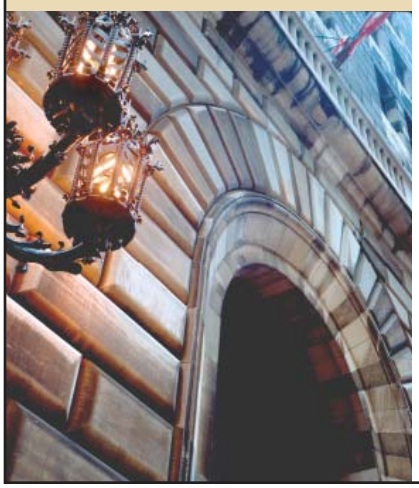
FEDERAL RESERVE BANK OF NEW YORK
current issues
IN ECONOMICS AND FINANCE
Volume 15, Number 1 • January 2009 • www.newyorkfed.org/research/current_issues



What's Behind Volatile Import Prices from China?

Mary Amiti and Donald R. Davis

In a sharp departure from earlier trends, the price of U.S. imports from China rose 6 percent in the 2006-08 period. To explore the forces behind this surprising increase, the authors create a new import index that uses highly disaggregated data to track price developments in different product types. The index reveals that the largest price increases were concentrated in industrial supplies—goods that rely heavily on commodity inputs. The authors conclude that the surge in commodity prices through mid-2008 was the primary driver of the rising import prices from China.

Prices of U.S. imports from China increased 7 percent from the beginning of 2007 through August 2008. Although the prices edged down in the fall, lowering the overall increase for the 2006-08 period to 6 percent, the long upswing in prices represented a sharp reversal of previous price trends and challenged the customary view of China as a wellspring of low-priced goods. It also raised concerns because China's position as the largest single supplier of U.S. imports—accounting for 20 percent of non-oil imports—meant that the price hikes could have far-reaching consequences for U.S. businesses and consumers.

The press initially speculated that rising Chinese wages were behind the price increases,[1] and subsequent news reports cited shifts in exchange rates and raw material prices as additional factors. In fact, however, it has been difficult to identify the forces driving the price rises. The primary source of information on the price movements of Chinese imports—a monthly price index compiled by the Bureau of Labor Statistics (BLS)—covers just the past five years and presents only aggregate figures for Chinese imports as a whole. It does not track price movements for individual product types over time—information that might shed light on the causes of the rise in import prices.

In this edition of *Current Issues*, we construct a new price index to obtain a better understanding of the behavior of Chinese import prices. Our new index uses highly disaggregated data that allow us to decompose the overall price index for Chinese imports into three end-use categories: industrial supplies, capital goods, and consumer goods. In addition, the index includes data going back to 1997, making it possible to follow price movements over a longer period.

A key revelation of the new index is that imports of Chinese industrial supplies showed the largest price increase over the 2006-08 period, while the prices of consumer and capital goods moved up only modestly. Since oil and raw materials are critical inputs in industrial supplies, we can infer that the dominant force behind higher U.S. import prices from China was the steep run-up in oil and commodity prices. With the

[1] See, for example, Keith Bradsher, "Wages Are on the Rise in China as Young Workers Grow Scarce," *New York Times*, August 29, 2007, late edition.

longer time series, the data also reveal that the upturn in consumer goods prices coincided with the rise of the Chinese renminbi against the U.S. dollar, suggesting that the appreciation of the Chinese currency was also a contributing factor. The rising wages of Chinese workers, though identified by the press as an important source of the price increases, proves on closer examination to be of scant importance.

Measuring Import Prices

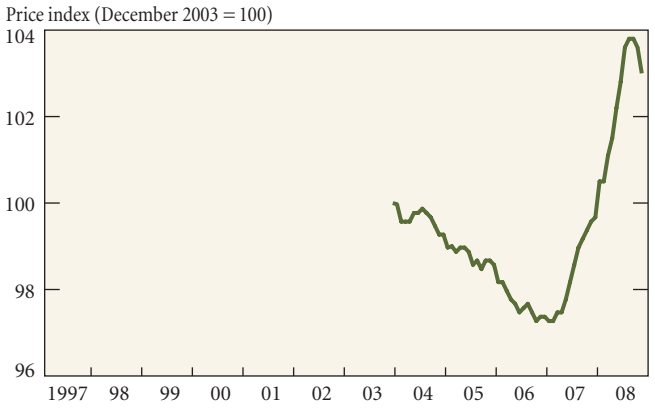
Each month, the Bureau of Labor Statistics publishes an aggregate U.S. import price index that averages price movements across all source countries. The aggregate index is in turn divided into separate indexes by type of goods imported, referred to as end-use categories. In addition, the BLS computes a separate price index for some source countries, including China. These country-specific indexes, however, are not broken out by end-use categories.

The BLS began publishing its index of Chinese import prices relatively recently, in December 2003. From the start of the sample through the end of 2006, the price index fell from 100 to 97, showing a 3 percent decline in prices (Chart 1). Beginning in 2007, however, it reversed itself and rose to 103.8 by August 2008, thus showing a 7 percent increase over this period. Although the index has declined recently, by 0.8 percent between August and November 2008, the overall rise of 6 percent in Chinese import prices over a two-year period represented a worrisome departure from earlier trends for U.S. firms and consumers accustomed to inexpensive goods from China.

To explore the forces behind these price increases, we construct a new index that tracks import prices from China for a longer time period, going back to 1997, and we then decompose the index by product type (see the discussion of our methodology in the box).

Chart 1

Import Prices from China



Source: U.S. Department of Labor, Bureau of Labor Statistics (BLS).

Note: The BLS introduced its import price index for China in December 2003.

Empirical Methodology

Our calculation of the growth in the import price index (*MPI*) is based on the Tornqvist formula:[a]

$$MPI_t^{China} = \Pi_{i,t}\left(\frac{uv_{i,t}}{uv_{i,t-1}}\right)^{w_{i,t}}, \text{ where } w_{i,t} = 0.5*(share_{i,t} + share_{i,t-1}).$$

The unit value $uv_{i,t}$ is defined as the ratio of the value of non-oil manufactured imports to the quantity of imports for each Harmonized System (HS) ten-digit product code i at year t. For product i to be included in the construction of the index at period t, the product must be imported from China in both period t and t-1. Each HS ten-digit product code imported from China is weighted ($w_{i,t}$) by taking the average share of imports of product i in period t ($share_{i,t}$) and period t-1 ($share_{i,t-1}$). Thus the basket of goods changes from period to period, as do the weights.[b] The formula gives the changes in import prices from period to period. To calculate the import price index series, we cumulate the *MPI*, obtaining the levels of the price index plotted in our charts.

We construct the import price index by end-use category in the same way after dividing the non-oil manufacturing HS ten-digit categories into three end-use categories—industrial supplies, capital goods, and consumer goods—using an official concordance from the U.S. Census Bureau. Note that we exclude from our analysis the separate end-use category for automotive vehicles and parts because it comprises less than 5 percent of imports from China. For each of the three end-use categories, we construct an import price index using the above formula.

This methodology differs from that of the Bureau of Labor Statistics (BLS). To construct the international import price indexes, the BLS adopts a Laspeyres-type formula that uses historical annual weights lagged by two years. The basket of goods used by the BLS changes over the period, as do the weights given each product. The Laspeyres formula computed with the unit value data as inputs yields the same conclusions as the Tornqvist formula; however, it produces more pronounced aggregate price increases. An advantage of using the Tornqvist index is that it corrects for the tendency of consumers to purchase lower quantities of goods whose relative price has risen. Thus, it is closer to a true cost-of-living index than is the Laspeyres index.

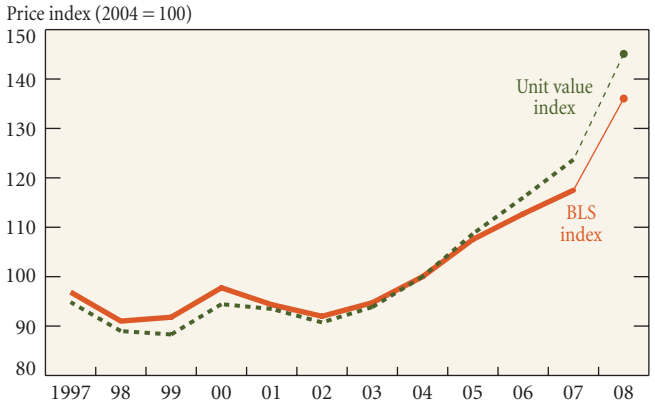
[a] See Diewert (1993) for a description of the various types of indexes.

[b] When we kept the basket of goods the same for the whole period, the sample of products was reduced considerably. This approach yielded the same general conclusions, although the price rises were even higher than those reported here.

Our calculations draw on unit value data, defined as the ratio of the import value of a particular product to the quantity of U.S. imports from China. To be sure, the use of unit value data to construct price indexes has a drawback, since the data make no adjustment for the quality and composition of goods. Thus, the indexes might overstate inflation if quality has improved or the composition of imports has shifted toward higher priced goods. Recognizing this drawback, we seek to minimize the compositional changes within a product category by using the

Chart 2

Comparison of BLS Index and Unit Value Index: Price of Imports from All Countries

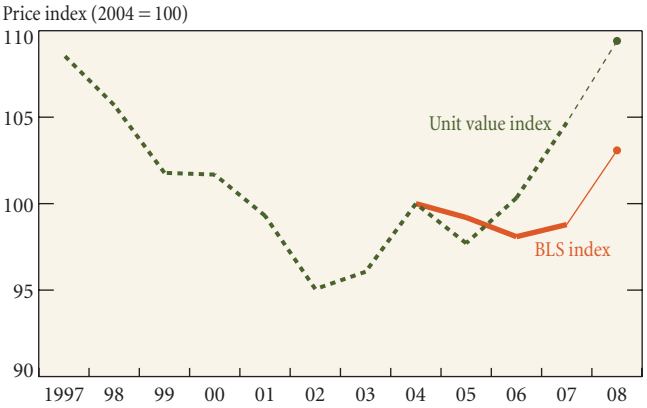


Sources: U.S. Department of Labor, Bureau of Labor Statistics (BLS); U.S. Census Bureau; authors' calculations.

Note: Values for 2008 are averages of monthly data through October 2008.

Chart 3

Comparison of BLS Index and Unit Value Index: Price of Imports from China



Sources: U.S. Department of Labor, Bureau of Labor Statistics (BLS); U.S. Census Bureau; authors' calculations.

Note: Values for 2008 are averages of monthly data through October 2008.

most disaggregated data available—the ten-digit classifications of the Harmonized System (HS). These classifications comprise more than 16,000 product codes in total, of which about 8,000 apply to goods imported from China by the United States. To get a sense of the level of disaggregation in the data, consider that there are more than sixty different product codes for textile carpets, each specifying whether the carpet is of manmade fiber, what type of material is used, and so forth.

The sample of goods used in our index is considerably larger than the sample used in the BLS index for China. Although the BLS indexes have the attraction of using actual price quotes from firm surveys, the BLS import price index for China comprises only about 3,000 products, with 2,000 actual price quotes collected for any given month.

The general reliability of our unit value data is borne out by the fact that, for the aggregate U.S. import price index we construct for goods from all countries exporting to the United States, the unit value data closely track the BLS aggregate price index (Chart 2).[2] Similarly, if we compare our unit value index for China with the corresponding BLS price index (Chart 3), we find that the two indexes tell broadly similar stories: both measures show an initial decline in import prices from China, followed by an increase. However, two important differences emerge in the data: the unit value data show an earlier turning point, 2005 rather than 2006, and a sharper recent escalation of import prices.

China Import Prices by Category

The unit value data permit a simple but revealing division of the imports from China into the three broad end-use categories used by the BLS in its aggregate U.S. import price index: consumer goods, capital goods, and industrial supplies.[3] In 2007, consumer and capital goods together accounted for approximately 85 percent of U.S. imports from China, and industrial supplies accounted for the remaining 15 percent.

An analysis of trends in import prices in each end-use category shows that the largest increases from China since 2004 were in the industrial supplies category (Chart 4). By contrast, the increases in consumer and capital goods prices were considerably more modest. These findings raise the question, Why were industrial supplies such a distinctive and important contributor to the rise in Chinese prices?

A Surge in Commodity and Oil Prices

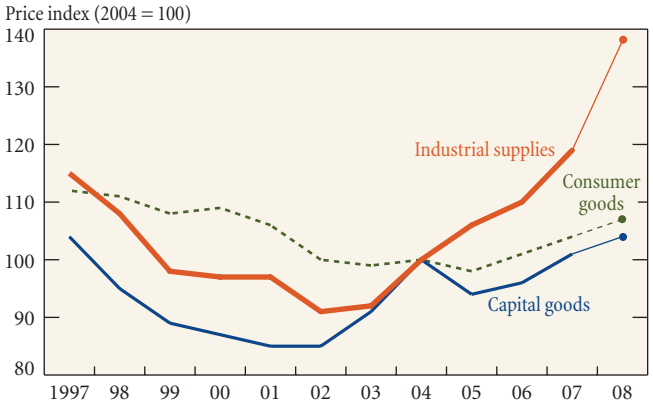
The large role of industrial supplies in boosting Chinese import prices relates closely to the composition of these goods. The industrial supplies category comprises intermediate inputs such as paper products, building materials, and metals and nonmetals related to durable goods. These products are made from commodities such as cotton, rubber, wool, plastics, chemicals, fuels, wood, glass, steel, and iron. Commodity and oil prices, of course, also rose steeply over the period examined in this study, as seen in Chart 5, where we plot the industrial supplies import price index against a commodity price index and the dollar price of

[2] Our unit value price index is computed using annual rather than monthly data. This approach has the advantage of smoothing out erratic price movements stemming from the irregular timing of shipments—that is, the fact that each product is not imported every month from China. Moreover, in order to compare the BLS index with our unit value measures, we average the BLS monthly data to create an annual time series.

[3] We exclude fuels from the industrial supplies category. However, industrial supplies also incorporate plastics, which are fuel-intensive.

Chart 4

Comparison of Import Price Indexes for Consumer Goods, Capital Goods, and Industrial Supplies

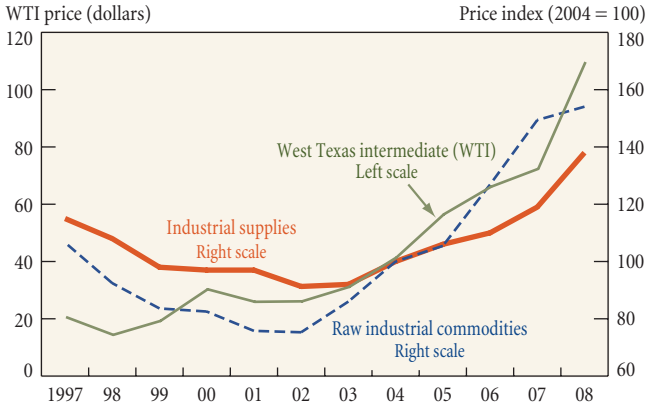


Sources: U.S. Census Bureau; authors' calculations.

Note: Values for 2008 are averages of monthly data through October 2008.

Chart 5

Industrial Supplies Import Prices from China and World Commodity Prices

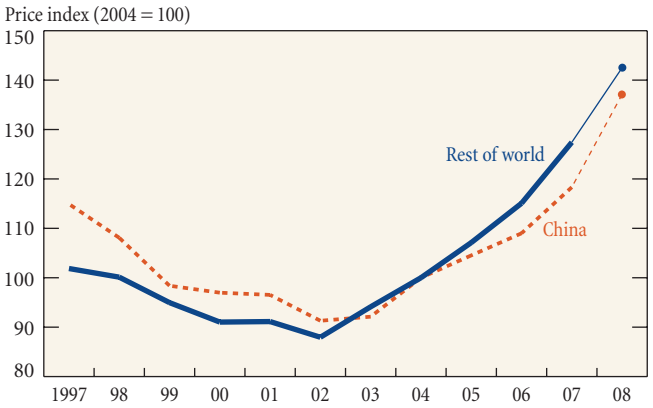


Sources: U.S. Department of Labor, Bureau of Labor Statistics; U.S. Census Bureau; authors' calculations.

West Texas intermediate (WTI) crude oil. The turning point in the industrial supplies index—between 2002 and 2003—coincides both with the turning point for non-fuel commodity prices ("raw industrial commodities") and with the step-up in the growth rate of oil prices. Of course, these series do not match exactly, because other factors also affect the overall behavior of prices.[4] Nevertheless, the series movements are broadly "in sync," suggesting that the surge in oil and commodity prices was instrumental in driving up import prices of China's industrial supplies.

Chart 6

Comparison of Industrial Supplies Prices: China and Rest of World



Sources: U.S. Census Bureau; authors' calculations.

Note: Values for 2008 are averages of monthly data through October 2008.

If the upswing in oil and commodity prices does indeed help to explain the rise in these prices, we would also expect to see an increase in U.S. import prices for industrial supplies from countries other than China. The reason is that oil and commodity price increases are a global development; hence, they should exert upward pressure on the prices of industrial supplies throughout the world. In Chart 6, we compare U.S. import prices of industrial supplies from China with those from the rest of the world for the same product codes. As the chart shows, import prices of industrial supplies from the rest of the world also climbed sharply during our sample period. Of course, rapid growth in China may be a contributing factor to the rise in commodity prices because of increased demand. But insofar as the price of industrial supplies is also rising rapidly outside China, an important determinant of the increase in Chinese import prices is a global, rather than a China-specific, phenomenon.

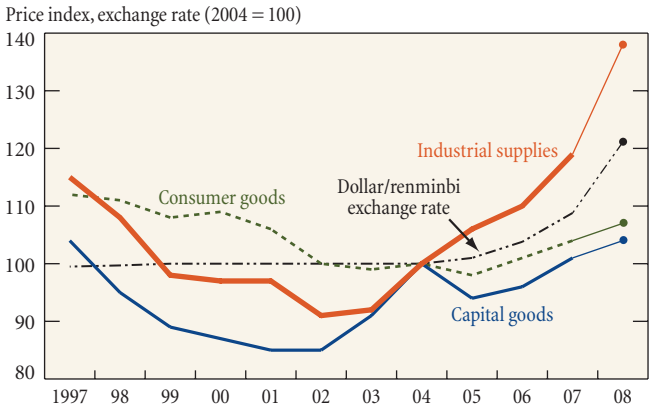
The Role of Exchange Rates in the Import Price Rise

As we noted earlier, import prices for consumer and capital goods from China also rose in recent years, though the increases were of smaller magnitude than those observed for industrial supplies. One factor that may have contributed to the higher prices of these goods was the appreciation of the Chinese currency. The renminbi began to strengthen against the U.S. dollar in 2005, the same year that import prices for both consumer and capital goods started to increase. Since 2005, the dollar/renminbi exchange rate has risen more than 20 percent.

[4] For example, China provides oil and fuel subsidies that help cushion some of the world commodity price increases, reducing the growth of costs for the producers of industrial supplies.

Chart 7

Dollar/Renminbi Exchange Rate and Import Price Indexes for Consumer Goods, Capital Goods, and Industrial Supplies

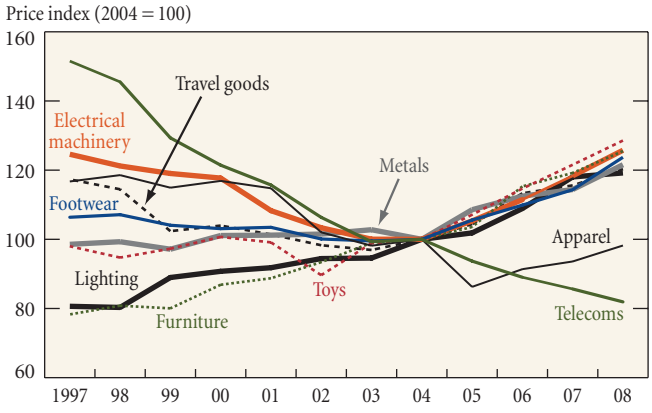


Sources: Bank for International Settlements; U.S. Census Bureau; authors' calculations.

Notes: Values for 2008 price indexes are averages of monthly data through October 2008. The 2008 value for the dollar/renminbi exchange rate is the average exchange rate for October of that year.

Chart 8

Disaggregated Indexes of Consumer Goods Prices



Sources: U.S. Census Bureau; authors' calculations.

Note: Values for 2008 are averages of monthly data through October 2008.

The appreciation of the renminbi relative to the dollar creates pressure for the dollar prices of Chinese goods to rise. This "pass-through" of the exchange rate change to dollar prices, however, need not be one for one. That is, if the exchange rate rises by 10 percent, the dollar price of goods might rise by less than 10 percent. The degree of pass-through would depend on market features such as the extent of competition from non-Chinese export sources and the prevalence of existing contracts that lock in particular dollar prices. In addition, it would depend on the extent to which the costs underlying Chinese exports indeed reflected value added in China. Since intermediate inputs imported to China account for a large share of the value of its exports, the price of these imports would also reflect China's exchange rate with the countries from which it imports intermediate goods.

While such factors complicate exchange rate pass-through, the renminbi appreciation clearly coincided with increases in import prices. Chart 7 plots the evolution of the dollar/renminbi exchange rate from 1997 to date against the price movements of our three categories of imports. The contemporaneous movement of the exchange rate and broad prices for consumer goods, capital goods, and industrial supplies is quite apparent. Chart 8 shows that this pattern is widespread across broad subcategories of consumer goods prices: import prices of almost all these subcategories increased between 2005 and 2008, when the exchange rate was rising. The two exceptions—apparel and telecoms—are easily explained. The divergent price movements for apparel imports reflect the existence of import quotas: the prices declined between 2004 and 2005 before beginning to rise in 2005 after import quotas were lifted.[5] The import prices of telecom products (such as videos and televisions) fell throughout the sample period because technological advances and productivity gains kept unit costs down.

Increasing Wages in China

A third factor that could have driven the higher import prices from China—cited often in early press coverage of this topic—is the rise in Chinese workers' wages. For given markups over marginal cost, increasing wages will account for the observed higher prices when two conditions hold. First, the wage increases must outpace productivity increases, so that unit costs are rising. Second, the wage component of the total cost for exports must be high. Although reliable unit labor cost data for China are difficult to obtain, the official statistics do indicate annual wage increases of 15 percent over the last few years. However, it appears that the labor share of export costs is not high enough to account for a significant part of the price rises.[6]

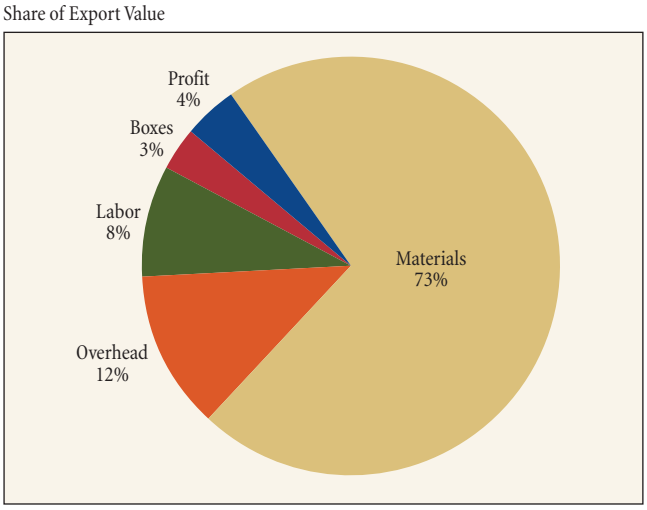
Consider, for example, the breakdown of total costs for a boot manufacturer in China (Chart 9). Material inputs account for nearly three-fourths of the manufacturer's export costs, while labor represents a mere 8 percent. Further evidence of labor's limited role is provided by firm-level data in Chart 10 that show how Chinese exporters' wage bills varied as a share of total sales value across the distribution of firms in 2004. Ninety percent of the nearly 8,000 firms in the sample had labor cost shares at or below 20 percent of total sales revenue. The most prevalent labor

[5] See Barrows and Harrigan (forthcoming) on the effect of lifting import quotas on apparel from China.

[6] Consistent with our findings, a survey by Deutsche Bank (2008) in March revealed that 50 percent of exporting firms surveyed in China identified raw material costs as the key factor driving down profit margins and only 13 percent identified labor costs as a factor.

Chart 9

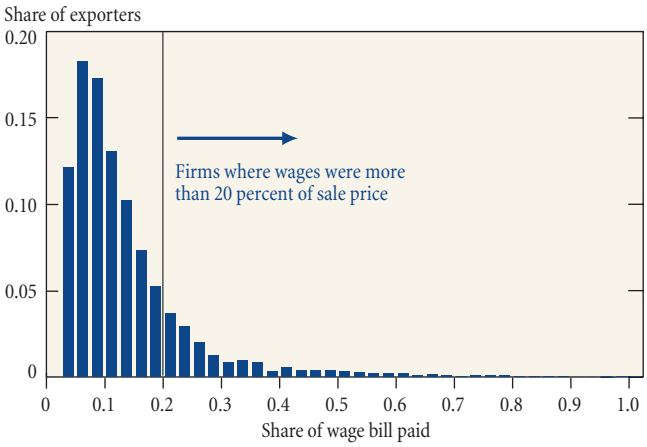
Total Costs for a Chinese Boot Manufacturer



Source: Forsan.

Chart 10

Histogram of Wages as a Share of Total Sales Value for Chinese Exporting Firms



Source: Bureau van Dijk, Oriana data set.

Note: The sample contains 7,900 firms.

cost share was just 5 percent.[7] These findings clearly indicate that even relatively strong wage growth in China is likely to have only a very modest impact on prices.

It is also important to consider whether the *pace* of wage changes has varied over time. Holding all other factors equal, we would expect a marked change in the path of import prices from China if there were a significant change in the growth rate of wages. While the annual growth rate of wages has been in the range of 12 to 15 percent according to official Chinese statistics, there has been only a modest acceleration in the growth rate of wages, on the order of 3 percent over a two-year period (from 15 percent in 2006 to 18 percent in 2007).[8] Given the relatively low weight of wages in total costs, this small boost would fall far short of explaining the rising import prices from China.

Changing Product Mix and Rising Product Quality

Before we conclude our inquiry into movements in Chinese import prices, we need to ask whether the observed price increases actually reflect higher prices for a given body of goods. Could it instead be the case that the increases are due to the import of higher quality goods or to changes in the composition of imports at a level too fine to be captured in the import price data?

As we noted earlier, it is not possible to adjust for quality changes when unit value data are used. Thus, in principle, the observed import price increases could stem from quality upgrading. However, given the pattern of price increases we have observed, this explanation seems unlikely. If quality upgrading were the driving force, the largest price increases would not be concentrated in industrial supplies—material-intensive goods that exhibit only small quality differentials at best. Instead, we would expect to see price increases in the consumer goods category that were similar to or even larger than those in industrial supplies. However, as our index has shown, the rise in prices for consumer goods has been quite modest.

Evidence is also lacking for the notion that higher import prices from China merely reflect the changing composition of the goods imported. Certainly, there have been dramatic changes in the broad composition of imports from China.[9] Footwear and clothing as a share of total manufactured imports from China have declined, from 60 percent in 1997 to 38 percent in 2007, while the share of machinery has grown from 29 percent in 1997 to 38 percent in 2007.[10] Nevertheless, when we keep the basket of goods fixed over the whole period, our import price index for China shows a *larger* increase than when we allow the basket to change to take account of new goods. Thus, it is doubtful that the composition of imports has shifted toward higher priced goods. Indeed, telecoms, the goods category with the largest price declines over the sample period (Chart 8), shows the greatest growth of any category and accounts for a striking 26 percent of

[7] Of course, some of the materials are domestically purchased, and so incorporate labor costs from China. But a large share of China's exports is "processing trade"—the practice of assembling duty-free inputs for export—which usually involves a large share of imported inputs. See Koopman, Wang, and Wei (2008).

[8] National Bureau of Statistics of China, Ministry of Labour and Social Security, *China Statistical Yearbook*, various years.

[9] See Amiti and Freund (forthcoming) for more details on China's export growth.

[10] Under the United Nations' Standard International Trade Classification system, these are one-digit categories, with the shift from the one-digit category 8 (other manufactures) to the one-digit category 7 (machinery).

consumer goods. The implication of this development is that the mix of imports from China has moved in the direction of products whose prices are falling, not rising.

Conclusion

What forces reversed the downward trend in import prices from China, leading to a 6 percent increase over the last two years? Our new import price index, which permits a breakdown by product type, casts fresh light on the causes of the upturn. In particular, it shows that the largest increases in import prices were in industrial supplies, with only moderate increases in consumer and capital goods prices.

These observations in turn help us to evaluate the underlying factors that may have driven the increases in import prices. For example, while improvements in the quality of Chinese exports are surely ongoing and could have led to an overstatement of actual price rises, it is hard to see why the quality upgrading would be concentrated in industrial supplies. Moreover, although wage growth is a reality in China, for a large range of firms the labor component of costs is just too small to explain the change in price trends.

More persuasive as a source of the increase in import prices is the 20 percent appreciation of the renminbi against the dollar. The appreciation began in June 2005, coinciding closely with the rise in import prices for consumer and capital goods in particular. But while the exchange rate change undoubtedly contributed to the upswing in import prices, the factor that best explains the very large increases in the import price of Chinese industrial supplies is the surge in the prices of oil and other commodities. Insofar as import prices of industrial supplies from other countries also rose with higher commodity prices, it appears that the higher import prices examined in this article were not really a China-specific effect, but a global phenomenon.

References

Amiti, Mary, and Caroline Freund. Forthcoming. "An Anatomy of China's Export Growth." In Robert Feenstra and Shang-Jin Wei, eds., *China's Growing Role in World Trade*. Chicago: University of Chicago Press.

Barrows, Geoffrey, and James Harrigan. Forthcoming. "Testing the Theory of Trade Policy: Evidence from the Abrupt End of the Multifibre Arrangement." *Review of Economics and Statistics*.

Deutsche Bank. 2008. *Asia China Macro Strategy*, April 1, p. 5.

Diewert, W. Erwin. 1993. "The Early History of Price Index Research." In W. Erwin Diewert and A. O. Nakamura, eds., *Essays in Index Number Theory*, 1: 33-66. Amsterdam: North-Holland.

Koopman, Robert, Zhi Wang, and Shang-Jin Wei. 2008. "How Much of Chinese Exports Is Really Made in China? Assessing Domestic Value-Added When Processing Trade Is Pervasive." NBER Working Paper no. 14109, June.

ABOUT THE AUTHORS

Mary Amiti is an officer in the International Research Function of the Federal Reserve Bank of New York's Research and Statistics Group; Donald R. Davis is the Kathryn and Shelby Cullom Davis Professor of Economics and International Affairs at Columbia University.

Current Issues in Economics and Finance is published by the Research and Statistics Group of the Federal Reserve Bank of New York. Linda Goldberg and Charles Steindel are the editors.

Editorial Staff: Valerie LaPorte, Mike De Mott, Michelle Bailer, Karen Carter

Production: Carol Perlmutter, David Rosenberg, Jane Urry

Subscriptions to *Current Issues* are free. Write to the Media Relations and Public Affairs Department, Federal Reserve Bank of New York, 33 Liberty Street, New York, N.Y. 10045-0001, or send an e-mail to pipubs@ny.frb.org. Back issues of *Current Issues* are available at <http://www.newyorkfed.org/research/current_issues/>.