Why Are Goods So Cheap in Some Countries?*

BY GEORGE ALESSANDRIA AND JOSEPH KABOSKI

Looking around the world, we observe substantial differences across countries in prices for most goods. These price differences also tend to be positively correlated with income differences, so that citizens of high-income countries tend to pay more for the same goods than citizens in low-income countries. In this article, George Alessandria and Joseph Kaboski summarize some of the evidence related to the big price differences across countries for a broad set of goods. They then discuss the relationship between prices and income levels and some possible explanations for that relationship.

Lovers of Big Macs will find China to be a true paradise and Switzerland quite the opposite, since the money spent to buy one Big Mac in Switzerland will get you almost four Big Macs in China.[1] These big international price differences haven't led Swiss Big Mac lovers to move to Beijing. In fact, despite a much higher price, based on annual income data for 2005, the average Swiss citizen earned enough to eat eight times as many Big Macs as the average Chinese citizen.[2]

These differences in prices and purchasing power extend beyond just Switzerland and China and Big Macs. In fact, when we look across the world, we find substantial differences across countries in prices for a broad range of goods. These price differences also tend to be positively correlated with income differences so that citizens of high-income countries tend to pay more for the same goods than citizens of low-income countries.

In this article, we will summarize some of the evidence of the big price differences across countries for a broad set of goods. We will then discuss the relationship between prices and income levels. Finally, we'll discuss some possible explanations for this relationship.

MAKING INTERNATIONAL PRICE COMPARISONS

Comparing prices across countries can be difficult because prices are typically quoted in different currencies. For instance, to compare the yuan price of a Big Mac in China with the franc price in Switzerland, we need to use the nominal exchange rate between the yuan and the Swiss franc to convert the prices into a common currency. Movements in the nominal exchange rate[3] over time can thus lead Swiss Big Macs to become relatively more or less expensive compared with Big Macs in China. We will ignore the short- to medium-run fluctuations

[1] Big Mac™ is a registered trademark of the McDonald's Corporation.

[2] Based on 2005 data on gross national income taken from the World Development Indicators: China $1,700 and Switzerland $54,930 (U.S. dollars).

[3] The nominal exchange rate is the value of one country's currency in terms of another country's currency.

*The views expressed here are those of the authors and do not necessarily represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

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related to exchange rates and instead focus on long-run differences in prices across countries.

Even though we've already seen otherwise, a natural expectation is that the price of a Big Mac should be the same everywhere; after all, it is the same good.[4] This idea is known as the law of one price (LOP). More formally, the LOP states that once prices are converted to a common currency, the same good should sell for the same price everywhere, provided there are no barriers to trade and markets are competitive.

The basic idea behind the LOP is that if prices differ across locations, firms can make some profits by buying in the low-price place and selling in the high-price place. This activity, which is called arbitrage, will continue until prices are similar in the two locations.

While the LOP is described as a "law," it does not hold for all goods. Gold and Big Macs provide evidence of its respective successes and failures as a description of world prices. The prices of Big Macs across countries reported in Table 1 provide a clear example of its failure. When converted into U.S. dollars, Big Macs sell for up to 65 percent more than in the U.S. and down to 57 percent less than in the U.S. On the other hand, from Table 2, which reports the price of one troy ounce of gold quoted on the same day at nearly the same moment on different exchanges throughout the world, we see that the LOP seems to hold, since the price of gold ranges in a 3 percent band around the price in the U.S.

One important reason the LOP does not hold is that there are barriers that make international trade, and thus arbitrage, costly.[5] These barriers can be man-made, such as tariffs, taxes, or trade restrictions, or physical, such as distance, which incurs shipping costs. The costs of these barriers differ quite a bit across goods. For instance, shipping costs primarily depend on the distance, weight, and mode of transportation. For goods such as gold,

TABLE 1

Some Big Mac Prices

Country	Big Mac Price		Actual Exchange Rate 1 USD=
	in Local Currency	in U.S. Dollars	
Switzerland	SFr6.30	5.12	1.23
U.S.	$3.10	3.10	1.00
China	Yuan10.50	1.31	8.00

Based on Big Mac prices and exchange rates as of March 25, 2006. The Big Mac index is published periodically by *The Economist*. Go to http://www.economist.com/markets/bigmac/ to find more information about Big Mac prices and exchange rates across many countries.

TABLE 2

Gold Prices Around the World

Exchange	Time (Eastern Standard Time)	USD/Troy Ounce
United States	10:28	$625.01
Australia	10:28	$625.00
Brazil	9:53	$617.71
Switzerland	10:28	$625.51
India	6:07	$634.89
United Kingdom	10:21	$622.75
Luxembourg	5:58	$624.50
Hong Kong	0:51	$623.40

Prices were downloaded from Bloomberg on November 3, 2006.

[4] There are some minor differences in the size and condiments across countries. The biggest difference is in India, where Hindu and Islamic Sharia dietary laws prohibit eating beef, and so the Big Mac is made with two all-chicken patties.

[5] For a detailed breakdown of the costs to trading goods across countries, see the *Business Review* article by Edith Ostapik and Kei-Mu Yi.

which have a high value to weight ratio, shipping costs are fairly minor. For Big Macs, which, based on U.S. prices, are 1/1400 as valuable per ounce as gold and don't travel particularly well, shipping costs are relatively large.[6] However, even though it's expensive to ship a Big Mac, Big Mac prices might be the same in different countries if the inputs to producing it are very easy to trade. This is essentially true for the beef and special sauce, but it's not true for the workers who fry it up or the building in which it is consumed. For some goods, such as buildings or haircuts, the shipping costs are so high that they are almost never traded. Economists call these goods nontraded goods.

Another reason prices may differ across countries is that the competitive environments may differ. For instance, in some countries, there may not be many close substitutes for a Big Mac, and so Big Macs might be relatively expensive. However, in countries with lots of low-cost alternatives, Big Macs might cost relatively less. Or it might be the case that people in some countries are just willing to pay more for certain goods. Firms take advantage of these differences in willingness to pay for certain goods by charging different prices across countries. Charging different people different prices for the same good is known as price discrimination, and it is a common practice in many industries.[7] To make this strategy effective, firms make arbitrage difficult by changing their product slightly across countries. For instance, film studios embed region codes on their DVDs so that they work only on DVD players in particular parts of the world.[8] Similarly, makers of cameras, electronics, and cars often won't honor warranties of products purchased in a different country.

A Broader Test: Comparing the Price of a Basket of Goods. As we have already discussed, prices of individual goods may not be equated across countries for many reasons. We would like to know if these deviations from the LOP are systematic. One way to do this is to see if these individual price differences wash out when we buy a broad basket of goods. But what basket should we compare? In the U.S. the consumer price index measures the price of the basket of goods the typical U.S. consumer purchases. Similarly, many countries measure the price of a basket of goods that their consumers purchase.

There are two problems with comparing these price indexes across countries. First, they are indexes, so their level is not meaningful, and therefore, we can talk only about how prices change over time relative to one another. Second, countries do not sample the same basket of goods, so we are comparing the prices of different baskets of goods, making price comparisons meaningless. Fortunately, there is a way around these problems.

The International Comparison Program (ICP) and the Penn World Tables (PWT) collect data that allow us to compare prices and income across countries. The ICP is a series of statistical surveys that collect prices on a representative sample of approximately 3000 goods and services. These surveys are conducted in many countries and are very careful to sample the price of very similar goods. Surveys are large projects involving each country's national statistical agency and are coordinated by the World Bank and the Organization for Economic Cooperation and Development (OECD).[9] The last survey took place from 1993 to 1996 and involved 117 countries, and it provides a useful starting point for analyzing prices and income across countries.[10]

Measuring Prices and Income. Based on the prices collected in each country, it is possible to come up with a world price for each good as a weighted average of all the prices in the world. For each country, real

Charging different people different prices for the same good is known as price discrimination, and it is a common practice in many industries.

[6] A Big Mac weighs 7.5 oz. (www.mcdonalds.com/app_controller.nutrition.index1.html) and 1 oz. equals 0.9 troy ounces. So a Big Mac weighs 6.75 troy ounces. Based on a U.S. price of $3.10, a Big Mac costs $0.46 per troy ounce compared with gold, which costs $625.01 per troy ounce.

[7] For example, by allowing children to fly for half price, airlines are engaging in price discrimination.

[8] This also occurs with video games and video consoles.

[9] The World Bank is an international organization that provides financial and technical assistance to developing countries. The OECD is a group of 30 countries committed to democracy and market economies, and this organization collects and publishes a range of economic and social statistics.

[10] For a brief overview of the ICP, refer to the article by Sultan Ahmed. A new survey is underway with almost 150 countries.

income is then calculated as the value of the goods purchased at world prices. Because each country's income is measured using the same prices, these measures of income are directly comparable across countries. The value of each country's purchases is then calculated at its own prices; this is a measure of its income at local prices. The ratio of income at local prices to income at world prices is a measure of a country's price level relative to world prices. In this way the Penn World Tables construct a measure of the price level and purchasing power (real income in each country). The procedures for measuring income and prices across countries are quite similar to how the Bureau of Economic Analysis measures income and prices in the U.S. over time.

Figure 1 presents a scatter plot of the relative price of the common basket of goods (on the y-axis) against the relative income of each country (on the x-axis). These data are from the 1996 Penn World Tables, and each point is relative to the U.S. and measured in logarithms, which means that the slope approximates the percentage change in the price level for a given percentage change in per capita GDP. There are obviously substantial differences in price level and income per capita. Turkmenistan has the lowest prices (-2.18, or 11 percent of the U.S. level), while Switzerland has the highest prices (0.53, or 170 percent of the U.S. price level). Tanzania has the lowest income per capita (-4.12, or 1.6 percent of the U.S. level), and Luxembourg has the highest income per capita (0.18, or 120 percent of the U.S. level).

From Figure 1 we see that there is a positive relationship between prices and income. As we saw with Big Macs and Switzerland and China, the countries with the highest income also pay the highest prices for a broad range of goods. A measure of the strength of this relation can be found by estimating how much relative prices increase with relative income. The results of this estimate are reported in the lower right corner of Figure 1. We find that a doubling of income per capita is associated with a 43 percent increase in the price level.

The differences in price levels and income per capita are quite persistent over time. For instance, of the 32 countries with price levels one-half of those in the U.S. in 1996 for which we also have data on price levels in 1985, 26 also had price levels less than half of those in the U.S. in 1985.

EXPLAINING THE PRICE-INCOME RELATIONSHIP

Economists tend to attribute the price-income relationship seen in Figure 1 to either differences in the prices of tradables (those goods that are either traded frequently or easy to trade) or differences in the prices of nontradables, those goods that are both costly and infrequently traded across countries.[11] We will discuss an explanation for the price-income relationship based on deviations from the LOP in tradables. (An alternative, complementary explanation based on deviations from the LOP in nontradables is presented in *Another Theory to Explain the High Prices in High-Income Countries.)*

Examining the role of prices for tradables for the relationship seen in Figure 1 requires a measure of the price of tradable goods. Fortunately, the ICP contains prices for over 3000 goods, so we can compare the price of a basket of those goods that are traded frequently across countries. Examples of the types of goods classified as tradable are machinery and equipment, tobacco, alcohol, and personal transportation equipment.

Figure 2 shows the relationship between the price of a basket of tradable goods and income per capita. Similar to what we saw in Figure 1, there is a positive relationship between the price of this tradable basket and income. In the lower right-hand corner of Figure 2, we estimate that a doubling of income per capita is associated with a 26 percent increase in the price of tradable goods. Comparing our measures of price differences of tradable goods to the measure of price differences for all goods, we find that differences in prices for tradables account for about 60 percent of the aggregate price-income relationship.[12]

One possible explanation for the positive relationship between prices for tradables and income is that prices for tradable goods include some nontradable inputs, which are cheaper in low-income countries. For instance, the price of a car includes the cost of transporting it from the factory to the dealership as well as the costs the car dealership incurs in selling the car. The costs in getting products to the consumer, essentially retail and wholesale distribution, are mostly nontradable and contribute to price differences across countries. If retail and wholesale distribution services are cheaper in low-income countries,[13] that

[11] Much of this section is based on our working paper.

[12] In our paper, we show that for certain commonly used price indexes, the contribution of differences in the prices of tradables to the relationship between price levels and income can be measured by comparing the coefficient from the regression of prices for tradables on income to the coefficient from the regression of price levels on income.

[13] Obviously, wholesale and retail distribution also includes some tradable inputs, such as trucks, airplanes, and fuel, which would tend to make their prices similar across countries.

FIGURE 1

Prices and GDP Per Capita

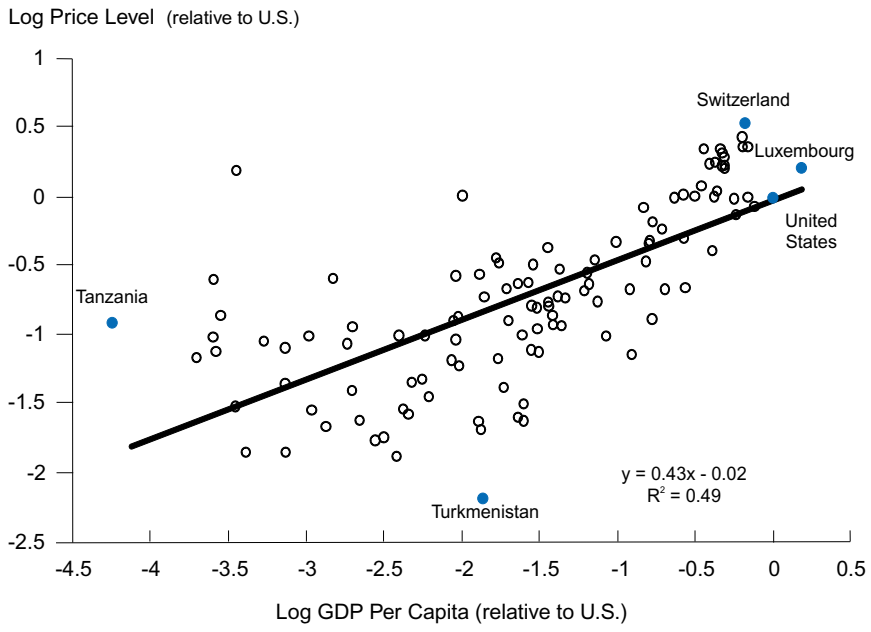
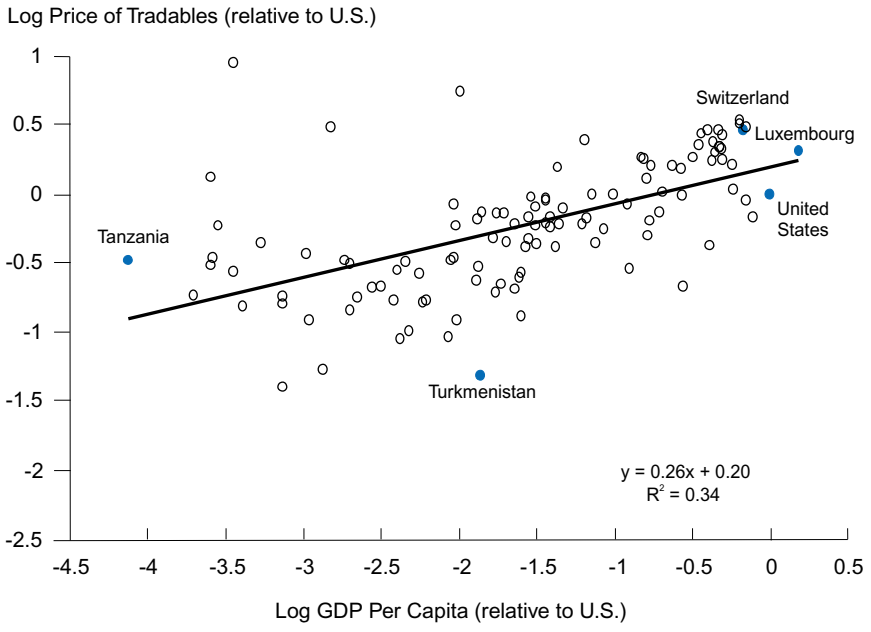


FIGURE 2

Price of Tradables and GDP Per Capita



may explain why prices for tradables are lower in low-income countries.

To isolate the source of differences in prices for tradables, we must compare the price of goods before these retail and wholesale distribution services are added. One way of doing this is to measure the price of goods as they leave the U.S. and are being shipped to different destination markets.

Measuring U.S. Export Prices at the Border. Destination-specific export prices can be constructed using data collected from shippers' export declaration forms. These are forms filed with Customs for every shipment of goods that leaves the U.S.[14] For each good, there are data, by destination country, on the average price of all shipments in each year from 1989 to 2000. These prices are measured at the U.S. border or the shipping dock before any taxes or nontradable services are added. Goods are classified according to the Harmonized Commodity Description and Coding System (HS). This is a system of names and numbers for classifying traded products.[15] The data cover 10,471 goods.

We focus on shipments to OECD countries plus some low-income countries for which we also have wage data. The complete list of countries

[14] These forms aren't necessary for shipments with values below $2000. These small-value shipments account for a very small share of U.S. exports.

[15] The HS system is an international classification system based on broad six-digit categories. Many countries classify traded goods in more detail. For example, the U.S. defines products using 10-digit HS codes. Export codes (which the U.S. calls Schedule B) are administered by the U.S. Census Bureau. In this system, 10-digit goods can be incorporated into nine-digit goods, nine digits into eight digits, and so on. The U.S. Census Bureau's website offers this example: Concentrated frozen apple juice is assigned a 10-digit number, but this product can be included in the broader six-digit category described as apple juice, which, in turn, can be incorporated into the broader four-digit category, fruit juices and vegetable juices, and so on.

Another Theory to Explain the High Prices in High-Income Countries

A number of explanations of the aggregate price-income relationship attribute it to deviations from the law of one price (LOP) in nontraded goods. Recall that nontraded goods are those goods that have high international shipping costs and thus are infrequently traded across countries; such goods include haircuts, restaurant meals, housing, and medical services.

To get an idea of how the price of nontraded goods differs with income, we plot in the Figure the relative price of nontraded goods to traded goods against real income per capita. By looking at how the ratio of nontraded to traded prices differs with income, we can isolate anything that affects nontradables separately from tradables. As we saw with the relationship between aggregate price levels and incomes, we find that the ratio of nontradable prices to tradable prices also rises with income. In fact, a doubling of income is associated with a 34 percent increase in the relative price of nontradables.

There are a variety of competing explanations of this observation. The most common is known as the Balassa-Samuelson theory.[a] It contains two main elements. First, the theory assumes that the LOP holds in tradables.

[a] For alternative explanations of this observation, see the work by William Baumol and William Bowen; Irving Kravis and Robert Lipsey; and Jagdish Bhagwati.

Second, it assumes that across countries, there are much larger differences in the productivity of workers producing tradable goods than nontradable goods. Since the LOP holds for tradable goods, the cost of producing tradables must be the same everywhere. This means that international wage differences are determined by differences in labor productivity in traded goods and are quite large. With large wage differences across countries and relatively small differences in labor productivity in nontradables, prices for nontradables will differ substantially across countries and will be higher in high-wage/high-income countries.

A simple two-country, two-goods example might help to explain how the theory works. Suppose the two countries, call them Richland and Poorland, can make cars, which can be freely traded, and haircuts, which are impossible to trade. The table below describes the productivity of workers in each country. Starting with case 1, we see that in Poorland, one worker can produce either one car or one haircut per day, while the typical worker in Richland is more productive and can produce either four cars or two haircuts per day. To keep things simple, suppose that workers in both countries get paid in dollars and that the daily wage in Poorland is $1.

Given that a worker in Poorland earns $1 per day and can produce one car per day, the price of a car must be $1 everywhere, since cars can be freely traded. Now, since Richland workers can produce four cars a day, they will earn $4 per day. With these wages, the price of haircuts

TABLE

A Two-Country Example of the Balassa-Samuelson Model

	# of units produced per worker			Prices		Price Level	Real Wage
Case 1	**Cars**	**Haircuts**	**Wages**	**Cars**	**Haircuts**		
Poorland	1	1	1	1	1	2	0.50
Richland	4	2	4	1	2	3	1.33
Case 2							
Poorland	1	0.5	1	1	2	3	0.33
Richland	4	2	4	1	2	3	1.33

will be $1 in Poorland, since a worker earning $1 can give one per day, while in Richland a haircut will cost $2, since it takes a worker earning $4 a half a day.

To see how prices vary with real income, we must define the bundle of consumption goods. Let's suppose that the typical basket of goods is composed of one car and one haircut. Given the prices for individual goods, this basket will cost $2 in Poorland and $3 in Richland. We can use these prices to get a measure of real wages in each country as the wage divided by the price. So notice that real income is 50 cents in Poorland and $1.33 in Richland. Clearly, then, the higher price country, Richland, also has a higher real income, as in the data.

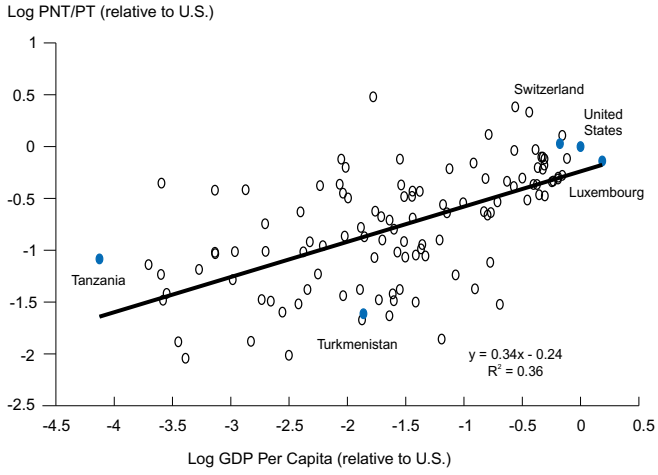
To see how prices and income depend on productivity in each sector, let's look at case 2 in the table. In this case, workers in Poorland are one-quarter as productive as workers in Richland for both goods. A Poorland worker still gets a daily wage of $1 and produces a car a day, so the price of a car is $1 and the price is $1 everywhere, since cars are freely traded. The price of a haircut will be $2, since it now takes two days to produce a haircut. In this case, the price level in Poorland will rise to $3, and the real wage will fall to 33 cents, while it is the same as case 1 in Richland. The price level is now the same across the two countries, and there is no positive relationship between prices and income. Thus, to get a positive relationship between prices and income, it is necessary for low-income countries to be relatively productive in producing nontradables compared to high-income countries.

There are three reasons to question the Balassa-Samuelson theory as a complete explanation of the aggregate price-income relationship. First, as we have seen, there are large deviations from the LOP in tradable goods. Second, the Balassa-Samuelson theory requires relatively large differences in the efficiency of producing tradable goods compared to nontradable goods across rich and poor countries. While we don't have good measures of these productivity differences across countries, we do have good measures from the U.S. Using data on sectoral labor productivity growth in the U.S. from a paper by Dale Jorgenson and Kevin Stiroh, we find that labor productivity in the nontradables sector has grown by about two-thirds as much as labor productivity in the tradables sector. Finally, for nontradable goods to explain the aggregate price-income relationship, the nontradables price-income relationship must be much stronger than the aggregate price-income relationship.[b] Comparing Figure 1 in the text and the figure in this box, we see that this is not the case.

[b] Notice from our first case that while the price of haircuts is twice as high in Richland, the price level is only 50 percent higher. The weaker relationship between aggregate prices and income is due to nontradables' accounting for only a part of the final basket of goods. In their paper, Alan Stockman and Linda Tesar measure the size of the tradables sector in OECD economies and find that it accounts for about one-half of the economy. This implies that the relationship between prices for nontradables and income per capita needs to be twice the relationship between the full basket of goods and income to explain the data.

FIGURE

Relative Price of Nontradables and GDP Per Capita



can be found at the bottom of Table 3. Overall, there are almost 1.2 million observations, where an observation is a particular good sold to a country in a particular year, accounting for about 75 percent of the value of U.S. trade in goods over the period.

We can use these data to ask whether, on average, goods being shipped to markets with relatively high income tend to be sold for relatively high prices (a description of the empirical specification can be found in the footnotes to Table 3).[16] The results of our analysis using these data on export prices confirm what we found using retail prices for tradables from the Penn World Tables: Prices for tradables increase as income per capita increases. Moreover, in export prices, this effect is about two-thirds as strong as that for retail prices for tradables in the Penn World Tables. This finding suggests that differences in the factory prices of tradables account for about 40 percent of the differences in retail price levels across countries, while wholesale and retail margins account for about 20 percent.[17]

For the most part, then, the evidence points to retail prices for tradables being higher in high-income countries because exporters sell these goods at higher prices in these countries.

Digging a Little Deeper into Export Prices. Even though we perform the analysis using data that have been broken down into subcategories, one might suspect that the price differences uncovered may be related to differences in the quality of the products being sold. For instance, it could be that a 10-digit category contains different quality goods, say, a high-quality 11-digit good and a low-quality 11-digit good, and that high-income countries purchase relatively more of the high-quality good. While this idea can't be directly tested for goods classified at the 10- and 11-digit levels, we can see if this is happening at broader levels of classification. For instance, we can compare the price-income relationship on 10-digit goods to the same goods classified at the nine-digit level. If rich countries purchase relatively more of the high-quality, more expensive 10-digit goods, we should find that the relationship between prices and income is stronger at the nine-digit level. We actually find the opposite and conclude that quality differences do not explain the differences in export prices by destination.

To get at the source of international price differences, we next examine the association between export prices and the real wage in the destination market. Not surprisingly, since high-income countries also tend to have high wages, we find a strong positive relationship with wages in destination countries (see the column labeled "Wages only"). However, wages and income per capita are not perfectly correlated, since there are differences in labor force participation, hours worked, capital income, and taxes across countries. When we examine the independent effect of income and wages on export prices, in the last two columns of Table 3, we find that wages explain export prices by destination. This leads us to conclude that high prices are associated with high wages.[18]

Since this is a big data set, we can dig a little deeper. We next examine the relationship between export prices and destination characteristics for different types of goods. This analysis can be found in the bottom seven rows of Table 3. We find that export prices increase more with wages for consumption goods than for capital goods, industrial supplies, autos, and a range of other products. We also find that the price of medicinal products tends to be most affected by the wage and income in the destination market. Finally, notice that when we control for wages and income per capita in the final two columns, for each type of good we find that wages are always positively associated with prices, while income per capita may have a negative or positive association with prices.

The analysis of export prices tells us three things. First, high prices for tradables are largely due to exporters' charging high prices as goods leave the country. Second, export prices are more strongly related to wages in the destination market than income per capita. Third, this effect is stronger for consumer goods than industrial supplies or capital goods.

For the most part, the evidence points to retail prices for tradables being higher in high-income countries because exporters sell these goods at higher prices in these countries.

[16] Here we are looking at prices for individual goods rather than baskets of goods. Since not all goods are exported to all countries, we cannot construct a representative basket as in the previous analysis.

[17] Recall that differences in the prices of tradables account for 60 percent of the difference in price levels. Since differences in export prices account for two-thirds of the differences in prices for tradables, we can conclude that differences in export prices account for 40 percent of the difference in price levels.

[18] These results hold even after controlling for a wide range of factors such as trade costs, the share of intra-firm trade, and the level of intellectual property protection.

TABLE 3

Export Prices and GDP Per Capita and Wages*

(t-statistics in parenthesis)

	Number of Obs.	Fraction of Total Value Exported	GDP Per Capita Only	Wages Only	Both Together	
					GDP Per Capita	Wages
All Goods**	1,177,803	0.751	0.170 (64.3)	0.162 (86.2)	0.012 (3.25)	0.156 (57.5)
Consumption Goods	228,074	0.085	0.236 (39.6)	0.218 (51.9)	0.036 (4.3)	0.200 (33.8)
Food/Feed/Beverages	109,646	0.078	0.156 (31.7)	0.091 (26.5)	0.128 (18.2)	0.027 (5.6)
Capital Goods	322,105	0.248	0.087 (14.5)	0.146 (33.5)	-0.126 (14.4)	0.213 (33.4)
Industrial Supplies	484,661	0.247	0.201 (52.9)	0.168 (63.4)	0.063 (11.4)	0.136 (34.9)
Autos	25,694	0.082	0.158 (8.84)	0.113 (8.9)	0.090 (3.5)	0.066 (3.6)
Agricultural Goods	61,991	0.044	0.140 (21.1)	0.077 (16.7)	0.128 (13.0)	0.012 (1.7)
Medicine	15,859	0.014	0.187 (6.4)	0.282 (13.2)	-0.201 (4.7)	0.390 (12.4)

* Income per capita and wages are measured in real terms using price deflators in the Penn World Tables.
The table reports the relationship between export prices and the characteristics of the export destination from a regression of export prices on the characteristics of the export destination. The regression takes the form: $p_{ijt} = a_{it} + b_1*y_{jt} + b_2*w_{jt} + e_{ijt}$, where p_{ijt} measures the logarithm of the price of good i sold to country j at time t. In country j at time t, income per capita is measured as y_{jt}, and the hourly manufacturing wage is measured as w_{jt}. The term e_{ijt} accounts for errors. The term a_{it} is a dummy variable that accounts for good-specific attributes, such as marginal cost. To explore the relationship between destination prices and just income per capita (or wages), we can run the regression constraining $b_2=0$ ($b_1=0$). The equation can be estimated by ordinary least squares. We construct White robust standard errors that allow for heteroskedasticity in e_{ijt} and also allow for country-year clustering.

** Countries include Australia, Austria, Belgium-Luxembourg, Brazil, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Ireland, Israel, Italy, Japan, South Korea, Mexico, the Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sri Lanka, Sweden, Switzerland, and the total U.S. exports of these goods.

Explaining the Export Price-Income Relationship. The export data confirm that exporters ship goods at lower prices to low-income locations. As we have already discussed, this type of price discrimination by destination market is possible only if trade barriers make it difficult for other firms to arbitrage these destination-specific prices away. Given that we see these price differences, it must be the case that arbitrage is limited, so prices are determined by either differences in competitive environments or consumers' tastes for particular goods, or a combination of the two.

In a recent paper, we develop a theory of price discrimination that can generate a positive relationship between export prices and wages. It builds on our second and third findings from studying export prices: Wages seem to matter most for export prices, and export prices increase with

wages more for consumer goods. The key idea of the theory is that searching to find goods at a really low price doesn't pay. We mean this literally. Since searching takes time away from working, the higher one's wage, the more costly it is to search repeatedly to find a good at a lower price. For this reason, high-wage individuals will be willing to accept higher prices than low-wage individuals and will pay more, on average.

To be a little clearer, our theory assumes that consumers do not know where to buy goods at the lowest price and must spend some time searching for goods. This is a theory of a cost that limits arbitrage, the time it takes to search, and is consistent with everyone's experience of finding the same good selling for different prices in different stores. It is also consistent with consumers' trade-off of paying a higher price at a local store to save time rather than traveling to a store farther away that sells goods at lower prices. As individuals search, they find goods at some price and must decide whether to accept a store's price or continue to search. Because search takes time away from work, consumers consider the forgone labor income of continuing to search, so the consumer's wage determines which prices the consumer will accept. Individuals with higher wages have a higher opportunity cost of time and therefore are willing to accept higher prices rather than search repeatedly.

Firms, knowing consumers' purchasing behavior, will charge higher prices in markets where it is more costly for the average consumer to search repeatedly. This implies that prices are higher in high-wage locations. Now, as long as the time it takes to shop is not so different between high- and low-income countries, low-income countries will have a comparative advantage in search, so prices will be lower in low-income countries. This is a natural extension of the Balassa-Samuelson mechanism described in the box on page 6.

The theory developed here also tells us something about the source of income differences across countries. In this model, countries with more productive workers will earn higher wages and be willing to pay higher prices for all goods, both tradables and nontradables. In contrast, in the Balassa-Samuelson theory, for prices to rise with wages, high-wage countries must be relatively more productive at producing tradables than nontradables. Thus, the Balassa-Samuelson theory requires that cross-country productivity differences in tradables be much larger than productivity differences in nontradables. The Balassa-Samuelson theory suggests that countries mainly become richer by becoming better at producing tradables, while our theory suggests a more balanced approach to growth in which workers in a country become better at producing everything.

Evidence on Shopping Time, Prices, and Income Per Capita. The theory we have described also implies a relationship between wages, shopping time per purchase, and prices. There is some evidence that these variables are related based on time-use surveys, which are studies in which respondents are asked to track their every activity in small time increments over the course of a day or week. Examples of activities tracked are sleeping, eating, working, commuting to work, shopping, traveling to shopping, and listening to the radio.

Two recent papers use time-use survey data to confirm a positive relationship between wages and prices paid and a negative relationship between wages and time spent shopping predicted by our theory. Using time-use data from the U.S., economists Mark Aguiar and Erik Hurst find that when people retire, and the opportunity cost of their time declines, they spend more time shopping per purchase and tend to pay less per unit purchased. Likewise, using time-use data from Argentina, David McKenzie and Ernesto Schargrodsky find that higher income individuals spend less time shopping per purchase and pay higher prices, on average (Table 4). In fact, shopping time per expenditure of people in the lowest income quartile is about 80 percent higher than that of people in the highest income quartile. Moreover, after the economic crisis in 2001, which lowered all Argentineans'

TABLE 4

Shopping Frequency Per Real Expenditure by Income in Argentina

		Households by Income Quartile			
	All	Lowest	2nd	3rd	Highest
Pre-Crisis	0.24	0.29	0.26	0.21	0.16
Post-Crisis	0.28*	0.35*	0.31*	0.26*	0.20*

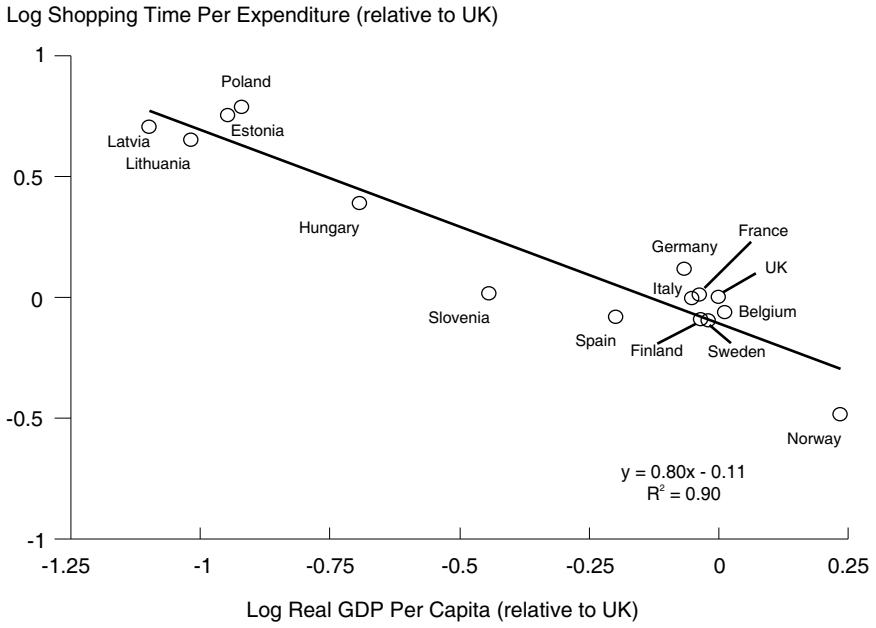
* Statistically different from 2001 mean at 1 percent level.
Shopping frequency measures time spent shopping.
From Table 3: McKenzie and Schargrodsky (2005)

real income, shopping time increased by about 25 percent per expenditure across all income levels.

We can also compare results of time-use surveys in different countries to get an idea of how shopping time differs by income per capita. Figure 3 presents a scatter plot of time spent per purchase against income per capita based on data collected from countries that participated in the European Harmonized Time Use Survey. The data show that shopping time per purchase tends to fall with income per capita, so that in low-income countries people tend to search more intensively than in high-income countries. As we have already seen, prices and wages tend to rise with income per capita. Thus, both the within-country evidence and the cross-country evidence are consistent with the model we have described.

FIGURE 3

Time Spent Shopping Per Purchase



Data: European Harmonized Time Use Survey and Eurostat (2002)

SUMMARY

There are large differences in prices across countries that are related to income per capita. On average, the cost of a basket of goods tends to be relatively high in high-income countries. These price differences exist both for goods that are easily and frequently traded and those goods that are not traded. Moreover, these price differences show up at the dock, so that export prices to high-income countries tend to be higher than export prices to low-income countries.

Understanding the determinants of the price-income relationship sheds light on the source of the large differences in income and well-being across countries. Traditional models of these price differences have focused on differences in prices of nontradable goods and thus attributed income differences largely to differences in productivity in the tradables sector. The evidence presented here that price differences are quite large in the tradables sector as well suggests a more balanced view of productivity differences across sectors and countries. The large price differences in tradable goods suggest that policymakers should target improving efficiency across the entire economy and not just in the tradables sector.

The discussion has purposely avoided nominal exchange rates. However, a good theory of price levels across countries is also useful as a long-run theory of nominal exchange rates. It provides a natural benchmark for determining whether a currency is overvalued or undervalued. For countries that actively manage their exchange rate, this may be a useful guide in determining an appropriate target level.

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