IPP introduces additional Locality of Origin import price indexes

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The International Price Program (IPP) of the Bureau of Labor Statistics, as the primary source of data on price changes in the foreign sector, publishes monthly indexes of import and export prices for U.S. merchandise.[1] While such indexes convey price information across product categories of goods traded between the United States and the rest of the world, there is evidence that price trends further vary by the geographic source of the product being traded.[2] U.S. Locality of Origin (LOO) import price indexes were first published by IPP in 1992 for the following groupings, geographic regions, and countries: industrialized and other countries, Canada, European Union, Japan, and the Asian Newly Industrialized Countries (NICs); in 1997 the Latin America locality was added to publication.[3] Since 1992, other countries and regions such as China and Mexico have emerged as important trading partners with the United States. Thus, in January 2005, price index series for these two countries were added to the set of published LOO price indexes along with six other localities: France, Germany, the United Kingdom, the Pacific Rim, the Association of South East Asian Nations (ASEAN), and the Asia Near East.[4] (See box.) The new localities were determined according to customer interest, having a sufficient number and variety of usable item prices to reflect the actual dollar value and type of trade, and the statistical stability of calculated indexes. This article discusses trends found in these newly-published Locality of Origin import price indexes.

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Background

The motivation for producing price indexes by geographic region of origin is twofold. First, the types of products being traded differ across localities; therefore, price indexes across localities should exhibit different trends that could not otherwise be observed from the world goods price indexes. For example, the proportion of trade in manufactured goods is relatively higher for industrialized countries than for developing countries.[5] As such, petroleum and other raw materials prices have a lesser impact than manufactured goods prices in the industrialized LOO price index than in the other LOO price index. (See chart 1.)

Second, the U.S. dollar's fluctuation against foreign currencies has an impact on internationally traded products. The magnitude of the influence of currency fluctuation on price levels (often referred to as the *pass-through rate*) depends on a variety of factors. 1) Historically, raw materials prices have been more independent of exchange rate fluctuations than finished goods prices. 2) The magnitude and duration of exchange rate movements also impact the pass-through rate—larger and more permanent fluctuations are more likely to pass through to prices. 3) A particular industry's pricing conventions, such as longer durations between negotiations among buyers and sellers, tend to result in less responsiveness to exchange rate fluctuations. 4) The impact of exchange rate movements on transaction prices between trade partners may vary depending on whether said trade is intrafirm or not. 5) Finally, the degree of competitive pressures in an industry can determine whether a seller absorbs exchange rate fluctuations or passes them on to selling prices.

The set of LOO price indexes selected for publication was determined according to the current levels of pricing data collected monthly by the IPP as part of the voluntary survey sample of importing and exporting U.S. companies. To guarantee accuracy and stability of a price index by locality of origin, an index must contain consistent and abundant price information. The methods for selecting potentially publishable LOO indexes based on accuracy and stability are outlined in the "Other decision criteria" section of this article. Data on imported products from the Consumption Entry Documents collected by the U.S. Customs Bureau serve as an information source on the value and type of trade with foreign countries. These data serve as weights across product categories within an LOO index and are updated annually to reflect frequent shifts in trade. The preferred price basis for imports is f.o.b. (free on board), which is the price at the foreign port of exportation before insurance, freight, or duty are added. The product universe for constructing price indexes is defined as all merchandise that is consistently traded, excluding works of art, military items, and used items.

The LOO indexes are constructed using a modified Laspeyres index formula and the North American Industrial Classification System (NAICS) for the aggregation structure. An updated classification system reflecting new and emerging industries, NAICS has been implemented or is in the process of being implemented across many Federal statistical agencies to provide a consistent conceptual framework. The NAICS further allows the LOO indexes to be published—publishability standards permitting—at the disaggregated "manufacturing" and "nonmanufacturing" categories.

Recent trends

The United States is the world's largest market for other exporting countries. In 2004, it imported more than

U.S. locality of origin (LOO) import price indexes

Industrialized countries
Other countries
Canada
European Union
France
Germany
United Kingdom
Latin America
Mexico
Pacific Rim
China
Japan
Asia Newly Industrialized Countries (Asian NICs)
Association of Southeast Asian Nations (ASEAN)
Asia Near East

NOTE: Localities in **bold** were added to publication in 2005. All other LOO indexes were first published in 1992, except Latin America which was first published in 1997

$1.3 trillion worth of merchandise—accounting for more than 17 percent of the total value of world-wide imported goods.[6] Of the total 2004 U.S imports, half came from the four top trading partners: Canada (17 percent), China (13 percent), Mexico (11 percent), and Japan (9 percent). (See chart 2.) When the Locality of Origin indexes were first introduced in 1992, Canada and Japan were overwhelmingly the top suppliers of merchandise to the United States. (See chart 3.) In the time since, the volume of trade with the United States for both Mexico and China substantially increased; imports from China have grown a staggering 665 percent since 1992, and imports from Mexico have grown 343 percent over the same period. What has changed?

Asia-Pacific region. In 1978, the year Deng Xiaoping announced China's Open Door Policy, market-oriented economic reform began in China, including the opening up of markets to world trade. Since then, China's economy has been one of world's fastest-growing; its gross domestic product (GDP) has grown from around $600 billion in 1978 to well more than $5 trillion in 2003. Direct foreign investment increased to nearly $50 billion, up from less than $300 million in 1978, while the volume of imports and exports both increased by well more than 1,000 percent over the same period.[7] More recently, the growth of China's imports, particularly for raw materials, has been attributed as a factor in rising world spot prices for raw materials and energy.[8] Their fuel and raw materials imports have increased more than 250 percent over the last decade. Chinese demand for finished goods has also increased substantially over the same period: manufacturing imports have increased more than 200 percent.

China has also become a major producer of manufactured products. Its exports of manufactured products have increased well more than 400 percent in the past decade. The United States is China's largest market, and approximately 40 percent of China's exports were purchased by the United States in 2003, consisting mostly of the following manufactured items: office and household machinery, telecommunications and electronic equipment, furniture, textiles, clothing, and footwear.

Imports from the Pacific Rim region as a whole totaled nearly $500 billion in 2004, more than doubling the import dollar value since 1992. Adding to the set of price indexes for imports from Asian-Pacific economies, the International Price Program is introducing indexes for the Pacific Rim region and the Association of South East Asian Nations (ASEAN). Comprised of 14 Eastern Hemisphere nations—including China, Japan, and Australia—the Pacific Rim is the most aggregated regional price index for that part of the world. The ASEAN was established in 1967 with the mission of providing not only economic integration, but also cooperation in social areas such as health, labor, poverty, women's and children's issues, education, and disaster management. Its population extends to nearly 500 million people with a collective GDP of nearly $686 billion, and exports to the United States totaling nearly $82 billion in 2003.

Chart 4 displays the China, Pacific Rim, and ASEAN Locality of Origin import price series for 2004. Because such small percentages of imports from these regions are of nonmanufactured goods, the price index for all imports excluding petroleum is included in the chart for comparison purposes. The data show that the price index for imports from China is stable throughout 2004; during this time the U.S. dollar equaled roughly 8.28 yuan, which has been the exchange rate since October 1998. Prices for imports from the ASEAN have drifted slightly downward over the year, evidence of the falling price trend for world computers and electronics, an industry area that comprises approximately 57 percent of imports from the ASEAN region. Prices for imports from the Pacific Rim region as a whole, like those from China, were relatively flat during 2004.

Mexico. Mexico has also become an increasingly important trade partner with the United States. Since the enactment of the North American Free Trade Agreement (NAFTA) in 1994, Mexico's trade with the United States and Canada has tripled.[9] Despite the economic crisis that began in late 1994 and resulted in a large current

Chart 1. **Comparison of world import price indexes with industrialized and other countries**

LOO indexes

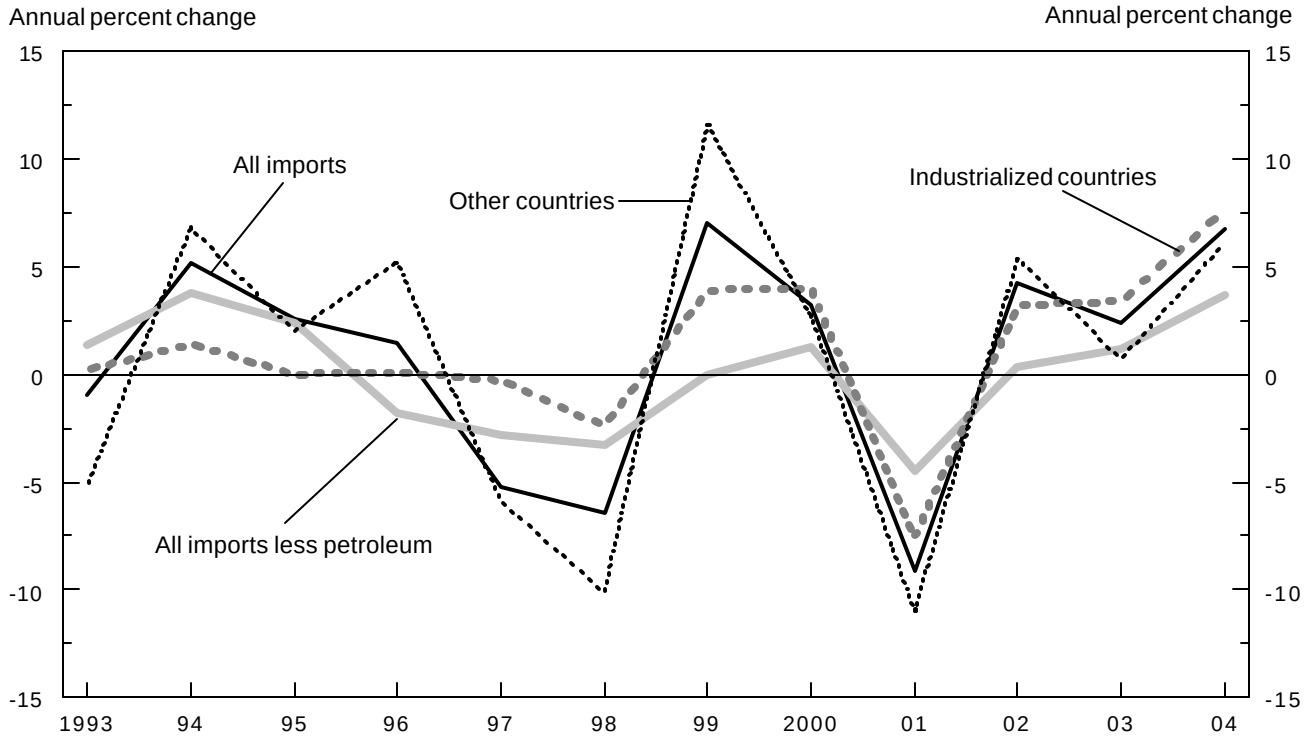
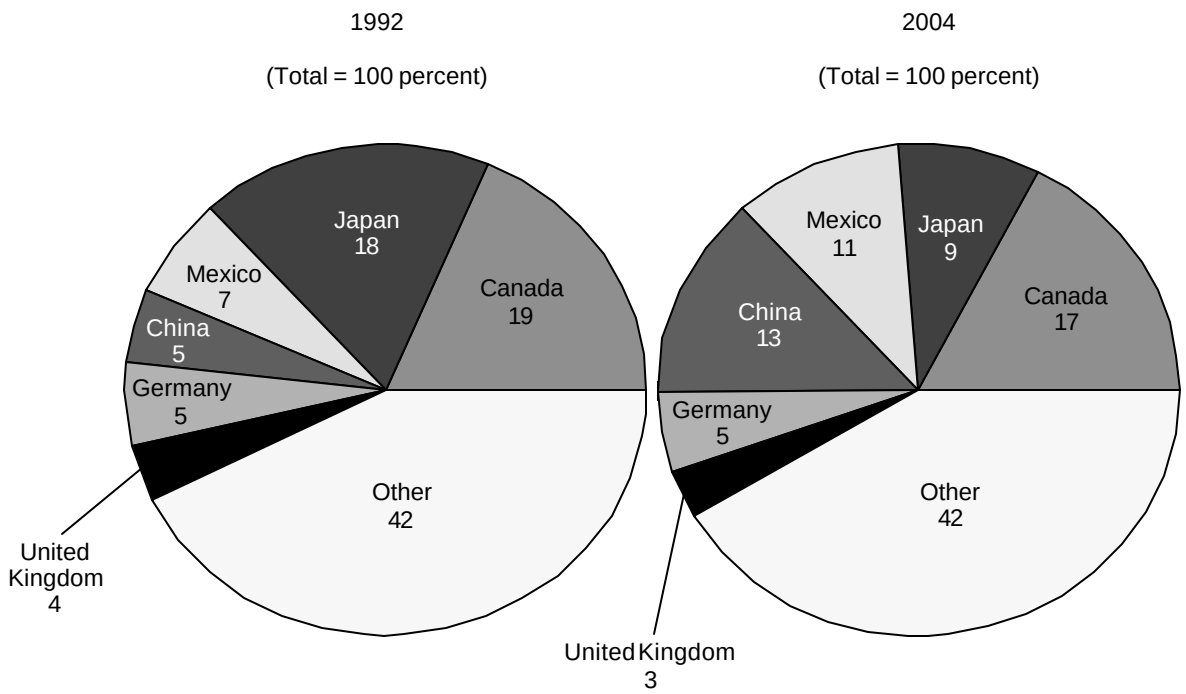


Chart 2. **Proportion of U.S. imports value held by top trading partners, 1992 and 2004, in percent**



NOTE: Data are in millions of U.S. dollars, not rebased because these are percentages of total.

Chart 3. **U.S. imports from top trading partners, by U.S. dollar value of trade**

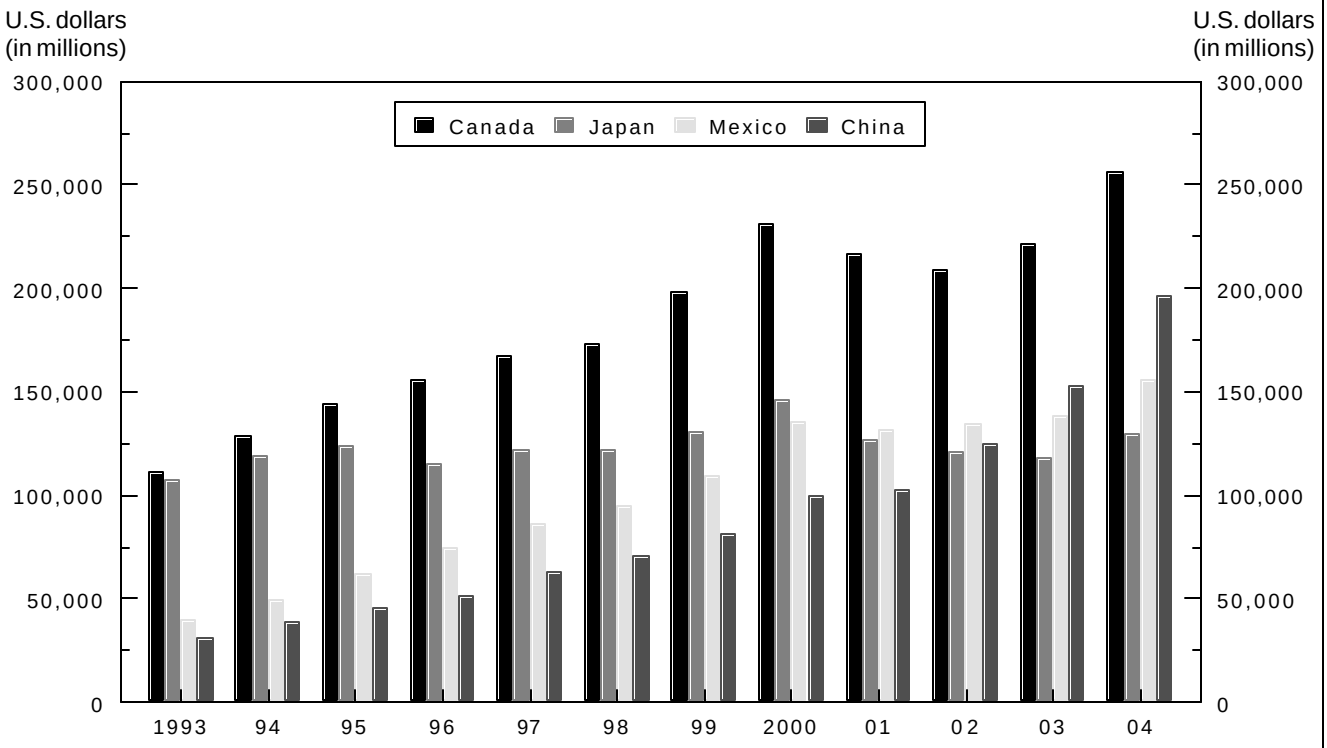
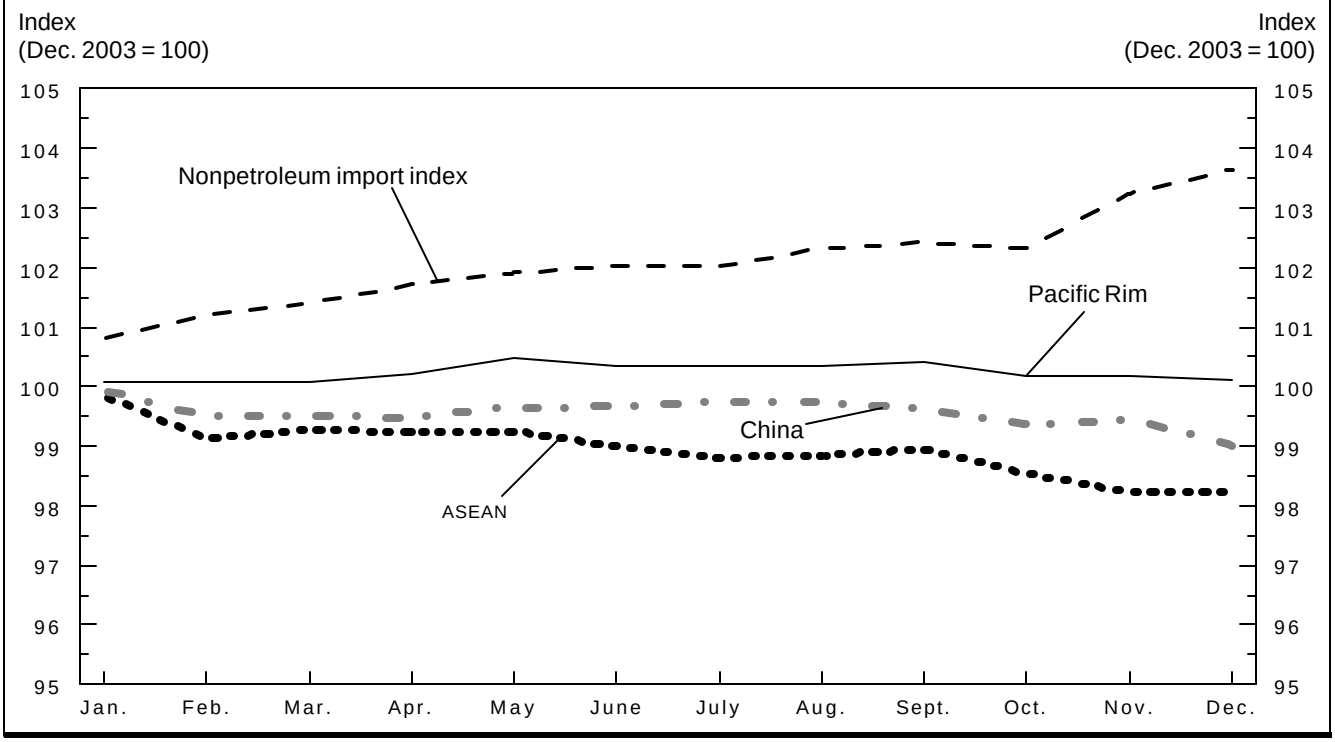


Chart 4. **Comparison of Association of Southeast Asian Nations (ASEAN), China and Pacific Rim locality of origin indexes with the nonpetroleum import index, 2004**



account deficit necessitating the Mexican government to float the peso—which subsequently lost half of its value against the U.S. dollar—Mexico's export sector rebounded quickly. Mexico's GDP grew an average of 12 percent per year from 1996 to 2000; and in 1995, Mexico began running trade surpluses with the United States. Such surpluses have grown to more than $40 billion, and in 2001 Mexico overtook Japan as the United States' second largest trading partner (after Canada) before more recently being surpassed only by China. Approximately 85 percent of Mexico's exports go to the United States, comprising nearly one-quarter of Mexico's GDP.[10] Mexico is not only the fourth largest supplier of petroleum to the United States, but also a significant supplier of manufactured goods such as motor vehicle parts and electronic equipment. Furthermore, intra-company trade plays a key role in U.S.-Mexico trade: about 64 percent of U.S. imports from Mexico and about 35 percent of U.S. exports to Mexico represent related party trade.[11]

Chart 5 displays the path of the import price index for goods from Mexico in 2004 along with the all imports price index. Import prices from Mexico trended upward over the year in a tendency similar to overall import prices, though the former showed a more pronounced increase and subsequent decrease resulting from the sharp petroleum price movements in the fall.

European countries. The International Price Program has published a Locality of Origin price index for the European Union since 1992. In 2005, price indexes for imports from France, Germany, and the United Kingdom were individually added to the set of published indexes to provide a more comprehensive picture of the behavior of import prices from that region. Together, the three countries make up more than half of the total dollar volume of imports from the European Union—and each is a significant contributor to the region's production of motor vehicles and chemicals, the industries accounting for the largest share of U.S. imports from the European region.

Chart 6 plots the import price indexes from Germany, the United Kingdom, and France along with a U.S. dollar-euro exchange rate index for comparison.[12] The U.K. import price index diverges from the two other countries' indexes and is attributable to the effect of world petroleum prices on the United Kingdom's refined petroleum industry. A noteworthy phenomenon in recent years is the U.S. dollar's weakening against major foreign currencies, particularly the euro. Between its June 2001 peak and January 2005, the dollar has lost more than 30 percent of its value against the euro.[13] However, chart 6 reveals that

Chart 5. Comparison of the import price index with the Mexico locality of origin (LOO) index, 2004

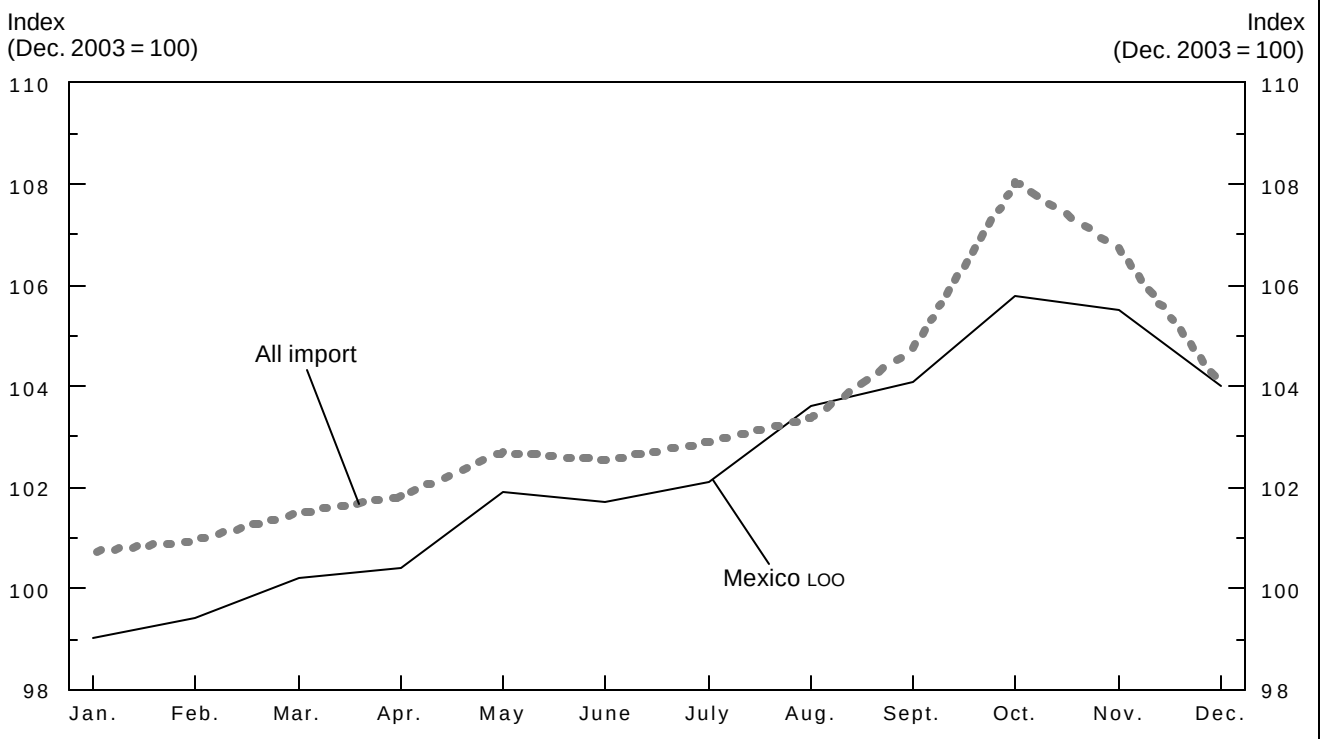
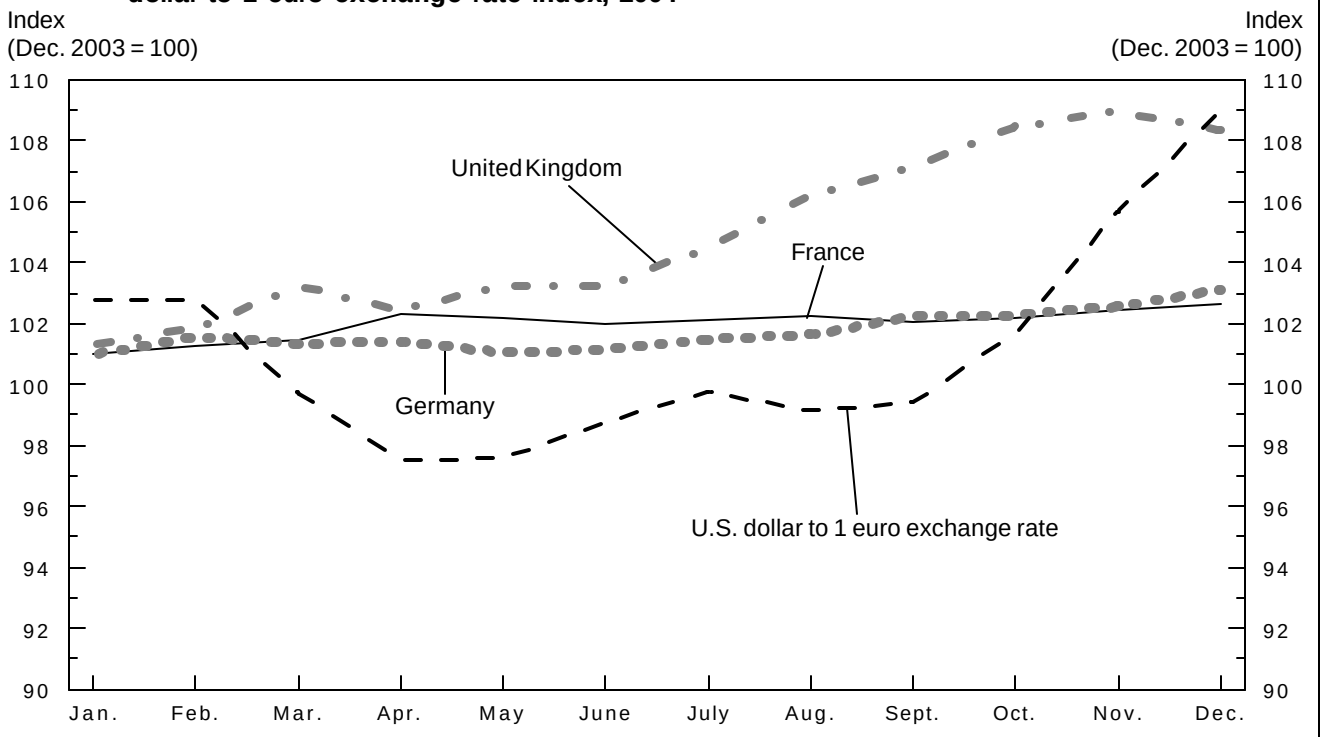


Chart 6. Comparison of France, Germany, and United Kingdom locality of origin indexes with U.S. dollar to 1 euro exchange rate index, 2004



any impact of the exchange rate movement appears inconclusive in both the Germany and France series, which were flat over the year—suggesting that exchange rate fluctuations were not passed through to import prices from major European trade partners to any notable degree.

Other Asia. The Asia Near East price index, which represents more than $40 billion in import merchandise value in 2003, is expected to be dominated by the behavior of petroleum prices, which account for nearly 60 percent of its exports to the United States.[14] Indeed, it can be seen in chart 7 that the series tracked closely with the world price index for petroleum in 2004. The remaining composition of imports from this region includes apparel, chemicals, and diamonds.

Other decision criteria

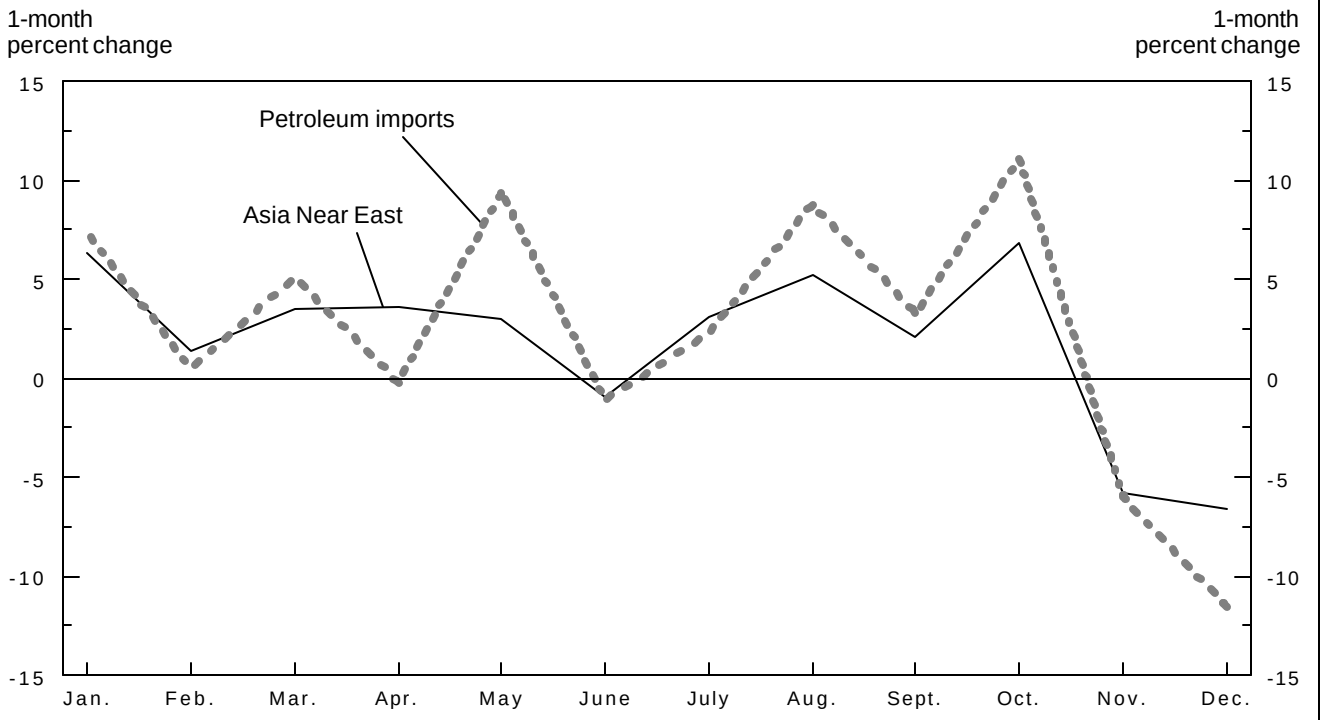
The feasibility research for determining acceptable additions to the set of published Locality of Origin indexes incorporated the evaluation of several criteria: annual dollar values of trade, goodness-of-fit measures, and variance analysis. First, the country's or region's trade dollar value with the United States generates customer interest—presumably, higher trade flows garner more public interest, particularly with individual countries such as China and Mexico.

In addition to customer interest, two goodness-of-fit statistics were used to compare the distribution of price quotes across disaggregated index strata to the distribution of trade dollar values across those index strata. Goodness-of-fit is especially important in determining the robustness of Locality of Origin indexes because the International Price Program samples from the universe of import and export transactions according to trade dollar values across product categories, rather than the trade dollar values across localities.[15] The goodness-of-fit measures thus provide a picture of how well the sampling process represents the distribution of trade by locality.

The first goodness-of-fit statistic bases the distribution of price quotes on the total number of prices *requested*, while the second goodness-of-fit statistic bases the distribution of quotes on the total number of *usable* prices. The general form of the goodness-of-fit statistic is

$$GOF = \frac{\sum_{i \in S} g_i \left(\frac{g_i}{\Gamma_S} - \frac{f_i}{\Phi_S} \right)^2}{\sum_{i \in S} g_i} \qquad (1)$$

Chart 7. Comparison of the Asia Near East locality of origin index and the import petroleum index monthly percent changes, 2004



where g_i is the sampled dollar value for stratum i; Γ_S is the sampled dollar value of trade in stratum i's parent stratum S; f_i is the number of prices in stratum i; Φ_S is the number of prices in stratum i's parent stratum S; and $GOF \in [0,1]$.[16] As the value of *GOF* gets closer to zero, the closer the distribution of prices is to the distribution of trade dollar value, indicating that the number of prices requested or collected is appropriately distributed to match trade patterns within a particular price index.

Acceptable upper-bounds for the two goodness-of-fit statistics were found by applying the statistics to price indexes for import products from the world published under the Harmonized products classification system.[17] The upper-bound was set at .05 for both goodness-of-fit statistics because approximately 95 percent of the two-digit-level Harmonized strata produced values of less than .05 for both versions of the goodness-of-fit statistic.[18] Therefore, LOO price indexes considered for publication should fall below the same upper-bound as the Harmonized strata; that is, a potentially publishable LOO price index should have a goodness-of-fit result equal to or less than .05.

Estimating the variances of price indexes is desirable as a measure of accuracy and stability. Variance estimates were obtained through a bootstrapping method to estimate the variability of the annual change of price index values.[19] The set of prices (known henceforth as item sets) for each potentially publishable country or region was independently re-sampled with replacement to obtain equivalent stratum-level item set sizes. This re-sampling was performed 50 times to create 50 item set realizations for each locality. For each replicate item set, bootstrap item weights were calculated by multiplying the original item weights by the number of times each item was randomly selected.[20] These re-sampled item sets, along with the adjusted item weights, were then used to create 50 realizations of each locality's price index series. Letting *PI* denote the price index value, *l* the locality, *s* the stratum of interest, *i* the replicate number, and *t* the time period (representing a monthly observation), the replicate annual changes in the price index values for each stratum within a locality were calculated as

$$\theta_{l,s,i,t} = \frac{PI_{l,s,i,t}}{PI_{l,s,i,t-12}} \quad (2)$$

And variances were calculated in the usual way as

$$Var_{l,s,t} = \frac{1}{50-1}\sum_{i=1}^{50}\left(\theta_{l,s,i,t} - \overline{\theta}_{l,s,t}\right)^2 \quad (3)$$

where

$$\overline{\theta}_{l,s,t} = \frac{1}{50}\sum_{i=1}^{50}\theta_{l,s,i,t} \quad (4)$$

Baselines for acceptable variance levels were established by calculating variances for the LOO indexes already published and for the Harmonized classification system import index. In general, variances for LOO indexes exceeded the variances for Harmonized import price indexes—an expected result because the number of prices in the world Harmonized indexes are greater than the number of prices in the LOO indexes. However, most fell within the Harmonized variances and the existing Locality of Origin indexes' variances. Locality of Origin countries and regions were then ranked and selected according to the number of periods that variances fell below the lowest variances for existing LOO indexes; the number of periods that variances fell between the lowest and highest variances for existing LOO indexes; and the number of periods that variances fell above the highest variances for existing LOO indexes.

Conclusion

The addition of newly-published Locality of Origin import price indexes to data offered by the International Price Program enhances the set of price indexes available to measure different aspects of inflation in merchandise markets. In 2004, price indexes for imports from Mexico, the United Kingdom, and the Asia Near East have trended with world petroleum prices, while the indexes for China, the Pacific Rim, France, Germany, and the Association of Southeast Asian Nations have been comparatively flat. The eight new Locality of Origin import price indexes are publicly available dating back to December 2003. It was not feasible to calculate indexes prior to December 2003 because the classification structure at the most disaggregated level changes so frequently that the market basket beyond a 1-year history cannot be reconstructed. Trade shifts are especially critical for LOO indexes; U.S. importers regularly change suppliers, which may not reside in the same locality as previous suppliers. □

Notes

[1] The Bureau of Labor Statistics also produces import and export price indexes for a set of services industries. The services sector is not included in locality of origin price indexes, and so is excluded from the discussion here.

[2] See "New international price series published by Nation and region," by Michelle Albert Vachris, *Monthly Labor Review*, June 1992, pp. 16–22.

[3] The Locality of Origin import price indexes measure prices at the point of exportation to the United States. Prior to January 2003, the "Industrialized Countries" and "Other Countries" categories were termed, respectively, "Developed Countries" and "Developing Countries." "Industrialized Countries" includes Western Europe, Canada, Japan, Australia, New Zealand,and South Africa, and "Other Countries" includes all other countries not comprising "Industrialized Countries." The Asia NICs category includes Hong Kong, Singapore, South Korea, and Taiwan.

[4] The Pacific Rim countries are Australia, Brunei, China, Hong Kong, Indonesia, Japan, Macao, Malaysia, New Zealand, Papua New Guinea, Philippines, Singapore, South Korea, and Taiwan.

[5] In 2003, the dollar value of nonmanufactured items comprised just more than 8 percent of industrialized imports compared with nearly 17 percent for other countries.

[6] Trade data collected from the Foreign Trade Division of the U.S. Census Bureau.

[7] World Bank 2004 World Development Indicators CD-ROM.

[8] See "A hungry dragon," *The Economist*, September 30, 2004.

[9] See *CIA-The World Factbook*, on the Internet at **http://www.cia.gov/cia/publications/factbook/geos/mx.html**.

[10] Trade data collected from the Foreign Trade Division of the U.S. Census Bureau and from the Organisation for Economic Co-operation and Development.

[11] Related-party trade information collected from the U.S. Bureau of the Census, on the Internet at **http://www.census.gov/foreign-trade/Press-Release/2003pr/aip/rp03-exh-1.txt**.

[12] The exchange rate is defined as the monthly average of the U.S dollar to 1 euro, and the exchange rate index is set according to December 2003=100, and then using the monthly percent changes to create subsequent index values. Note that the United Kingdom employs the British pound as its currency rather than the euro.

[13] As of January 2005. In June 2001, $1=1.172 euros; in January 2005, $1=.762 euros.

[14] The countries included in the Asia Near East region include the following: Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, United Arab Emirates, and Yemen. This definition is based on that used by the U.S. Census Bureau. Other definitions include countries in northeastern Africa and/or all countries along the southern and eastern parts of the Mediterranean Sea. The area is also frequently referred to as the "Middle East."

[15] For additional details of the International Price Program's sample design, see Chapter 15 of the *BLS Handbook of Methods*, on the Internet at **http://stats.bls.gov/opub/hom/homch15_a.htm**.

[16] Disaggregated strata are termed "child strata" when considered relative to "parent" strata, which are the next broadest level in an established classification structure.

[17] The Harmonized system is used for product classification during the sampling process in the International Price Program and so is thus assumed to offer the most appropriate baseline measure.

[18] Harmonized import and export price indexes are published at the following levels: Section, Chapter (2-digit), and 4-digit levels. The HTUSA (import) codes are maintained by the U.S. International Trade Commission and the Schedule B (export) codes are maintained by the U.S. Census Bureau.

[19] Annual percent changes are less noisy than monthly percent changes.

[20] The original item weights are those used in the calculation of the import and export price indexes and are based on probability sampling techniques. The weights are a function of the product category's and company's importance in trade.