Chemical trade prospers in the 1980's

A strong U.S. chemical trade surplus in the 1980's reflected industry competitiveness in the international market; the favorable balance of trade was achieved through diversification, cost advantages, gains in efficiency, and economies of scale

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The United States maintained a significant trade surplus—more exports than imports—in the chemical industry during the 1980's. Indeed, from 1985 onward, the chemical trade surplus more than doubled.[1] Some of the reasons for this prolonged surplus while overall U.S. trade has accumulated a large deficit are examined in this article.

The analysis begins with a brief background covering the factors that have most influenced the chemical trade balance. Among these are the large fluctuations in exchange rates and export and import prices that occurred in the 1980's. In particular, during the latter part of the decade, depreciation in the value of the dollar largely contributed to the rise in the chemical trade surplus. In addition, other factors unique to the chemical industry are analyzed—its highly technical nature, increased merger activity in the industry, and the costs of energy, regulation, and research and development. Finally, the focus will shift to specific industries associated with chemicals that had the most impact on the surplus.

U.S. trade balance in the 1980's

As the decade began, the United States had an overall annual trade deficit of $18.4 billion, compared with a trade surplus of $12.3 billion in the chemical industry. By 1985, the U.S. trade deficit had increased to $130.6 billion. However, in chemical products, the balance of trade remained in surplus, albeit at a lower level of $7.6 billion. Between 1985 and 1990, the trade surplus in the chemical industry more than doubled, increasing each year to a peak of $16.8 billion. (See chart 1.) During this same period, the overall U.S. trade deficit reached a historical peak of $158.2 billion in 1987, before dropping to $116.1 billion by the close of the decade.

Japan is the largest U.S. chemical export market and the third largest source of chemical imports. The United States maintained a chemical trade surplus with Japan during the 1980's, peaking at $2.3 billion in 1989. More than 60 percent of U.S. exports in 1989 were bound for the top 10 foreign markets: Japan, Canada, Mexico, Belgium, the Netherlands, Taiwan, South Korea, the United Kingdom, Australia, and West Germany. More than 75 percent of U.S. chemical imports came from Canada, West Germany, Japan, the United Kingdom, France, Switzerland, the Netherlands, Italy, Mexico, and Ireland. As these figures demonstrate, the majority of America's chemical trade was with the developed nations of Europe and Asia and with the neighboring North American countries. While the United States maintained sizable surpluses with its principal Asian trading partners, it had *deficits* with many European nations. In 1989, the largest such deficit was $1.3 billion, with West Germany. Trade deficits with France and Great Britain approached $500 million each.

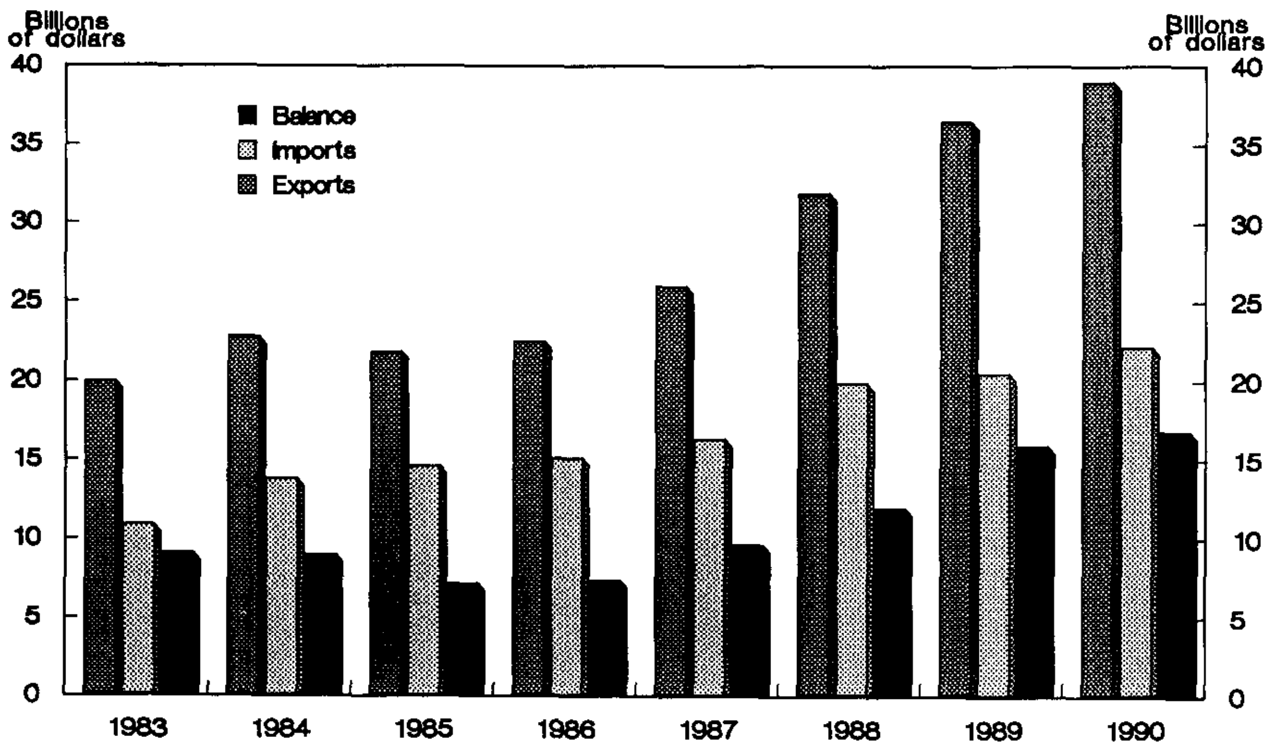
Another component of the trade balance in chemicals is foreign direct investment. U.S. companies are expanding overseas chemical production, most of which is in Asia. In return, this globalization of production is expected to diminish U.S. chemical exports. In 1989, foreign direct investment in the U.S. chemical industry (book value, $46 billion) exceeded U.S. direct investments abroad in foreign chemical companies (book value, $36.2 billion). However, the income from the latter exceeded the income of foreign companies from their direct investment in the United States by $3.7 billion. When licensing fees and service charges and rentals are added into the totals, U.S. earnings from foreign chemical investments exceeded foreign company earnings in the United States by $5.1 billion.[2] This combination of trade surpluses and earnings from investments abroad has made the chemical industry a significant contributor to U.S. international accounts.

Exchange rates and prices of chemicals

Much of the movement in trade volumes of chemicals is attributable to trends in import and export prices. Throughout the 1980's, these prices (in dollar terms) moved closely together.[3] From 1983, the first full year of the Bureau of Labor Statistics International Price Program import and export chemical measures, to the last quarter of 1986, chemical export and import prices generally moved downward—7 and 5 percent, respectively. However, substantial chemical price increases occurred between 1987 and 1988—import prices increased 19.1 percent, while export prices surged 26.0 percent. (See chart 2.) Price increases for fertilizers, petrochemicals, and plastics were largely responsible for the rise. Since then, prices in the industry have eased somewhat: export prices fell 8.2 percent during 1989, while import prices fell a more moderate 3.8 percent.[4]

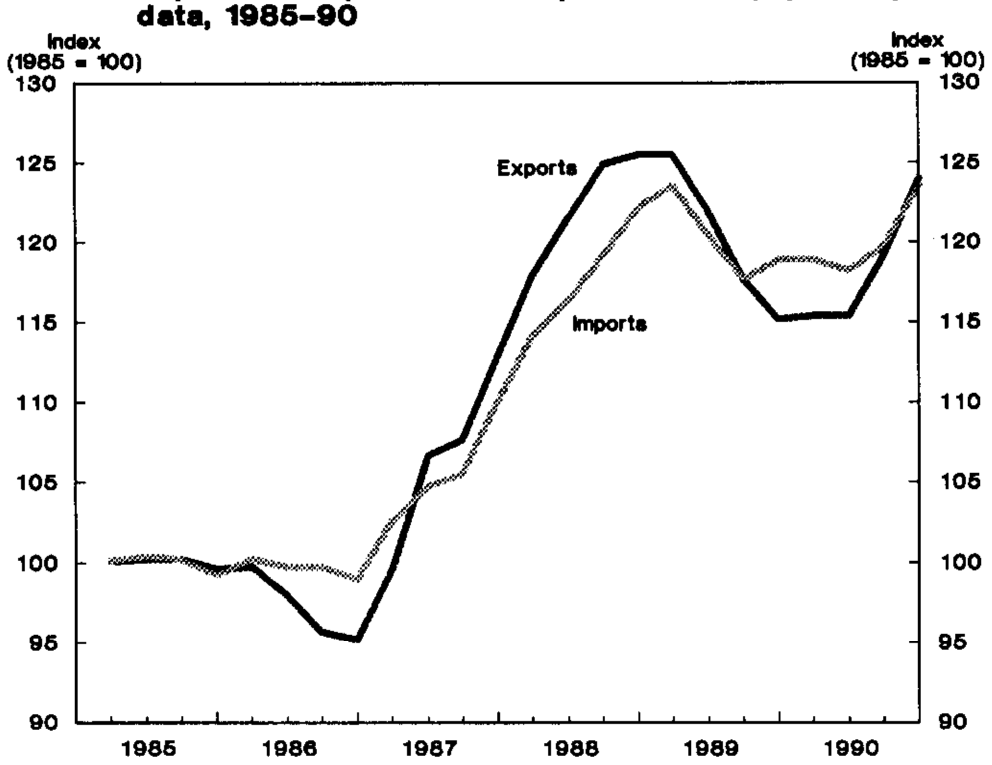
The value of the dollar compared with other currencies must also be considered when accounting for the movements in chemical trade volumes. As shown in table 1, the Bureau of Labor Statistics computes average exchange rate

Chart 1. U.S. chemical trade balance, 1983–90



SOURCE: U.S. Department of Commerce. Data are U.S. Customs values.

Chart 2. Export and import chemical price indexes, quarterly data, 1985-90



indexes, as well as dollar and foreign currency indexes, by one- and two-digit Standard International Trade Classification areas.[5] These indexes are based on 1985 unilateral trade values. During the past decade, the relative value of the dollar versus the currencies of foreign competitors has been extremely volatile. For the overall economy, the trade-weighted value of the dollar increased rather consistently to its peak in 1985. Then it began to decline, losing approximately a third of its value versus the currencies of the major U.S. trading partners by the end of 1990. Exchange rates based specifically on trade flow for chemicals exhibited a similar decline.

These movements in the relative value of the dollar affected the competitiveness of U.S.-produced chemical products. Measured in dollars, chemical export prices increased 24 percent since 1985. However, adjusted by exchange rate fluctuations, the relative prices for U.S. chemical exports, as measured by the foreign currency index, declined 16 percent, making U.S. chemical exports relatively cheaper in foreign markets. Exports accordingly became more attractive, and their demand increased. U.S. Department of Commerce trade figures show a rise in chemical exports of about 60 percent between 1985 and 1990.

Chemical import prices measured in dollars also rose substantially during 1985-90. The foreign currency index indicates the degree to which foreign sellers lowered their chemical prices in their own currency, after adjustments are made for fluctuations by the dollar. The exchange rate index for chemicals fell about 40 percent during the period 1985–90, compared to a 34-percent drop in the relative value of the dollar for imports. Exporters to the United States responded by drastically reducing prices of chemicals, as measured in foreign currency terms, by almost twice as much as prices of other commodities imported into the United States.

One way to assess the efforts of chemical companies to remain competitive is to measure what is known as the *pass-through rate*. This figure indicates the extent to which a change in exchange rates causes a change in the selling price of a good.[6] As shown in chart 3, companies appear to find it easier to pass through currency fluctuations for a depreciating currency. After 1985, U.S. exporters could lower the selling price in foreign currency terms without having to lower U.S. dollar prices (and possibly profit margins), due to the sustained relative depreciation of the dollar. Although the pass-through rate gap between imports and exports is now shrinking, the rates for exports are still higher than those for imports. During the past 5 years, even with the lower relative value of the dollar, the pass-through rate for chemical exports declined because the dollar prices of U.S. exports increased every year except for 1989.

The pass-through rate for chemical imports has exhibited a trend opposite to that of chemical exports over the same 5-year period. This trend suggests that, with the sustained depreciation of the dollar, foreign companies delayed passing through a greater proportion of their currencies' appreciation until later in the decade.[7] Although now on a converging path, chemical import pass-through rates still are much lower than those for exports. In 1990, the pass-through rate was about 20 percent for imports, compared to more than 70 percent for exports.

These statistics indicate that pass-through values tend to be lower in two circumstances: when the "home" currency is appreciating and when the company is foreign based. The first case is plausible because passing through an appreciating currency will have the negative consequence of making exports more expensive in terms of the currency of the foreign buyer. In the second case, foreign companies may be less willing to allow their selling prices to be dictated by fluctuating exchange rates. Bureau data support the notion that foreign companies attempted to moderate the impact of volatile exchange rates. In recent years, in response to appreciating currencies, foreign companies reduced costs, lowered profit margins, or priced products in their home currency. The rationale underlying the last strategy was that a company received a certain price for an export in its home currency that was not dictated by the value of the importing country's currency. This pricing practice is most prevalent in Western European countries and, to a lesser degree, in Japan, both of which are the largest chemical exporters to the United States.

Background during the 1980's

In addition to fluctuations in the exchange rate of the dollar, other factors came into play in the chemical industry during the past decade. In the early 1980's, the industry was still recovering from the 1979 oil shock and coping with the ensuing recession. Net profits for the 12 largest American chemical companies fell nearly 40 percent during the recession in 1982.[8] Industry capacity utilization rates slowed during the first several years of the 1980's. In 1982, capacity utilization rates fell to 71 percent, the lowest of

Chart 3. Cumulative pass-through rates for U.S. exports and imports of chemicals, 1985–90

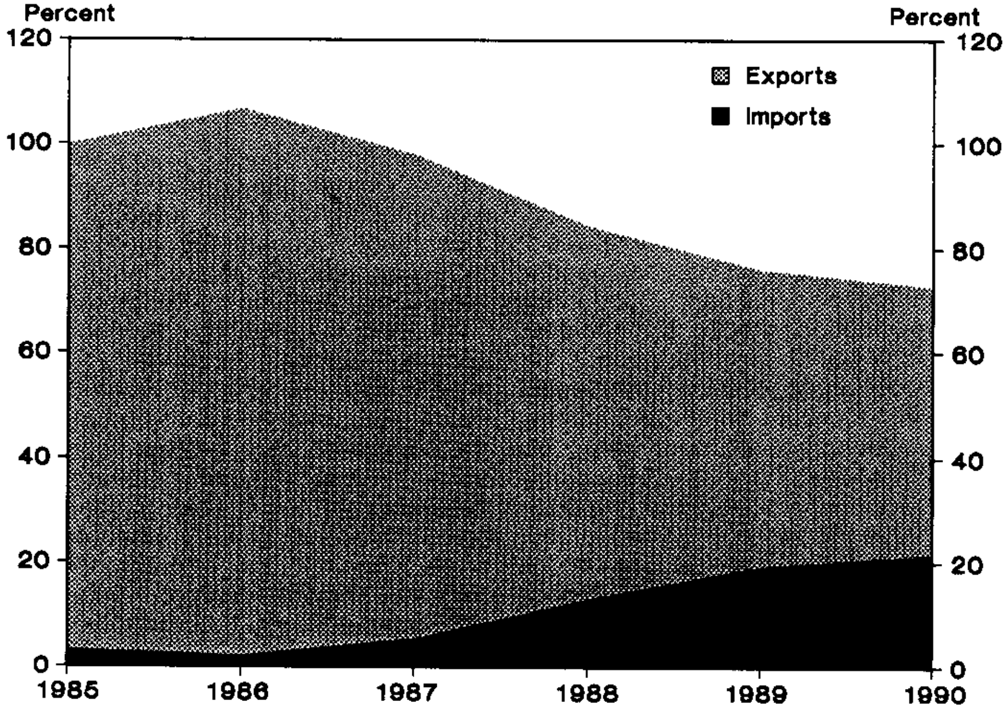
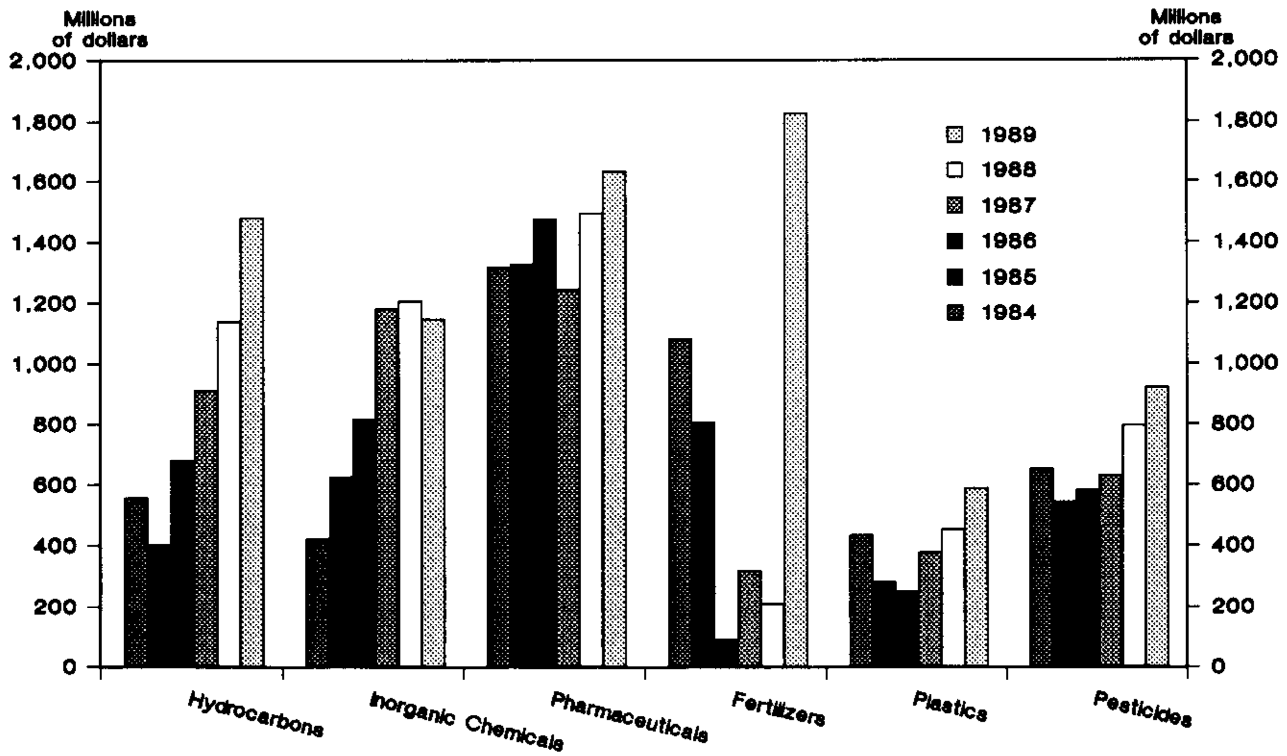


Chart 4. Trade surpluses for specific chemical industries, 1984–89



SOURCE: U.S. Department of Commerce.

the decade.[9] In response, companies shut down or retooled inefficient petrochemical and plastics plants. The recession also increased merger activity. By merging into larger firms, many chemical companies decreased operating costs and realized economies of scale. In 1988, capacity utilization rates reached 83.9 percent, and industry employment rose to 1.06 million.[10]

As a result of the 1979 oil shock and recession, many firms began to diversify into the more stable value-added specialty chemical businesses. By diversifying away from commodity products and into higher margin specialty chemicals, U.S. producers used their experience and technological expertise in an area where the price of crude oil represented a much smaller proportion of the value of the product produced. Specialty chemical areas such as pharmaceuticals and farm chemicals showed some of the greatest prospects for growth in profits. At the same time, the Far East expanded its petrochemical and plastics capacity and made plans for future growth. Also, oil-rich Middle Eastern producers began to compete in the markets for petrochemicals and plastics commodity resins. This rising competition and increase in foreign capacity forced U.S. plastics producers to shift into specialty plastics and other specialty chemicals to increase margins. These low-production-volume chemicals have a high research and development cost and involve larger technical support and related costs than do commodity chemicals.

Large American companies countered much of the costs associated with volatility in the price of feedstock by capitalizing on advanced technical resources and market niches. However, as firms shift their focus to specialty chemicals, research and development expenditures increase because specialty chemicals generally require much higher levels of spending on research and development than do basic chemicals. According to the National Science Foundation, research and development expenditures for the chemical industry have tripled since 1980, from $4 billion to almost $12 billion in 1990.[11]

Mirroring the U.S. experience, large chemical markets in other countries struggled through a recession following the 1979 oil shock. Fluctuations in the price of energy continued to have a major impact on chemical prices during the 1980's. Rising petroleum prices translate into steep increases for petrochemicals. This in turn boosts prices for petrochemical derivatives, including plastics. Increased petroleum costs

Table 1. **Average change in prices of U.S. exports and imports from March 1985 to December 1990, selected chemical categories**

Category	Imports			Exports		
	Dollar index	Exchange rate index	Foreign currency index	Dollar index	Exchange rate index	Foreign currency index
All commodities	29.8	-34.0	-14.3	14.7	-32.0	-22.0
All commodities except fuels	34.4	-35.8	-13.8	—	—	—
Petroleum	5.9	-12.0	-6.9	5.3	-37.4	-34.0
Chemicals	23.4	-40.3	-26.4	24.0	-32.2	-16.0
Organics	23.2	-42.5	-29.2	34.5	-36.8	-15.0
Inorganics	-13.5	-35.3	-44.1	—	—	—
Pharmaceuticals[1]	63.4	-44.0	-8.5	10.9	-29.1	-21.3
Fertilizers	24.3	-22.1	-.3.2	11.4	-8.1	2.3
Plastics	33.0	-40.6	-21.0	31.1	-33.4	-12.7
Chemicals, n.e.s.[2]	40.3	-46.0	-24.3	18.5	-22.2	-7.9

[1] Pharmaceutical index changes begin in December 1985.
[2] n.e.s. = not elsewhere specified.

NOTE: Dash indicates data not available.

hurt chemical producers worldwide. The United States, however, enjoys an initial advantage during oil shocks. Some important petrochemicals, such as ethylene, can be produced from either natural gas or petroleum, and with abundant natural gas supplies both in the United States and in neighboring Canada, U.S. producers can shift to more natural gas in the production of ethylene and related petrochemicals. By contrast, Europeans and, especially, the Japanese rely more heavily on petroleum feedstocks. Nonetheless, oil-rich developing countries such as Malaysia, Indonesia, and some Middle Eastern countries, have subsequently become competitive in the energy-intensive commodity chemicals areas.

As the U.S. chemical industry enters the next decade, environmental regulatory costs are expected to continue to grow. The Chemical Manufacturers Association estimates that capital outlays for the air toxins provisions of the Clean Air Act Amendments will cost the industry an estimated $17 billion over the next 20 years.[12] Higher research and development expenditures already have increased costs for both pesticide producers and pharmaceutical makers and have forced many companies to merge into larger corporations.

Industry trends

Petroleum. The U.S. chemical industry is energy intensive. Petroleum is used both as a feedstock and as an energy source. For specialty chemicals such as pharmaceuticals, petroleum is not an important input. For basic petrochemicals, however, petroleum energy and feedstock costs can constitute more than half of the cost of the final product. The Chemical Manufacturers Association estimates that a doubling of oil prices from $18 per barrel to $36 per barrel results in a $15 billion increase in energy costs for the chemical industry.[13] A study by the Federal Emergency Management Agency found that a 50-percent increase in oil prices results in an increase of less than 1 percent in pharmaceutical and toiletry costs, compared to an increase of almost 5 percent in industrial and inorganic chemicals.[14] The burden of higher energy costs is, therefore, unevenly distributed within the chemical industry.

Petrochemicals. Petrochemicals, as the name implies, are highly vulnerable to fluctuations in oil prices. (See chart 4.)[15] A good example of their vulnerability occurred in 1985, when Saudi Arabia pushed world oil prices down by flooding the market. From September 1985 to December 1986, petrochemical prices plummeted 44 percent. Petrochemical prices continued to follow the oil market through the end of the decade, reaching a high in 1990 with Iraq's invasion of Kuwait.

Despite their frequent fluctuations in price, basic petrochemicals have made a significant contribution to the U.S. chemical trade surplus. The years 1981 and 1982 were characterized by high petroleum costs and slower trade, but by 1983 the industry began to grow again. From 1985 to 1986, the balance of trade increased 68 percent, and sizable gains continued through 1989. From 1985 to 1989, the trade surplus for basic petrochemicals (hydrocarbons) more than tripled, from $355 million to almost $1.5 billion.

However, increasing numbers of developing nations have invested in domestic petrochemical industries. The Far East especially emerged as a new petrochemical center. Plans for new plant construction are so numerous in the Far East that some experts predict a glut in primary petrochemicals in the region during the 1990's.[16] Following the examples of Taiwan, Singapore, and South Korea, nations rich in oil and natural gas, such as Indonesia and Malaysia, will be home to a multitude of new plants. The latter two nations are estimated to be among the lowest cost petrochemical manufacturers in the Far East, and both have the potential to become competitive exporters. While many of the region's plants are the product of foreign investment by Japanese, American, and European concerns, domestic sources are also contributing.

Increases in Far East petrochemical production will affect the U.S. trade balance adversely. Japan, Taiwan, and South Korea are three of the United States' most important export markets. In 1989, 39 percent of U.S. exports were destined for these nations. The upshot of this scenario is already apparent: from January to August 1990, the U.S. trade surplus in petrochemicals fell 35 percent from the figures for January to August 1989, and this decline was mirrored by a 35-percent decrease in exports to Japan, Taiwan, and South Korea.

Plastics. The plastics trade has been shaped by the state of the petrochemical industry, because production depends largely on petroleum-derived chemicals. Applications for plastics multiplied during the 1970's and 1980's as plastic replaced many materials for uses in packaging, automobiles, construction, health care, and other industries. The demand for plastics outpaced the supply in the past two decades. However, the momentum was interrupted during the first half of the 1980's, when high oil prices and a subsequent recession dampened world demand for plastics. These effects were strongest in commodity resin plastics, which are sensitive to price changes in petrochemical feedstock. Commodity resins are characterized by high production volumes but involve relatively low costs and low dollar values. These plastics constitute roughly 80 percent of the industry.

As a result of higher oil prices and the recession, the trade surplus in commodity resins dropped more than 20 percent between 1983 and 1985.[17] As the world recovered from the recession, the U.S. trade surplus in plastics increased nearly twofold between 1985 and 1989, from $1.9 billion to $4 billion. Increases in the International Price Program export price indexes reflected this mid-decade growth.[18] Prices rose in the first quarter of 1987 and peaked by the third quarter of 1988. Commodity resins were largely responsible for the gain of almost 32 percent in export prices. The International Price Program export indexes showed a 20-percent price decline between the third quarters of 1988 and 1989. During the past 2 years, the plastics market has been depressed for U.S. producers. The 1988 political unrest in China, the 11th largest export market, contributed to the decline in the U.S. trade surplus. Additionally, increased competition from Asia and the Middle East, combined with rising petrochemical prices, is squeezing U.S. profit margins.

In response to increased competition in commodity plastics, companies began moving more resources into the production of specialty plastics, of which engineering resins are a large part. Petrochemical costs are less significant in the production of engineering resins than in that of the commodity resins. The specialty market comprises roughly 20 percent of the entire plastics industry. Trading success in the U.S. plastics industry may have been limited to the 1986–88 expansion, when the trade surplus increased 193 percent. By contrast, from 1989 to 1990, the year-to-date plastics trade surplus increased only 1.6 percent. Engineering resins contributed 4.4 percent of the increase, while commodity resins accounted for less than 0.1 percent.

Between 1985 and 1990, the trade surplus in the chemical industry more than doubled.

Pharmaceuticals. The balance of trade for pharmaceuticals grew 14 percent from 1983 to 1989, from $1.43 billion to $1.63 billion.[19] In 1989, 8 of the top 10 countries from which the United States imported goods were Western European. Japan and Canada were the only non-European countries, ranking 4th and 10th, respectively. Likewise, 8 of the top 10 export markets were Western European, with Japan and Canada again being the only non-European nations. Japan was the largest export market for U.S. goods, and Canada was the third largest. The U.S. pharmaceutical industry has been very price competitive. From December 1985 to December 1990, export prices rose only 10.9 percent. Import prices, in contrast, rose 55.6 percent over the same period.

However, lack of protection for intellectual property rights, especially in developing countries, is a major source of lost revenue for U.S. pharmaceutical firms. It is estimated that overseas patent violations cost U.S. companies $2 billion in 1986 alone.[20] U.S. negotiators are working to correct this problem in multinational trade negotiations. Escalating costs for research and development may also be behind the large number of U.S. patent violations in developing countries. These nations cannot afford to develop many pharmaceuticals domestically. Lack of protection for U.S. intellectual property rights encourages firms in developing nations to copy U.S. pharmaceuticals without compensating the patent holder. Intellectual property rights and patent protection, as well as worldwide health cost containment efforts, will probably continue to be an issue throughout the 1990's. Moreover, collaborations and mergers between U.S. and foreign pharmaceutical firms are likely to continue to increase. The high cost of developing new pharmaceuticals has led some small firms to merge with large firms that are better able to afford large expenditures for research and development.

Increases in Far East petrochemical production will affect the U.S. trade balance adversely in the future.

Pesticides. At $922 million in 1989, the pesticides trade surplus nearly doubled 1985's $544 million.[21] Expenses for research and development, regulatory costs, and infringements of intellectual property rights affect competitiveness in the industry. In addition to incurring costs for things such as the development and testing of new chemical formulations for pest resistance, producers often must pay registration fees. The United States, with strength in technological resources, is the world's largest producer of pesticides. The most important markets for pesticides are developed nations, the largest of which are in North America. The top five export markets for U.S. pesticides are Canada, Belgium and Luxembourg, Japan, France, and Australia. Also among the leading countries in the market close behind U.S. pesticide manufacturers are Germany, the United Kingdom, and Japan. This stiff competition has helped keep export prices stable. From December 1985 to December 1990, pesticide prices have risen less than 0.1 percent. Germany, the United Kingdom, and Japan are also the leading import markets for U.S.-produced pesticides. In 1989, the United States held the largest trade deficits in pesticides with Germany and the United Kingdom. Third World consumption of pesticides has been limited.

Regulatory cost factors vary from country to country. The most recent legislation affecting the U.S. pesticide industry is the Federal Insecticide, Fungicide and Rodenticide Act. Under the Act, manufacturers must pay registration fees and research costs for many pesticides. In contrast, Great Britain has one of the most liberal regulation programs in Europe, relying chiefly on voluntary pesticide registration. Other European countries and the United States enforce registration. Because of the high costs of production, the intellectual property rights of the United States and other developed nations regarding pesticides are often violated, damaging trade advantages.

Fertilizers. The U.S. trade surplus in fertilizers fluctuated widely during the 1980's.[22] It hit bottom in 1986 at $92 million and peaked in 1989 at $1.8 billion. Imports, 70 percent of which come from neighboring Canada, remained relatively unchanged, averaging just under $1 billion during most of the 1980's. China, the Soviet Union, the United States, and India are among the world's largest consumers and producers of fertilizers. The United States leads the world in exports of nitrogen and phosphate fertilizer, while Canada leads in exports of potash fertilizer. The United States will probably continue to lead the world in phosphate production for the rest of this century, but may lose some market share to Morocco, whose resources of phosphate rock are larger.[23]

Large variations in exports have been behind most of the changes in the trade surplus in fertilizers. A good example of these variations was the eightfold increase in the trade surplus from 1988 to 1989. Following the 1988 drought, fertilizer producers were overly optimistic about the 1989 planting season. Actual fertilizer consumption was not as high as predicted, however, creating a serious oversupply of many fertilizer products. Domestic producers turned to the export market to alleviate the situation. Fertilizer exports more than doubled in 1989, from $1.2 billion to $2.8 billion. China, India, the Soviet Union, and Japan, four of the Nation's largest export markets, imported most U.S. excess fertilizer. Exports to Japan increased 90 percent in 1989, while exports to the Soviet Union and China more than doubled and exports to India quadrupled.

While the value of fertilizer imports and exports varied significantly during the 1980's, import and export prices have generally trended together. Import prices have had steeper increases, however. From June 1986 to December 1990, import prices jumped 17 percent, while export prices rose just 7 percent.

Inorganic chemicals. The trade surplus in inorganic chemicals increased steadily from almost $425 million in 1984 to more than $1.2 billion in 1988.[24] From 1988 to 1989, however, the surplus fell 5 percent, and the trend seems to be continuing in the 1990's. Basic inorganic chemicals are suffering from some of the same problems as basic petrochemicals. Chemical manufacturers in industrialized nations such as the United States are moving out of bulk commodity chemicals and into specialty chemicals. As the Middle Eastern nations and lesser developed countries pour more and more money into their own chemical industries, they import less from the developed nations.

Inorganic chemicals is a mature industry in the United States. Plant expansions and new plant construction occur infrequently. In fact, many companies are merging in an effort to achieve economies of scale in feedstock, energy, and labor costs. While U.S. capacity is not expected to increase significantly, many lesser developed countries are planning new plant construction. Such construction could lead to a continued erosion of the U.S. trade surplus in inorganics. Lower import prices also pose a problem for the domestic industry. From March 1984 to December 1990, inorganic import prices fell 20 percent.

Conclusion

The U.S. chemical industry remained competitive in the international market during the past decade, as reflected in the strong chemical trade surplus. U.S. companies achieved this success through diversifying, capitalizing on cost advantages, and realizing efficiency gains and economies of scale. Many companies reorganized or merged with domestic and foreign companies. As the relative value of the dollar decreased, prices fell for U.S. exports, in foreign currency terms. This competitive price advantage driven by the falling exchange rates contributed to the more than twofold increase in the chemical surplus from 1985 to 1990. Many U.S. companies chose to open foreign-based facilities in order to be closer to their markets and sources of raw material. Domestic companies took advantage of their technological strengths by entering the more profitable specialty chemical market. Maintaining the surplus at previous levels into the the 1990's will be difficult, however, because of slower world economies and increased competition from regions such as the Far East. □

Footnotes

[1] Trade figures discussed in this article are based on U.S. trade data from the U.S. Department of Commerce, 1980–90.

[2] Allen J. Lenz, *The U.S. Chemical Industry Performance and Outlook* (Washington, Chemical Manufacturers Association, November 1990), pp. 40–41.

[3] Price developments discussed in this article are based on data from the Bureau of Labor Statistics International Price Program. This program produces import and export price indexes based on the Standard International Trade Classification scheme. Both indexes are a modified Laspeyres formula. Price data are collected for more than 22,000 products and are not seasonally adjusted. Beginning with data for the first quarter of 1988, released in April, International Price Program indexes were weighted by the value of trade in 1985. (Formerly, the indexes had been weighted by the value of trade in 1980.) In addition, the indexes were recalculated from 1985 forward using the new weights. The Bureau also published these price data by Standard Industrial Classification, as determined by the Office of Management and Budget, and by end-use classifications developed by the Department of Commerce's Bureau of Economic Analysis.

[4] One important consideration in price trends is the way multinational firms affect the pricing structure among their affiliates. The International Price Program attempts to capture price movements that are "arms-length" transfers, such as prices affected by a U.S. company's selling to a foreign dealer or distributor. However, as the relationship matures, oftentimes the affiliate will become involved in a marketing or sales capacity, progressing eventually to designing and engineering functions. As the parent company and subsidiary become more involved, special licensing arrangements and joint ventures can evolve into pricing arrangements between companies that do not accord with the market trend. In constructing the International Price Program import and export price indexes, the Bureau excludes intracompany transfer prices that do not trend like "arms-length" transactions. This exclusion is particularly significant in chemical industries, because the percentage of trade between related parties is high.

[5] Exchange rate figures are based on the International Price Program's nominal average exchange rate indexes. These indexes measure the change in the price of trade-weighted baskets of currencies against the dollar and are designed to match the export and import price index series published by the Bureau at the two-digit, one-digit, all-export, and all-import levels, as defined by Revision II of the Standard International Trade Classification system.

[6] While pass-through rates are especially useful where raw materials are not a major component of cost, they also appear to have some use in the chemical sector of trade, particularly as regards the larger value-added components. Pass-through rates are calculated for exports by dividing the percentage change in the foreign currency index by the percentage change in the average exchange rate index. For example, from March 1989 to June 1989, the foreign currency index went up 1.2 percent and the dollar increased 4.3 percent, resulting in a pass-through rate of 30 percent.

[7] Import pass-through rates are calculated similarly to those for exports and are the result of the percentage change in the dollar import price index divided by the percentage change in the reciprocal of the foreign currency exchange rate index.

[8] "Chemical Companies: Again in a Stew," *The Economist*, Dec. 1, 1990, p. 84.

[9] Lenz, *Chemical Industry Performance*, p. 6.

[10] *Ibid.*, p. 75.

[11] *Ibid.*

[12] *Ibid.*, p. 67.

[13] *Ibid.*, p. 55.

[14] Daniel J. Meckstroth and Patricia Buckley, "Implication of Higher Oil Prices for U.S. Industry," *Business Economics*, January 1991, p. 38.

[15] For the purpose of this discussion, the term "petrochemicals" refers to Standard International Trade Classification (Revision 2) section 511, "Hydrocarbons, n.e.s., and their halogenated, sulphonated, nitrated or nitrosated derivatives."

[16] Lyn Tattum and Andrew Wood, "Far East: Producers Seek Balance in an Area of Dynamic Growth," *Chemicalweek*, Aug. 29, 1990, p. 22.

[17] Trade figures regarding plastics refer to Standard International Trade Classification (Revision 3) section 57, "Plastics in primary forms," excluding section 579, "Waste, parings, and scrap, of plastics."

[18] International Price Program import and export prices regarding plastics refer to Standard International Trade Classification (Revision 2) section 58, "Artificial resins and plastic materials, and cellulose esters and ethers."

[19] For the purposes of this discussion, the term "pharmaceuticals" refers to Standard International Trade Classification (Revision 2) section 54, "Medicinal and pharmaceutical products."

[20] *Hearing on the Competitiveness of the U.S. Chemical Industry* (U.S. Congress, Subcommittee on Foreign Commerce and Tourism of the Committee on Commerce, Science, and Transportation, 100th Cong., 2d sess., June 1, 1988), p. 20.

[21] For the purposes of this discussion, the term "pesticides" refers to Standard International Trade Classification (Revision 2) section 591, "Disinfectants, insecticides, fungicides, weed killers, anti-sprouting products, rat poisons and similar products, put up in forms or packings for sale by retail or as preparations or as articles (e.g., sulphur-treated bands, wicks and candles, fly-papers)."

[22] For the purposes of this discussion, the term "fertilizers" refers to Standard International Trade Classification (Revision 2) section 56, "Fertilizers, manufactured."

[23] 1990 *Fertilizer Facts and Figures* (Washington, The Fertilizer Institute, 1991), pp. 31–33.

[24] For the purposes of this discussion, the term "inorganic chemicals" refers to Standard International Trade Classification (Revision 2) section 52, "Inorganic chemicals."

A note on communications

The *Monthly Labor Review* welcomes communications that supplement, challenge, or expand on research published in its pages. To be considered for publication, communications should be factual and analytical, not polemical in tone. Communications should be addressed to the Editor-in-Chief, *Monthly Labor Review*, Bureau of Labor Statistics, U.S. Department of Labor, Washington, DC 20212.