets, video recorders, etc.
	Record players, cassette recorders, etc.
Cookers, hobs, and ovens	

(*box continues next page*)

changes in the number of traded goods in our sample, as follows: 1990, 94 categories; 1993, 122; 1996, 123; 1999, 112. (Box 3.1 lists the categories.)

In summary, we believe that these price measures improve upon previous measures because they are trustworthy, comprehensive, and internationally comparable. Researchers have long recognized prices as perhaps the most promising tool for assessing protection, but differences in quality have bedeviled attempts to use prices, except for certain homogeneous goods such

Box 3.1 *(continued)*

Manufactured household goods *(continued)*

Heaters and air conditioners	Cameras and photographic equipment
Vacuum cleaners, polishers, etc.	Other durable recreational goods
Other major household appliances	Records, tapes, cassettes, etc.
Glassware and tableware	Sports goods and camping equipment
Cutlery and silverware	Games, toys, and hobbies
Motorless kitchen and domestic utensils	Films and photographic supplies
Motorless garden appliances	Flowers, plants, and shrubs
Electric bulbs, wires, plugs, etc.	Pets and related products
Cleaning and maintenance products	Books
Other nondurable household goods	Newspapers and other printed matter
Drugs and medical preparations	Durable toilet articles and repairs
Other medical supplies	Nondurable toilet articles
Spectacle lenses and contact lenses	Jewelry, watches, and their repair
Orthopedic and therapeutic appliances	Travel goods and baggage items
Passenger vehicles	Goods for babies, personal accessories
Motorcycles and bicycles	Writing and drawing equipment and supplies
Tires, tubes, parts, accessories	
Motor fuels, oils, and greases	
Radio sets	

Capital goods

Structural metal products	Precision instruments
Products of boilermaking	Optical instruments, photographic equipment
Tools and finished metal goods	Electrical equipment including lamps
Agricultural machinery and tractors	Telecommunication and electrical equipment n.e.c.
Machine tools for metal working	Electronic equipment, etc.
Equipment for mining, metallurgy	Motor vehicles and engines
Textile machinery	Boats, steamers, tugs, platforms, rigs
Machinery for food, chemicals, rubber	Locomotives, vans, wagons
Machinery for working wood, paper	Aircraft and other aeronautical equipment
Other machinery and mechanical equipment	Other transport equipment
Office and data processing machines	

n.e.c. = not elsewhere classified

as agricultural products. These data, because they have resulted from intensive multilateral efforts to correct for quality differences, are more trustworthy as accurate measures of true price gaps. In addition, they are comprehensive, covering all traded final goods. Previous studies have tended to limit their coverage to sectors in which protection was thought to exist, without testing whether other sectors might enjoy well-disguised insulation from foreign competition. Finally, many other estimates have been derived only

Table 3.1 Consumer prices in sample countries relative to lowest prices in sample

Country	1990	1993	1996	1999
Belgium	1.41	1.57	1.72	1.45
Germany	1.48	1.67	1.79	1.38
Italy	1.44	1.71	1.47	1.24
Netherlands	1.36	1.64	1.63	1.38
United Kingdom	1.38	1.54	1.51	1.61
Australia	1.43	1.38	1.41	1.29
Canada	1.52	1.32	1.18	1.15
Japan	1.91	2.15	2.36	2.02
United States	1.16	1.13	1.18	1.21
Unweighted mean	1.45	1.57	1.58	1.41

Note: Data are expenditure-weighted average ratios of national final sales goods prices to the lowest price in the sample.

for a single country at a time, making it difficult to rank countries in terms of openness. Our measures use the same data and apply the same method to each country in the sample, thus allowing such rankings.

Consumer Prices

The prices used for estimating PPP are consumer (or final goods) prices. These are appropriate for comparing international living standards—indeed, that is the purpose for which they were gathered. Table 3.1 reports expenditure-weighted averages of these prices for goods in the nine sample countries in four sample years.[3] The lowest price among the nine countries in each category is assigned a value of 1, and the other prices for that category are reported as a ratio to that price. Thus these ratios do not use any one country as a reference. Instead the benchmark varies from product to product, depending on which country has the lowest price for that product. As reported in table 3.1, a striking feature of these data is the range of prices that consumers across the OECD pay for various products. The mean consumer goods price ratio in the sample was 1.45, or 45 percent above the lowest price in the sample, in 1990, and 1.41 in 1999. On average, measured in a common currency, in 1999 Canadian consumer prices were the lowest in the group (averaging 15 percent above the lowest sample price). The highest were Japanese consumer prices, at more than twice (102 percent above) the lowest sample price. Other countries with relatively low consumer prices were the United States (21 percent above the lowest), Italy (24 percent above), and Australia (29 percent above).[4] Other

3. The expenditure weights come from the OECD, which calculates them for each of the PPP basic heading categories.

4. Australian relative prices declined over the decade, from 43 percent above the lowest in 1990 to 29 percent in 1999.

Table 3.2 Average absolute deviations in consumer prices between sample countries and country groups (percent)

Country	Between country and European countries in sample[a]		Between country and non-European countries in sample[b]		Between country and all other countries in sample	
	1990	1999	1990	1999	1990	1999
Belgium	18	17	29	30	24	23
Germany	19	16	30	29	24	22
Italy	25	19	34	30	29	24
Netherlands	19	17	30	29	25	23
United Kingdom	23	19	34	28	29	24
Australia	24	24	31	32	27	27
Canada	25	25	29	32	27	28
Japan	45	46	47	54	46	49
United States	30	23	37	30	33	26

a. For example, average absolute deviation of German consumer prices from those in Belgium, Italy, the Netherlands, and the United Kingdom.
b. For example, average absolute deviation of German consumer prices from those in Australia, Canada, Japan, and the United States.

European consumer price levels ranged from 38 percent above the lowest price in Germany to 61 percent above in the United Kingdom. At this aggregate level, therefore, the so-called law of one price certainly does not hold across either the OECD or Europe. Nor is there much evidence of convergence across the OECD over time. The coefficient of variation in consumer price ratios across the countries in the sample was actually lower in 1990 (14 percent) than in 1999 (19 percent).

When the disaggregated product categories are examined, again a picture of considerable variation emerges. We have weighted the standard deviation of each consumer price category by its share in overall expenditure. We find that this measure of dispersion was virtually unchanged between 1990 and 1999, at 0.40 and 0.41, respectively. We also estimated the absolute percentage price differences between pairs of countries (table 3.2). For example, in 1999 the absolute difference between the United States and the other countries in the sample for the 120 price measures averaged 26 percent.[5] Countries clearly have very different consumer prices: on average, the absolute bilateral price difference in the sample was 29 percent in 1990 and 27 percent in 1999. These differentials break down into three tiers.

First, prices in countries on the same continent in our sample typically differed by around 20 percent in 1999. Absolute price differentials between European countries averaged 17.5 percent. (Germany had the smallest differences with other European countries in 1999, averaging 15.7 percent, and the United Kingdom the largest, at 19.5 percent.) Absolute differentials between the United States and Canada were similar at 18.4 percent.

5. The measure is $(|P_i - P_j|)/(0.5P_i + 0.5P_j) * 100$, where i and j index countries.

Second, price differences are larger between countries on different continents than between countries on the same continent. In 1999 the absolute difference in consumer prices between the European countries, on the one hand, and the United States, Australia, and Canada, on the other, averaged 23 percent, 24 percent, and 25 percent, respectively. Australian prices differed from those of all other countries by an average of 27 percent.

Third, Japanese prices are very different from those in other countries. On average, Japanese consumer prices had absolute price differentials with other countries in the sample of 46 percent in 1990 and 49 percent in 1999.[6] Japan's unusual price behavior has a large impact on overall measures of price dispersion at the product level. For the sample as a whole, when product categories are ranked according to the coefficient of variation of their consumer prices, a clear pattern emerges. Prices are most dispersed for food products (beef, cocoa, pasta, potatoes, and cereal products have the largest coefficients of variation) and least dispersed for equipment (photographic equipment, cycles and motorcycles, electronic equipment, boats, locomotives, and aircraft have the smallest). However, this pattern is heavily influenced by the impact of Japan. When Japan is dropped from the sample, the patterns are less clear. Outside of Japan, food prices do not appear to be substantially more dispersed than nonfood prices.

Producer Prices

Measures of final goods prices include nontraded value added. These prices may therefore provide an inaccurate picture of market fragmentation, since they include elements that cannot be eliminated through arbitrage. The price of a pound of coffee purchased in a supermarket in Tokyo may be higher than that of a pound of coffee purchased in New York, either because trade barriers raise the wholesale price of coffee, or because the costs of distributing coffee in Tokyo are higher, or both. In this study, since we seek to isolate the role of trade barriers, it is necessary to compare producer or ex factory prices rather than consumer prices.[7] We therefore used data on margins (wholesale trade, retail trade, transportation, and taxes) to convert the consumer price measures to what we refer to as

6. These differentials are consistent with the findings of Parsley and Wei (2000).

7. The Japanese Ministry of International Trade and Industry–US Department of Commerce retail price survey (US Department of Commerce 1991) has been used by some to claim evidence of protection in Japan. But retail prices do not reflect protection for producers to the extent that domestic trade margins differ by country. Since we find that margins can vary widely, we do not think that simple comparisons of retail prices provide reliable information about protection. Also, the products for comparison were chosen through political negotiations, so that the final list is not random and does not reflect scientific sampling techniques. See Yager (1991) and Noland (1995), however, for interesting analyses of the results.

producer prices.[8] All of the nine countries in our sample keep track of the detailed margins data that we needed, as part of their input-output tables. Although we originally wanted to include more countries, such as France, in our sample, the availability of detailed margins data determined the countries that were included. We matched these margins with the OECD retail price data and derived estimates of producer prices by peeling off the relevant margins. Thus,

$$p_{ij}^{\,p} = \frac{p_{ij}^{\,c}}{1 + m_{ij}},$$

where:

$p_{ij}^{\,p}$ = the producer price of good i in country j,
$p_{ij}^{\,c}$ = the consumer price of good i in country j, as taken from the OECD data,
m_{ij} = the margin for good i in country j, as taken from the national input-output table.

Unfortunately, margins data only become available with a considerable time lag.[9] The producer price estimates for 1996 and 1999 were therefore obtained by assuming that distribution margins were the same percentage of overall value added as they were in the most recent year for which data were available. The estimates for these years should therefore be treated with some caution, and our analysis of these prices will concentrate on 1990 and 1993.

In these years we actually find more dispersion across producer prices as we do across consumer prices.[10] As reported in table 3.3, in 1993 Japan again stands out as having the highest producer prices (in the aggregate, 96 percent above the lowest) and the United States the lowest (just 16 percent above the lowest in the sample). As in the case of consumer prices, Australia (45 percent) and Canada (47 percent) occupied the next rung, with European producer prices ranging between

8. Roningen and Yeats (1976) also used retail prices and adjusted for taxes and transport costs, but they did not adjust for wholesale and retail trade margins, which we find significantly outweigh taxes and transportation.

9. For 1993, 1996, and 1999, the margins data come from the following years: Australia, 1995; Belgium, 1990; Canada, 1990; Germany, 1993; Italy, 1992; Japan, 1995; the Netherlands, 1990; the United Kingdom, 1990; and the United States, 1992. For the 1990 producer price estimates, the data for Australia, Germany, and Japan are also from 1990.

10. When prices are compared with the lowest price in the sample, the standard deviation for aggregate consumer prices is higher than for producer prices: in 1993, for example, standard deviations were 0.29 and 0.25 for consumer and producer prices, respectively. Compared with the lowest price in the sample, however, consumer prices tend to be lower than producer prices. In 1993 the average ratios to the lowest price were 1.57 and 1.64, respectively. Thus the coefficient of variation for consumer prices (19 percent) is actually higher than that for producer prices (16 percent).

Table 3.3 Producer prices in sample countries relative to lowest prices in sample

Country	1990	1993	1996	1999
Belgium	1.66	1.82	2.04	1.70
Germany	1.61	1.75	1.98	1.48
Italy	1.57	1.85	1.62	1.34
Netherlands	1.62	1.80	1.90	1.65
United Kingdom	1.60	1.72	1.68	1.78
Australia	1.50	1.45	1.47	1.33
Canada	1.62	1.47	1.32	1.25
Japan	1.96	1.96	2.28	1.93
United States	1.19	1.16	1.24	1.24
Unweighted mean	1.59	1.66	1.73	1.52

Note: Data are expenditure-weighted average ratios of imputed producer prices to the lowest price in the sample.

75 percent above the lowest sample price in Germany and 85 percent in Italy.

At the aggregate level, in 1993 producer price levels in the nine countries in the sample had a coefficient of variation of 16 percent. However, when the data are disaggregated, they reveal a remarkable amount of dispersion. In 1990, weighted by expenditure shares, producer prices had an average coefficient of variation of 35 percent and do not appear to have narrowed much over the decade. As reported in table 3.4, the mean bilateral absolute producer price differentials in 1990 and 1999 were 33 percent and 31 percent, respectively. Again, as with consumer prices, Japanese prices were the most unusual, with mean absolute producer price differentials in bilateral comparisons with other countries in the sample averaging 47 percent in 1990. In 1990 mean absolute producer price differentials in North America were 35 percent (average of Canada and the United States), and bilateral differentials among the five European countries in the sample averaged 25 percent.

If competition is less than perfect, profit-maximizing firms will determine prices as a markup over marginal cost. That markup will in turn be a function of the elasticity of demand. Everything else being equal, the elasticity of demand will be influenced by the number of firms in the market. Thus, under the assumption that marginal costs are similar internationally, relative domestic prices could be taken as a proxy for competitive pressure. The producer price data suggest that these pressures are greatest in North America and lowest in Japan. They indicate considerable variance across Europe, with the greatest pressure evident in Italy and the least in the United Kingdom.

Fragmentation Measures

Producer prices allow us to get a sense of which industries in which countries have the lowest prices. But inferring the extent of insulation from for-

Table 3.4 Average absolute deviations in producer prices between sample countries and country groups (percent)

	Between country and European countries in sample[a]		Between country and non-European countries in sample[b]		Between country and all other countries in sample	
Country	**1990**	**1999**	**1990**	**1999**	**1990**	**1999**
Belgium	23	23	33	35	28	29
Germany	22	21	33	31	28	26
Italy	26	25	36	32	31	28
Netherlands	25	23	34	34	29	29
United Kingdom	27	24	42	34	35	29
Australia	28	33	35	35	31	34
Canada	29	30	34	33	31	31
Japan	44	41	50	50	47	44
United States	38	31	43	34	40	32
Mean for all eight	29	28	38	35	33	31
EU mean	25	23	36	33	30	28

a. For example, average absolute deviation of German producer prices from those in Belgium, Italy, the Netherlands, and the United Kingdom.
b. For example, average absolute deviation of German producer prices from those in Australia, Canada, Japan, and the United States.

eign competition requires one more step: taking account of transport costs from one country's market to another. A foreign good must travel from the foreign factory to the foreign border and then to the domestic border in order to compete with a domestic good.[11] Thus one cannot infer protection simply by comparing producer prices. *The domestic producer price must be compared with the landed price of the foreign good.* We do not, however, have import ex factory price data that can be matched with the domestic price data. So we infer the import price by combining data on export margins, also available from national input-output tables, with international transport costs. (We have export margins for all countries except the United Kingdom, for which we used export margins for the Netherlands. Export margins tend not to vary much by country, and so we feel confident that using the Netherlands margins does not compromise our results.)

We could obtain detailed data on international transport costs only for Australia and the United States. Both countries report import values for detailed commodities both on a basis that includes insurance and freight (cost plus insurance and freight, or c.i.f.) and on one that does not (f.o.b, or free on board).[12] The ratio of the two is a good measure of all the costs of

11. For a discussion of the importance of export margins, see Rousslang and To (1993).

12. As with the domestic and export margins data mentioned above, these international transport cost data had to be concorded to the sectors used in our analysis. A concordance is available from the authors upon request.

shipping goods into these countries. For costs between other countries we simply average the costs of the United States with those of Australia. The ratios for both countries, however, are small, so that the gap between the two is also small. The average for all products for the United States is 1.05, and that for Australia is 1.09. Thus, for each detailed sector, we take the average of the two c.i.f./f.o.b. ratios and use this as an estimate of the international transport cost for that product for all countries.

We use these data on export margins and international transport costs to compute landed prices for each product and country, as follows. Scaling up producer prices with export margins gives export prices for individual products in each country. For each product, scaling up the lowest export price by the common international transport cost gives the landed price. Thus the export price is given by:

$$p^e{}_{ij} = p^p{}_{ij}(1 + em_{ij}),$$

where:

$p^e{}_{ij}$ = the export price of good i for country j,
em_{ij} = the export margin of good i for country j.

The landed price is then given by

$$p^\ell{}_{ij} = p_{iM}(1 + t_i),$$

where:

$p^\ell{}_{ij}$ = the landed price of good i into country j,
t_i = the international transport margin for good i,
p_{iM} = $\min(p^e{}_{i1}, p^e{}_{i2}, \ldots, p^e{}_{i9})$, that is, the lowest of the nine export prices.

We then took the ratio of each country's producer price and the common landed price as our measure of fragmentation. If this ratio was less than 1, we assigned it a value of 1:[13]

$$f_{ij} = \max(p^p{}_{ij}/p^\ell{}_{ij}, 1).$$

The landed price could well be higher than the domestic price. For instance, this is always true of the country with the lowest export price. Also, if the gap between the highest and the lowest producer price is less than the sum of the export margin and the international margin for a given product, then the producer price in each country would be lower than the landed price. In such cases we conclude that there is no detectable fragmentation. Thus a country can have a producer price that is higher than

13. If these data were based on prices for all producers in the world, a ratio less than 1 would indicate negative protection. Since we are looking at only a subset of countries, however, a ratio less than 1 probably reflects competition from outside the nine countries and thus should not be construed as negative protection.

the lowest producer price in the sample and still have an integrated market, because of the unavoidable costs of shipping goods between countries. Under these circumstances we consider the actual price to be the lowest possible and enter it as unity.

The fragmentation measures tell us how restricted each market is relative to forming a single market with the other eight, not relative to a regime of complete free trade between these countries and the rest of the world. For a given good, these measures will differ from true total protection measures if all of the countries in the sample have barriers to imports for that good. For such goods the calculated landed price will be higher than the true world price to the extent that the low-cost producer has barriers against imports. This may be true of clothing, for instance, against which all these countries have barriers. In practice, however, these fragmentation measures are likely not to differ substantially from true protection measures. If just one of the nine has no barriers to imports in a particular good, our measure of fragmentation will in fact approximate a true measure of protection, because in this case the price in the free-trading country will approximate the world price.

These results are reported in table 3.5. As one would expect, the fragmentation measures are lower than those for consumer and producer prices. This partly reflects transport costs. It also reflects cases when the domestic price is above the lowest foreign price but less than the common landed price, so that fragmentation is set at unity. Overall, the mean fragmentation index in the sample was 12 percent and 11 percent less than the mean producer price average in 1990 and 1999, respectively. It was 4 percent and 6 percent less in those two years, respectively, than the mean consumer price differential, suggesting that, for most countries, relative consumer prices provide a fairly good (but upwardly biased) approximation of fragmentation. Japan is also unusual because its fragmentation index is 20 percent lower than the ratio of its consumer prices to the lowest consumer prices in the sample. Nonetheless, as reported in table 3.5, despite this adjustment, Japan again has the highest measures in all four years that we sample, and the measure falls by only 3 percent between 1990 and 1999. On the other hand, the United States consistently has the lowest measures over the period. In the four sample years, the US measure falls in a tight range between 1.16 and 1.14. The second least fragmented economy in 1999 is Canada (1.17), followed by Italy (1.21) and Australia (1.23). Aside from Italy, measures in the European countries are fairly high in 1999: Germany, 1.29; the Netherlands, 1.41; Belgium, 1.42; and the United Kingdom, 1.50.

We take these measures as capturing the magnitude of existing obstacles to fragmentation and will use them in the next chapter to simulate the benefits of integration. Before proceeding with that analysis, however, we consider the implications of our evidence for the three other issues that

Table 3.5 Fragmentation indexes

Country	1990	1993	1996	1999
Belgium	1.42	1.53	1.65	1.42
Germany	1.39	1.48	1.60	1.29
Italy	1.38	1.55	1.36	1.21
Netherlands	1.42	1.55	1.58	1.41
United Kingdom	1.41	1.50	1.41	1.50
Australia	1.31	1.29	1.29	1.23
Canada	1.39	1.29	1.18	1.17
Japan	1.67	1.64	1.82	1.61
United States	1.16	1.14	1.14	1.15
Unweighted mean	1.39	1.44	1.45	1.33

Note: Data are expenditure-weighted average ratios of imputed producer prices to the landed price of goods from the country with the lowest price in the sample.

are the focus of the study, namely, European integration, North American integration, and Japanese openness.

European Integration

European countries typically have high levels of trade. According to Frankel (1997, 84), "most of this trade can be explained by the EC members' size, level of development, proximity, common borders and common languages." Using a gravity equation model, he finds that these factors suffice to explain intra-EC trade between 1970 and 1985, without any additional effects that might be ascribed to EC membership. However, he finds that, starting in 1985, membership has a significant impact on trade, and that this impact grows larger in 1990.[14]

Nonetheless, as of the early 1980s, the amount of trade among European countries was certainly less than would occur in a single national market—a concern that led to the initiative to deepen European integration through the EU 1992 program. In their study of the costs of Non-Europe, the European Commission used consumer price data, compiled by Eurostat for calculating PPPs, to evaluate European integration (Emerson et al. 1988, chapter 7). They found that in 1985 there was an average dispersion of 19.4 percent for prices of consumer goods inclusive of taxes, 15.2 percent for consumer goods prices net of taxes, and 12.4 percent for equipment goods net of taxes (Emerson et al. 1988, 150). They also

14. Head and Mayer (1999) found that the home bias coefficient for nine European countries declines from around 21 in the late 1970s to 12.7 in 1993–95, but most of the drop occurs before 1986. Indeed, the coefficient on the dummy variable in 1995 is not significantly different from that in 1986. The authors concluded that, when the effect of language is taken out, the European Union appears substantially more integrated than North America.

examined a group of consumer durable goods and found that, on average, price dispersion for these goods across German cities was half that across the European Community as a whole, suggesting that price convergence still had a way to go.[15]

Several recent studies reach similar findings. A study by Head and Mayer (1999) found that European consumers act as if imports from other members are subject to high nontariff barriers on the order of 40 to 50 percent.[16] Official European publications continue to argue that the integration process within Europe is incomplete. According to the European Central Bank (2002, 39), for example, "The data available suggest that price level dispersion for many tradable goods and services remains higher between euro area countries than within individual countries implying that further improvements in the functioning of the Internal Market are possible." According to the European Commission's Directorate-General for Economic and Financial Affairs (2001, 2), "Price dispersion for individual branded products is higher in the EU than in the US." The commission also reported that, in 1998, a comprehensive data set indicated that overall price dispersion in the United States, at 11.8 percent, is lower than the European Union at 14.6 percent. It concluded that "there is scope for further EU price convergence towards US levels especially for tradable products." The commission bolstered its argument by citing a variety of studies. One of these found no convergence in European automobile prices during the 1990s.[17] Another is based on a price survey by Dresdner Kleinwort Benson Research (DKBR), which sampled prices of 56 identical products across the United States and the European Union and found only 4 with greater variation in the United States. DKBR found that it was common practice in the United States to set a single wholesale price and that this was not the case in Europe. Similarly, a *Financial Times* survey of the cost of living across 155 cities worldwide indicated that the dispersion of price levels across 15 EU capital cities was 9.8 percent (the figure for those in the euro area was 7.5 percent), compared with 5.8 percent for the seven US cities surveyed.

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15. Emerson et al. (1988) estimated the gains from price convergence. The largest gains occur when prices converge on the lowest level attained in the European Community. The gains obtained by multiplying the price reductions by the share of each product in expenditure amount to 6.5 percent of EC GDP for goods. Including some services leads to an estimate of 8.3 percent of GDP. The authors emphasized that these are very mechanical estimates and that they ignore the impact of increased competition on price-cost margins and on innovation. One could add that this approach is surely flawed, since it fails to take account of the fact that lower prices will reduce producer incomes.

16. Head and Mayer (1999) found that border effects are largest for ingestible products—food, beverages, tobacco products, and drugs—and considerably lower for capital goods.

17. Goldberg and Verboven (2001) found similar results: a lack of pass-through, two-thirds of which is due to the local cost component and one-third to changes in markups. Firms keep local prices stable.

Rogers, Hufbauer, and Wada (2001) suggested there has actually been more progress toward convergence than some of these other studies imply.[18] Using cost-of-living data collected by the Economist Intelligence Unit, they found a strong decline in European price dispersion, particularly in the first half of the 1990s, to the point that recent price dispersion for traded goods, although still above that in the United States, is now close to it.[19] Moreover, dispersion of nontradable goods prices was actually higher in the United States than in Europe, apparently because the United States has more variable housing costs.[20] Overall, the literature appears to suggest that European price dispersion has declined, but not quite to the point where the European market mimics the degree of US integration.

Some debate also remains about how to deepen integration. Head and Mayer (1999) questioned the approach used in the EU 1992 project because they were unable to find that explicit nontariff measures, such as differences in regulation and government procurement, help account for home bias. They concluded that it primarily reflects differences in tastes. Others argue that the launch of the euro will go a long way toward reducing remaining barriers. Anderson and van Wincoop (2002) argued that, with an elasticity of substitution among goods equal to 5, the tariff-equivalent of the national money border barrier is 26 percent. However, Lutz (2002) examined four different data sets and did not find that the European Monetary System has led to smaller price differentials.

On the surface, our results accord with those of Crucini, Telmer, and Zachariadis (2000). They examined Eurostat data between 1975 and 1990 and found that equally weighted and CPI-weighted averages of a large number of European goods prices generated relatively accurate predictions of nominal exchange rates, thereby confirming that PPP generally held between European economies. For 1990 we find that aggregated European price levels for consumer goods were remarkably similar (see table 3.6).[21] At the consumer level our calculated price ratios ranged from 1.36 above the lowest in the Netherlands to 1.48 in Germany (table 3.1), with a mean of 1.41 and a coefficient of variation of 3.2 percent. At the producer level, the range was from 1.57 in Italy to 1.66 in Belgium (table

18. See also Rogers (2002), who concluded that the level of traded goods price dispersion in Europe is now quite close to that in the United States.

19. The European Commission Directorate-General for Economic and Financial Affairs (2001) found that, between 1985 and 1999, the standard deviation in price levels across the 15 EU countries fell from 21 to 15 percentage points.

20. Knetter and Slaughter (1999) found that the dispersion of prices of McDonald's Big Mac hamburgers and newsstand copies of the *Economist* magazine declined in Europe in the 1970s and 1980s.

21. This result may not be very surprising, given that our sample includes only five quite similar European countries.

Table 3.6 Measures of price dispersion in European countries in sample

Measure	1990	1993	1996	1999
Standard deviation[a]				
Consumer prices	0.24	0.26	0.27	0.20
Producer prices	0.36	0.39	0.41	0.33
Average mean absolute percentage deviation				
Consumer prices	20.8			17.5
Producer prices	24.7			23.4

a. Average standard deviation for each product category, weighted by expenditure share.

3.3), with a mean of 1.61 and a coefficient of variation of 3.4 percent. Aggregate fragmentation indexes were even more tightly concentrated, ranging from 1.38 for Italy to 1.42 for the Netherlands (table 3.5), with a mean of 1.39 and a coefficient of variation of 1.3 percent. From these data one might have concluded that the law of one price actually held for traded European goods and that the European countries were in quite a good position to fix their exchange rates at their existing parities. But the aggregate data conceal a considerable amount of price dispersion.[22] In 1990 the mean absolute difference between pairs of European countries for consumer prices was 21 percent. (Table 3.2 provides data for the individual countries.) As reported in table 3.7, the European countries with the most similar consumer prices were Belgium and the Netherlands (with a 14.9 percent mean absolute difference), with Germany and the Netherlands a close second (15.1 percent). The least similar prices were to be found between Italy and the Netherlands (27.1 percent), with Italy and the United Kingdom a close second (26.8 percent). Producer price pairs were more dispersed, with the greatest price similarities found (in 1990) between Germany and Italy (19.7 percent) and Belgium and the Netherlands (20.4 percent), and the least between Italy and the United Kingdom (27.3 percent). The average for all country pairs was 25 percent.

Over the decade, European aggregate price levels actually diverged. The standard deviation of price level went up from 0.04 to 0.14 and 0.03 to 0.18 for consumer and producer prices, respectively. This took place in the first half of the 1990s, precisely when underlying price differentials seem to have narrowed. Between 1990 and 1996, the coefficient of variation for aggregate consumer prices increased from 3.2 percent to 8.4 percent, and that for producer prices from 2.2 percent to 10.8 percent. By 1999 our consumer price measures ranged from 1.24 in Italy to 1.61 in the United Kingdom, and our producer price measures from 1.34 in Italy to 1.78 in the United Kingdom. Yet it would have been a mistake to conclude

22. This also accords with the findings of Crucini, Telmer, and Zachariadis (2000, 2001).

Table 3.7 Mean absolute differentials of consumer and producer prices between bilateral country pairs

Country	Australia	Belgium	Canada	Germany	Italy	Japan	Netherlands	United Kingdom	United States
Consumer prices, 1999									
Australia	0.0	25.5	21.6	24.2	24.1	53.0	22.3	26.0	21.2
Belgium	25.5	0.0	26.1	13.2	18.2	42.0	16.3	18.9	24.8
Canada	21.6	26.1	0.0	24.2	22.6	56.7	22.4	29.3	18.4
Germany	24.2	13.2	24.2	0.0	16.5	45.1	14.6	18.4	20.9
Italy	24.1	18.2	22.6	16.5	0.0	50.7	18.0	21.7	20.8
Japan	53.0	42.0	56.7	45.1	50.7	0.0	48.8	42.8	51.0
Netherlands	22.3	16.3	22.4	14.6	18.0	48.8	0.0	18.9	22.5
United Kingdom	26.0	18.9	29.3	18.4	21.7	42.8	18.9	0.0	26.2
United States	21.2	24.8	18.4	20.9	20.8	51.0	22.5	26.2	0.0
Producer prices, 1999									
Australia	0.0	36.0	26.9	31.2	29.5	47.3	32.3	36.1	29.5
Belgium	36.0	0.0	35.4	21.4	27.3	33.9	20.4	24.4	33.4
Canada	26.9	35.4	0.0	27.1	24.9	50.3	30.0	34.0	22.2
Germany	31.2	21.4	27.1	0.0	19.7	39.5	22.7	21.4	26.9
Italy	29.5	27.3	24.9	19.7	0.0	46.6	25.2	26.5	26.1
Japan	47.3	33.9	50.3	39.5	46.6	0.0	41.1	43.0	51.1
Netherlands	32.3	20.4	30.0	22.7	25.2	41.1	0.0	24.9	32.0
United Kingdom	36.1	24.4	34.0	21.4	26.5	43.0	24.9	0.0	34.8
United States	29.5	33.4	22.2	26.9	26.1	51.1	32.0	34.8	0.0

Consumer prices, 1990									
Australia	0.0	22.4	19.6	22.9	28.3	45.1	21.8	23.2	28.8
Belgium	22.4	0.0	23.4	15.4	21.7	43.5	14.9	22.0	27.9
Canada	19.6	23.4	0.0	24.1	28.8	41.5	25.2	24.8	27.1
Germany	22.9	15.4	24.1	0.0	22.7	44.6	15.1	21.5	28.3
Italy	28.3	21.7	28.8	22.7	0.0	41.0	27.1	26.8	37.5
Japan	45.1	43.5	41.5	44.6	41.0	0.0	46.9	48.1	55.3
Netherlands	21.8	14.9	25.2	15.1	27.1	46.9	0.0	20.5	26.3
United Kingdom	23.2	22.0	24.8	21.5	26.8	48.1	20.5	0.0	28.8
United States	28.8	27.9	27.1	28.3	37.5	55.3	26.3	28.8	0.0
Producer prices, 1990									
Australia	0.0	26.5	25.0	27.1	29.6	46.6	24.9	30.5	34.0
Belgium	26.5	0.0	26.5	19.9	23.8	39.3	20.0	26.9	41.1
Canada	25.0	26.5	0.0	27.8	30.0	42.5	28.6	32.6	34.8
Germany	27.1	19.9	27.8	0.0	23.8	42.2	21.6	24.5	34.8
Italy	29.6	23.8	30.0	23.8	0.0	43.4	28.0	30.0	42.6
Japan	46.6	39.3	42.5	42.2	43.4	0.0	45.6	51.2	61.5
Netherlands	24.9	20.0	28.6	21.6	28.0	45.6	0.0	28.4	36.0
United Kingdom	30.5	26.9	32.6	24.5	30.0	51.2	28.4	0.0	37.1
United States	34.0	41.1	34.8	34.8	42.6	61.5	36.0	37.1	0.0

from the aggregate measures that underlying prices had become more dispersed. In fact, the standard deviation across European prices, weighted by expenditure shares, narrowed from 0.24 in 1990 to 0.20 in 1999 for consumer prices and, over the same period, from 0.36 to 0.33 for producer prices (table 3.6). Similarly, the average bilateral absolute price differential fell from 20.8 percent to 17.5 percent for consumer prices and from 24.7 percent to 23.4 percent for producer prices. These data confirm that European markets continued to become more integrated. As reported in table 3.7, as of 1999, Belgian and German consumer prices differed on average by 13 percent, and those in the Netherlands and Germany by 15 percent. Also in 1999, UK consumer prices differed from those in Italy by 22 percent (versus 27 percent nine years earlier), and Italian and Dutch prices differed by just 18 percent (versus 27 percent nine years earlier). We estimate that in 1999, European consumer price differentials, averaging 17.5 percent, were quite similar to those between the United States and Canada (18 percent), and that the differentials in producer prices (23 percent in Europe and 22 percent in North America) were quite similar as well.

Used with caution, the overall level of prices could be an indicator of competitive pressure. Compared with the lowest prices in the sample, average consumer prices in Europe were at the same level in 1990 and 1999: a ratio of 1.41. For producer prices, however, there was a decline from 1.58 to 1.50, suggesting some increase in competitive pressure. Nonetheless, average European prices remained considerably higher than in the United States in 1999 (where the ratios were 1.21 for consumer prices and 1.24 for producer prices), Canada (1.15 and 1.25), and Australia (1.29 and 1.33).

We conclude that Europe has made progress toward market integration but that the process is by no means complete. There remain remarkable differences, even for food prices, even though in principle the Common Agricultural Policy should have equalized input costs. In addition, overall European price levels remain relatively high, suggesting that price competition is not as strong as in North America. As our simulations below will confirm, substantial benefits could accrue from increased integration.

US-Canada Integration

The US-Canada linkages have become the poster child for large border effects. As already noted, in pioneering work, McCallum (1995) found a sizable home bias in the manner in which Canadian provinces traded with each other as compared with their trade with US states of similar economic size and distance. Similarly, Engel and Rogers (1996) found relative price changes to be much more similar within the United States and Canada than between them. Crossing the border, they concluded, had the same impact in raising relative price dispersion as separating locations by 75,000 miles. Helliwell (1997) found even more pronounced border effects at the

industry level.[23] These findings are surprising given the proximity of most of the Canadian population to the US border and the lack of physical barriers between the northern US states and most of the Canadian provinces.

Yet the two countries have deepened their integration by concluding a bilateral preferential trade agreement in 1988 and the North American Free Trade Agreement with Mexico in 1994, and there is evidence that the impact of the border may have declined over time.[24] Using aggregate data and a gravity model, Clausing (1995, reported by Frankel 1997, 92) could not find evidence that, in its first five years, the Canada-US agreement had increased bilateral trade. However, on examining data at a more disaggregated level, she found that tariff reductions did have highly significant effects on trade in sectors that had been subject to high tariffs before 1988. Indeed, she concluded that about half the increase in bilateral trade during the period could be ascribed to the Canada-US agreement. Similarly, Helliwell (1997) used new and revised data to extend Macullum's original work to cover US-Canada trade from 1988 to 1996. Macullum had found that intraprovincial trade was 20 times larger than trade between Canadian provinces and US states, after accounting for the effects of differences in economic size and geographic distance. Using revised data, Helliwell found a decline in border effects from about 19 in 1990 to about 12 in 1993 and beyond (Helliwell 1997, 4). He suggested that the effects of the preferential trade agreement might have run their course by 1996 (Helliwell 1997, 113).[25] Engel and Rogers (1996) did not find an independent effect from the agreement, although this work used a short sample period. However, using later data, Engel and Rogers (2000) found that the effects of both the border and distance fell by about 20 percent from before the preferential trade agreement to after.

We find powerful movement toward increased integration over the decade, consistent with the view that increased integration with the US market has had an important impact on the Canadian economy, both in enhancing competition and in bringing prices into line with those in the United States. The single most striking change in the sample over time is

23. For example, Helliwell (1997, 35) found border effects to be almost 100 for dairy products; over 80 in fruit, vegetables, and feed; 65 for grains; and 30 for other agricultural commodities.

24. There is also evidence that the Canada-US free trade agreement had an important impact on Canadian manufacturing. Trefler (2001) finds that the agreement boosted productivity in Canadian firms, suggesting a change in competitive conditions in Canada. He also finds short-run effects on worker displacement. For an exploration of the impact of the free trade agreement on an industry scale, see Head and Ries (1997).

25. On the other hand, Rogers and Smith (2001) found that Mexican relative price changes became more similar to those in the United States between 1980 to 1994 but did not find much evidence of convergence from 1988 to 1994 between the United States and Canada.

the decline in relative Canadian prices over the decade. In 1990, in the aggregate, Canadian consumer prices were the second highest of the nine countries in our sample, averaging 52 percent above the lowest in the sample (table 3.1). By 1999, however, Canadian prices were the lowest in the sample: just 15 percent above the lowest on average. Most of the change took place in the first half of the decade, when the Canada-US preferential trade agreement would have been expected to have its greatest effects, but the decline continued from 1996, when Canadian prices were still 18 percent above the lowest in the sample, to 1999.[26]

Canadian producer prices followed a similar pattern of decline (table 3.3). In 1990 Canadian aggregate producer prices, at 62 percent above the lowest in the sample, were far in excess of US levels and, although considerably lower than prices in Japan, were just below those of Belgium and comparable to those in other European countries. By 1999 Canadian prices, at 25 percent above the sample's lowest, were just 1 percentage point higher than prices in the United States. Canada's fragmentation measure also fell from 1.39 in 1990 to 1.17 in 1999, suggesting that, in 1999, Canada was about as integrated globally as the United States (table 3.5).

These relative Canadian price declines at the aggregate level have also been associated with a narrowing of Canada-US price differentials at a disaggregated level. In 1990 the mean absolute percentage differences between Canadian and US consumer and producer prices were 27 percent and 35 percent, respectively—remarkably large differences for countries that had concluded a preferential trade agreement (table 3.8). Indeed, the mean absolute bilateral price differentials between Canada and the United States were about the same as the mean absolute bilateral price differentials for all the countries in the sample: 29 percent and 33 percent for consumer and producer prices, respectively. By 1999, however, the differentials between Canada and the United States had declined to 18 percent and 22 percent for consumer and producer prices, respectively. Those differences are considerably smaller than the average 1999 bilateral differentials for all the countries in our sample, which were 27 percent and 31 percent for consumer and producer prices, respectively. These disaggregated data show that the North American economy has become considerably more integrated. They also highlight that, although there was

26. In explaining monthly relative price changes, the literature has placed considerable emphasis on the role of nominal exchange rate changes. In the short run, it is certainly plausible that domestic nominal prices are sticky. However, this effect is less likely to be important over longer periods, when prices are free to adjust. The exchange rate could, perhaps, account for some of the aggregate convergence, but not all. Between 1990 and 1999, the Canadian dollar depreciated by 21 percent against the US dollar. Measured in US dollars, Canadian consumer prices declined by 27 percent relative to US consumer prices over the same period.

Table 3.8 Measures of price convergence between Canada and the United States

Measure and country	1990	1993	1996	1999
Consumer prices[a]				
Canada	1.52	1.32	1.18	1.15
United States	1.16	1.13	1.18	1.21
Difference (percent)	30.1	16.8	−0.4	−4.9
Producer prices[b]				
Canada	1.62	1.47	1.32	1.25
United States	1.19	1.16	1.24	1.24
Difference (percent)	36.2	26.5	5.8	1.3
Fragmentation index[c]				
Canada	1.39	1.29	1.18	1.17
United States	1.16	1.14	1.14	1.15
Difference (percent)	20.1	12.7	3.3	1.5
Disaggregated mean absolute price differential (percent)				
Consumer prices	27.1			18.4
Producer prices	34.8			22.2

a. From table 3.1.
b. From table 3.3.
c. From table 3.5.

PPP in traded goods between Canada and the United States in 1999, sectoral price disparities continued to be fairly pronounced.

Japanese Openness

Official trade barriers in Japan are not significantly higher than those in other industrial countries. In 1999, for example, the average Japanese import-weighted tariff was 2.5 percent—the same as in the United States—and the average tariff on primary products was 4.5 percent, versus 3.1 percent in the United States (Bergsten, Ito, and Noland 2001). The debate about Japan, however, relates to barriers that are more opaque. A number of features of Japan's trade and investment patterns are unusual for a developed economy, including an unusually low share of manufactured goods imports, a low share of intraindustry trade, and low levels of international investment,[27] but there is considerable disagreement over the reasons for these patterns. On one side are those who emphasize the role of natural endowments and other economic factors, such as Japan's relative scarcity of natural resources, remoteness from its trading partners, and relatively high saving rate; on the other are those who see a large role played by both official and nonofficial behavior, which has resulted in discrimination against foreign products and firms. A number of studies have used a variety of

27. For a more complete list see Lawrence (1993).

quantity and price approaches in an effort to resolve the debate. Two early studies, by Saxonhouse (1983) and Leamer (1984), found that Japanese trade patterns were not significantly different from those predicted by a model that explained net exports by relative factor endowments.[28] Saxonhouse argued that these findings suggest that Japanese barriers are not significantly different from those in other industrial countries. However, they could also indicate that the models used are unable to predict trade patterns very accurately. Indeed, Saxonhouse's tests failed to indicate that Japanese trade patterns were distinctive in 1964—a period in which it is widely agreed that the market was actually highly protected (Saxonhouse 1989). There was also evidence on the other side: Lawrence (1987), for example, used a gravity model to explain manufactured goods imports by OECD countries and concluded that Japanese imports of these goods were unusually low,[29] and Noland (1997) controlled for relative factor endowments and cross-national differences in factor productivity and found evidence of unusually low imports.

Price gap studies have also been used to study Japan. Several official surveys have found that traded goods prices are higher in Japan than elsewhere. (For a review see Bergsten and Noland, 1993, 183.) In the context of the Structural Impediments Initiative, for example, a joint survey conducted by the Japanese Ministry of International Trade and Industry (MITI) and the US Department of Commerce in 1991 found that two-thirds of the products covered were on average 37 percent more expensive in Japan than in the United States.[30] However, Saxonhouse (1993) pointed out that these findings applied mainly to foreign products sold in Japan. He claimed that, "in general the prices of Japanese products are not substantially higher in Japan than are the prices of identical products in American and European markets," and he maintained that (overall) "the size of price differentials between Japan and other countries are not distinctively different from the common experience of other major industrialized economies" (Saxonhouse 1993, 29). Saxonhouse (1993, 30) concluded that "the price evidence reviewed here indicates that Japan's market barriers do not differ in degree from those faced when seeking access to other industrialized economies."

This interpretation of the evidence raises some questions about how the quantity and price evidence might be reconciled. If foreign products are subject to higher markups in Japan, why is it that Saxonhouse finds

28. In addition, see Saxonhouse (1989, 1993).

29. Lawrence (1987) obtained this result with a model specified in logarithms. Goto (1990) found that Japan is not an outlier when distance is specified linearly.

30. Bergsten and Noland (1993, 182). Noland (1995) found that tariff and nontariff barriers as well as the presence of *keiretsu* contributed to the differences in relative prices between Japan and the United States.

that Japanese trade patterns are normal? This interpretation also conflicts with the views expressed by Ito, for example, who has argued, "The keiretsu or other structures that make vertical restraints and resale price maintenance possible may segregate the Japanese market from the rest of the world. Such segregation makes pricing-to-market behavior possible . . . ." (Ito 1992, 403). It is also contradicted by the evidence found by Sazanami, Urata, and Kawai (1995). They used comparable unit value measures for Japanese imports and domestic factory shipments to estimate the price equivalent of Japanese border barriers. They isolated all those categories in which domestic unit values exceeded import unit values by more than 5 percent—a sample that accounts for 19 percent of imports by value. Overall, for this group, they estimated that protection of these sectors has a tariff equivalence of 178 percent. Using these differentials as measures of protection, they undertook a partial equilibrium analysis and estimated that, in 1989, these barriers cost Japanese consumers between $75 billion and $100 billion, or between 2.6 and 3.8 percent of GNP. They concluded that the deadweight gains from eliminating these barriers would be between $8 billion and $17 billion—about 0.3 to 0.6 percent of GDP.

By using data on producer unit values, Sazanami, Urata, and Kawai obtained a domestic price measure that was free of the impact of the distribution system, and thus a more appropriate benchmark against which import prices can be compared. They were also able to compare a much wider range of products than are included in the usual price surveys and to do so in a way that was not subject to political influence. However, as the authors acknowledged, "unit value comparisons are plagued with statistical difficulties" (Sazanami, Urata, and Kawai 1995, 4). These measures are derived by simply dividing the value of imports (or domestic shipments) by a physical unit of measurement (such as kilograms or yards) or by the number of units imported or shipped. For the estimates to be valid, it is crucial that similar products be compared. If, for example, for a given product type, Japan typically imports goods of lower quality than those produced domestically, this would create serious problems with the measure, since a higher price of domestic goods would reflect higher quality rather than hidden barriers to trade.[31] On the other hand, if foreign exporters apply higher markups on their exports to Japan because of the barriers they face, by removing these barriers Japan might benefit not only from eliminating the distortions they cause, but also from lower import prices. Such pricing is likely if foreign firms have pricing power and if

31. Sazanami, Urata, and Kawai (1995) found, for example, that the unit values of radios and televisions produced in Japan were six times higher than the unit values of radios and televisions imported into Japan. The actual level of protection, however, is probably much less than this because Japanese radios and televisions are generally of much higher quality than those that the Japanese import.

Japanese barriers operate like quotas that reduce the demand elasticity faced by importers.[32]

Several of these studies are a decade or more old, and the data they use are even more out of date. There are reasons to believe that conclusions that might have been valid then might no longer hold. Although Parsley and Wei (2000) found evidence of large differences in relative price behavior in the United States and Japan, they also found that these differences have declined over time. In addition, Bergsten, Ito, and Noland (2001) suggested that the estimates obtained by Sazanami, Urata, and Kawai (1995) could now be regarded as setting an upper bound on the costs of Japanese protection, since some of the barriers captured in the price data in 1989 have been reduced or eliminated in the intervening years. Bergsten, Ito, and Noland referred, for example, to a 1999 MITI survey, which found that although the average price for industrial goods (including manufactured goods and services used in manufacturing) was 67 percent higher in Japan than in the United States, more detailed data however suggested that "the prices for manufactured goods were roughly the same in Japan as elsewhere and the differences come from energy and services prices."[33] This is not, however, the implication of a recent study by Hufbauer, Wada, and Warren (2002), who used price data from 1999 and found that price convergence could increase Japanese welfare by 1.8 percent of GDP, a considerably larger effect than the 0.3 to 0.6 percent of GDP suggested by Sazanami, Urata, and Kawai. Thus, even among researchers within the Institute for International Economics, the degree to which Japan is open today appears to be a matter of dispute.

The results of this study suggest that Japan was and remains a considerable outlier. In the aggregate, as reported in table 3.1, Japanese consumer prices were 91.2 percent above the lowest in the sample in 1990, and 102 percent above the lowest in 1999. (The countries with the next highest consumer prices were Canada in 1990 and the United Kingdom in 1999, with prices 52 percent and 61 percent above the lowest in the sample, respectively.)

Japanese distribution margins are sometimes cited as the explanation for these price differences. However, our estimates of Japanese producer prices indicate that, by and large, distribution margins do not contribute much to explaining why relative Japanese prices are so high. In 1990, relative Japanese consumer prices were actually 2 percent lower than relative producer prices. In the three later sample years, relative consumer prices were higher than relative producer prices, but only by an average of about 5 percent. Indeed, this accords with findings by Ito (1992) that

32. In a related argument, Hummels and Skiba (2002) showed how higher transportation costs and quota protection can bias trade toward high-quality products.

33. See Hummels and Skiba (2002, 151).

the Japanese and US distribution systems account for similar shares of final value added.[34]

To a greater degree, however, the unusual behavior of Japanese prices does reflect the impact of transport costs. The relative fragmentation measures are substantially lower than both the producer and consumer price estimates. Although Japan continues to have the highest measures of fragmentation in the sample, those measures are on average 20 percent below those for its relative consumer prices.

Between 1990 and 1993, the yen appreciated from 145 to the dollar to 111 to the dollar—a shift of 31 percent. Thereafter it remained in a fairly narrow range, averaging 109 and 114 to the dollar in 1996 and 1999, respectively. Obviously, Japan's traded goods sectors were subject to considerable competitive pressure as a result of the appreciation. Since Japanese producer prices were already 96 percent above the lowest producer prices in the sample, the movement of the exchange rate was clearly in the opposite direction from that required to establish PPP for traded goods. Indeed, in 1990 a yen-dollar exchange rate of 239 would have been required to bring Japanese producer prices in line with those in the United States. Between 1990 and 1993, measured in US dollars, Japanese producer goods prices relative to those in the United States increased by just 3 percent (and Japanese producer goods prices remained roughly 96 percent above the lowest in the sample). During this period, therefore, the exchange rate change was fully reflected in traded goods prices. However, as might be expected, at the consumer price level the story was different. Japanese consumer goods prices rose by 16 percent relative to US consumer prices, and Japanese consumer goods prices increased from 91 percent above the lowest in the sample to 115 percent above. This experience points to the role played by distribution margins, whose costs are likely to be sluggish in domestic currency, and to the importance of extracting distribution margins in appraising barriers to trade.[35]

Between 1993 and 1996 the change in the yen's exchange rate was modest—from 111 to 109 yen to the dollar. Over the same period, however, Japanese relative consumer goods prices rose from 115 percent to

34. For a detailed discussion of the Japanese distribution system, see Ito (1992, chapter 13). The fact that Japan's share of distribution in final value added is similar to the United States's does not imply that Japan's distribution system is efficient. Bradford (2002, 2003b) found potentially large welfare gains from increased efficiency in Japan's distribution.

35. We strip out distribution margins to clarify this study's analysis, but this does not mean that we consider distribution to be perfectly nontraded and immune to international competitive pressure. The recent movement of major retailers, such as Wal-Mart, into many different countries clearly shows that distribution is potentially a traded service, and the negotiations under the General Agreement on Trade in Services include distribution services in their coverage.

136 percent above the lowest in the sample and an additional 5 percent relative to US prices. Japanese relative producer prices increased from 96 percent above the lowest in the sample to 128 percent above and increased by 8 percent relative to US prices. Over this period neither the exchange rate nor increased import price competition played a role in Japanese "price destruction." Between 1996 and 1999, on the other hand, Japanese consumer prices declined relative to US consumer prices by 15 percent, and relative to the lowest consumer prices in the sample by 14 percent. Changes in this period are thus compatible with the idea of price destruction, although it remains the case that, compared with the lowest prices in the sample, relative Japanese consumer prices at the end of the decade were somewhat higher than at the start. Under the assumption that distribution margins were the same proportion of total costs in 1999 as in 1996, we can also say that, relative to the lowest prices in the sample, Japanese producer prices were about the same in 1999 as they were in 1990. Over the entire decade, therefore, we observe relative PPP. The domestic currency prices of Japanese producers rose sufficiently slowly to fully offset the 21.4 percent nominal appreciation of the yen from 145 to the dollar in 1990 to 114 in 1999. Japanese producer prices, however, were as far away from absolute PPP in 1999 as they were in 1990.

Exploring price differentials at more disaggregated levels reinforces these conclusions. The bilateral differences between Japanese consumer goods prices and those of other OECD countries in the sample ranged between 41 and 55 percent in 1990 and between 42 and 57 percent in 1999. These differences are markedly higher than those for any other bilateral pair in the sample. With one exception (US and Belgian producer prices in 1990), in both 1990 and 1999, all countries recorded their greatest bilateral price disparities for both producer and consumer prices with Japan. As these numbers indicate, over the decade as a whole, these differentials have not narrowed.

Disaggregation suggests that food prices are one important reason why Japanese prices overall are so high. In 1999, for example, an unweighted measure of Japanese food prices at the consumer level shows that average Japanese food prices were 235 percent above those in other countries, whereas the corresponding figure for nonfood prices was 82 percent. High relative food prices in Japan are also evident in producer prices in 1990 and 1993. Although relative Japanese prices for nonfood items also remained the highest in the sample, food clearly played an important role in the high overall level of Japanese prices. In fact, once we take account of transport costs, we find that, for nonfood products, Japanese fragmentation ratios are similar to those in the United Kingdom. Japanese nonfood fragmentation remains the highest in the sample, but Japan is no longer a conspicuous outlier.

Nonetheless, these fragmentation estimates indicate significant further potential for welfare gains. In the analysis in chapter 4, we argue that

Japanese deadweight benefits from integrating goods markets would equal 2.4 percent of GDP. This estimate is somewhat larger than that of Hufbauer (1.82 percent of GDP) and an order of magnitude larger than the estimates obtained by Sazanami, Urata, and Kawai (1995).

Concluding Comments

We believe that the openness measures we report here are more complete and more accurate than previous ones. Their completeness stems from the use of price gap measures, which make it possible to capture the combined effects of all barriers, explicit and implicit, including any number of regulations and bureaucratic procedures. Previous studies have tended to limit their coverage to sectors in which protection was thought to exist, without testing whether other sectors might also enjoy insulation from foreign competition that was better disguised. Our approach does not allow such preconceptions to limit the analysis. For example, a UN study (United Nations Conference on Trade and Development 1992) analyzed how excess paperwork and cumbersome customs procedures impede the international flow of goods. The study pointed out that these regulations impose not only direct but also indirect costs, such as losses due to deterioration or pilferage while cargo is waiting to be cleared, and the strong disincentive that complicated procedures pose for potential exporters. The study conservatively estimated that these barriers imposed costs of 10 to 15 percent on top of any other trade barriers. Measures of protection that rely on lists of individual barriers, such as the United Nations' own measures of nontariff barriers, will tend to overlook barriers such as these because they are both subtle and ubiquitous: they do not stand out for purposes of list-making. Our method will capture the full protective impact of such bureaucratic frictions, if the low-cost producer in the sample is free of them. To be sure, if the low-cost producer in the sample has such barriers, then our method will only capture the amount by which these barriers in other countries exceed those in the low-cost country. This is better, however, than ignoring them completely. In addition to providing more complete estimates of the effects of various policies, these measures are comprehensive, covering all final goods.

Accuracy in this area of research stems from comparing actual prices of identical or equivalent goods. Until now, researchers have recognized prices as perhaps the most promising tool for assessing protection, but differences in quality have bedeviled attempts to use prices, except for certain homogeneous goods such as agricultural products. The data we use, however, were generated through intensive multilateral efforts to correct for quality differences.

A further advantage of this approach is that it allows us to rank the openness of several countries at once. Many other estimates have been

derived for a single country at a time, making such rankings difficult. Our measures, however, use the same data and apply the same method to each country in the sample, leading to rankings in which we can have some confidence.

Finally, in deriving these estimates, we note that there is no necessary connection between tariff equivalents and the amount by which imports are reduced. Quantity changes depend on the elasticities of supply and of demand. Thus a high barrier on a good with a low elasticity of demand may reduce imports by less than a low barrier on a good whose demand is highly elastic. We do not purport, however, to analyze prices and quantities at the same time. These tariff equivalents are simply price gaps. To assess the impact of barriers on quantities traded, and thus on welfare, one needs a model of supply and demand relationships in the sector in question. We claim that the cleanest, most effective way to measure protection is to first derive tariff equivalents, leaving quantity and welfare analysis for the next step. We believe, therefore, that to reject tariff equivalents, as, for example, did Holzman (1969), because they do not tell how much trade flows are reduced, is to tie one's hands unnecessarily. Deardorff and Stern (1998) also concerned themselves with prices and quantities at the same time and became involved in a very detailed taxonomy of various barriers. Tariff equivalents, on the other hand, cleanly capture the combined effects of all kinds of barriers. These price gaps can then be used as inputs in a rigorous welfare analysis, as we do in the general equilibrium modeling in the next chapter.