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EXPLAINING PRODUCT PRICE DIFFERENCES ACROSS COUNTRIES

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ABSTRACT

A substantial part of international differences in prices of individual products, both goods and services, can be explained by differences in per capita income, wage compression, or low wage dispersion among low-wage workers, and short-term exchange rate fluctuations. Higher per capita income is associated with higher prices and higher wage dispersion with lower prices. The effects of higher income and wage dispersion are moderated for the more tradable products. The effects of wage dispersion, on the other hand, are magnified for the more labor-intensive products, particularly low-skill services. The differences in prices across countries are reflected in differences in the composition of consumption. Countries in which prices of labor-intensive services are very high, such as the Nordic countries, consume much less of them. For some services, the shares of GDP consumed in high-price countries are less than 20 percent of the shares in low-price countries. Since these are services of very low tradability, the low consumption levels of these services imply low employment in them.

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1. Introduction

International differences in national price levels and prices of individual products are striking and have persisted over long periods, despite the presumed equalizing influence of international trade and despite the liberalization of trade and reduction of transport costs that have occurred. For example, prices in Japan in the 1980s and 1990s were 40 percent higher, on average, than for the OECD countries as a group. In the Nordic countries and Switzerland, prices were 15 to 25 percent higher. In the United States, by contrast, prices were 10 percent lower, and in Portugal 20 percent lower than the OECD average.

Individual product prices often differ even more sharply from one country to another. In 1999, for example, prices for Office Machines and Equipment in Austria were twice as high as in the United States, and they were almost twice as high in France. Prices for Domestic and Other Household Services in Norway were 3 to 4 times as high as in the United States and 3 times as high as in Ireland.

Most explanations of the causes of national price differences focus on factors that affect the prices of less tradable products, especially services, since price differences tend to be eroded in the more tradable sectors of the economy. However, most empirical studies have analyzed differences in national price levels rather than in prices of individual products. In an earlier paper, the present authors examined the determinants of product prices across countries, distinguishing between goods prices and service prices. We found that country characteristics such as per capita income and wage compression, specifically relatively high wages of the least skilled, raised the price of services somewhat more than the price of goods. But the difference

was rather small. We concluded that the dichotomy between goods and services was an oversimplification, partly because all goods prices had a nontradable component in the form of domestic transportation and distribution costs. We also suggested, but did not test, that the effect of per capita income and wage compression would vary depending on the labor intensity of the final product.

In this paper, we examine how international differences in goods and service prices are explained by not only country characteristics, but particularly by the interaction between country characteristics and the characteristics of the individual goods and services. We focus on the role of a product's tradability and labor intensity in offsetting or intensifying the effect of country characteristics such as per capita income and wage compression. Then, we go on to show how differences in relative prices impact the composition of consumption in different countries and, in particular, offer an explanation as to why unskilled-labor-intensive activities are less important in some countries than in others.

The analysis covers about 200 products across 20 OECD countries from 1985 to 1999. Country characteristics include real per capita income, wage compression, and medium-term fluctuations in exchange rates. The product characteristics are a product's tradability and labor intensity. A novel feature of our calculation of labor intensity is that we add an estimate of the labor content of distribution to that in production.

The evidence we present indicates that high per capita income and high wage compression, or low wage dispersion, are associated with high prices of labor-intensive and less tradable products, reducing both consumption and production of these products in a country. The effect of wage compression highlights a rather neglected effect of what is sometimes called a "solidaristic" wage policy, namely, that at least part of the cost of the policy is borne by

consumers. While the effect of high statutory and negotiated minimum wages and the associated labor market institutions on unemployment (e.g., Bertola, Blau and Kahn, 2001) and the structure of employment (e.g., Freeman and Schettkat, 2001, Davis and Henrekson, 2004) have been the subject of some analysis, their effect on prices has not received similar attention.

The paper proceeds as follows. Section 2 describes briefly the explanations that have been offered for international price differences and motivates the variables used in the empirical analysis. Section 3 presents the regression results. Section 4 discusses the quantitative importance of the findings on particular types of products, and Section 5 shows how relative prices affect the composition of consumption. Section 6 concludes.

2. Explanations for International Price Differences

The traditional explanation of international differences in aggregate national price levels attributed them to differences in real per capita income. The gross relationship between income and unweighted averages of individual price levels for OECD countries since 1985 is shown in Appendix Chart 1. The relationship is positive, as expected, with Japan accounting for some extremely large positive outliers and the United States for large negative outliers. That positive relationship is also visible in the relationship between changes in income and changes in average prices, in Appendix Chart 2, although it is much weaker.

The traditional explanation for this positive relationship was based on the dichotomy between services, assumed to be nontradable, and goods, assumed to be tradable and therefore subject to the international equalization of prices through trade. International price level differences were assumed to be concentrated in the nontradable service sector, with high per capita income associated with high service prices. A basic assumption was that exchange rates

and prices of labor were determined in the tradable, or goods sector, where high-income countries enjoyed large productivity advantages over low-income countries. The second basic assumption was that in the service sector, productivity differences between rich and poor countries were smaller than in the goods sector. The combination of large wage differences determined by goods sector productivity, with small differences in service sector productivity, caused services to be expensive in rich countries. That explanation in terms of difference in productivity relationships is often referred to as the Balassa-Samuelson effect, although it has a long history, going back to Ricardo (1817). Some of the history of this explanation is described in Kravis and Lipsey (1983).

A different explanation of the role of service industries in price level differences was given by Kravis and Lipsey (1983) and Bhagwati (1984). Without any assumptions about productivity differentials between goods and services, they ascribed the higher prices of services in rich countries to the higher labor intensity of services than of goods, combined with the higher prices of labor in the rich countries. An advantage of the latter explanation is that industry labor intensities are easier to measure than the multifactor productivity levels relevant to the first explanation.

The continuing series of international price and income comparisons stemming from the International Comparison Program has made it clear that the goods-services dichotomy is an oversimplification. “The price level for tradables...rises as income rises, despite the near unanimity found in the literature on real exchange rates that the law of one price prevails for tradables” (Kravis and Lipsey, 1988, p. 475).

Two earlier studies by the present authors examined food price differences across countries and price differences in general at a fairly disaggregated level. Agricultural protection

played an important role in explaining large differences in food prices (Lipsey and Swedenborg, 1996). More generally, high per capita income, temporarily high currency exchange values, high levels of protection, and wage compression, or low wage dispersion in a country's labor market, were associated with high product prices (Lipsey and Swedenborg, 1999).

In this paper, we examine how country characteristics interact with product characteristics to determine the prices for individual goods and services. We focus on the characteristics of individual products (including services), such as their tradability and labor intensity, that might affect their response to the country characteristics, such as per capita income, wage dispersion, and exchange rate fluctuations.

Products differ widely in their tradability, which we measure by rough estimates of worldwide ratios of trade to consumption. The ratios range from close to zero in some services to a median level of over 60 per cent in clothing and footwear, as can be seen in Appendix Table 1. Higher tradability for a product should weaken the effect of per capita income and wage compression by moving price levels toward international averages

The labor intensity of a product at the consumer level incorporates not only the inputs of labor and capital in its production, but also the transportation, and wholesale and retail trade margins for it, and the factor intensities in these service sectors. These distribution margins differ widely across product groups, from under 17 per cent on average in machinery and equipment, to more than three quarters in clothing and footwear, as is shown in Appendix Table 2. We take account of distribution costs by adding the factor intensities in the transportation, wholesale, and retail trade industries to those in the producing industries themselves to arrive at the factor intensities of the final products. We expect labor intensity to strengthen the effect of per capita income and wage compression.

A product variable tried, but discarded, was a crude measure of the skill intensity of a product, the average wage per worker. The variable was available at the necessary level of product detail only from the US Input-Output tables, as was our labor intensity measure, and was strongly correlated with labor intensity.

An extreme version of our incorporation of trade margins and transport costs in calculating factor intensity would be to assume that all traded products are “middle products” in the sense of Sanyal and Jones (1982), with prices at the borders equalized by competition. In that case, the labor intensity of production of the product itself would be irrelevant, and only the labor intensity in the nontraded transport, wholesaling, and retailing would affect the final product price. That assumption would imply that the employment and value added in the industry producing the product are irrelevant and should be dropped from the factor intensity formula, leaving only the factor content in the supposedly nontraded services.

Wage compression, defined as a low level of wage dispersion in the lower parts of the wage distribution, is measured here as the ratio of the median wage to the wage at the 10th percentile. While not directly a policy variable, wage compression is presumed to be at least partially a reflection of “interventionist labor market institutions” (Bertola, Blau, and Kahn, 2001, p. 6). More broadly, wage compression has been associated with minimum wage regulations, employment protection, unemployment benefit generosity and duration, and union strength (Freeman, Topel, and Swedenborg, 1997, Koeniger, Leonardo, and Nunziata, 2004). All of these interventions are stronger, and wage compression is greater, in Europe than in the United States.

The gross relationship between wage dispersion and unweighted averages of price levels in the OECD countries since 1985, is negative, as shown in Appendix Chart 3. That negative

relationship is not reflected when changes in price are related to changes in wage dispersion. Increases in wage dispersion are positively, but weakly, related to increases in prices, as can be seen in Appendix Chart 4, although the relationship is not statistically significant.

The effect of wage dispersion on price should be larger, the more labor-intensive, and especially the more unskilled-labor-intensive, a product is. A country in which labor markets are relatively unregulated by law, centralized bargaining, or union power will produce products intensive in unskilled labor cheaply, using low-wage labor. A country in which government or union regulations make even the lowest-skill labor expensive will have high prices for products intensive in unskilled labor, especially the less tradable ones, and, as a result, higher overall price levels. The effect of wage compression should be smaller, the more cheaply or conveniently the product can be traded.

Another candidate for determinant of product prices is product market regulation. A measure of product market regulation constructed at the OECD (Conway, Janod, and Nicoletti, 2005) was tried in some equations, but did not contribute to the explanation of prices. A reason for the failure to find effects of product regulation was given by a comparison in Blanchard and Giavazzi (2003) between levels of product regulation and levels of employment protection legislation, showing that the two were strongly correlated. Thus any effects of product market regulation may be incorporated in those we find for wage dispersion.

Per capita income and wage compression are not the only country characteristics to influence country price levels. Exchange rate changes can also do so, at least over short periods over which prices do not fully respond to exchange rate movements. We have used as our exchange rate variable here, deviations from nine-year averages of exchange rates. Other variants were tried, including deviations from shorter and longer trends, and exchange rate

coefficients differed, but the coefficients of other variables were not much affected by the choice of exchange rate measures.

Indirect tax levied on products sold in the country, but not on exports from the country is, a further reason for price differences between countries. One form of indirect tax, the VAT on food, was included separately for food prices in some calculations, but the effect was very small on the overall equations and those results are not shown. Several other measures of the tax burden, ranging from indirect taxes alone through comprehensive aggregates of taxes and government expenditures, relative to country GDP, were tried but eventually discarded. The estimated coefficients for the tax or expenditure burdens were sometimes positive and sometimes negative, depending on the inclusion of other variables, and did little to improve the fit of the equations.

We have not been able to take account of country differences in trade barriers on the individual product level, a potentially important reason for price differences. Market support estimates for agricultural products, a form of protection found to be significant influences on food prices in Lipsey and Swedenborg (1996), are included in calculating predicted prices for the related food products, but the coefficients are not shown here because they were not relevant for explaining prices in general.

3. Regression results

Equations for some 200 individual product prices have been run for 1985, 1990, 1993, 1996, and 1999 data, pooled, with various combinations of year dummies and country dummies. For comparison, we have also run equations for aggregate country price levels in the same years.

The form of the equations, with some variations, is as follows:

$$(1) PR(i,j,y) = f[RGDPC(j,y), WD(j,y), XR(j,y), RGDPC(j,y) \times TRD(i), RGDPC(j,y) \times LI(i), WD(j,y) \times TRD(i), WD(j,y) \times LI(i), D(j), D(y)].$$

Where:

$PR(i,j,y)$ = Price of product i in country j in year y , relative to the average price of that product in all countries in that year.

$RGDPC(j,y)$ = Real GDP per capita in country j in year y relative to the average in all countries.

$WD(j,y)$ = Wage dispersion in country j relative to average in all countries in year y .

$XR(j,y)$ = Exchange rate deviation of country j in year y .

$TRD(i)$ = Tradability of product j , measured as the worldwide ratio of trade to output, relative to the average tradability of all products.

$LI(i,y)$ = Labor intensity of product i relative to the average labor intensity of all products in year y .

$D(j)$ = Dummy variable for country j

$D(y)$ = Dummy variable for year y .

Definitions and measures of variables are described in detail in the appendix. Dummy variables for products were tried, but, because each product prices was measured relative to the mean for all countries, they were never significant and were dropped.

a. Aggregate price levels

Equation 1, pooled for all the years for which we have the individual product prices, shows how country characteristics influence the aggregate price level in different countries. The product in this case is the aggregate country real GDP, calculated with international weights.

$$(1) \text{ PR } (j,y) = .6661^{***} \text{ RGDPC } (j,y) - .4694^{***} \text{ WD } (j,y) + 1.1173^{***} \text{ XR } (j,y) + .8023^{***}$$

$(0.0776) \qquad \qquad (0.0848) \qquad \qquad (0.2299) \qquad \qquad (0.1140)$

$$\text{ADJ RSQ} = .5790 \qquad \text{NOBS} = 99$$

*** = significant at the 1% level

Over half of the variance among aggregate national price levels is explained by per capita income, wage dispersion, and short-term fluctuations in the exchange rate. Higher per capita income and lower wage dispersion produce higher national price levels. Deviations of a country's exchange rate from a nine-year moving average produced corresponding, but somewhat larger, deviations in the country's GDP price level.

It might be expected that membership in the European Union, with its large free trade area, would affect country price levels. By intensifying competition in member countries the single market might make prices lower than they otherwise would have been. However, this expectation is not borne out in Equation 2. There, we distinguish, in each year, between members of the European Union in that year and non-members but find that membership had no significant effect on the aggregate price level, or on the coefficients. One reason for this might be that some new EU members, as well as some non-members, had previously had the benefits of a free-trade area without actually being members of the EU. That still applies to Norway and Switzerland, for example (under the so-called European Economic Space Agreement).

$$(2) \text{ PR } (j,y) = .6227^{***} \text{ RGDPC } (j,y) - .4871^{***} \text{ WD } (j,y) + 1.1588^{***} \text{ XR } (j,y)$$

(0.0776)
(0.0856)
(0.2314)

$$-0.0370 \text{ EU } (j,y) + .8836^{***}$$

(0.0288)
(0.1301)

$$\text{ADJ RSQ} = .5819 \quad \text{NOBS} = 99$$

*** = significant at the 1% level

Figures in parentheses are standard errors

b. Individual product prices

The equation for individual product prices, pooling all products, countries, and years, is shown in Table 1. We make no distinction between goods and services, on the ground that the ranges of the product characteristics encompass the relevant distinctions. The equation includes one country dummy, for Japan.

The explanatory power of the individual product price equation, in comparison to that of the aggregate price equation, is limited by the pooling, in the sense that idiosyncratic features of price setting for individual products in individual countries cannot be taken into account. The one exception is protection levels for some individual food products that are included in the equation for those products. However, there must be many other taxes, regulations, and institutions that vary across product-country combinations, but which we have not taken into account.

The positive influence of per capita income levels on prices is evident, but the coefficient is considerably smaller than in the aggregate equation, partly because it is significantly modified by international trade and product characteristics. The more tradable a product is, the smaller the effect of per capita income on its price. The higher the labor intensity in production and

distribution of a product is, the greater the effect of per capita income in the consuming country on product price. Both these interaction effects suggest that the influence of per capita income on country price levels is to a large degree due to the fact that there is a nontradable component in final consumption and, furthermore, that the nontradable component is often relatively labor intensive.

Table 1: Regressions Relating Price Levels to Country Characteristics & Their Interactions with Product Characteristics

GDPC (GDP per capita)	0.3210*** (0.0311)
GDPC × LI (Labor intensity)	0.1282*** (0.0229)
GDPC × TDB (Tradability)	-0.1182*** (0.0098)
WD (Wage dispersion)	-0.5112*** (0.0305)
WD × TDB	0.1167*** (0.0095)
WD × LI	-0.1291*** (0.0223)
XRR (Deviation from 9-year averages)	1.0476*** (0.0545)
Year Dummies	
yr85	-0.0017 (0.0076)
yr90	-0.0011 (0.0068)
yr93	-0.0003 (0.0068)
yr96	0.0007 (0.0065)
Country Dummies	
Japan	0.3993*** (0.0198)
Constant	1.1692*** (0.0213)
No. of Observations	17107
Adj. R-squared	0.2000

Robust Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
 Note:
 Agricultural protection is included as a variable in the equations for some food products, but the coefficients are not shown here.

Wage dispersion, at the mean level, of product tradability and labor intensity, has a significant negative effect on product prices, much larger than that shown by the aggregate equation. The effect is reduced by greater tradability of a product, but strengthened by higher labor intensity.

Temporarily high values of a country's currency are associated with high prices, indicating that domestic prices do not change so as to offset exchange rate deviations from long-term trends.

In general we have been reluctant to use country dummies. We have made the exception for Japan because this country is such an extreme outlier, with very high prices. A dummy captures what we are unable to explain with the other variables. It has little effect on the overall explanatory value of the estimates, however.

One reason for our reluctance to use country dummies is that some country characteristics show little variation over time, and their influence could be captured by the country dummies and attributed to them. This effect is exacerbated because we miss some variation in country characteristics that does occur over time. Particularly for wage dispersion, the sources from which we derive the data do not collect or do not publish them annually, and we assume no change from the nearest date of collection. That fact adds some spurious stability to the variable's real stability. Wage dispersion, as we measure it, is so stable that country dummies alone can explain almost all the variance in it—94 percent of it. Much the same can be said about other country characteristics, such as per capita income, various measures of tax or expenditure burdens, and measures of labor market or product market regulation. The consequence of that stability is that it is difficult to know which stable country characteristic is influencing prices. Therefore, a certain ambiguity arises in attributing price differences to these

country variables. They might be standing in for other, unspecified, stable country characteristics that affect product prices. We try to reduce that ambiguity by adding the interactions of the country variables with product characteristics, introducing a source of variation not provided by the country characteristics themselves. We interpret the fact that the interaction variables have the expected sign and are significant as providing support for our interpretation of the country characteristics.

The inclusion of country dummy variables for all countries raises the degree of explanation of product price differences from 20 to 28 percent (Table 2). This fixed effects version reduces the coefficient for per capita income, now representing the effects of changes in per capita income, by almost two thirds, but the income effect is still statistically significant. The coefficient for wage dispersion, representing the effects of changes in wage dispersion, becomes positive, but only marginally significant. That is a counter-intuitive result, but it matches the positive gross relationship between changes in wage dispersion and changes in price levels shown in Appendix Chart 4.

The significance of the country dummies indicates that our explanatory variables leave some of the average variation in prices across countries unexplained. Beyond what can be explained by the influence of per capita income, wage dispersion, and short-term fluctuations in exchange rates, and their interactions with product characteristics, individual product prices in Japan have been more than 40 percent above the OECD average, and those in the Nordic countries and Switzerland, 17 percent or more above average. Prices in Australia, New Zealand, Portugal, and the United States have been 13 percent or more below the average.

The significance of the country dummy variables suggests the possibility that the standard errors might be understated by the clustering of observations within countries.

Table 2: Regressions Relating Price Levels to Country Characteristics & Their Interactions with Product Characteristics

GDPC (GDP per capita)	0.1161** (0.0525)
GDPC × LI (Labor intensity)	0.1287*** (0.0203)
GDPC × TDB (Tradability)	-0.1143*** (0.0093)
WD (Wage dispersion)	0.1227** (0.0624)
WD × TDB	0.1123*** (0.0091)
WD × LI	-0.1299*** (0.0196)
XRR (Deviation from 9-year averages)	1.0600*** (0.0555)
Year Dummies	
yr85	0.0066 (0.0072)
yr90	-0.0003 (0.0065)
yr93	0.0001 (0.0065)
yr96	0.0003 (0.0062)
Country Dummies	
Australia	-0.1482*** (0.0124)
Austria	0.0111 (0.0101)
Belgium	-0.0314** (0.0127)
Canada	-0.2180*** (0.0222)
Denmark	0.1767*** (0.0132)
Finland	0.1917*** (0.0133)
France	
Germany	-0.0113 (0.0100)
Ireland	-0.0721*** (0.0167)
Italy	-0.0445*** (0.0128)
Japan	0.4046*** (0.0216)

Netherlands	-0.0831*** (0.0095)
New Zealand	-0.1305*** (0.0159)
Norway	0.2444*** (0.0167)
Portugal	-0.1469*** (0.0196)
Spain	-0.1052*** (0.0175)
Sweden	0.2135*** (0.0147)
Switzerland	0.1996*** (0.0168)
United Kingdom	-0.0917*** (0.0116)
United States	-0.2112*** (0.0299)
Constant	0.7547*** (0.0743)
No. of Observations	17107
Adj. R-squared	0.2829

Robust Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Table 3 gives the equations of Tables 1 and 2 with an adjustment for clustering within countries. The coefficients that are affected are those for per capita income and wage dispersion without interaction terms, representing the effects of changes in income and wage dispersion.

Both of them become statistically insignificant when country dummies are in the regression but remain significant and with the expected sign when they are not. Some of the standard errors of coefficients of interaction terms are higher after correction, however.

Can country dummies “explain” prices as well as our country characteristics? Using the country dummy variables by themselves, without including any other explanatory variables, the country dummies “explain” almost 25 percent of the variance in individual product prices.

Adding interaction terms for tradability and labor intensity with the country dummies adds only very slightly to the explanation. It does, however, modify some country dummy coefficients. Higher product tradability slightly offsets the negative country coefficient for low-price countries, such as Australia, New Zealand, and Portugal. It reduces the coefficient for high-price countries, Japan, Switzerland, Sweden, and Denmark. An oddity is that it also reduces the coefficient for the United States, a low-price country, making it a larger negative value.

The interaction terms for labor intensity are mostly insignificant, but as expected, they add to the coefficients of the country dummies for high-priced countries, Japan, Switzerland, Norway, and Sweden, and lower the coefficients for low-price countries, such as Portugal, the UK and the United States.

The fact that so few interaction terms with country dummies are significant suggests that the country dummies do not incorporate all the variation in country characteristics, such as per capita income and wage dispersion, that we use in Tables 1 and 2. However, the fact that some are significant suggests that the country dummies do incorporate some of those characteristics.

4. How Important Are These Price Determinants for Individual Product Prices?

How important are the price level determinants we have measured? The country with the highest price level (aside from Japan, the price level for which we could not explain without a dummy variable) was Norway, and the country with the lowest price level was Portugal. The average price of a product in Norway was more than 60 per cent higher than in Portugal. The difference in per capita income between Norway and Portugal alone, if all other factors were at the average levels for the 20 countries, could have accounted for a difference in price levels of those two countries of 21 per cent, according to the equation of Table 1.

In contrast to per capita income, wage compression is a variable directly, or indirectly, affected by policy. The country with the widest wage dispersion, on average, was Canada, with the United States following closely. The country with the narrowest dispersion, or the greatest wage compression, was Sweden, with Norway and Belgium following closely. The difference in wage dispersion between Canada and Sweden, all other variables held at the 20-country average, was enough to make prices in Sweden a third higher than in Canada, according to the same equation of Table 1.

The actual price level for the average product was almost 40 percent higher in Sweden than in Canada. The effect of slightly higher Canadian per capita income in raising Canadian prices was more than offset by the much larger effect of Sweden's lower wage dispersion in raising Swedish prices.

These are substantial effects on aggregate price levels. However, according to our price equation, the effects on individual prices are modified by the characteristics of the products, such as their tradability and labor intensity. For example, the effect of the higher per capita income of the United States, the highest income country, relative to Portugal would be greatly reduced for the most tradable products, jewelry, watches, and their repair, (Table 3). These would be about the same price in the United States and in Portugal, while the least tradable product, services of hairdressers and beauty parlors, and eggs and egg products, would be 40 percent more expensive. High tradability, as we expected, greatly dampens the effect of income on prices.

Table 3: Price Differences Between Highest and Lowest Per Capita Income Countries Implied by Equation in Table 1^a

A. For Most and Least Labor Intensive Products		
Income Per Capita	Labor Intensity	
	Lowest ^b	Highest ^c
Lowest (Portugal)	0.890	0.745
Highest (U.S.)	1.065	1.208
Lowest Income as % of Highest	83.6	61.7

B. For Most and Least Tradable Products		
Income Per Capita	Tradability	
	Lowest ^d	Highest ^e
Lowest (Portugal)	0.824	0.974
Highest (U.S.)	1.157	0.970
Lowest Income as % of Highest	71.2	100.4

Note:

- a. The variables set at OECD average;
- b. Average of Electricity, Education Fees, Town and Natural Gas;
- c. Restaurants and Take-aways;
- d. Average of Hairdressers, Beauty Parlors, etc, and Eggs & Egg Products;
- e. Jewelry, Watches and Their Repair.

Labor intensity also affects the impact of income differences on prices. Given the difference in per capita income between the United States and Portugal, but setting other values at the average levels, the most labor-intensive product, services of restaurants and take-aways, would be more than 60 percent more expensive in the United States than in Portugal. The prices of the least labor intensive products, electric, telephone, gas, and other public utilities and education fees would be only about 20 percent higher in the United States.

The effects of wage dispersion, too, were modified by product characteristics, as can be seen by comparing countries with the extremes of wage dispersion, Canada and Sweden (Table 4). Relative to Sweden, the highest wage dispersion, holding income at the average 20-country level, reduced prices in Canada by 10 percent for the most tradable products, such as jewelry, watches, and their repairs, but by 27 percent for the least tradable, services of hairdressers and

Appendix Table 1

Median Levels of Tradability in Various Product Groups

Basic Headings for Eurostat- OECD PPP Programme	Commodity Group	Median
111	Food, beverages and tobacco	20.83
112	Clothing and footwear	61.95
113	Gross Rent, fuel and power	0.49
114	Household equipment and operation	20.75
115	Medical and health care	0.02
116	Transport and communication	7.78
117	Education, recreation and culture	10.00
118	Miscellaneous goods and services	1.22
131	Collective consumption by government	0.00
132	Education	0.00
133	Medical Supplies and Services	0.01
134	Social security and welfare services / Recreation, cultural, religious affairs	0.01
141	Machinery and equipment	54.56
142	Construction	0.00

Source: UNIDO (2000) & US Department of Commerce, 2002.

Table 4: Price Differences Between Countries with Highest and Lowest Wage Dispersion Implied by Equation in Table 1^a

A. For Most and Least Labor Intensive Products		
Wage Dispersion	Labor Intensity	
	Lowest ^b	Highest ^c
Lowest (Sweden)	1.045	1.105
Highest (Canada)	0.831	0.697
Lowest WD as % of Highest	125.8	158.5

B. For Most and Least Tradable Products		
Wage Dispersion	Tradability	
	Lowest ^d	Highest ^e
Lowest (Sweden)	1.098	1.003
Highest (Canada)	0.801	0.905
Lowest WD as % of Highest	137.1	110.8

Note:

- a. With other variables set at OECD average;
- b. Average of Electricity, Education Fees, Town and Natural Gas;
- c. Restaurants and Take-aways;
- d. Average of Hairdressers, Beauty Parlors, etc, and Eggs & Egg Products;
- e. Jewelry, Watches and Their Repair.

beauty parlors. The highest level of wage dispersion reduced the prices in Canada by almost 40 percent for the most labor-intensive products, restaurants and take-aways, but by only 21 percent for the least labor intensive ones, public utilities and education fees.

Clearly, institutions that promote wage compression have considerable effects on consumer prices. As noted by Björklund and Freeman (1997) in a comparison between Sweden and the United States, if wage policy means that the less skilled are paid more than they would have been in a more market driven system, someone has to bear the cost. Our calculations support Björklund and Freeman's conjecture that in the case of less-traded goods and services, that someone is, at least partly, consumers.

5. Product Prices and Product Consumption

One consequence of higher prices for some products, whether they stem from high overall wage levels or high prices for unskilled labor, or high distribution costs, could be a lower level of consumption of those products, given the other characteristics of a country. Table 5 shows the logarithmic relation between the relative price of product *i* in country *j*, in comparison to its price in other countries, and the consumption share of product *i* in GDP in country *j*, relative to the share in other countries (pooled for all years).

Table 5: Relative Product Share ^a in GDP as Function of Relative Product Price ^b and Real Per Capita Income: Logarithmic Equations^c

Relative Price	-0.6771*** (0.0216)	-0.7644*** (0.0222)
Real GDP Per Capita		0.5986*** (0.0391)
Constant	-0.3883*** (0.0070)	-0.3836*** (0.0069)
No. of Observations	19161	19161
Adj. R-squared	0.0488	0.0603

Note:

- Relative product share is the share of product *i* in the real GDP of country *j* relative to the average share in all 20 countries.
- Relative product price is the price of product *i* in country *j* relative to the average price in all 20 countries.
- Relative product shares of less than 0.0005 have been truncated. As a result, 130 relative country shares are omitted.

The negative effect of a higher relative price on relative consumption is statistically significant in the pooled data for all years, even without any other determining variables. The price elasticity indicated by the pooled data is .68. When we add country *j* real income per capita as a determinant of relative consumption share, the price elasticity for the pooled data rises to .76.

Since we expect that these variables would have their strongest effect on products that are the least tradable and are labor-intensive and, particularly, intensive in their use of low-skill labor,

we calculate the same equations for a few product groups with these characteristics. We exclude “Local bus, bus, train, tube, tram, and taxi services” because they are likely to be publicly owned or subsidized, and Repair and Maintenance of housing because of differences among countries in the treatment of owner-occupied housing. The equations are shown, for five such product groups, all in service industries, in Table 6

Table 6: Relative Product Shares in GDP as Function of Relative Product Price and Real Per Capita Income

Logarithmic Equations, Five Unskilled-Labor-Intensive Products					
	Product				
	1	2	3	4	5
Relative Price	-1.2375*** (0.3978)	-1.1882*** (0.1579)	-0.5451*** (0.1075)	-0.9314*** (0.2389)	-0.7371*** (0.2349)
Real GDP Per Capita	2.3466*** (0.7078)	0.5259* (0.2797)	0.4200* (0.2207)	-1.3549** (0.5512)	-0.6047 (0.5778)
Constant	-0.5895*** (0.1291)	-0.2132*** (0.0509)	-0.0981*** (0.0329)	-0.6094*** (0.0940)	-0.4138*** (0.0922)
No. of Observations	95	99	99	99	96
Adj. R-squared	0.1450	0.3588	0.2076	0.2505	0.1494

Note:

- Product 1: Laundry and dry cleaning;
- 2: Restaurants and Takeaways;
- 3: Hairdressers, beauty parlors, etc;
- 4: Pubs, cafés, bars and tea-rooms;
- 5: Domestic services.

In all the products, the relative price coefficient is negative and significant at the 1 percent level. Per capita income is usually significant, but the coefficients range from large positive to large negative. The relative price coefficients are in some cases larger and in some cases smaller than the coefficient for all products in Table 5. However, the degree of explanation is much greater for these unskilled-labor-intensive products, about 15-35 percent, as compared with 6 percent across all products. If we exclude per capita income from the equations, the degree of explanation hardly changes, except in the case of Laundry and dry cleaning services, for which the income elasticity is high. The price coefficients are hardly affected by the omission of the income variable.

These equations imply large differences in the shares of GDP in unskilled-labor-intensive activities between the countries where they are high in price and those where they are relatively cheap, other characteristics equal. The implied differences in GDP shares are shown in Table 7. For example in a country with Denmark's price for Laundry and dry cleaning, but all other characteristics at the 20-country average, the share of that industry in GDP would amount to 38 percent of the typical country's share. It would be 92 percent, almost 3 times as much, in a country with Canada's relative price and average characteristics in other respects. The share of restaurants and take-aways in GDP in a country with Sweden's relative prices for these services and average characteristics in other respects would be 55 percent of the typical country's share. It would be 172 percent of the average country's share, three times as much, in a country with New Zealand's relative price for these services but average characteristics in other respects.

Table 7: Relative Product Shares in GDP Predicted by Equation of Table 6 For Highest and Lowest Relative Price Levels, Holding Real Per Capita Income and Wage Dispersion at Averages Logarithmic Equations, Five Unskilled-Labor-Intensive Products

	Product 1	Product 2	Product 3	Product 4	Product 5
Highest	0.3773	0.5524	0.7175	0.3454	0.4683
Lowest	0.9176	1.7242	1.4816	1.3924	1.6628
Differences	-0.5403	-1.1718	-0.7641	-1.0470	-1.1945
Ratios	0.4112	0.3204	0.4843	0.2481	0.2816

Note:

- Product 1: Laundry and dry cleaning (Highest relative price: Denmark; Lowest relative price: Canada);
- 2: Restaurants and Takeaways (Highest relative price: Sweden; Lowest relative price: New Zealand);
- 3: Hairdressers, beauty parlors, etc (Highest relative price: Norway; Lowest relative price: Portugal);
- 4: Pubs, cafés, bars and tea-rooms (Highest relative price: Norway; Lowest relative price: Portugal);
- 5: Domestic services (Highest relative price: Norway; Lowest relative price: Portugal).

Table 8 shows the actual shares of GDP, instead of the theoretical ones of Table 7, relative to the average of all countries, for the countries with the highest and lowest relative prices for these services. The price differences, given the actual levels of each country's

**Table 8: Actual Relative Product Shares in GDP For Highest and Lowest Relative Price Levels
Five Unskilled-Labor-Intensive Products**

	Product 1	Product 2	Product 3	Product 4	Product 5
Highest	0.9798	0.4182	0.7992	0.1668	0.4079
Lowest	1.8066	1.4571	1.3030	1.0204	2.1918
Differences	-0.8268	-1.0389	-0.5039	-0.8537	-1.7838
Ratios	0.5424	0.2870	0.6133	0.1634	0.1861

Note: Same as notes for table 7.

characteristics, were associated with large differences in the consumption of unskilled-labor-intensive services. Denmark really did consume much less of its GDP in the form of laundry and dry cleaning services than Canada did. And Sweden consumed much less of its GDP in the form of restaurants and take-aways than New Zealand did. The differences in consumption presumably produced similarly large differences in employment in these industries, since these are activities of low tradability.

The effects of relative prices on actual consumption may be somewhat exaggerated, since do-it-yourself and grey market activity are especially close substitutes to services purchased in the market in the case of these low-skill, labor intensive services. Often, the effect of high wage costs is compounded by high indirect taxes, making grey market production especially profitable for both firms and workers. Official statistics in Sweden, for example, recognize this and make substantial adjustments in the published data for underreporting of income in these services, up to 35 percent for “Hairdressing” and 16 percent for “Restaurants” in 1996 (See Davis and Henrekson, 2006, pp. 15-16). The United States makes similar adjustments to the national accounts, although it is hard to match them to the industry classification used here. As far back as 1977, they were approximately 5 percent in retail trade and services (Parker, 1984, p. 24).

The exaggeration of the price effect depends on the extent to which the various countries adjust their accounts for underreporting.

Nevertheless, it is likely that the consumption shares for products in general reflect also shares in production and employment, at least in the case of low-tradability services.

Our attempts to directly relate employment to wage dispersion were severely handicapped by the lack of employment data on anything like the product detail available for prices. Among a group of labor-intensive industries for which employment data were available in the OECD STAN data set, the only major group to show a strong relationship between country wage dispersion and the industry share of national employment in 1999 was the combination of Wholesale and Retail Trade with Restaurants and Hotels, where as much as 60 percent of the variance in industry shares across 18 countries could be explained by wage dispersion. The industry share was larger in countries with higher wage dispersion. Narrowing the industry classification, at the cost of losing one country, indicates that it is the Restaurants and Hotels industry that is the one for which the share is related to wage dispersion. However, Davis and Henrekson (2004), in cross-sections of countries for 1991-94, 1994, and the late 1990s found that several measures related to wage dispersion did not add significantly to the explanation of employment or value added shares in Eating and Drinking Places and Lodging, once a tax variable that was the sum of tax rates on payrolls, labor incomes, and consumption was included (Table 8). Employment shares in other labor-intensive industries for which there is data, such as Health and Social Work and Other Community, Social, and Personal Services did not show any significant relation to wage dispersion, probably because consumption is financed in large part by governments, rather than consumers.

The connection between labor market policy and employment shares is not a simple one, however. Freeman and Schettkat (2001), comparing Germany and the United States, find that the much higher wage dispersion in the United States partly reflects a higher dispersion of skills in the United States than in Germany. They also find that skill differences and wage compression are insufficient to explain the fact that Germany has relatively fewer workers in low-wage services. While wage dispersion is greater across all industries in the United States, it is actually greater in low-wage sectors in Germany. They suggest that wage differences may not tell the whole story and that, among other things, one also needs to take account of Germany's higher non-wage labor costs (paid vacation time, payroll taxes) and tax-benefit wedges, which would impact especially on labor intensive services. These costs, higher in Germany than in the United States, mean that the dispersion of labor costs in Germany, and the difference from the United States, is understated by the wage comparison.

A later paper by the same authors (Freeman and Schettkat, 2005) relates the lower overall employment and hours inputs in the EU countries, as compared to the United States, especially for women, to greater "marketization" of traditional household production in the United States. But the "marketization" hypothesis, while proposed as an alternative to the "labour market institutions" hypothesis, is really not entirely distinct from it. (Duflo, 2005) Labor market institutions and tax wedges may influence the degree of "marketization.", along the lines of our explanation here.

Overall, our results tally with the findings of other studies of the effect of labor market policies on relative employment patterns. By tracing the effect of relative prices on consumption shares, we provide support, via a different route, for the idea (Freeman and Schettkat, 2001, Fredriksson and Topel, 2006, and Davis and Henrekson, 2005) that the smallness of the share of

the low-skill, labor intensive private service sector in many European countries relative to that in the United States is at least to some extent due to their higher price of low-skilled labor.

6. Conclusions

Per capita real income, wage compression, and exchange rate fluctuations, in combination with the tradability and labor intensity in production and distribution of individual products, explain a substantial part of international differences in individual product prices of goods and services. In general, higher per capita income raises prices, and that influence is stronger on more labor-intensive products, but weaker on more tradable products. A higher degree of wage compression at the lower end of the wage distribution (lower wage dispersion) in a country tends to raise prices, particularly for more labor-intensive products. The role we hypothesized for wage compression, or wage dispersion, is reinforced by its relation to the labor intensity of products.

The role of product tradability is confirmed by its effect on the impact of higher per capita income; more tradable products being less affected by a country's income level. And it is confirmed also by its effect on the wage dispersion coefficient: The effect of wage compression in raising product prices is weakened by high tradability of the product or service.

The role of short- or medium-term exchange rate fluctuations is also confirmed in our data. Medium-term deviations of nominal exchange rates from longer-run trends or fluctuations are not offset by price changes in the short run, but represent changes in real exchange rates.

Because there is limited variability over time in this set of countries in our main country variables, per capita income and wage dispersion, and in other likely country variables, there is some possibility that other stable country characteristics, not included in our equations, are

equally good explanations for the product price relationships we find. Country dummy variables alone can account for the majority of intercountry price differences and adding them to our standard set of variables adds to the explanation of prices. The resulting equation shows that increases in income do raise a country's prices, but we cannot find evidence that increases in wage dispersion lower prices. However, the interaction of per capita income and wage dispersion with a product's tradability and labor intensity lends plausibility to our interpretation of the role of these country characteristics.

All our variables combined can explain almost half of the observed aggregate price difference between a high-price country such as Norway and a low-price country such as Portugal. The difference in wage dispersion alone between a high-dispersion country such as the United States and a low-dispersion country such as Belgium was enough to raise aggregate prices in Belgium by 30 percent. The higher wage dispersion in the United States was enough to offset the effect of higher US per capita income on US prices.

Our estimates suggest that wage dispersion is key in understanding why a high income country such as the United States has a much larger private low-skill service sector than many European countries. This conclusion is reinforced by our finding that a high relative price of a product in a country is associated with a lower relative consumption of that product. The relationship between relative price and consumption share in a country is particularly strong for unskilled-labor-intensive products not primarily provided by governments. Since these are mostly services of low tradability, their high prices inhibit not only the consumption of these services, but also their production and their employment of low-skill workers.

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Appendix Table 2

Average Combined Transportation, Wholesale, and Retail Trade Margins

Basic Headings for Eurostat- OECD PPP Programme	Commodity Group	Average Margin
111	Food, beverages and tobacco	34.20
112	Clothing and footwear	78.74
114	Household equipment and operation	39.11
115	Medical and health care	50.43
116	Transport and communication	24.48
117	Education, recreation and culture	41.79
118	Miscellaneous goods and services	56.83
141	Machinery and equipment	16.57

Source: US Department of Commerce, 1991, 1994, 1997, and 2002.

Appendix Table 3

Regressions Relating Price Levels to Country Characteristics & Their Interactions with Product Characteristics, Clustered at Countries

GDPC (GDP per capita)	0.1155 (0.0754)	0.3205*** (0.0965)
GDPC × LI (Labor intensity)	0.1285*** (0.0343)	0.1280*** (0.0343)
GDPC × TDB (Tradability)	-0.0041*** (0.0011)	-0.0043*** (0.0011)
WD (Wage dispersion)	0.0671 (0.0749)	-0.3141*** (0.0713)
WD × TDB	0.0025*** (0.0007)	0.0026*** (0.0007)
WD × LI	-0.0797*** (0.0202)	-0.0792*** (0.0202)
XRR (Deviation from 9-year averages)	1.0616*** (0.1060)	1.0464*** (0.1263)
Year Dummies		
yr85	0.0052 (0.0200)	0.0077 (0.0256)
yr90	-0.0025 (0.0200)	0.0116 (0.0229)
yr93	-0.0019 (0.0184)	0.0119 (0.0199)
yr96	-0.0021 (0.0118)	0.0160 (0.0145)
Country Dummies		
Australia	-0.1477*** (0.0059)	
Austria	0.0115** (0.0043)	
Belgium	-0.0334* (0.0181)	
Canada	-0.2132*** (0.0438)	
Denmark	0.1751*** (0.0165)	
Finland	0.1906*** (0.0106)	
France		
Germany	-0.0122 (0.0085)	
Ireland	-0.0693** (0.0296)	

Appendix Table 3 (cont.)

Regressions Relating Price Levels to Country Characteristics & Their Interactions with Product Characteristics, Clustered at Countries		
Italy	-0.0462*** (0.0150)	
Japan	0.4048*** (0.0069)	0.3993*** (0.0237)
Netherlands	-0.0837*** (0.0062)	
New Zealand	-0.1316*** (0.0135)	
Norway	0.2425*** (0.0210)	
Portugal	-0.1468*** (0.0248)	
Spain	-0.1030*** (0.0273)	
Sweden	0.2115*** (0.0180)	
Switzerland	0.1985*** (0.0192)	
United Kingdom	-0.0903*** (0.0144)	
United States	-0.2065*** (0.0475)	
Constant	0.7702*** (0.1352)	1.1594*** (0.1486)
No. of Observations	17107	17107
R-squared	0.2846	0.2011

Standard errors in parentheses;

* significant at 10%;

** significant at 5%;

*** significant at 1%

Data Appendix

Product price is the price of an individual product in each country, measured in national currency and converted into U.S. dollars by the average exchange rate against the U.S. dollar during that year, as reported in OECD (2001). The individual product prices are for almost 200 categories of goods and services covered in OECD price comparisons. After conversion to \$U.S., each product price was taken as a relative to the average price in all the OECD countries.

Real gross domestic product per capita is gross domestic product in current year international prices, as reported in OECD (2003). The figure for each country in each year was taken as a per cent of the average for all OECD countries.

Wage dispersion, our measure of wage compression, is measured by the ratio of the median wage to the wage at the lowest decile. Each country's wage dispersion in each year was taken as a per cent of the average for all OECD countries. The wage dispersion data for years before 1996 are from OECD (1996). Data for later years, and some revisions of earlier data, were obtained directly from the OECD "Database on Earnings." For maximum consistency across countries, wage dispersion was calculated from the distribution of men's earnings where it was available, but for Denmark and Norway, the distributions are for the earnings of men and women. The wage distribution of the year of the price observation was used where it was available, but in some cases, that of the closest year had to be taken. Most of the country wage dispersion levels varied only slowly over time.

Tradability is measured by the extent of international trade (exports plus imports) in a product (including services), relative to the value of production. The figure for each product or service was taken as a per cent of the average for all the products and services. For goods, the ratios are based on UNIDO (2000), which provides export, import, and production data for ISIC

Revision 2 industries. Tradability is assumed to be a fixed characteristic of a product and data for a single year are used for the calculation, 1991 for 41 countries, 1992 data for three, 1990 for one, and 1986 for one.

We could not find corresponding international data for services. The most detailed breakdown was for the United States, for which we used the 1997 Input-Output table of the Bureau of Economic Analysis, which provided exports, imports, and domestic production for a large number of services.

The exchange rate deviation for each year is calculated from nominal exchange rates relative to the dollar, in terms of dollars per unit of other currency, from International Monetary Fund (2002). Each country's rates from 1970 to 2002 were averaged across years, and the series were put in terms of relatives, with the period average = 100. These relatives were averaged across all 19 or 20 countries, and were recalculated with the average of all countries in each year as the base (=100). A nine-year moving average was fitted to each country's series of relatives, and deviations from this nine-year index form our exchange rate deviation measure.

Market support estimates are measures of agricultural protection. Market Support = Consumer Subsidy Equivalent / (Total Consumption – Transfer to Consumers from Taxpayers) * 100, where the consumer subsidy equivalent is calculated by the OECD from data on price differences for agricultural products between individual country and international markets. Data are from OECD (1991 and later issues).

Labor intensity is measured as the ratio of the number of employees to the value added in an industry. Since the prices are at the final product level, we wish to include the labor intensity of the margin between the producer price and the final price, which we take to be the sum of costs incurred in three broad industry groups, transportation, wholesale trade, and retail

trade to deliver the final product. Unfortunately, there is no subdivision of these costs according to the product involved, so that labor intensities in these three industry groups are assumed to be identical across all products that are transported, all that are wholesaled, and all that are retailed.

Thus, the labor intensity for a product (i) is measured as:

$$LI = \frac{EMP_i + EMP_{TR} * \frac{TC_i}{\sum TC} + EMP_{WT} * \frac{WT_i}{\sum WT} + EMP_{RT} * \frac{RT_i}{\sum RT}}{(VA-T)_i + (VA-T)_{TR} * \frac{TC_i}{\sum TC} + (VA-T)_{WT} * \frac{WT_i}{\sum WT} + (VA-T)_{RT} * \frac{RT_i}{\sum RT}}$$

where

EMP_i : Employment in industry i;

EMP_{TR} : Total employment in Transportation industries;

EMP_{WT} : Total employment in Wholesale Trade industry;

EMP_{RT} : Total employment in Retail Trade industry;

$(VA-T)_i$: Value added excluding indirect taxes in industry i;

$(VA-T)_{TR}$: Value added excluding indirect taxes in Transportation industries;

$(VA-T)_{WT}$: Value added excluding indirect taxes in Wholesale Trade industry;

$(VA-T)_{RT}$: Value added excluding indirect taxes in Retail Trade industry;

TC_i : Transportation costs in industry i;

WT_i : Wholesale margin in industry i;

RT_i : Retail margin in industry i;

$\sum TC$: Total transportation costs in all industries;

$\sum WT$: Total wholesale margin in all industries;

$\sum RT$: Total retail margin in all industries.

The labor intensity data for each product in each year was taken as a per cent of the average for all products. Data come from U.S. Input-Output tables for 1982, 1987, 1992 and 1997. The calculations of labor intensity for 1996 and 1999 are both based on the 1997 U.S. Input-Output tables. Our use of U.S. data to represent the world labor intensity implies an assumption that these product characteristics do not vary greatly from country to country.