How Changes in the Value of the Chinese Currency Affect U.S. Imports

Index: June 2005 = 100

Value of Renminbi Relative to Dollar

Prices of U.S. Imports from China

120	
115	
110	
105	
100	
95	
0	

Dec. 2004 Mar. 2005 June 2005 Sept. 2005 Dec. 2005 Mar. 2006 June 2006 Sept. 2006 Dec. 2006 Mar. 2007 June 2007 Sept. 2007 Dec. 2007 Mar. 2008

JULY 2008

A CBO PAPER

How Changes in the Value of the Chinese Currency Affect U.S. Imports

July 2008

Preface

This Congressional Budget Office (CBO) paper discusses factors that would limit the benefit to U.S. manufacturers from a potential appreciation of the Chinese currency. In keeping with CBO's mandate to provide objective, nonpartisan analysis, the report makes no recommendations.
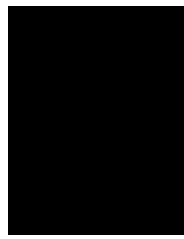
Peter R. Orszag
Director

July 2008

Contents

How Changes in the Value of the Chinese Currency Affect U.S. Imports

Introduction and Summary

Rapid growth in imports of merchandise from the People's Republic of China over the past decade has posed a challenge for competing U.S. manufacturers. The value of those imports quintupled between 1997 and 2007, rising from $65 billion to $342 billion.[1] By comparison, during the same period, the value of such imports from other countries doubled, growing from $825 billion to $1,664 billion. By 2007, China was the largest supplier of U.S. imports, accounting for 17 percent of all imported manufactured goods. A further indication of the growing competition to manufacturers in the United States and in other countries is that in 2006, China's mounting current-account surplus with the world reached $250 billion, or 9 percent of its gross domestic product.[2]

Some observers believe that the Chinese government has contributed to growth in U.S. imports by maintaining an undervalued currency. An undervalued Chinese currency would cause the dollar prices of U.S. imports from China to be lower than they would be in a competitive market. Such artificially low prices would benefit U.S. consumers but in the view of many observers would be unfair to U.S. producers whose products must compete with the imports. Consequently, there have been calls for China to revalue its currency, the renminbi—that is, to raise its value (or allow it to rise) relative to the dollar—as a way to level the playing field for U.S. manufacturers. Since 2005, the Chinese government has allowed the renminbi

to appreciate against the dollar, but the roughly 20 percent appreciation in its currency's value that has occurred since then has translated into only a small increase in the dollar price of U.S. imports from China.

This Congressional Budget Office (CBO) paper examines two important determinants of how appreciation of the renminbi against the dollar might affect competition in U.S. markets.

■ The first determinant is the portion of the value of Chinese exports that is produced in China—that is, the value of the exports minus the value of the imported inputs (such as parts and raw materials) used to produce them. That portion is often called the *domestic value added,* or the *domestic content.* It includes the costs of the labor, capital, buildings, and land in China that are used in the production of the exports. A revaluation of the renminbi would affect the dollar price of only the domestic content of China's exports. It would not affect the portion of the exports' value attributable to the cost of imported inputs—often called the *foreign content*—unless the countries that supply those inputs allowed their currencies to rise in value as well.

■ The second determinant is the degree to which Chinese exports to the United States compete with other countries' exports rather than with the products of U.S. manufacturers. In general, a decline in U.S. imports from China would be offset to some extent by an increase (or more rapid growth) in imports from elsewhere.

The effect of revaluing China's currency would be muted for U.S. producers if the domestic content of Chinese exports was small and if decreases in U.S. imports from

---

1. All import values are c.i.f. (customs, insurance, freight)—that is, the values of the products at the U.S. port of entry before any tariffs are applied.

2. The current-account balance of a country is a broad measure of its trade balance that includes goods, services, and unilateral current transfers (such as nonmilitary grants or gifts).

China led to increased imports from elsewhere. Other factors are also important in a full explanation of the trade and financial flows between the United States and China and between those countries and the rest of the world. However, the two determinants addressed here are key to understanding how changes in the value of China's currency might affect the dollar prices of Chinese goods in U.S. markets and, in turn, how much competing producers in the United States stand to gain if the dollar prices of those goods increase.

In brief, CBO finds the following:

■ A review of the relevant literature indicates that the average domestic value added of Chinese exports to the United States is probably between 35 percent and 55 percent. As a result, a 20 percent revaluation of the renminbi (for example) would cause the average price of imports from China to rise by roughly 7 percent to 11 percent if Chinese exporters continued to fully pass through their costs and previous rates of profit after the revaluation. The increase would be smaller if the exporters reduced their profit margins to maintain their share of the market, as firms often do when their currencies appreciate. The increase could be larger if the other countries that supply inputs to China's exports allowed their own currencies to appreciate in response to the Chinese revaluation.

■ By CBO's estimate, roughly one-third of the increase in the share of U.S. imports from China from 1998 through 2005 was offset by reductions in the shares of imports from the rest of the world. However, slight variations in CBO's estimating methodology lead to meaningful differences in the estimate; thus, the actual offset could be somewhat higher or lower. CBO's estimate is considerably lower than the 75 percent to 90 percent reported in two previous studies for periods between 1988 and 1997. The lower value probably reflects, at least in part, a decline in the offset over time as China has developed economically and technologically and its exports have become more similar to the output of U.S. manufacturers and less similar to U.S. imports from elsewhere. The lower value may also stem in part from differences in methodology.

Recent Movements in China's Currency and in the Prices of U.S. Imports

The Chinese monetary authority maintained a fixed exchange rate of 8.28 yuan to the dollar from October 1997 until July 21, 2005, when China revalued the renminbi slightly and moved to a "crawling peg" regime.[3] Under that regime, the People's Bank of China has limited the amount of deviation in the exchange rate on any given day—initially to 0.3 percent and then, starting on May 21, 2007, to 0.5 percent—resulting in a gradual appreciation of the renminbi. By the end of May 2008, the renminbi had appreciated to 6.94 yuan to the dollar.

Overall, from July 2005, just before the revaluation and change in the exchange-rate regime, through May 2008, the renminbi appreciated by about 19 percent—which is more than one-half of the revaluation targeted in some legislative proposals. However, the dollar prices of U.S. imports from China rose by only 2.5 percent over that period. Thus, the rise in import prices was much smaller than the rise in the value of the renminbi (see Figure 1). That fact stems in part from the low domestic content of Chinese exports—a focus of CBO's analysis. Another possible contributing cause is that Chinese exporters might have cut their profit margins to maintain their share of the market. However, producer prices in China (expressed in its currency) have not fallen, and the profit margins in many Chinese industries have increased, leading some observers to propose still another hypothesis: that productivity may have grown more rapidly in China's export sector than in the rest of its economy.[4] Such growth would have put downward pressure on China's export prices relative to its domestic prices. Thus, even though producer prices averaged throughout the economy did not fall, export prices might have. Whatever the reason, the magnitude of the rise in the dollar prices of U.S. imports from China has been insufficient to substantially slow the rapid growth of those imports.

---

3. Unlike the United States and many other countries, China uses a different word—yuan—for the unit in which product prices, exchange rates, and other such values are denominated from the word used for its currency. Thus, the price of a good might be 5 yuan.

4. See Morris Goldstein and Nicholas R. Lardy, "China's Exchange Rate Policy: An Overview of Some Key Issues," in Goldstein and Lardy, eds., *Debating China's Exchange Rate Policy* (Washington, D.C.: Peterson Institute for International Economics, April 2008), pp. 23–24.

Figure 1.

Renminbi/Dollar Exchange Rates and Dollar Prices of U.S. Imports from China

(Index: June 2005 = 100)
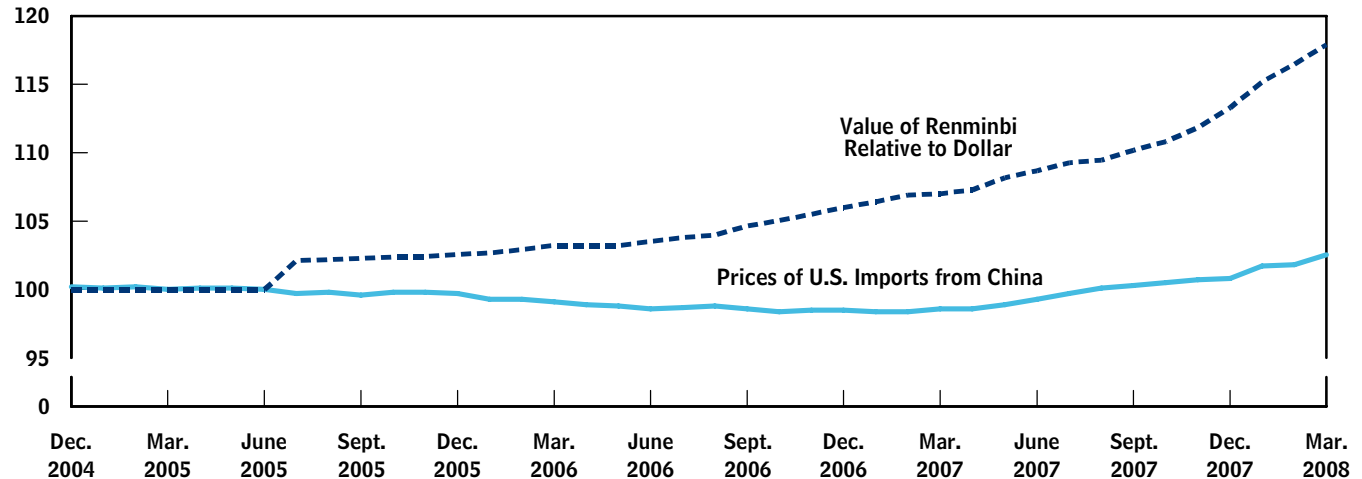
Source: Congressional Budget Office using import-price data from the Bureau of Labor Statistics and exchange-rate data from the International Monetary Fund's *International Financial Statistics.*

Note: On July 21, 2005, China moved from a fixed exchange rate between the renminbi and the dollar to a managed floating regime in which it limited the amount of deviation in the exchange rate on any given day.

The Scope of CBO's Analysis

This analysis addresses two important determinants of the effects that a renminbi revaluation would have on competing manufacturers in the U.S. market—the portion of the value of Chinese exports that is produced in China and the degree to which Chinese exports to the United States displace other countries' exports. However, a revaluation would also have effects on U.S. manufacturers that are not fully addressed here. For example, rather than competing with imports from China, some U.S. manufacturers purchase some of their inputs from China or have various stages of their production processes—in many cases, that of final assembly—located in China. Those manufacturers benefit from imports from China, and their costs would increase if the renminbi was revalued. That rise in costs would also, though, be limited by the low domestic value added of Chinese exports. Moreover, the effect on manufacturers that purchase inputs from China would be lessened by the offsetting changes in imports from elsewhere.

Another impact of a renminbi revaluation involves U.S. manufacturers that compete with Chinese exports in other countries. An increase in the value of the renminbi would reduce the Chinese competition faced by such manufacturers in those markets. However, that reduction in competition would be muted by the low value added of Chinese exports and by some offsetting reduction in the imports that those countries obtain from the rest of the world. (The size of that offset would not necessarily be the same as the size of the offset in the U.S. market.)

In addition, those U.S. manufacturers that export to China would benefit from a revaluation of the renminbi because, for a given dollar price of their products, the revaluation would reduce the price in China's currency. On average, the domestic value added of U.S. exports to China is not as low as that of Chinese exports to the United States; consequently, the effect of a revaluation on U.S. export prices would be greater than the effect on the prices of U.S. imports from China.[5] A revaluation would increase the competitiveness of U.S. products in China relative to those made there, but it would not directly affect the products' competitiveness with Chinese imports from other countries.

---

5.   See Lawrence J. Lau and others, *Estimates of U.S.–China Trade Balances in Terms of Domestic Value Added*, Working Paper No. 295 (Palo Alto, Calif.: Stanford University, October 2006, updated November 2006), for estimates of domestic value added in China and the United States.

Table 1.

Percentage of Foreign-Sourced Intermediate Inputs in Chinese Exports, by Source Country

	1996	2005
Hong Kong, Taiwan, South Korea, and Singapore	32	33
Japan	20	16
Rest of Southeast Asia[a]	6	9
European Union (15)[b]	8	9
United States	9	7
Australia and New Zealand	5	4
All Other Countries	20	22

Source: Congressional Budget Office based on Judith M. Dean, K.C. Fung, and Zhi Wang, *Measuring the Vertical Specialization in Chinese Trade,* Office of Economics Working Paper No. 2007-01-A (U.S. International Trade Commission, January 2007), Figure 3.

Note: Intermediate inputs are goods other than fixed assets that are used as inputs into the production process of a business establishment and that are produced elsewhere in the economy or are imported.

a.   This category (excluding Singapore) comprises Brunei Darussalam, Cambodia, East Timor, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Thailand, and Vietnam.

b.   The European Union (15) denotes the 15 member countries of the European Union (EU) before 2004. (In that year, the EU expanded to 25 members.)

Reasons for the Low Domestic Value Added of Chinese Exports and the Offsetting Changes in Other U.S. Imports

The low domestic value added of Chinese exports and the fact that changes in U.S. imports from China are partially offset by changes in imports from elsewhere are notable characteristics of trade with China. One of the underlying contributing causes of those characteristics is that a sizable portion of the rise in imports from China stems from its development as a location for labor-intensive final-assembly operations. Many manufacturers have moved such operations from other Asian countries to China in order to lower their costs and to be closer to the large Chinese market for their products. The manufacturers ship parts and other intermediate inputs to China,

where they are assembled into finished products that are sold in China or exported to the United States and other countries. Japan, the so-called Four Dragons (Hong Kong, Taiwan, South Korea, and Singapore), and the other Southeast Asian countries (besides Singapore) supply most—58 percent in both 1996 and 2005—of the intermediate inputs shipped to China for use in exports to the United States (see Table 1). Therefore, a considerable portion of the U.S. trade deficit with China is effectively a trade deficit with much of Asia funneled through China.[6]

One effect of the relocation of final-assembly operations to China is that much of the value of Chinese exports represents foreign content—the value of the intermediate goods that are shipped to China from other countries for final assembly—rather than domestic value added. That fact is important because it reduces the size of the increase in the dollar price of Chinese exports that might be expected if the renminbi was revalued or allowed to appreciate. The price of a Chinese export must cover the cost of its imported inputs plus the cost of the value added domestically in China. However, the renminbi's appreciation would make only the domestic value added more expensive in dollar terms. The same appreciation that raised the dollar price of the export for a given price in the Chinese currency would also reduce the cost in that currency of the imported inputs. For that reason, the portion of the price of the finished Chinese export that was attributable to imported inputs would remain unchanged in dollar terms unless the currencies of the countries supplying those inputs appreciated as well.

Another major effect of the relocation of final-assembly operations to China is that a sizable portion of the large increase in Chinese exports in recent years has been accompanied by reduced growth (and in some cases declines) in the exports to the United States from other Asian countries where final-assembly operations previously took place. Hence, the relocations have had little net effect on total exports from Asia, although total exports have increased for other reasons. The firms that moved their operations to China gained a cost advantage and thereby improved their competitiveness relative to firms producing in the United States; however, the increase in U.S. imports from China that resulted from

---

6.   Although Hong Kong is now ruled by China, it remains a separate economic entity in many ways and is treated separately in sets of statistics on international trade and finance.

the relocation for the most part came at the expense of exports from other Asian countries—and not at the expense of goods produced by manufacturers in the United States.

The portion of Chinese exports representing a net increase in Asian production and exports to the United States rather than merely the relocation of final-assembly operations from elsewhere in Asia is also sizable. Chinese exports currently consist disproportionately of labor-intensive goods. The United States has long had a comparative disadvantage in the production of such goods, and imports from other low-wage countries already command a large fraction of the U.S. market for them. As a result, when new imports from China have entered the U.S. market, much of their competition has been goods from manufacturers in other low-wage countries (such as Mexico) rather than the products of U.S. manufacturers.

Thus, both the imports from China that result from relocated final-assembly operations and many of the imports that represent net new Asian production have been offset to some extent in the U.S. market by reductions in imports from other countries. Consequently, the effects on U.S. manufacturers have not been as great as might appear on the surface. Correspondingly, the share of imports from the rest of the world in the U.S. market would probably increase in response to any fall in the share of imports from China that might result from revaluation of the Chinese currency. And the combined shares of imports from all countries—that is, from China and all others—would decline by a smaller amount than the share of imports from China alone declines.

What Is the Domestic Value Added of Chinese Exports?

In its survey of research on the domestic value added of Chinese exports, CBO found that the studies that best addressed data and estimating problems obtained estimates ranging from roughly 35 percent to 55 percent for various years from 1995 through 2002.[7] The evidence concerning the trend in the domestic value added over time is mixed.

Determining Domestic Value Added

The analysis required to determine an export's domestic value added depends on what percentage of the good's intermediate inputs are imported. In the case of Chinese exports for which almost all intermediate inputs are imported, the approximate domestic value added is simply the remaining costs—those for wages and salaries, land and buildings, and interest and other returns to capital—which can be calculated as the difference between the value of the exports and the value of the imported intermediate inputs. More typically, however, only some of the required intermediate inputs are imported, and the rest are purchased domestically in China. The domestically purchased inputs may themselves have been produced with imported intermediate inputs. Therefore, they do not constitute purely domestic content, and the domestic content of the exports cannot be calculated simply by subtracting the value of the imported inputs from the value of the exports.

To analyze that more typical case, the standard methodology uses an input-output (IO) table for the Chinese economy. For each industry, an IO table tells how much of the value of the industry's output represents inputs purchased from each other industry. Provided that the table distinguishes between the inputs that each industry purchases domestically and those that it imports, the table can be used to determine the domestic value added of exports.[8] Such tables take a considerable time to produce (because they require extensive data gathering and estimation) and thus are already somewhat dated when they are first published. The most recent studies that CBO reviewed used an IO table for the Chinese economy for 2002.

Published IO tables generally do not distinguish between production for export and production for domestic sale. That limitation would not be a problem if goods produced for export had the same domestic value added as the same goods produced for sale in China—but in many instances that is not likely to be the case. The Chinese government maintains two programs under which it exempts some imports from tariffs if those imports are used as inputs in the production of goods for export. The trade associated with those programs is referred to as *processing trade*, and the goods exported from China that

---

7. Web Appendix A, which is posted with this paper on CBO's Web site (www.cbo.gov), provides a more detailed review of those studies.

8. Published IO tables do not distinguish between inputs purchased domestically and those that are imported. However, analysts have devised methods for distinguishing them.

include exempted imports to China are called *processing exports*.[9] Because the government does not similarly exempt imports that are used to produce goods sold domestically, processing exports are likely to have greater foreign content than the same kinds of goods produced for domestic sale in China. Moreover, processing exports make up a large share of China's total exports. It is therefore likely that the average domestic value added of China's total exports is also lower than the domestic value added of goods produced for domestic sale. Because of that likelihood, estimates produced by using IO analysis are likely to overstate the domestic value added of China's exports unless the analysts develop methods to modify the tables to account separately for production of goods for export and production of goods for domestic sale.

Three studies that CBO reviewed used various methods to modify the IO tables to address the problem of separately accounting for export and domestic production. Their estimates of the domestic value added of Chinese exports range from roughly 35 percent to 55 percent. (Table 2 presents an overview of the studies as well as full citations.) Two other studies used IO tables as published and without any modifications to account separately for domestic and export production. Those two studies obtained higher estimates of the domestic value added— in the range of 60 percent to 95 percent. Another study that CBO reviewed—that by Fung, Lau, and Lee—did not use IO analysis. Rather, it calculated the domestic value added of processing exports by subtracting the value of imported inputs from the value of exports; the study cited anecdotal evidence for nonprocessing exports. Its results are broadly consistent with the range of 35 percent to 55 percent spanned by the first group of studies.[10]

Changes Over Time in Domestic Value Added
The results are mixed from the studies that CBO reviewed concerning how the domestic value added has changed over time. One pair of studies taken together— the papers by Chen and others and by Lau and others— indicates a decline in domestic value added from 1995 through 2002 (see Table 2). Another study—the 2007

---

9. The two programs are the processing-and-assembly program (in which ownership of the inputs and the output they are used to produce is retained by the foreign firm that exports the inputs and imports the final products) and the processing-with-imported-materials program (in which ownership of the inputs is transferred to the Chinese firm using them for production).

10. See Web Appendix A for more information on the studies.

paper by Dean, Fung, and Wang—finds a decline from 1997 through 2002, but the 2008 paper by Koopman, Wang, and Wei, which revises the analysis of the Dean, Fung, and Wang paper to distinguish between production of processing exports and other production, finds a slight rise over that period in the domestic value added of total exports.

The lack of more recent IO tables has prevented analysts from estimating the domestic value added of Chinese exports for years since 2002. However, a study by Aziz and Li in 2007 examined the issue indirectly by estimating the sensitivity of China's export volume (that is, the value of its exports adjusted for price changes over time) to changes in the exchange rate. That sensitivity is a function of the domestic value added, among other things. From trends in the sensitivity as well as other evidence, the study concluded that domestic value added has most likely increased over the past decade, although the timing of the increase is difficult to pinpoint from the study's results.[11]

Effect on Prices of Exports
The estimates presented here mean that even if Chinese firms continued to fully pass through their costs and previous rates of profit to their sales prices after a revaluation of the renminbi, the percentage increase in the dollar price of their products in the United States would be significantly less than the percentage increase in the renminbi's value. For example, if China revalued the renminbi by 20 percent relative to the dollar and Chinese

---

11. The sensitivity averaged over all products is greater for the period from the first quarter of 1999 to the last quarter of 2006 than it is for the period from the first quarter of 1996 to the last quarter of 2003. Correspondingly, a plot showing the average for each of those two periods as well as for many periods in between indicates some fluctuation around an increasing trend. However, the beginning and ending periods substantially overlap, making it difficult to precisely determine the timing of the rise. The Aziz and Li analysis shows that throughout the past decade, the changing mix of products has increasingly contributed to greater sensitivity as products with high sensitivity have become more prominent in the mix and those with low sensitivity less prominent. The change in the average sensitivity for a given distribution of products is largely concentrated in a range of periods beginning with one extending from the first quarter of 1996 to the fourth quarter of 2003 and ending with one extending from the fourth quarter of 1996 to the third quarter of 2004. Again, those two periods substantially overlap, making it difficult to determine the precise timing of the rise.

Table 2.

Estimates of Domestic Value Added of Chinese Exports

Study	Date of IO Table Used	Number of Industries	Exports to	Value Added (Percent)	Comments
Studies That Account Separately for Production of Goods for Domestic Consumption and for Export					
Chen and Others[a]	1995	33	U.S.	46–48	
	1995	33	World	55	
Lau and Others [b]	2002	42	U.S.	37	
Koopman, Wang, and Wei[c]	1997	124	World	52	
	2002	122	World	54	
	2002	122	U.S.	46	
Studies That Use Published IO Tables Without Modifications					
Analysis by ITC Staff[d]	2001	57	n.a.	83–94	Includes foreign content of domestically sourced inputs.
Dean, Fung, and Wang[e]	1997	124	World	71[f]	
	2002	122	World	64[f]	
Studies That Use Other Methodologies					
Fung, Lau, and Lee[g]					
Processing trade[h]	n.a.	n.a.	World	28	Based on processing imports and exports for 2002.
Nonprocessing trade	n.a.	n.a.	World	40	Based on anecdotal evidence.
Aziz and Li[i]	n.a.	7	World	Increasing over time	Paper does not estimate value added but instead estimates price sensitivity of Chinese exports and provides other indirect evidence of trends in value added.

Source: Congressional Budget Office.

Notes: The domestic value added of exports is the value of those exports minus the value of any imported intermediate inputs (such as parts or raw materials) used to produce them.

   IO = input-output; ITC = U.S. International Trade Commission; n.a. = not applicable.

a. Xikang Chen and others, *The Estimation of Domestic Value-Added and Employment Induced by Exports: An Application to Chinese Exports to the United States* (presentation to the Institute of Systems Science, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing, June 2001).

b. Lawrence J. Lau and others, *Estimates of U.S.-China Trade Balances in Terms of Domestic Value-Added,* Working Paper No. 295 (Palo Alto, Calif.: Stanford University, October 2006, updated November 2006).

c. Robert Koopman, Zhi Wang, and Shang-Jin Wei, *How Much of Chinese Exports Is Really Made in China? Assessing Foreign and Domestic Value-Added in Gross Exports,* Office of Economics Working Paper No. 2008-03-0B (U.S. International Trade Commission, March 2008).

d. U.S. International Trade Commission, *Technical Assistance on Domestic Value Added to Exports in China* (prepared for the staff of the House Committee on Ways and Means, April 20, 2005).

e. Judith M. Dean, K.C. Fung, and Zhi Wang, *Measuring the Vertical Specialization in Chinese Trade,* Office of Economics Working Paper No. 2007-01-A (U.S. International Trade Commission, January 2007).

f. The paper by Dean, Fung, and Wang estimates the vertical specialization percentage, which is 100 percent minus the value-added percentage.

g. K.C. Fung, Lawrence J. Lau, and Joseph S. Lee, *U.S. Direct Investment in China* (Washington, D.C.: AEI Press, 2004), pp. 143–156.

h. Processing trade is trade associated with two Chinese government programs under which some imports are exempted from tariffs if those imports are used as inputs in the production of exports.

i. Jahangir Aziz and Xiangming Li, *China's Changing Trade Elasticities,* IMF Working Paper WP/07/266 (Washington, D.C.: International Monetary Fund, November 2007).

firms continued to fully pass through their costs and previous rates of profit, the price of Chinese exports to the United States would increase—in line with the value of their domestic content—by 7 percent to 11 percent, on average. Moreover, economists have long noted that firms in countries whose currencies appreciate tend to raise the foreign-currency prices of their exports less than proportionally to the increases in the values of their domestic currencies, accepting lower rates of profit to minimize the loss of market share that results from the price increase.[12] In this example, the prices of Chinese exports would probably increase by an average of less than 7 percent to 11 percent. Exports with a larger- or smaller-than-average domestic value added would have, respectively, a greater- or smaller-than-average price increase.

The calculation of price increases presented here rests on the assumption that other Asian countries would not intervene in currency markets to raise the values of their own currencies in response to a revaluation by China. (Many Asian countries maintain managed floating regimes for their currencies—that is, they allow market forces some role in determining the nominal values of their currencies but sometimes intervene to modify the resulting value.) As noted earlier, if many of those countries responded to a Chinese revaluation by raising the values of their currencies (or ceased interventions that had previously kept the values low), the combined effects of all of the currency appreciations on Chinese export prices could be significantly larger than the effect of the rise in the Chinese currency alone. As Table 1 showed, in 2002, Japan, Hong Kong, Taiwan, South Korea, Singapore, and the rest of Southeast Asia together supplied almost three-fifths of the imported intermediate goods incorporated in Chinese exports. If the currencies of those countries also rose in response to a Chinese revalua-

tion, the price of Chinese exports would go up in proportion to the Chinese domestic value added plus almost three-fifths of the foreign content. However, a number of those Asian countries have already allowed their currencies to rise relative to the dollar (several of them by more than the renminbi has risen). Those appreciations reduce the likelihood that there would be enough further appreciation in response to a Chinese revaluation to substantially increase the effect on the prices of Chinese exports.[13]

How Much Would Declines in Imports from China Be Offset by Increases in Imports from Other Countries?

Any benefit that a Chinese currency revaluation might provide to U.S. firms in the form of less competition from imports from China in the U.S. market would be offset to some extent by resulting increases in imports from other countries. Two studies in the literature contain estimates of the degree of offset that prevailed more than a decade ago, measured in terms of the share of the increase in imports from China that was offset by a reduction in imports from other countries. The first study concluded that a little over 90 percent of the increase in the share of imports from China in the U.S. market from 1988 through 1994 was offset by smaller shares of imports from elsewhere.[14] The second study contains an estimate—by the same economist and using the same methodology—that roughly 75 percent of the

---

12. See, for example, José Manuel Campa and Linda S. Goldberg, *Exchange Rate Pass-Through into Import Prices: A Macro or Micro Phenomenon?* Working Paper No. 8934 (Cambridge, Mass.: National Bureau of Economic Research, April 2002), for an assessment of the extent of incomplete pass-through of exchange rates to prices for 25 member countries of the Organisation for Economic Co-operation and Development. The paper finds that pass-through tends to be more nearly complete in the long run than in the short run. Hence, pass-through would probably be more nearly complete for a currency revaluation by China that was perceived to be permanent than it would be for a floating exchange rate.

13. From July 2005, when China began its crawling peg regime for the renminbi, through March 2008, the currencies of the Philippines, Thailand, Singapore, and Malaysia all appreciated relative to the dollar by more than the renminbi did—by 33.6 percent, 31.2 percent, 22.0 percent, and 19.2 percent, respectively, compared with 17.9 percent for the renminbi. The currency of Japan appreciated by 10.3 percent, that of Taiwan by 4.0 percent, and that of South Korea by 3.4 percent. Hong Kong's currency depreciated by 0.2 percent.

14. Marcus Noland, *U.S.–China Economic Relations*, Working Paper 96-6 (Washington, D.C.: Peterson Institute for International Economics, 1996). Specifically, Noland estimated that the value of imports from China rose by $10.9 billion more than they would have if their share of the market had remained constant over that period and that $10.0 billion of that amount came at the expense of imports from elsewhere.

increase in the Chinese share of the U.S. market from 1993 through 1997 was offset by reduced shares of imports from other countries.[15]

Using a broadly similar methodological approach but with some possibly significant differences, CBO found that roughly one-third of the increase in the share of imports from China in U.S. markets from 1998 through 2005 was offset by reduced growth and, in some cases, declines in the shares of imports from other countries. The precise value obtained for that estimate is sensitive to details of the estimating procedure, so the actual offset could be somewhat different. The substantially lower value of CBO's estimate in comparison with the earlier estimates in the literature may in part reflect a downward trend in the offset over time. It might also result in part from the differences in the methodologies used to produce the estimates.

Methodology and Data for CBO's Analysis

Any analysis of the extent to which increases in U.S. imports from China have been offset by reductions (or slower growth) in imports from the rest of the world faces a fundamental challenge: Although actual imports from China and the rest of the world are known, what those imports would have been if imports from China had not grown so rapidly is not known and must be estimated. To develop such an estimate, CBO followed the general approach used in the existing studies: It compared actual imports with what they would have been if the market shares of imports from China, imports from the rest of the world, and U.S. manufacturers' shipments had remained constant, on average, over time.[16]

For its analysis, CBO used data on trade and U.S. manufacturers' shipments to calculate the shares of imports from China, imports from the rest of the world, and U.S. manufacturers' domestic sales in 344 U.S. product markets. (The markets were defined according to the six-digit codes of the North American Industry Classification Sys-

tem, or NAICS.) Imports in those markets make up more than 99.4 percent of U.S. imports from China.[17]

From 1998 through 2005, the value of U.S. imports from China in the 344 markets increased by about $180 billion, or 248 percent. If the share of imports from China in each of the product markets had remained constant, the rise in value would have been only $16 billion, or 21 percent. Thus, the value of imports from China increased by $164 billion more than it would have if China had maintained a constant market share in all of the product markets.

That additional $164 billion caused the shares of imports from China to increase in 327 of the 344 markets. The tendency for growth in the market shares of Chinese products to be offset by reductions in the market shares of imports from other countries is evident from the fact that in many of the markets in which the shares of Chinese imports increased the most, the shares of imports from the rest of the world declined noticeably (see Table 3). For example, from 1998 to 2005, imports from China gained an additional 48 percent of the U.S. market for luggage while imports from the rest of the world lost 27 percent of that market. Similarly, imports of dolls,

---

15. That estimate, also by Marcus Noland, appears in Daniel H. Rosen, *China and the World Trade Organization: An Economic Balance Sheet*, Policy Brief 99-6 (Washington, D.C.: Peterson Institute for International Economics, June 1999). Specifically, Noland estimated that imports from China increased by $10.1 billion more than the amount that would have maintained constant market shares over the period and that $7.6 billion of that increase displaced imports from elsewhere rather than the products of U.S. manufacturers.

16. CBO modified the assumption slightly by allowing for an overall increase in the share of imports from the entire world over time to reflect the ongoing increase in the U.S. trade deficit with the world as a whole.

 An alternative would have been to assume that the value of imports from China and from the rest of the world in the various industrial categories—rather than their shares—remained constant on average. Under that assumption, the degree of offset could be determined by estimating the correlation across industries between the changes in U.S. imports from China and the changes in U.S. imports from the rest of the world. That assumption is not very realistic, however. Most U.S. product markets have grown over time, and U.S. manufacturers' shipments and imports from all countries have grown accordingly to varying degrees. That circumstance suggests the use of the assumption about constant market shares that underlies previous estimates in the literature and CBO's analysis. Under that assumption, the offset can be determined by estimating the correlation between the changes in the shares of imports from China in the U.S. market and changes in the shares of imports from the rest of the world.

17. Additional details about the data and CBO's analysis are presented in Web Appendix B, which is posted with the paper on CBO's Web site (www.cbo.gov).

Table 3.

Largest Increases in Market Shares of Chinese Imports and Changes in Market Shares of Imports from the Rest of the World, 1998 Through 2005

(Percentage of U.S. market)

Market	China	Rest of the World
Luggage	47.9	-26.9
Office Machinery	40.4	-8.3
House Slippers	37.8	-10.9
Computer Storage Devices, Terminals, and Other Peripheral Equipment	37.3	-10.9
Electric Housewares and Household Fans	37.1	-10.9
Costume Jewelry and Novelties	33.5	-2.5
Metal Household Furniture	32.5	-11.4
Silverware and Hollowware	31.8	-11.5
Rubber and Plastics Footwear	29.3	2.2
Apparel Accessories and Other Apparel	28.7	-4.7
Residential Electric Lighting Fixtures	23.6	-6.8
Dolls, Toys, and Games	22.4	-16.0
All Other Leather Goods	22.1	-6.9
Electronic Computers	21.7	10.9
Power-driven Handtools	21.0	16.0
Women's Footwear (Except athletic)	20.6	-15.4
Vitreous China, Fine Earthenware, and Other Pottery	20.5	-4.9
Household Vacuum Cleaners	20.0	10.1
Household Cooking Appliances	18.9	-8.6
Curtains and Linens	18.8	7.8
Blankbooks, Looseleaf Binders, and Devices	17.4	1.9
Pens and Mechanical Pencils	16.9	3.8
Radio and TV Broadcasting and Wireless Communications Equipment	16.4	18.9
Men's Footwear (Except athletic)	16.3	-5.3
Institutional Furniture	16.2	-1.9
Audio and Video Equipment	14.5	-16.2
All Other Miscellaneous Textile Products	14.3	-0.8
Hardwood Veneer and Plywood	13.9	-2.2
Personal Leather Goods (Except women's handbags and purses)	13.8	-3.7
Showcases, Partitions, Shelving, and Lockers	13.4	1.3

Source: Congressional Budget Office based on trade data from the Bureau of the Census and data on U.S. manufacturers' shipments from the Bureau of the Census and the Bureau of Economic Analysis.

Note: Markets are defined according to the six-digit codes of the North American Industry Classification system, or NAICS.

toys, and games from China gained an additional 22 percent of that market while imports from the rest of the world lost 16 percent of it.

The actual offset from 1998 through 2005 was larger than it would appear from those numbers, however. If imports from China had grown less rapidly than they did during that time, the market shares of imports from the rest of the world in many industries would not have remained constant but would instead have expanded as

part of the ongoing increase in the U.S. trade deficit with the world as a whole. Thus, the pattern across U.S. product markets of changes in the market shares of imports from the rest of the world was one of a general increase in those shares in most markets superimposed on decreases in shares that varied from market to market in proportion to the expansion of the share of imports from China.

The net effect is that the shares of imports from the rest of the world increased in most U.S. markets and, in fact,

increased in 255 of the 327 markets in which the shares of imports from China increased.[18] However, the shares of imports from the rest of the world tended to increase the most in those markets in which the shares of imports from China increased the least, and to increase the least (in some cases, to actually contract) in those markets in which the Chinese shares increased the most. Moreover, in any market in which the share of imports from China grew, the offsetting change in the share of imports from elsewhere was not the absolute decline in that market share but rather the decline relative to the increased share those imports would have had if imports from China had not grown so rapidly. CBO used statistical analysis of those changes in market shares for the 344 industries encompassed by the data set to sort out the effects and thereby determine the size of the offset and the amounts by which the market shares of China and the rest of the world would have increased if imports from China had grown at the same rate as did other imports.

CBO's Results and Their Implications

CBO's analysis indicates that the offset from 1998 through 2005 was roughly one-third—that is, about one-third of the increase in the share of imports from China was offset by a decline or reduced growth in the shares of imports from other countries. More specifically, after accounting for statistical sampling error, CBO determined that there was a 90 percent chance that the offset was between 29 percent and 43 percent. That interval presumes the accuracy of the assumptions made in the analysis—in particular, the accuracy of the assumption about constant market shares.

The methodology that CBO used to produce its estimate incorporated the assumption that the offset would be the same for all industries. To test that proposition, CBO divided the data into 10 groups of related industries, allowing for a different offset for each group. Many of the resulting estimates were statistically very uncertain. Although those estimates suggest that the offset may, indeed, be larger for some groups of industries than for others, the overall average offset for all industries as calculated from those results remains within the range identified for the original estimate—and therefore is not significantly different from it.

The estimate is also highly sensitive to the specifics of the estimating procedure. (CBO's procedure and results are discussed in more detail in Web Appendix B.) Although the actual offset could have been larger or smaller than one-third, it is unlikely to have been greater than one-half.

The offset of roughly one-third means that approximately two-thirds of the increase in the market share of imports from China displaced some of the market share of U.S. manufacturers. However, that estimate does not necessarily mean that U.S. manufacturers saw declines in sales of that amount. The actual change in sales could be either larger or smaller depending on what happened to the sizes of the relevant U.S. markets.

For example, suppose that increased imports of a product from China drove down the price of that product in the U.S. market and that U.S. consumers responded by buying more of it—meaning that the sum of the purchases from U.S. manufacturers, Chinese manufacturers, and manufacturers in other countries increased. In the extreme case in which the quantity demanded is very sensitive to price changes, a small decline in the product's price could lead consumers to purchase enough of the product to absorb all of the growth in imports from China with almost no reduction in how much they purchased from U.S. manufacturers or from suppliers in other countries. In that case, a sizable expansion in the market share of imports from China could transpire with almost no effect (in terms of lost sales or lower prices on their sales) on U.S. manufacturers or other countries' suppliers. Even in a less extreme case, the effect on U.S. manufacturers and suppliers in other countries could be less than suggested by the reductions in their market shares.

Conversely, suppose that for some reason the size of the U.S. market for a given product shrank (perhaps because the product was outmoded and consumer demand was switching to some newer related product), while the market share of Chinese imports increased. In that case, the increase in the market share claimed by imports from China would have a greater effect on U.S. manufacturers and suppliers of imports from other countries than the size of the increase would otherwise indicate.

Thus, a limitation of the offset analysis is that its focus on market shares does not produce an estimate of the absolute reduction in domestic demand for U.S. manufacturers' shipments that resulted from the increase in imports

---

18. For many of the industries listed in Table 3, however, the shares of imports from the rest of the world declined. The reason is that those industries are the ones that saw the largest increases in the market shares of imports from China and larger increases in the market share of Chinese imports are more likely than smaller increases to cause the market shares of the rest of the world to fall.

from China from 1998 through 2005. A different calculation indicates a reduction that was no more than $79 billion, which equals 44 percent of the total growth of $180 billion in imports from China over the period and is roughly 2 percent of U.S. manufacturers' shipments in 2005. The premise of that calculation is that the decline in demand for U.S. manufacturers' shipments attributable to the increase in imports from China can be no larger than the total decline in demand that the industry actually experienced or than the rise in imports from China. (In a number of industries, imports from China did not grow, so no decline is attributable to increased imports from China.) Consequently, for each of the 330 industries in which imports from China increased, the maximum possible absolute decline in demand attributable to such imports is the actual decline in U.S. manufacturers' shipments or the increase in imports from China, whichever is less. Summing those maximum amounts over all industries gives the $79 billion figure.

The offset of roughly one-third is historical and not necessarily prospective. The offset appears to have declined over time and to be different for different kinds of products. With China's rapid growth and the changing mix of products that the United States imports from China, the offset that would now apply to any reductions in imports resulting from a currency revaluation would not necessarily be the same as that from 1998 through 2005.

Even if the offset is assumed to remain at roughly one-third, the numbers presented here are insufficient to determine the total effect that a revaluation of the renminbi would have on competing U.S. manufacturers. Such a determination would require factoring in changes in U.S. exports to China and to other countries. Moreover, the analysis does not consider the fact that for some U.S. manufacturers, locating part of their production process in China while leaving the rest in the United States improves their competitiveness relative to other

manufacturers located elsewhere and may thereby save the production left in the United States from further losses to those competing manufacturers.

The numbers are also insufficient to determine the effects of a revaluation on the employees of competing U.S. manufacturers, which would require factoring in changes in labor productivity as well.

Comparison with Other Estimates
CBO's estimate of one-third for the offset from 1998 through 2005 is substantially smaller than previous estimates in the literature, which ranged from 75 percent to a little over 90 percent for earlier periods. (CBO's estimate is well below those even when the substantial uncertainty surrounding it is taken into account.) At least part of the reason that CBO's estimate is lower may be a decline in the offset over time. China's economy has developed rapidly over the past decade. A paper by Zhi Wang and Shang-Jin Wei presents evidence that, as a result of that development, the mix of products that China exports to the United States has over time become more similar to that produced by the U.S. economy.[19] Such a change could be expected to result in Chinese exports' competing less with U.S. imports from elsewhere and more with U.S. production, which in turn would cause a decline in the offset over time. Consistent with that analysis, the later of the two estimates from the literature (roughly 75 percent for 1993 through 1997) is smaller than the earlier one (a little over 90 percent for 1988 through 1994), and CBO's estimate for a more recent period is smaller still (roughly one-third for 1998 through 2005). Differences in the methodologies used might also contribute to the lower value of CBO's estimate.

---

19. Zhi Wang and Shang-Jin Wei, *What Accounts for the Rising Sophistication of China's Exports?* Working Paper No. 13771 (Cambridge, Mass.: National Bureau of Economic Research, February 2008).

INSIDE MAIL