

MARCH/APRIL 1990

# ECONOMIC PERSPECTIVES

A review from the  
Federal Reserve Bank  
of Chicago

**Changing U.S. trade patterns**

**Chicago Fed and University of Illinois  
form regional research lab**

**Chicago's economy:  
Twenty years of structural change**

FEDERAL RESERVE BANK  
OF CHICAGO



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### **ECONOMIC PERSPECTIVES**

MARCH/APRIL 1990 Volume XIV, Issue 2

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ISSN 0164-0682

## Changing U.S. trade patterns

Jack L. Hervey



The last year in which the U.S. merchandise trade balance recorded a back-to-back annual surplus was twenty years ago, in 1970. That surplus was \$2.6 billion on the balance-of-payments basis. In 1987, the merchandise trade deficit bottomed out at \$160 billion. By 1989, the deficit had been reduced to around \$110 billion (see Figure 1). Much has been made of the persistent U.S. trade deficit, why it became so large, why it has improved in recent years, and why, finally, it has not improved more.

Underlying and shaping these statistical changes in the U.S. trade sector is a complex matrix of global economic and political structure changes. This article examines a portion of that matrix; specifically, it looks at the changing pattern of U.S. trade with other major geographic regions, in terms of important commodity groupings.

Such a discussion is particularly appropriate now. Recent political and economic developments in Europe make likely major new developments in trade structures and patterns within the near term. World trade relationships are once again on the threshold of significant change.

The economic and political rebirth of Eastern Europe, the movement toward the economic and political integration of Western Europe in 1992 and beyond, and the interaction of these two developments will leave the European canvas with quite a different appear-

U.S. foreign trade has grown ten-fold in twenty years—much of the increase has flowed to and from Japan and emerging Southeast Asia

ance than would have been thought possible as little as a year ago. These developments, in turn, will have a profound impact on world economic and trading relationships.

The revision and restoration of Europe has only just begun. How this different but integral part of the world picture will fit into the overall scheme can only be speculated upon—but not in this article. Here, we will examine the changes in the flow and direction of U.S. trade over the past twenty years or so. In doing so, perhaps we can make out where these flows will go—and how large they might be—in coming years.

### Setting the stage

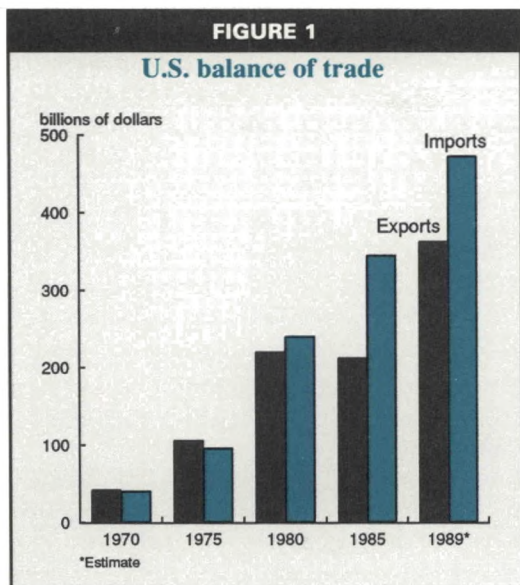
During the decade of the 1960s, the international economic environment changed as it never had before. Western European countries were drawn more closely together economically in the form of the European Economic Community (EEC) and the European Free Trade Association (EFTA). The extent of this economic integration would have been hard to imagine a few years earlier as the region struggled to recover from World War II.

Japan, also recovering from the war, was not yet a major force in the world economy. Nonetheless, it was on its way to becoming an economic power as it regularly recorded annual real economic growth rates in the 10-to-15 percent range.

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The Kennedy Round trade negotiations were initiated and completed during the decade. Large reductions in tariffs on manufactured goods were begun. World trade growth accelerated. Manufactured-goods exports worldwide tripled in value from \$64 billion in 1960 to \$190 billion by 1970. The physical volume of manufactured-goods trade expanded 2.7 times between 1960 and 1970, according to estimates by the Secretariat of the General Agreement on Tariffs and Trade (GATT).

U.S. investment abroad, especially direct investment, increased at a rapid pace. The dollar dominated international exchange, although it was widely considered to be overvalued under the then existing fixed exchange rate system. The high foreign exchange value of the dollar made the dollar price of foreign acquisitions attractive. Indeed, it was common to read critical foreign commentary on the undesirable aspects of U.S. companies "buying up" the economic base of Western European countries.

By the late 1960s evidence was plentiful that times and the world were changing, and rapidly. But how rapidly no one would have dared guess.

### U.S. dominance dwindles

In 1968 and 1969 the U.S. merchandise trade surplus dropped from the \$5–\$7 billion range that had held during much of the decade to near balance. Concern in official circles intensified about the high value of the dollar and its increasingly detrimental impact on the

ability of the U.S. to compete effectively in world markets.

Early in the 1970s the environment began to change quickly. The U.S. merchandise trade moved into deficit in 1971, by \$2.3 billion. The gold window was closed; foreign holders of dollars could no longer claim U.S. gold reserves in return for dollars (August 1971). The dollar was twice officially devalued (effectively in August 1971 but formally at the beginning of 1972, then again in early 1973 prior to the general "floating" of exchange rates in March of 1973). The dollar depreciated further over the course of the decade. Meantime, OPEC gained effective control of sufficient crude oil supplies to enforce a quadrupling of world petroleum prices in late 1973. Large quantities of dollars acquired by the oil-exporting countries, especially the Arab oil exporters, were subsequently recycled to the developing countries of Latin America and Southeast Asia.

U.S. merchandise exports increased more than five times between 1970 and 1980. But during the same period imports increased more than six-fold and the trade balance slipped into constant deficit—averaging \$26 billion annually during the last half of the decade.

Exports peaked in 1981, bottomed out in 1985, and not until 1987 did they exceed the 1981 level. Exports in 1989 are thought to have exceeded the 1981 peak by about 50 percent. All of that gain has occurred during the last three years.

Unlike exports, imports grew steadily throughout the 1980s and are estimated to have exceeded the 1981 level by about 80 percent during 1989. The divergence between export and import growth increased rapidly in 1983, and continued through 1987. During the period 1983 through 1989 the deficit averaged more than \$120 billion annually.

Changes in trade flows of this magnitude over a period of two decades should reasonably be expected to include compositional changes—changes both in geographic patterns and commodity patterns of trade. To these we now turn.

### Geographical changes in U.S. trade

Historically, the United States' primary international trade relationships have been with other Western Hemisphere countries and Western Europe. As recently as 1970, two-



thirds of U.S. exports went to these regions and seven-tenths of imports came from these regions. (See Figures 2 and 3.)

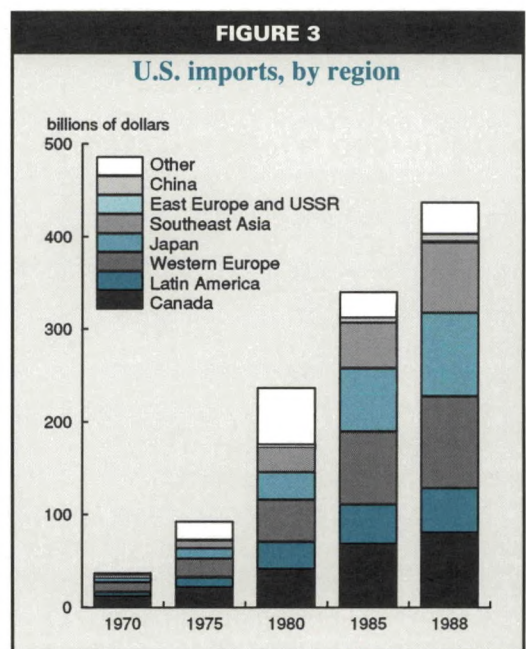
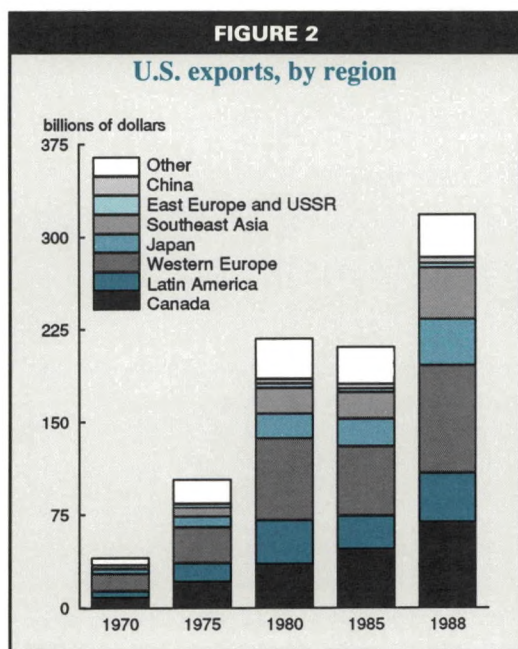
Canada long held the position of primary trading partner, accepting 21 percent of U.S. exports in 1970 and sending 30 percent of U.S. imports. In terms of total trade, that is, exports plus imports, Canada remains the largest single trading partner for the United States. But, the dominant magnitude of the U.S./Canada trade relationship, as far as the overall U.S. trade picture is concerned, is not as secure as it once was. The U.S. actually exported a slightly larger proportion of its total to Canada in 1989, nearly 22 percent, than in 1970, when Canada received nearly 21 percent of U.S. exports (but the 1970 figure may be understated, see box). Canada's contribution to U.S. imports, on the other hand, dropped sharply, from nearly 30 percent in 1970 to just under 19 percent in 1989.

The pattern of U.S. international trade in the late 1980s indicates that Western Europe has also become a less prominent trading partner. In 1970, one-third of U.S. merchandise exports went to Western Europe, but by 1989 the proportion had dropped to 27 percent. Likewise, with imports. In 1970, 28 percent of U.S. imports came from Western Europe but by 1989 the proportion had dropped by a quarter to 21 percent.

U.S./Latin American trade as a proportion of the U.S. total hovered in the low-to-mid teens throughout the two decades, diminishing only slightly in recent years.

If these traditional markets are accounting for a lesser share of the total than was formerly the case, it is clear that the excess has been picked up elsewhere. Imports from Japan increased sixteen-fold between 1970 and 1989. The import value of \$94 billion in 1989 was the largest from any single country and was equal to 93 percent of the total from all of Western Europe. In 1970, imports from Japan were just shy of 15 percent of total U.S. imports and less than half the total from Canada. By 1989, imports from Japan had risen to 20 percent of the total and were slightly greater than imports from Canada.

U.S. exports to Japan did not fare as well as did imports, increasing less than ten-fold during the 1970–1989 period—therein lies the summary cause of the trade-related friction between the two countries. Nonetheless, U.S. exports to Japan did maintain a proportionate share of total U.S. exports—in fact, exports to Japan increased slightly, from less than 11 percent in 1970 to more than 12 percent of total U.S. exports in 1989. This was a relatively stronger performance than the deterioration in the share of U.S. exports going to Western Europe.





## The growth area in trade

The dollar value of U.S. international trade increased ten-fold between 1970 and 1989—8.5 times for exports and 11.8 times for imports. But, the shares accounted for by traditional markets in Western Europe and the Western Hemisphere had a net downward shift. Some increase in trade share has taken place with Japan, but it was not sufficient to offset a decline in shares of the magnitude recorded in trade with Western Europe.

That leaves us with one of the more interesting trade developments of the past two decades, the emergence of the newly industrializing countries of Southeast Asia (NICs) as a major trading bloc. These four countries, Hong Kong, the Republic of Korea, Singapore, and Taiwan, have become a formidable trade bloc and are the focal point of the Southeast Asia (excluding Japan) market. In combination they exceed in importance the United Kingdom and West Germany, together, as a market for U.S. exports and as a source of U.S. imports.

In 1970, the NICs accounted for 4 percent of U.S. exports and 5 percent of imports. By 1989, the proportions had increased to 11 percent and 13 percent, respectively. By comparison, the rest of Southeast Asia (primarily Malaysia, Thailand, Indonesia, and the Philippines) has maintained a steady 2-to-4 percent share of U.S. exports and imports throughout the two decades.

Finally, one additional regional bloc requires mention. Eastern Europe and mainland China are not particularly significant in the overall U.S. trade picture currently (although with respect to U.S. exports of agricultural commodities and imports of clothing they are of some importance). As a market for U.S. goods these two areas have increased their aggregate share of the U.S. total from less than 1 percent in 1970 to 3 percent in 1989 with the current shares equally divided between Eastern Europe (including the Soviet Union) and China. However, imports from Eastern Europe have held at one-half percent of the total throughout the period. Imports from China, on the other hand, which were nil in 1970, increased to a 2.5 percent share of U.S. imports in 1989; most of that increase in share occurred after 1980.

In sum, there has been a substantial geographic redistribution in the pattern of U.S.

merchandise trade during the past two decades. Three characteristics of this reshuffling of trade relationships stand out.

First, the traditional primary market sources for U.S. imports have experienced marked declines in import share, specifically, Canada and Western Europe. Still, these market areas remain at or near the top as sources of U.S. imports.

Second, the relative importance of Western Europe as a market for U.S. export goods has diminished. Nonetheless, Western Europe and Canada remain the dominant markets for U.S. exporters.

Third, Southeast Asia has increased dramatically as a market for exports and a source of imports. Importantly, the expansion in this potentially large market is a development not solely associated with the well-known surge in Japanese/U.S. trade but also with the less well-recognized but rapidly growing U.S. trade ties with the Asian NICs.

## The composition of trade has also changed

The dynamic adjustment of U.S. trade away from some and toward other regions in a shifting world market is only half of the story. Interrelated with the geographical changes are the changes in the goods/commodity composition of trade—an issue to which we now turn.

### Commodity exports

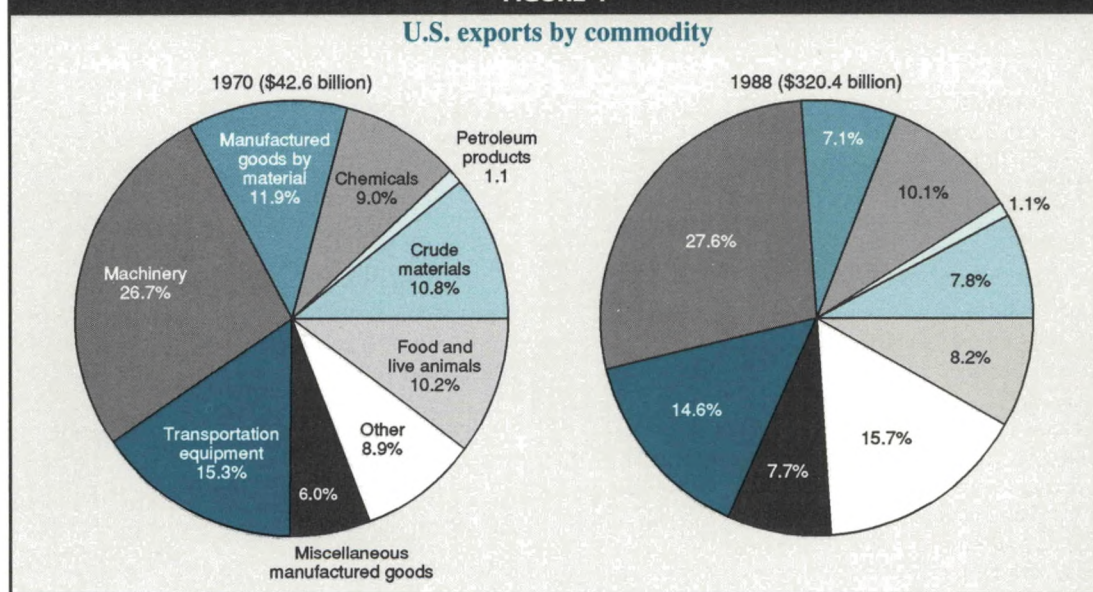
Even though the value of U.S. exports increased from nearly \$43 billion in 1970 to more than \$360 billion in 1989, the composition mix for major categories of exports appears to have changed surprisingly little (See Figure 4). The aggregate figure may be somewhat misleading because of possible undercounting in the early part of the period, however (see box).

Using an *adjusted* total as a base for calculating the export shares of various commodities indicates that the relative importance of agricultural exports has deteriorated, dropping from a 19 percent share in 1970 to 14 percent in 1988. Similar, but more modest, declines hold for exports of foods and live animals and intermediate manufactured materials, such as metals, building materials, and textile products.

Picking up the slack is the increased relative importance of chemicals, up from 10 percent to 12 percent of the export bundle, and



FIGURE 4



machinery, up from 29 percent to 33 percent. In the latter category, the export share for business machinery and data processing equipment more than doubled to nearly 9 percent between 1970 and 1988. Electrical machinery, power generating machinery, and telecommunications equipment all recorded increases in relative share.

### Commodities by countries

Examination of trade by country-by-commodity provides a somewhat different picture of U.S. trade patterns than is gleaned from aggregate trade (see Figure 5). As noted in the box, for example, U.S. exports by country-by-commodity point out the distortion in trade patterns caused by the inadequate export documentation of overland shipments to Canada during the 1970s and early 1980s.

### Canada

The most striking characteristic of the U.S. exports to Canada data is the "other" shipments category. This category share increased from 6 percent of the total in 1970 to 27 percent in 1988, a change that was more than adequate to wipe out meaningful trends during that period for the major goods.

Adjusting for the "other" shipments, however, indicates the following: Transportation equipment, automotive equipment in particular, is the one major category that recorded an appreciable increase in its share of

the adjusted total, moving from 29 percent in 1970 to 36 percent in 1988. During the same period machinery exports maintained a 30 percent share. Agricultural commodities and intermediate manufactured goods currently account for a smaller share of U.S. exports to Canada than in 1970. Export share for the major manufactured-goods categories remained steady.

### Western Europe

The pattern of U.S. exports to this region differ from those for Canada, not only in the direction of change for several of the categories, but also in the more substantial magnitude of the changes over time.

U.S. exports of machinery to Western Europe became substantially more important, increasing from 27 percent of the total in 1970 to 33 percent in 1988. Nearly all of that share increase was accounted for by the increase in business equipment and computers. Except for a slight increase in the share for power generating equipment, the share of other machinery categories remained stable across the nearly 20-year span.

The miscellaneous manufactured-goods category, which includes professional and scientific equipment, clothing, and printed matter, also increased, from 6 percent to 10 percent of the total. Exports of transportation equipment, primarily aircraft, also increased as a share of the total.



## The “other” problem

In recent years merchandise trade data have included a sizable value of exports that did not neatly fall into the major commodity categories. These exports included such things as foreign goods reexported, shipments of military equipment, nonmonetary gold, and undocumented exports to Canada. In the accompanying article these items are included in a residual category called “other.” During the 1970s the recorded value of such exports was relatively small. But, during the 1980s the “other” category began to expand rapidly, raising questions whether there was something unusual going on with the data, and were these changes masking developments in other categories?

For example: Export shipments of machinery as a proportion of total U.S. exports changed only slightly during the 1970-1988 period, increasing less than 1 percentage point to nearly 28 percent of the total in 1988. This seems to defy the common perception that capital equipment, in particular, has become a substantially more important component of U.S. exports during recent years. Moreover, the share of intermediate manufactured goods actually declined by nearly 5 percentage points to 7 percent of the total between 1970 and 1988. Agricultural commodity exports recorded a decline in share from 17 percent of exports in 1970 to around 11 percent currently.

Most of the share declines noted in the agriculture and intermediate manufactured-goods categories

were offset in the “other” category. And, it turns out that most of the rather substantial change in the “other” category can be identified as “undocumented shipments to Canada”—in large part overland shipments to Canada that are not covered by export documentation and that therefore are not counted in the regular export statistics. Only in recent years have these exports been picked up by U.S. trade authorities from Canadian import declarations.

Excluding the “other” category from total exports results in quite a different export pattern. Using this “adjusted total” as a base for calculating the export shares indicates that the relative importance of agricultural exports continues to deteriorate, dropping from a 19 percent share in 1970 to 14 percent in 1988. Similar, but more modest, declines hold for exports of intermediate manufactured materials, such as metals, building materials, textile products, and the like.

The adjusted total increases the relative importance of chemicals, up from 10 percent to 12 percent of the export bundle, and machinery, up from 29 percent to 33 percent. In the latter category, the export share for business machinery and data processing equipment more than doubled to nearly 9 percent between 1970 and 1988. Electrical machinery, power-generating machinery, and telecommunications equipment, all recorded increases in relative share.

On the down side, both the agricultural commodities and intermediate manufactured-goods categories became relatively less important components of the U.S. export bundle to the European market. In the aggregate they declined from a 31 percent share in 1970 to a 15 percent share in 1988. Chemical exports held a relatively stable share over the two decades—in the 10-to-12 percent range.

### Japan

Share changes in exports to the Japanese market were rather modest. This is not surprising in light of the ongoing dispute between the U.S. and Japan over the alleged unwillingness of the Japanese to open their markets to new products—indeed, the stability of the market shares might be argued as a support for the U.S. contention.

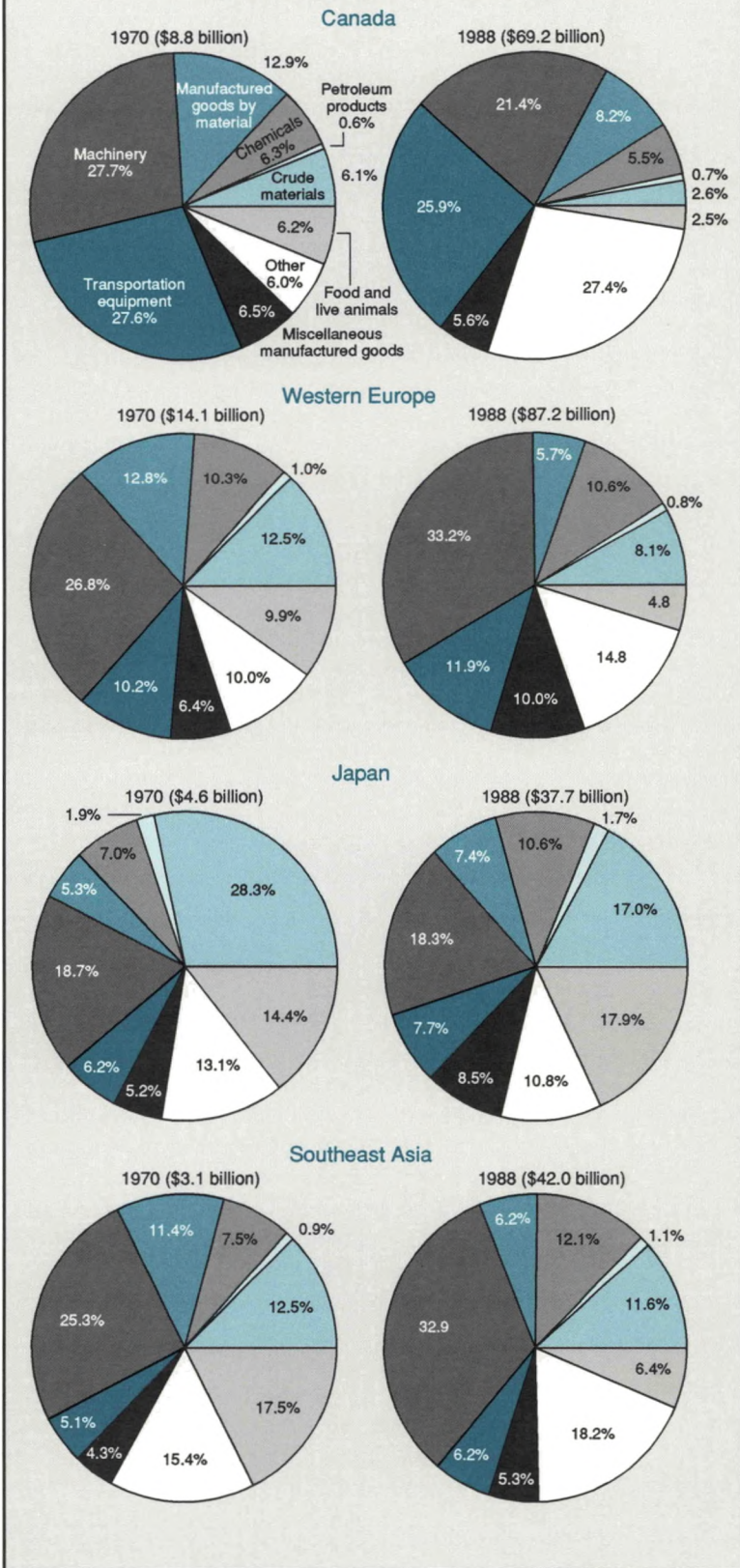
The export share for machinery, which was nearly 19 percent in 1970, declined to 12 percent by 1980 before recovering to 18 percent in 1988, a net share loss. Within this category, business equipment, computers, and telecommunications equipment recorded modest share increases during the period, in the aggregate from 5 percent in 1970 to 8 percent in 1988. But these gains were offset by share reductions in the heavier equipment categories, such as power-generating and metalworking equipment.

Exports of chemicals and other intermediate manufactured goods increased their relative importance in the export bundle to Japan, moving up from 12 percent of the total in 1970 to 18 percent in 1988. The export share for the relatively minor category, professional and scientific equipment, doubled to more than 3



**FIGURE 5**

**U.S. exports, by region and commodity (unadjusted)**



percent during the two decades.

Agricultural exports to Japan follow the nearly universal pattern, declining from 26 percent of U.S. exports to this market in 1970 to 20 percent in 1988. But the decline contains an interesting twist. The share of food and live animal exports increased from 14 percent to 18 percent.

A major difficulty for the U.S. in increasing more aggressively its exports to Japan is the fact that it has been unable to substantially increase machinery exports as a proportion of the total.

**The NICs and Southeast Asia**

This market is the most interesting of the major U.S. export markets. Not only is the rate of increase in U.S. exports to this area the most rapid of any major market area but the shift in commodity shares is a telling characteristic of the rapid economic development within this area. (The major countries in this grouping are the NICs—Hong Kong, the Republic of Korea, Singapore, and Taiwan—plus Malaysia, Thailand, Indonesia, and the Philippines.)

Food-related products accounted for a major proportion of U.S. exports to this area in 1970—28 percent of the total. By 1988 the share was down to 13 percent.



The share of intermediate manufactured products has also declined by nearly half to 6 percent. These share declines, however, have been offset by increased export shares from capital intensive industries—chemicals up from 8 percent to 12 percent, aircraft from 1 percent to 4 percent, professional and scientific equipment from 1 percent to 2 percent, and machinery up from 25 percent to 33 percent. Within the latter category the largest share increases occurred in business equipment and computers, up from 2 percent to 7 percent, and electrical machinery and equipment up from 7 percent to 15 percent.

The four major market areas discussed above accounted for 72 percent of U.S. exports worldwide in 1970 and 74 percent in 1988. What of the remaining quarter of U.S. exports? In general, a larger share of U.S. exports to these “other” areas (Latin America, non-market socialist areas in Europe and Asia, Africa, South Asia, and Australia and Oceania) in 1988 was accounted for by agricultural products than was the case in 1970. Export shares for machinery, and transportation equipment if anything slipped a little from 1970 to 1988 and the export share of intermediate manufactured products dropped several percentage points. These characteristics reflect the economic difficulties that many of these regions have been experiencing, specifically, the inability to provide adequate food supplies to feed the population, a weak indus-

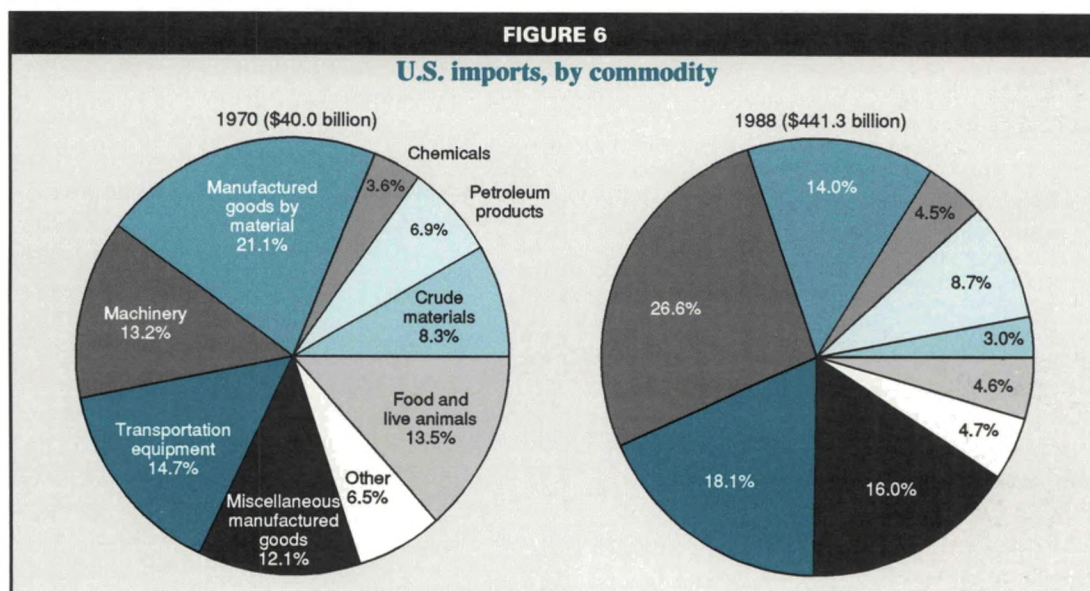
trial base that can not support imports of capital goods or intermediate goods, and a heavy international debt burden.

### Commodity imports

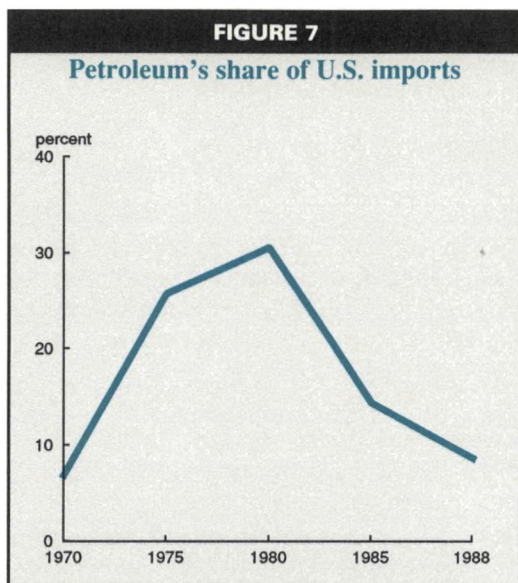
A twelve-fold increase in the value of U.S. imports between 1970 and 1989 (from \$40 billion to more than \$470 billion) contained within it a substantial change in composition mix, in the aggregate as well as from the individual source countries of those imports (see Figure 6).

The most dramatic compositional shift was that imposed by the oil price shocks in 1973–1974 and again in 1979–1980. These shocks greatly disrupted and distorted trade patterns during the period. While petroleum imports accounted for only 7 percent of imports in 1970 and a 10 percent share in 1989, they accounted for a 26 percent share in 1975, a 31 percent share in 1980, and a 14 percent share as recently as 1985 (see Figure 7).

Apart from these distortions, there were also trend changes occurring in the relative import composition of other major commodity groups. Not unlike the patterns noted above in U.S. exports to other industrial countries, the relative importance of U.S. imports of foods and agricultural products dropped substantially during the period—from 14 percent of total imports in 1970 to 5 percent in 1988. Crude materials’ share also declined as did the share for intermediate manufactured goods (basi-







cally, industrial supplies)—down from a 21 percent share to a 14 percent share.

Offsetting those share declines were large share increases in finished product manufactured goods of all sorts, including electrical and nonelectrical machinery, transportation equipment, other finished manufactured goods such as professional and scientific equipment, and consumer goods. Machinery as a proportion of total imports increased from 13 percent in 1970 to nearly 27 percent in 1988. This increase was dominated by business equipment and computers, telecommunications equipment, and electrical machinery. Transportation equipment, especially automotive, also increased, from 15 percent to 18 percent. Miscellaneous manufactured-goods imports increased in share from 12 percent to 16 percent.

### Commodities by countries

The shift in import patterns was much greater than the shift in export patterns over the last twenty years (see Figure 8).

#### Canada

Traditionally Canada has been an important supplier of crude materials to the United States. In 1970, 26 percent of U.S. imports from Canada were foods, crude materials and minerals, and petroleum. While such materials remain an important component of U.S. imports the relative proportion has shifted substantially toward goods with a higher level of value added—in 1988 these higher value

goods accounted for 18 percent of imports from Canada.

Crude materials, primarily minerals, lost share rather sharply, falling from 15 percent to 9 percent over the period. Offsetting most of that share decline was the relative increase in transportation equipment, mostly autos and parts, that in 1988 made up 33 percent of U.S. imports from Canada—compared with their 26 percent share of imports in 1970. The two other major import categories, intermediate manufactured products and machinery, which accounted for 19 percent and 12 percent, respectively, in 1988, showed only marginal changes in trade shares over the period.

#### Western Europe

Historically, Western Europe has primarily been a supplier of manufactured goods to the United States. In 1970, foods, crude materials, and petroleum made up less than 10 percent of imports from this area. The oil price shock pushed that proportion of this broad category of materials to nearly 15 percent in 1980. By 1988, however, such materials accounted for just over 8 percent of the total, less than in 1970. Imports of intermediate manufactured goods have also declined as a proportion of the total, from nearly 24 percent in 1970 to 17 percent in 1988. Most of that decline was associated with a contraction in the relative importance of iron and steel mill products and textiles in the overall U.S. import bundle.

The import share for chemicals nearly doubled to more than 10 percent. Machinery imports increased from 19 percent to 26 percent. Transportation equipment maintained a relatively stable share with 17 percent of U.S. imports from Europe in this category. Aircraft imports picked up share lost by automotive equipment.

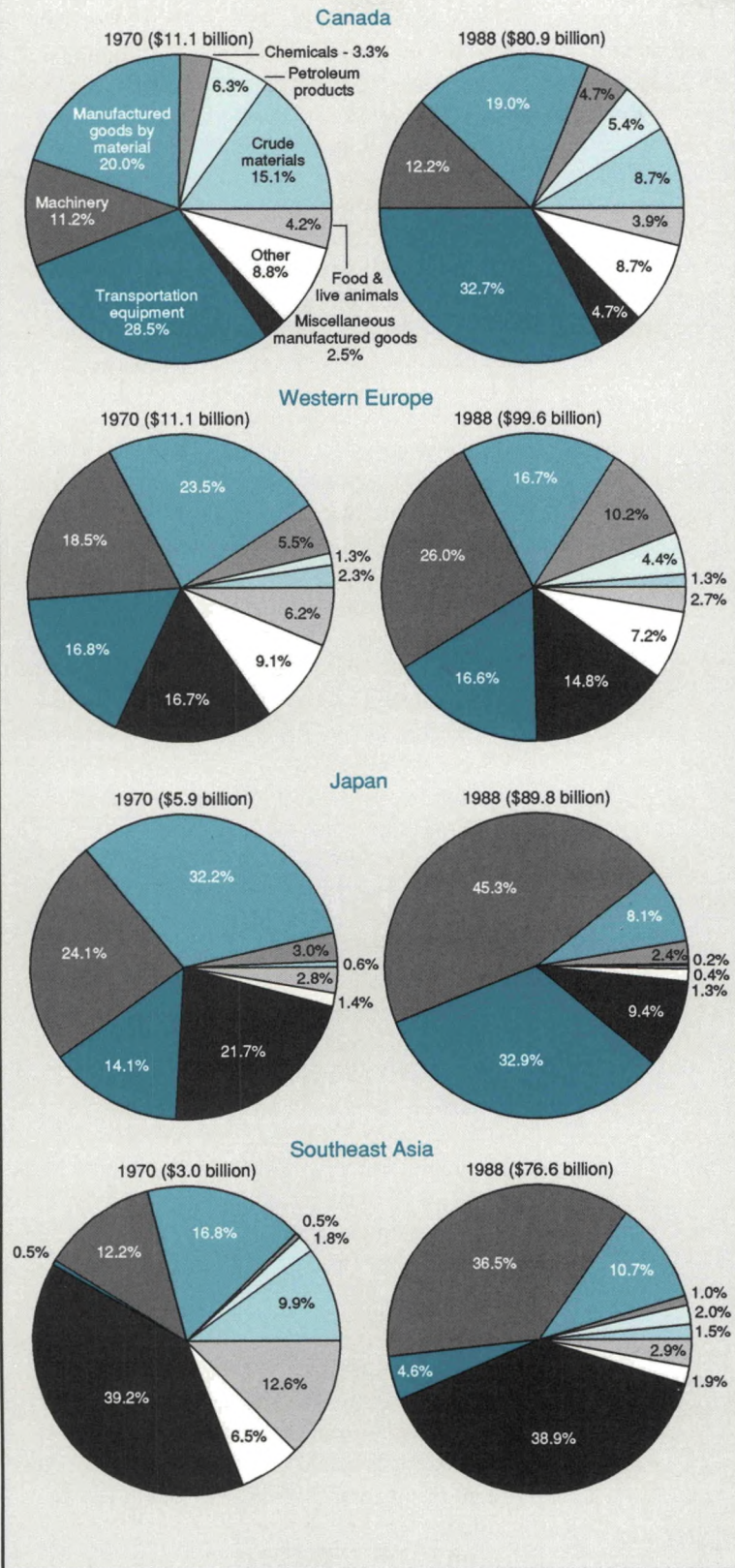
#### Japan

More than any other trading area Japan is a supplier of manufactured goods to the United States. Furthermore, the composition of those manufactured goods has changed toward a greater degree of high-value-added products. The shift has been dramatic. Imports of intermediate manufactured goods stood at 32 percent of the total in 1970. In 1988, they accounted for only 8 percent of total imports from Japan. Transportation equipment, pri-



**FIGURE 8**

**U.S. imports, by region and commodity**



mainly automotive, accounted for a 14 percent share in 1970 and rose to a 33 percent share in 1988. Machinery, office equipment and computers, and electrical, which made up 24 percent of imports from Japan in 1970 rose to 45 percent in 1988.

**The NICs and Southeast Asia**

This grouping of countries includes a conglomeration of diverse economically developing economies. The developing nature of these economies is reflected in the major compositional changes in U.S. imports from this region that have occurred during the past two decades.

Foods, crude materials, and petroleum imports made up 24 percent of U.S. imports from this area in 1970. With the high oil prices of the mid-1970s (Indonesia is the oil exporter in this group), the proportion rose to nearly 34 percent. By 1988, however, only 6 percent of U.S. imports from this region fell into these three raw materials categories.

The other major goods category to lose share was intermediate manufactured goods, which slipped 6 percentage points during the two decades to an 11 percent share in 1988.

The offset to these share declines in raw materials and intermediate manufactured goods came in the higher-value-



added machinery category. That share rose dramatically, from 12 percent of total imports from this region in 1970 to nearly 37 percent in 1988. Business and computer equipment, telecommunications equipment, and electrical machinery accounted for most of the gain in share—not a surprising development. But interestingly, nearly 4 percentage points of the gain was accounted for by an increase in the share of the “heavier” capital equipment, such as industrial machinery and power-generating equipment. A like gain was recorded in imports of transportation equipment, automotive in particular.

### **Pulling it together**

U.S. international trade has changed dramatically during the past 20 years. Large increases in exports and imports, in value adjusted for price increases, have taken place during that period. Along with increased trade there have been substantial changes in the patterns of U.S. trade. These changes are manifest in differences in 1) the composition of trade with regard to the type of goods; 2) the regions with which trade is conducted; and 3) the type of goods traded by specific region.

**U.S. exports:** First and second place Western Europe and Canada, respectively, maintained their relative positions from 1970 to 1988. But examination of their rankings in various commodities indicates some slippage occurred. Latin America remained the fourth largest market for U.S. exports ahead of fifth place Japan. The pattern changes were dominated by the Asian NICs and Southeast Asia which have become a major market for U.S. manufactured goods. These countries, in the aggregate, ranked as the third largest market for U.S. exports in 1988, up from sixth place in 1970.

**U.S. imports:** The patterns of change have been more volatile for imports than for exports. Canada and Western Europe, which ranked first and second, respectively, in 1970, ranked third and first, respectively, in 1988. Japan, which became the dominant source of

final product manufactured goods, supplanted Canada as the second largest source overall for U.S. imports in 1988. Southeast Asian countries again are impressive as they move from sixth place to fourth place as a source for U.S. imports. These gains primarily came as this region became the second largest source of machinery imports—following Japan—and the largest source for miscellaneous manufactured products (dominated by clothing, footwear, toys, games, and sporting goods).

The primary conclusion to be drawn from this discussion is derived from the increasing importance to the United States of Southeast Asia as an economic entity. It has become clear that Japan is not the only trade power in Asia. Economically, this is an area with which the U.S. has a vital interest.

Southeast Asia is an economic bloc that is not only a major expanding source of imports but also an expanding market for exports. These are not unrelated developments. It is true that Southeast Asia constitutes a low-wage area where U.S. firms have transferred certain high-cost production stages. But this process has brought with it increased U.S. exports that 1) support the transferred production and 2) result from the increased income generated by the export-oriented industrialization of these economies.

Finally, the geographical groupings identified in this article were drawn for more than reasons of expository simplicity. These regions are identifiable as relatively homogeneous economic markets and they are becoming more so. Southeast Asia is a clear example. The same is true for Western Europe.

Western Europe as a market holds the potential for considerable change in coming years—internally as the conditions of 1992 and beyond become a reality, and externally as the Eastern European economy increasingly blends with that of the West to become a single European market. Such change, should it occur, will result in considerable further trade pattern changes for the United States during the coming decade.



# Chicago Fed and University of Illinois form regional research lab

David R. Allardice



Over much of its 75-year history the Federal Reserve Bank of Chicago has worked to understand more fully and describe more accurately the

changing economic structure of the Seventh Federal Reserve District. The Seventh District--all of Iowa and major segments of Indiana, Illinois, Michigan, and Wisconsin--lies in the heart of the Midwest. With major industrial and commercial centers, such as Chicago, Detroit, Des Moines, Indianapolis, and Milwaukee, as well as vitally important agricultural resources, the Seventh District is also near the heart of the U.S. economy. In its research on this region, the Bank has sought out new data sources and institutions with which to cooperate to improve and enhance the knowledge base on the District economy.

In January of 1989, the Bank and the University of Illinois at Urbana/Champaign joined forces to establish a center to study the changing nature and performance of the District economy. The center, called the Regional Economic Applications Laboratory (REAL), will enable researchers from the Federal Reserve Bank of Chicago and the University of Illinois to cooperate in the development of a set of integrated models of the Seventh District economy and its component parts. Ultimately, the models will be available to individual researchers, public and private corporations, and federal, state, and local government agencies interested in urban and regional economic issues. The center is a not-for-profit institution that resides within the Institute for Govern-

ment and Public Affairs at the University of Illinois. Direction of REAL's research activities is shared jointly by the two institutions.

## Regional economic modeling

Regional economic analysis has been focused increasingly on the identification and understanding the quantitative impact of economic events on regional economies, whether the events occur at the national or international levels or even in other regions.

The traditional approach to modeling regional economies has been based on the regional input-output model. This model can describe the linkages that exist between industries. In this structure, changes in one industry can be shown to have both direct and indirect effects on other sectors within the regional economy. However, the increasing complexity of regional economies requires that greater attention be focused on other aspects of the regional system--for example, on the nature of the labor markets, on household expenditures, and on migration patterns. Thus, a need is created for the design and implementation of a set of models linked to one another, each describing an important component of the region's economy.

## Input-output models

Input-output models, developed by the Nobel laureate Wassily Leontief, allow comprehensive forecasts and economic analyses of

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a regional economy. The completeness of the models allows one to trace the effects of a change in one component of an industry on all other industries. Moreover, the model relates changes in one facet of the economy directly and indirectly to the whole economy. This aspect of the input-output model makes it distinctly different from econometric models.

The major problem in constructing a regional input-output model is a lack of regional data and the inadequacies of the national data as a substitute. The most recent national input-output table using actual data is more than thirteen years old. A regional input-output model based on this national table would not only be out of date, it would also not capture the subtle differences between the District and the national economy.

There are numerous methods that allow the regionalization of national input-output models. But there are problems with such regionalization, in both technique and the data used.

Efforts at the University of Illinois have been directed toward analyzing separate components of an input-output table, instead of the whole table. Researchers at the University have found that, depending on the region, an analyst need update and regionalize only a few components of the national table. This makes the task of the regionalization much easier. However, even that simplification would require a substantial effort on the part of the data gatherer.

One of REAL's jobs will be to utilize available data sets necessary for the regionali-

zation and updating of the national table, as well as to select available techniques to combine with the defined data sets. REAL has an arrangement with the Center for Economic Studies at the U.S. Bureau of the Census in Washington, D.C., to obtain the most current establishment-level data collected through the various censuses.

So far, attention has been focused on the *Census of Manufactures* data. These data provide the very best information currently available for the construction of input-output tables. The initial efforts of REAL have also focused on the integration of input-output and econometric models to produce a consistent accounting scheme suitable for input analysis, forecasting, and projections.

The work allows for a more detailed analysis of important issues facing the Seventh District economy. It should provide a research framework in which to analyze many commonly held beliefs. For example, the models developed will be capable of examining the life cycle of firms and their relocation patterns. From this study, it will be possible to determine the extent to which the District economy is dependent on small firms for its growth.

The following article, "Chicago's economy: Twenty years of structural change," reports on some initial findings developed in the joint research effort. Future articles will report on other research findings stemming from REAL's efforts.



## Chicago's economy: Twenty years of structural change

**Philip Israilevich and  
Ramamohan Mahidhara**



The Chicago economy experienced a dramatic structural change during the last decade, making the 1980s very different from the 1970s. The most

extreme changes took place in the Chicago labor market. In the post-World War II period, up to the last decade, manufacturing had been Chicago's major employer. However, in 1980, employment in services<sup>1</sup> matched and subsequently surpassed employment in manufacturing.<sup>2</sup> Between 1970 and 1987, the Chicago economy lost close to a quarter of a million manufacturing jobs, a striking loss by any standards.

A historical analysis of the Chicago economy provides useful insights into the nature of Chicago's structural change. Historical data analysis is, however, often inadequate in assessing the complete impact of any given change. We supplement our historical analysis here with simulation results for the years 1979 to 1987 obtained from the Chicago Regional Econometric Input-Output Model (CREIM).<sup>3</sup> In particular, these simulations are used to obtain estimates of potential losses and to answer some "what-if" questions.

Chicago's transition from a manufacturing-dominated employment base to a service-dominated employment base raises a number of questions. Did Chicago lose its share of national manufacturing employment? How did this transition affect employment, income, and output in other sectors? Did the decline in manufacturing employment imply a decline in

There are more service jobs than manufacturing jobs in today's Chicago; despite this reversal, new manufacturing jobs retain a much stronger ripple effect in creating other new jobs in the economy

output? More importantly, does the shrinking share of manufacturing employment mean that the region should be less interested in the fate of manufacturing jobs?

To answer these and other questions, we analyze the Chicago economy as a highly interdependent system where changes in any one sector affect other sectors of the economy. Quantitative measures of such spillover effects cannot be obtained from analysis of historical trends. We obtain such estimates from simulation results using CREIM. Along with changes in employment, we also look at changes in productivity, output, and income.

### Chicago and the nation

Economic regions, such as Chicago, compete with each other in order to maintain or enhance their share of national output of goods and services. Regions that outperform others expand their market, while regions that lag behind lose market share. Any evaluation of a region's economic performance requires a comparison of that region with the nation as a whole.

Nationally, service employment surpassed manufacturing employment in 1982. In Chicago, this watershed was reached in 1980. In both the nation and Chicago, service employ-

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ment approximately doubled between 1970 and 1987.<sup>4</sup> Over the same period, manufacturing employment, while somewhat constant in the nation, declined in Chicago.<sup>5</sup> The fall in Chicago's manufacturing employment was steady in the 1970s and sharper in the 1980s (see Figures 1 and 2).

In the last two decades, Chicago's manufacturing employment experienced a gradual decline relative to manufacturing employment in the nation. Chicago's share of national manufacturing employment decreased from 4.9 percent in 1970 to 3.4 percent in 1987. Over the entire period, this constitutes a 31 percent decline in Chicago's manufacturing employment base relative to the nation (see Figure 3).

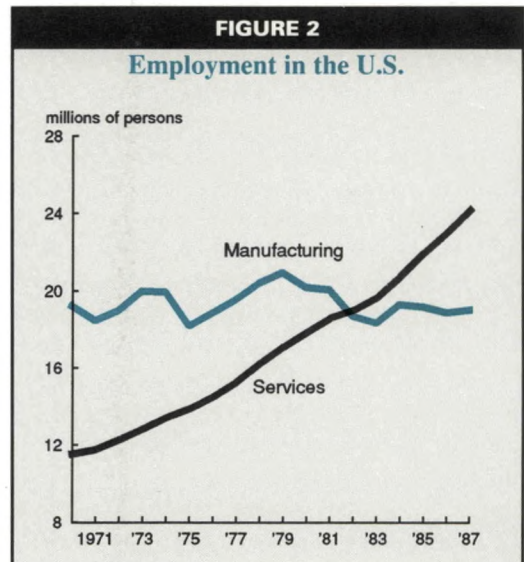
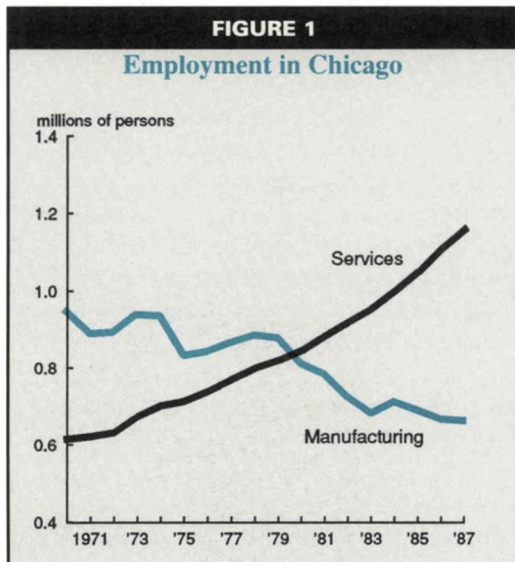
Prior to the 1970s, growth in Chicago's manufacturing sector was aided by a number of factors. The availability of natural resources, easy access to waterways and railroads, and close proximity to major consumers located in the Midwest and East made Chicago an attractive place to site manufacturing activity. As these advantages declined over time, so did Chicago's ability to draw manufacturing. In addition, relatively expensive labor and electricity further eroded the manufacturing base.

Other structural factors, such as a higher than average proportion of mature industries, played a prominent role in the restructuring of Chicago. Such mature industries as steel and automobiles which were highly energy intensive were also inefficient users of energy.

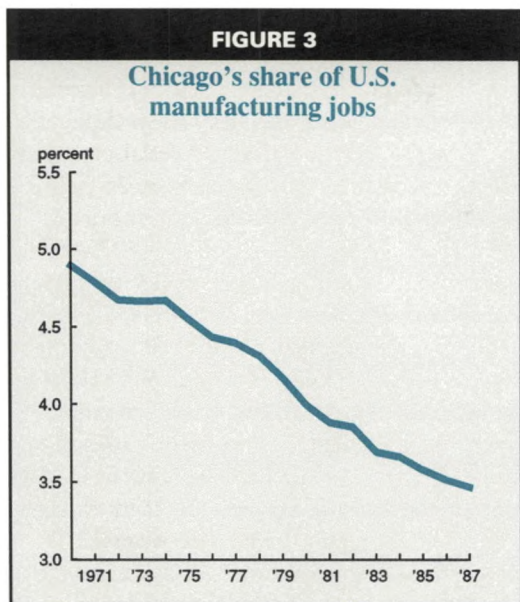
This drawback hardly mattered, given the abundant availability of cheap oil in the 1950s and the 1960s. But, the oil price increases of 1973 and 1979 rendered part of the capital stock in such industries obsolescent. Meanwhile, the stricter environmental regulations of the early 1970s raised costs by requiring considerable capital investment in pollution control devices. The net effect on the Chicago region was to raise manufacturing costs and lower productivity in the short run.

Chicago's service industry, on the other hand, showed substantial growth in employment from 1970 to 1987. However, employment growth in Chicago's service industry was slightly lower than that of the nation between 1970 and 1979. As a result, Chicago's share of national service employment declined from 5.3 percent in 1970 to 4.8 percent by 1979. From 1979 onwards, Chicago's service employment growth has kept pace with national service employment growth, and remained at a constant 4.8 percent of national service employment (see Figure 4).

The steady growth in Chicago's service employment in the face of declining manufacturing employment runs counter to conventional wisdom, which considers manufacturing the prime mover behind all employment growth. A decline in manufacturing employment should be accompanied by a decline in service and other nonmanufacturing employment. This line of thinking can be wrong, at least in Chicago, where the service sector grew even as manufacturing employment declined.







But such counterintuitive growth does not necessarily diminish the importance of the manufacturing sector. Indeed, manufacturing-service linkages grew stronger in Chicago in the post-1979 period.

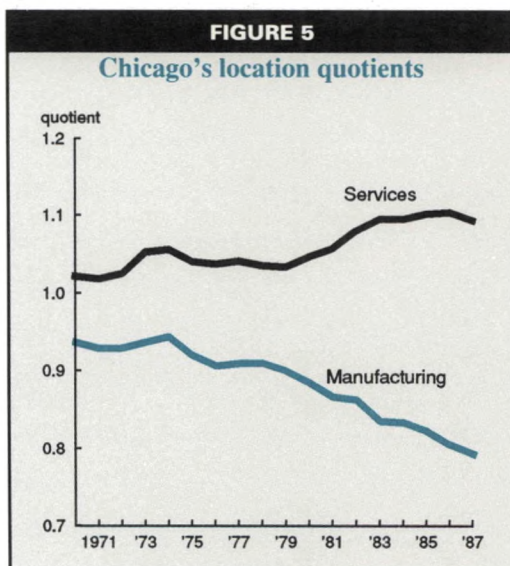
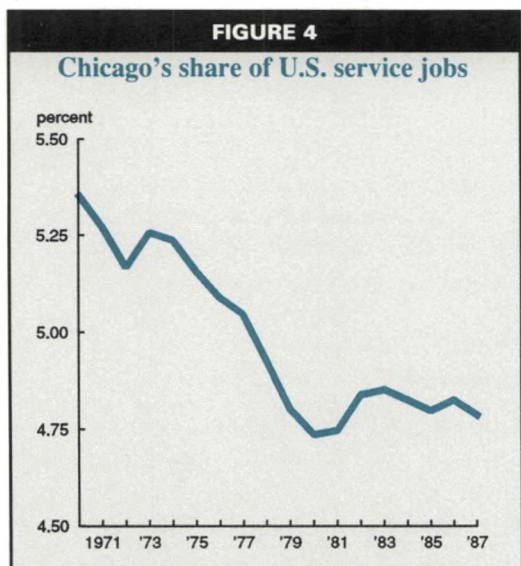
To study the structural relationship between Chicago and the nation, we use location quotients. Location quotients measure the importance of a sector in the local economy relative to the importance of the same sector in the national economy.<sup>6</sup> A location quotient value less than one implies that the given sector has a smaller role to play in the local economy than in the nation as a whole. Similarly, a location quotient greater than one implies

that (in terms of the variable being measured), the given sector has a larger role to play locally than in the nation as a whole.

Manufacturing and service sectors location quotients are graphed in Figure 5. The service sector employment location quotient was greater than one over the last two decades, rising from 1.02 in 1970 to 1.09 by 1987. Thus a larger proportion of Chicago's overall employment came from the service industry than was the case with the nation. Manufacturing location quotients were, however, lower than those for the service sector, and differed both in levels as well as trends. The location quotient for manufacturing fell from 0.93 in 1971, to 0.79 in 1987. These numbers clearly indicate that, over the last two decades, manufacturing employment has had an increasingly smaller role in Chicago's overall employment, not only in absolute terms but also relative to manufacturing at the national level.

**General changes in the Chicago economy**

Between 1970 and 1987, employment in manufacturing fell from 947, 290 to 659, 700. Much of this decline occurred between 1978 and 1987, when the Chicago economy lost manufacturing jobs in every year but one. Overall employment, however, rose during that period, from 3.7 million to nearly 4.5 million. Thus, as manufacturing jobs were disappearing from Chicago, other (nonmanufacturing) sectors were posting employment gains that more than made up for manufactur-





ing job losses. Within the nonmanufacturing sector, services generated the most jobs. While industries such as trade and finance, insurance, and real estate (FIRE) displayed substantial gains in employment, service industry gains were so much larger that we focus here only on manufacturing and services—the key job loser and gainer.

The continued, long-term ability of a region to retain and raise employment is of great importance to public policymakers. Policymakers in the Chicago region might see little cause at first to be worried about Chicago's employment-generating capability because of the gain in overall employment over the last decade. But, there are important concerns. Replacement of manufacturing jobs by service jobs implies replacing high-wage jobs with low-wage ones. This is likely to have a significant impact on income distribution in the region.

Table 1 presents total personal income figures for the two sectors. Personal income in manufacturing dropped between 1970 and

1987 along with the drop in employment. Employment losses in manufacturing over this period were about a quarter of a million jobs, while corresponding income losses amounted to about five billion dollars. At the same time, employment in services grew by about half a million, while personal income in services grew by about ten billion dollars. While both these variables might suggest that manufacturing is becoming less important to the Chicago economy, it is necessary to look at output figures before arriving at any such conclusion.

Despite substantial reductions in employment and a noticeable drop in personal income, Chicago's manufacturing output in 1987 was about the same as it was in 1970. Output in the service sector doubled between 1970 and 1987, along with the doubling of service income and employment. Thus, output *per worker* in services remained virtually constant over nearly two decades. In manufacturing, however, output per worker rose from \$75,865 in 1970 to \$108,829 in 1987. Thus, while the manufacturing sector was losing jobs heavily, the workforce that remained was producing more output per worker—43 percent more in 1987 than in 1970. On the other hand, output per worker in services was about one tenth of one percent higher in 1987 than in 1970.

These changes in productivity growth rates and differences in productivity levels were also reflected in annual earnings per worker for the two sectors. Annual earnings per worker in services rose from \$18,200 in 1970 to \$19,490 in 1987, a simple growth rate of 7.4 percent over the entire period. In contrast, annual earnings per worker in manufacturing rose from \$22,600 to \$25,800 between 1970 and 1987, averaging a simple rate of 14.2 percent—nearly twice as fast as in services.

Table 2 shows the annual rates of change in labor productivity in manufacturing and services. Over the 18-year period, manufacturing labor productivity fell only for two consecutive years after each oil price hike. In contrast, service productivity fell in ten out of 18 years. Between 1980 and 1987, service productivity fell in six of seven years.

### Lessons in CREIM

Until now, our discussion has centered around the analysis of historical changes in labor requirements along with changes in income and output. This so-called *direct* analy-

	<b>Manufacturing</b>	<b>Services</b>
1970	\$21.39	\$11.24
1971	20.59	11.48
1972	21.32	11.94
1973	22.41	12.62
1974	22.00	12.63
1975	19.87	12.69
1976	20.82	13.41
1977	21.78	14.07
1978	22.35	14.76
1979	22.10	15.02
1980	20.35	15.28
1981	19.24	15.71
1982	17.71	16.19
1983	16.96	17.29
1984	17.86	18.52
1985	17.58	19.71
1986	17.38	21.64
1987	17.01	22.57



	<b>Manufacturing</b>	<b>Services</b>
1970	N.A.	N.A.
1971	6.54	-0.92
1972	4.15	2.23
1973	2.13	2.45
1974	-1.96	-3.01
1975	-1.36	-0.91
1976	6.44	-0.03
1977	4.17	0.25
1978	0.07	1.78
1979	-0.03	1.99
1980	-3.08	-2.07
1981	1.28	-0.30
1982	0.35	-2.21
1983	8.79	1.30
1984	3.14	-1.41
1985	2.15	1.66
1986	3.05	-0.64
1987	1.45	-0.62

sis, where each sector of the economy is analyzed independent of the performance of the other sectors, is both useful and interesting. However, it ignores numerous linkages that exist between sectors. For example, steel production requires coke as an input. Coke production, in turn, requires machinery, and the production of machinery, in turn, requires steel. Thus, in order to produce 1 ton of steel as a final product, the economy has to supply 1 plus  $x$  tons of steel where " $x$ " is the indirect consumption of steel used to make the machinery that produces coke, which then acts as an input for steel. In the direct analysis, all inter-industry linkages are ignored and only first-order, i.e., direct, demands are considered.

Direct analyses provide snapshot pictures of the economy. However, if one were interested in a more comprehensive dynamic analysis, one would have to take into account all indirect effects as well. These would include interindustry effects based upon the techno-

logical structure of production processes, as well as final demand effects that arise from these interlinkages. CREIM allows us to measure both direct and indirect impacts. We use CREIM to determine employment, output, and income losses in the Chicago economy arising from employment or output loss in a given sector (see box for details on CREIM).

We have noted that employment in Chicago's manufacturing sector has declined both in absolute terms and as a proportion of national manufacturing employment. This decline was not unique to Chicago. There was a general decline in the manufacturing sector throughout much of the Midwest (see, for example, Bluestone and Harrison 1982, Schnorbus and Israilevich 1987). As one may recall, there was considerable debate in the late 1970s and early 1980s about regional restructuring in the United States (Hulten and Schwab 1984, Sawers and Tabb 1984). The central theme of this debate was the decline of the Midwest and the rise of the South and the West. One particularly prominent concern was that employment, income, and output in the Midwest were growing slower, or in some cases, declining faster, than in the nation as a whole.

While Chicago's declining employment share of national manufacturing is cause for concern, the full import of this decline is not apparent at first. A declining sector has a twofold impact on an economy—direct and indirect. Over time these effects produce a cumulative effect. Using CREIM, we compute the direct and indirect effects of change in a sector on all other sectors of the economy for a given year. We further calculate cumulative effects across years.

We ran two sets of simulations, one each for the durable and nondurable sectors. Output in Chicago's durable manufacturing sector peaked in 1978. Our simulation assumed that Chicago's durable manufacturing output grew at the same rate as that of the nation from 1979 to 1987. Similarly, output in Chicago's nondurable manufacturing sector peaked in 1979. We assumed that output in this sector grew at the same rate as its national counterpart from 1980 to 1987. In each case, we computed a separate base-line simulation, in which we used the model to "forecast" all variables for the years under question (1979–1987 for



## How CREIM pays off

The Chicago Regional Econometric Input-Output Model, or CREIM, is based upon the Washington Projection and Simulation Model (WPSM). CREIM combines detailed interindustry information (obtained from the input-output component) with time series data (obtained from the econometric model). Input-output models provide a physical analog of purchases and sales in an economy. However, these models can not adequately describe intertemporal changes. On the other hand econometric models are not rich enough in data to be able to describe detailed interindustry relationships. The combination of these two models results in a rich and elaborate model for the Chicago economy, capable of predicting structural changes, along with other variables typical of regional econometric and input-output models. Since the following discussion (which draws heavily on Conway 1990) is presented exclusively in terms of CREIM, it must be noted that features that appear unique to CREIM have their origins in WPSM.

CREIM covers the Chicago SMSA, consisting of Cook, Du Page, Kane, Lake, McHenry, and Will counties. Currently formulated on a one-digit SIC basis, CREIM has eight private industrial sectors and three government sectors. The model has 50 behavioral equations, 9 identities, 59 endogenous variables, and 30 exogenous variables. It is set up for annual long-term projections.

The Chicago economy faces two sets of demands in CREIM: (1) Exports from outside the region constituting external demands, and (2) demands from the various economic sectors within the Chicago economy which constitute internal demands.

In the first stage, exports are predicted using national GNP figures. Exports for individual industries in Chicago are linked to the same industries at

the national level. Projections for all exogenous variables (including GNP and US industrial output) are obtained from Data Resources Incorporated (DRI). In the second stage, production of local exports generates a set of internal demands, that is, regional interindustry demands. The individual output equations capture these internal demands with input-output relationships. Unlike many other models which use national input-output coefficients, CREIM uses coefficients from a Chicago-specific input-output model (constructed at REAL\*). Interindustry coefficients are adjusted for temporal changes, allowing for new interindustrial relationships every year.

Forecasts of output (obtained using national data and exports) are combined with forecasts of labor productivity and wage rates to predict employment and earnings by industry. These projections are further combined with projections of the labor force participation rate and the unemployment rate to obtain population forecasts. Meanwhile total earnings are obtained by predictions of property income, transfer payments, residence adjustments, and personal contributions to social insurance. Total earnings are then combined with population forecasts to obtain estimates of personal income. This completes the first set of demands the external demands.

Personal income and population now explain internal demands, that is, the final demand sector, which consists of consumption, investment, and government. Very briefly, four types of consumption expenditures and three types of investment expenditures are considered, along with one type of state and local government expenditure.

Until now, the entire stimulus to the Chicago economy in the model has come from external demand, that is, exports. For example, an increase

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durables and 1980–1987 for nondurables). The difference between results obtained from these base line simulations and the preceding growth scenarios then give us a quantitative measure of the losses that arose due to the relative decline of Chicago's manufacturing economy when compared to the U.S. average.<sup>7</sup>

In the first scenario, we assumed that output in Chicago's durable manufacturing sector grew at the same rate as its national counterpart. On an average, this means that

Chicago's durable manufacturing output would have been about 2.7 percent higher in each year between 1979 and 1987 than observed historical data. While this persistent slow growth is likely to generate some concerns among Chicago's public policymakers, there is no reason for immediate alarm. However, they do have a cumulative effect that is very significant.

In employment terms, these figures mean that durable manufacturing employment in



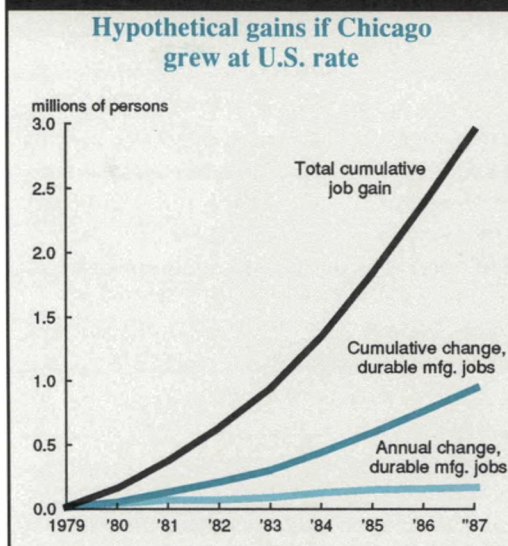
in the nation's GNP would lead to an increase in exports from the Chicago region. As explained in the preceding steps, this increase in exports would feed into the input-output model, which would then give rise to a set of interindustry demands. The increase in output would trigger an increase in employment, and thus earnings. Given labor force participation rates, the rise in employment would give rise to an increase in population. The rise in population, and earnings produces a rise in personal income, which is reflected in rising personal consumption, investment, and state and local government expenditures. This increase in personal income now gives rise to the second set of demands driving the model, namely, the internal demands.

The model is closed as the final demands feed into the output sector. The increase in final demand (consumption + investment + government) further raises output. This time, though, the output increase comes about not in response to exports *but in response to increased internal demand for goods and services, both private and public*. This increased internal demand works its way through the input-output model in exactly the same way as exports did, resulting in another chain of increases in output, earnings, employment, population, income, and ultimately, final demand. What we see here is a multiplier effect at work. This process continues, and at each stage, the multiplier effect grows smaller and smaller. After several iterations, the model converges, and we obtain figures on the employment, output, and income impact of increased exports.

\*The Regional Economics Applications Laboratory (REAL), is a cooperative venture between the University of Illinois and the Federal Reserve Bank of Chicago, focusing on the development and use of analytical models for urban and regional economic development.

Chicago would have been about 2.5 percent higher than actual observed data. While the "shortfall" in any given year was rather small, the cumulative effect of this modest yet persistent shortfall was very large. By 1987, the cumulative loss in potential output is estimated at \$187 billion, approximately 86 percent of Chicago's 1987 total output. The cumulative loss of potential jobs\* between 1979 and 1987 was about 2.9 million jobs, nearly two-thirds of Chicago's 1987 total employment. Figure 6

FIGURE 6



shows that the relatively small annual changes in a given sector (in this case durable manufacturing) led to large cumulative changes in total employment.<sup>9</sup>

Results of the second set of simulations were similar in effect though smaller in magnitude. Had output in Chicago's nondurable manufacturing sector grown at the same rate as the nation, the average annual increase in nondurable manufacturing output would have been about 0.7 percent, while the average annual increase in nondurable employment would have been about 0.5 percent. This "shortfall" leads to cumulative losses of potential. By 1987, cumulative losses in potential total output for Chicago amounted to about \$95 billion, or nearly 43 percent of total output in Chicago by 1987. Similarly, the cumulative losses in potential employment were 1.3 million jobs, approximately 29 percent of Chicago's 1987 total employment.

These small annual changes resulting in such large cumulative effects naturally leads us to the issue of multipliers. In general, what is the effect of an additional job in a given sector on the rest of the economy? Does this impact vary over time? Given the radical restructuring in Chicago's economy, does one additional manufacturing job now mean more total jobs than before, or has manufacturing become less important in generating jobs?

In order to answer some of these questions, we ran additional simulations using CREIM. The sectors chosen were once again



durable and nondurable manufacturing. Within each sector, simulations were run across two time periods. In the first set of simulations, we investigated the impact of \$1 billion annual increase in output for durable manufacturing between 1972 and 1979. In the second set, we repeated the exercise, but for the years 1980–1987. Two identical exercises were also run for the nondurable manufacturing sector. The employment multiplier for durable manufacturing in the first period (1972–79) was 2.84. In other words, one new durable manufacturing job created 1.84 additional jobs, leading to a total increase of 2.84 jobs in the Chicago economy. For the second period, the employment multiplier rose to 3.12, implying that one additional durable manufacturing job led to a total increase of 3.12 jobs in the Chicago economy. Thus, durable manufacturing in Chicago appears to have become more important in the 1980s. Nondurable manufacturing figures were similar—3.45 for the first period and 3.83 for the second.

## Conclusion

We have used three perspectives to analyze the structural change that has affected the Chicago economy: Regional and national comparisons; Chicago's output, employment, and income; and simulations obtained from the Chicago Regional Econometric Input-Output Model.

The structural change was due, in part, to the rapid growth of productivity in manufacturing, and to the lack of productivity growth in services. We found: 1) that most of the labor force growth came from the service sector and not manufacturing; 2) that average earnings per worker declined in the 1980s as a result of this employment restructuring; and 3) that linkages between employment in manufacturing sector and the rest of the economy became greater.

While Chicago's structural readjustment was similar to that of the nation, the timing was different. More specifically, structural readjustment in Chicago preceded that in the nation by about two years. Furthermore, actual readjustment in Chicago was more pronounced than in the nation as a whole. Chicago's service industry grew at the national rate during the 1980s, while Chicago's manufacturing sector grew more slowly than the national average. As a result, the gap between manufacturing and service employment grew over the 1980s in Chicago.

If trends observed in the 1980s continue, employment in services is likely to increase its share of total employment in Chicago. Does this mean that manufacturing will no longer be important? It does not. Manufacturing jobs will retain their importance because, to a much greater degree than service jobs, they generate increases in per capita income and additional employment in all other sectors.

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## FOOTNOTES

<sup>1</sup>In our paper, services refer to SIC codes 7 and 8. Included among these are hotels, personal services, business services, auto repair, amusement, health, and legal services.

<sup>2</sup>By manufacturing, we refer to SIC codes 2 and 3. Included among these are food and beverages, printing and publishing, chemicals, heavy metals, machinery, and miscellaneous manufacturing.

<sup>3</sup>A brief description of CREIM is presented in the box. Our geographical definition of Chicago is the six county metropolitan area consisting of Cook, Du Page, Kane, Lake, McHenry, and Will counties. Data on the Chicago economy were obtained from a detailed database built for CREIM.

<sup>4</sup>In 1970, service employment in Chicago and the nation was 0.62 million and 11.55 million respectively. By 1987, Chicago's service employment stood at about 1.12 million, while national service employment rose to 24.2 million.

<sup>5</sup>In 1970, manufacturing employment in Chicago and the nation stood at 0.95 million and 19.4 million respectively. In 1987, corresponding values were 0.66 million for Chicago and 19.0 million for the nation.

<sup>6</sup>Specifically, location quotients are ratios of ratios and are of the form  $(A/B)/(C/D)$ . For example,  $A$  would be Chicago employment in manufacturing, while  $B$  would be total Chicago employment. Thus  $A/B$  tells us what proportion of Chicago's total employment is accounted for by the manufacturing sector.  $C$  would then be national manufacturing employment, while  $D$  would be total national employment. Thus  $C/D$  would tell us what proportion of the nation's total employment is accounted for by the manufacturing sector. The ratio of these two ratios would then enable us to gauge whether a particular industry is more important to Chicago than it is to the nation. Furthermore, one is not restricted to using employment values alone. One can also obtain income and output location quotients.



<sup>7</sup>The difference between base case values and actual, i.e., observed, historical values represent random errors. The average error for all variables was relatively small and of the order of about 2 percent.

<sup>8</sup>This “loss” is the difference between the hypothetical employment gain for Chicago, if the area’s durable manufacturing industry had grown at the national rate, and the

actual gain in Chicago—in other words, it measures the lost potential gains in employment.

<sup>9</sup>In general, the size of the cumulative effect will depend upon the size of the initial stimulus, the sector being affected, and the duration of the initial stimulus.

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## ECONOMIC PERSPECTIVES

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