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ECONOMIC PERSPECTIVES

A review from the
Federal Reserve Bank
of Chicago

**Realignment in the auto supplier
industry: the rippling effects of
Big Three restructuring**

**The geographic distribution
of financial institutions
in Chicago**

FEDERAL RESERVE BANK
OF CHICAGO

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Realignment in the auto supplier industry: the rippling effects of Big Three restructuring

Paul D. Ballew and Robert H. Schnorbus



Over the past fifteen years, American industry has experienced unprecedented changes in production processes, markets and market share, and

organizational structure. As this transformation has unfolded, observers have focused on the large finished-goods producers, from capital goods to autos, that dominate their respective industries. In steel, for instance, analysts have studied the impact on USX, Bethlehem, and Nucor; in autos, on the Big Three (GM, Ford, and Chrysler) and, to a lesser extent, their foreign competitors. Studies of these industries and their major companies have yielded valuable insights into the evolving industrial economy. But the massive adjustments underway in the U.S. and world economies go far beyond the large finished-product firms; indeed, they are affecting downstream suppliers at least as much.

Suppliers can in fact serve as important indicators of conditions in the finished-good industries they supply as well as in the regional economies in which they are located. Furthermore, U.S. manufacturing is likely to continue changing rapidly. By studying the effects on downstream industries, we can sharpen our understanding of the underlying factors that are reshaping American industry. To illustrate these points, this article reviews past and recent developments in the auto supplier industry.¹

Adjustments in the market for automobiles

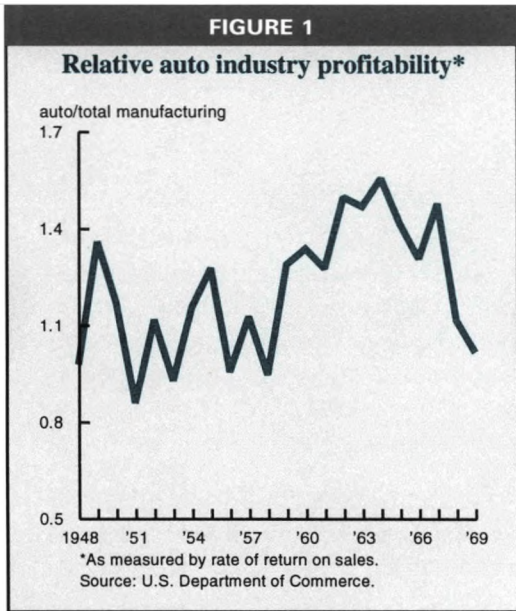
As the demand for all supplier industries is derived from the demand for finished goods, the auto supplier industry is shaped primarily by

changes in the market for automobiles. As a result, the auto supplier industry has experienced the highs and lows of the immediate post-World War II boom and the adjustment period that followed.

When automotive production resumed after the war, sales of autos led a consumer-driven economy. Sales growth from 1946 through the late 1960s was robust. The mushrooming market was dominated by domestic firms, specifically the Big Three, whose market share exceeded 90 percent of the U.S.-Canadian vehicle market for much of the period.² Because of the oligopolistic nature of the Big Three, competitive pressures to reduce costs and improve quality were minimal and profits were solid.

A robust auto market and limited competition produced high rates of profit for the industry. As figure 1 shows, in almost every year between 1949 and 1969, automakers were more profitable than the average manufacturing firm, that is, the ratio of return on sales in the auto industry to that of all manufacturers was greater than 1. Auto shareholders enjoyed high rates of return and employees received high compensation, which in turn boosted the Midwest as a whole. Income levels and manufacturing wages in auto-producing states such as Michigan and Ohio were substantially above the national averages. Not surprisingly, the auto industry expanded substantially in these years. Employ-

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ment in the industry more than doubled, while capacity increased by almost 300 percent.

The 1970s saw fundamental change in the auto industry. Automakers faced slower domestic growth, declining market share, and profitability troubles in large segments of the industry. Manufacturers as a group—but especially automakers—began making profound structural adjustments. The changes included radically new operational processes, organizational downsizing, and notable technological shifts.³

The initial shock that precipitated this transformation was the oil embargo of the early 1970s. This event disrupted the macroeconomic growth pattern of the 1960s and altered conditions in core sectors, such as the market for automotive products. Additionally, domestic automakers were overly exposed to higher gas prices, since their product line almost exclusively contained energy-inefficient automobiles (“gas guzzlers”). Higher gas prices eroded Big Three consumer loyalty and prompted rapid changes in auto technology.

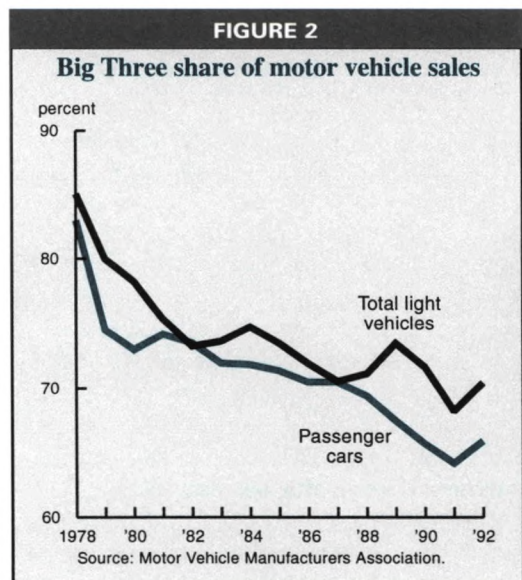
Equally important were the structural changes occurring in the auto market. Through the 1960s, certain foreign nameplates such as Toyota and Volkswagen had increasingly crept into the U.S. market. By the early 1970s, foreign competitors accounted for approximately 12 percent of all car sales annually, and that share grew throughout the decade. During the vehicle slump in the early 1970s, the Big Three lost four percentage points of market share to foreign competitors. Accordingly, the Big Three

accounted for a disproportionate share of the sales decline of that decade.

Eventually, a sales recovery did take shape—a long and sustained one, even by the robust standards of the 1950s and 1960s. By the mid-1980s, sales hit historic highs, bolstering the bottom line and the viability of the domestic auto industry. These years were strong for the Big Three, at least in terms of profits. Yet even as sales hit new highs and automakers’ fortunes seemed to turn, the recovery generated no euphoria. Worker rolls continued to be cut, factories were closed, and operations were streamlined; in short, the pace of restructuring quickened. This was a radical departure from the past, when sales jumps typically pushed up employment along with production.

The difference was largely due to U.S. automakers’ loss of market share, due in part to the strengthening dollar. During the peak of the recovery, Japanese competitors increased their market share by nearly 10 percentage points. This fact substantially diluted the benefits of the recovery to domestic automakers, especially GM. The Big Three’s share of passenger car sales slipped to approximately 65 percent by late in the decade, their combined vehicle share to almost 70 percent (see figure 2). By the mid-1980s, Big Three share of the retail market had sunk even lower.⁴

Lower price tags and fuel efficiency were not the only reasons for the growing popularity of foreign autos. By the mid-1980s, they were of higher quality and, increasingly, aimed at the



upscale market as well. Through the use of nontraditional methods, including different production processes and organizational structures than U.S. automakers used, Japanese automakers increasingly set the standard for quality and value.

In response to these competitive pressures, U.S. automakers undertook a radical restructuring in the way they conceived, designed, manufactured, and sold motor vehicles. By the mid-1980s, this transformation was well underway. As a result, terms that were once unknown have become buzzwords of the auto industry—lean production, just-in-time inventory, and worker-management teams.⁵

The ongoing changes in the auto industry are important to the nation, since the industry sets trends for much of manufacturing and the economy as a whole. But the auto industry is of special concern to the midwestern states of Illinois, Indiana, Michigan, Wisconsin, and Ohio, which continue to produce over 60 percent of all vehicles manufactured in the U.S. Between the Big Three, foreign nameplates, and parts facilities, more than 500,000 Midwest workers are employed in the auto industry. When suppliers and related industries are added, the number rises to over 1.25 million. Not surprisingly, given the magnitude of the changes, the Midwest has been disproportionately affected by the adjustments in the auto industry. Between 1979 and 1991, when employment in the industry fell sharply, Michigan lost 150,000 jobs at the Big Three and 100,000 at suppliers. These figures do not include other jobs supported by the industry, especially in the service sector.⁶

Restructuring at the supplier level

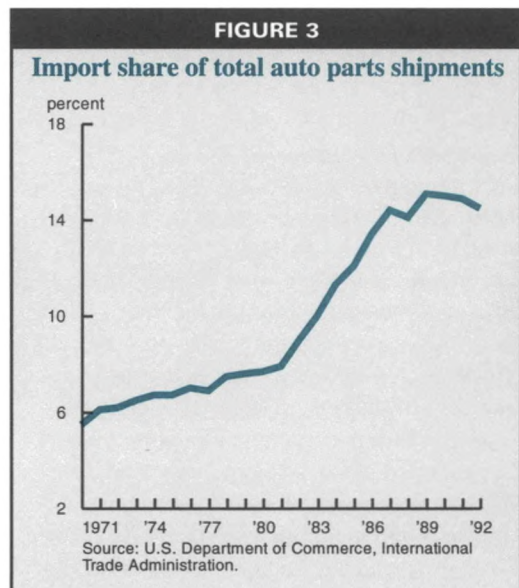
In the period immediately after World War II, strong auto sales and profitability caused robust growth among industry suppliers. Supplier shipments increased over 400 percent between 1950 and the early 1970s. Employment levels also rose substantially, with auto supplier employment close to 500,000 by the early 1970s. Strong sales by the Big Three and the general upward trend in the auto market allowed suppliers to keep their prices high. While products and processes in the auto industry evolved steadily, the pace of change was not unsettling, and the supplier industry thrived.

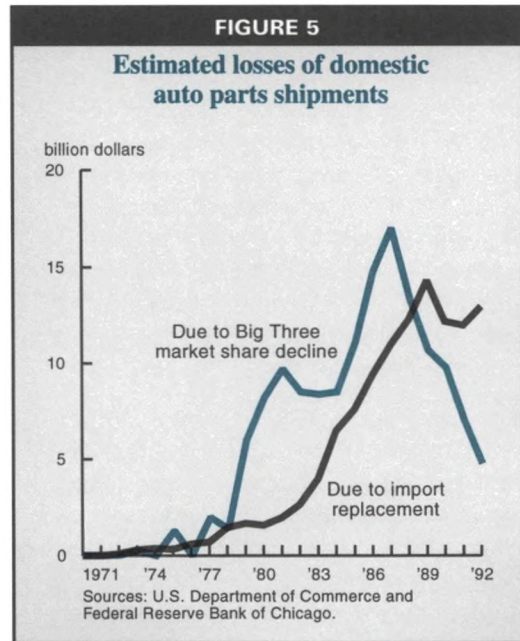
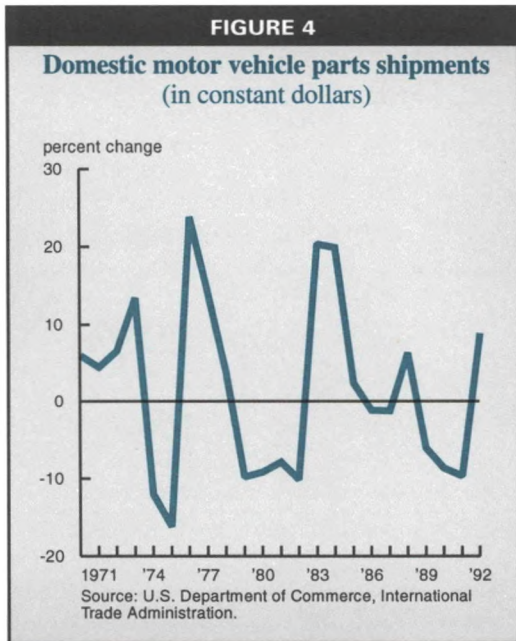
By the 1970s, auto sales growth declined and the Big Three began losing market share to foreign competitors. Suppliers followed the lead

of the finished-goods producers and responded by adjusting their production processes, capacity, and employment. At the same time, however, foreign parts suppliers began their own rapid penetration of the domestic market. The market share of imported parts to total parts purchased in the U.S. doubled during the 1970s (see figure 3). In real dollar terms, shipments of domestic parts showed only sporadic growth throughout the decade (see figure 4).

Like the finished-goods producers, domestic suppliers lagged their foreign competitors in productivity. In the 1970s, the unit labor costs of domestic suppliers were 20 to 30 percent higher than the international standard being set by Japanese suppliers.⁷ Yet domestic product quality was lower. In an attempt to address these problems and those of overcapacity and weak margins, suppliers began reorganizing processes and technology and cutting employment.

Compounding all of these problems were the slow market growth of the late 1970s and the severe recession of the early 1980s. Domestic parts shipments declined by 43 percent between 1977 and 1982. Import penetration was responsible for much of this decline—and not just imports of finished vehicles. By the early 1980s, imported parts made up more than 10 percent of all parts purchased in the U.S. Even the advent of transplant assembly facilities of foreign companies in the U.S. did not fully offset these trends, since it was accompanied by a proliferation of transplant parts facilities and increased importation of parts.⁸ (In the last few years,





transplants have increasingly been using domestically-produced parts.)

Additionally, domestic parts shipments grew slowly during the mid-1980s even when vehicle sales were peaking. The impact of imports and falling market share gradually began to lessen later in the decade. Nevertheless, by 1987, domestic auto parts suppliers were losing an estimated \$12 billion annually because of import penetration of foreign-made parts, and another \$17 billion because of the reduction in Big Three market share (see figure 5).⁹ These problems were exacerbated by declining vehicle sales after 1990. As a result, a number of radical adjustments occurred in the domestic auto supplier industry during the 1980s. The sections that follow describe the most notable ones.

Reduction in the number of first-tier suppliers

In response to overcapacity in the industry, the number of domestic auto suppliers declined by almost 25 percent between 1970 and 1990. At the same time, suppliers diversified their activities. For instance, many that formerly produced only auto parts began producing components used to manufacture those parts and, in some cases, components for other manufacturing industries.

Because of the heightened emphasis on quality, price, and customer satisfaction, the relationship between the Big Three and their suppliers also changed. Most noticeable was the reduction in the number of first-tier suppliers—

those that interact directly with the finished-goods producers. Ford, for instance, cut back from 2,400 major suppliers in 1980 to fewer than 1,400 by the early 1990s. Some models now have fewer than 200 first-tier suppliers those who interact directly with the finished-goods producers.¹⁰

Margin/price pressures

Until the 1970s, price constraints were not a major concern of American automakers. In the current competitive environment, they are. Automakers now expect price decreases from their suppliers as well as increased quality and reliable supply. In fact, the Big Three have been known to request price reductions of between 1 and 5 percent annually, with the expectation that any reductions will extend indefinitely into the future.¹¹ Internationally, such reductions are not unprecedented. During the 1980s, while U.S. supply prices generally remained flat, Japanese suppliers experienced annual price decreases of up to 5 percent. Of course, the continuing excess capacity of suppliers makes it easier for automakers to extract price concessions from them. Automakers discussed building permanent ties with suppliers in the late 1980s, but they commonly pressured suppliers to lower prices during those years, bidding suppliers against each other and using market buying power. As GM's recent financial disclosures indicate, this approach has enabled the company to elicit price reductions sometimes greater than

10 percent, although the practice may abate as conditions at GM improve.

Faced with the prospect of declining prices and rising benefit and wage costs, auto suppliers have been placed in a vise. In response, they have squeezed their own profit margins considerably. Even in peak sales years such as 1984-88, returns on equity have been substandard. Furthermore, because of the narrow spreads and limited cash supplies available from more robust years, cyclical downturns can now have unusually strong effects.

Downsizing and productivity gains

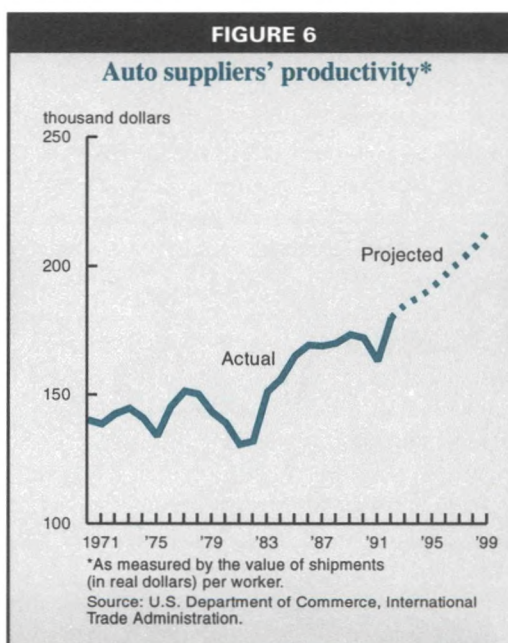
Between 1979 and 1991, national employment in the supplier industry dropped 54 percent. Part of this decline was due to the decline in domestic auto sales. But in addition, suppliers have cut employment radically as part of their efforts to improve productivity, a shift required by the demands of the new marketplace. This trend is still continuing, and suppliers are likely to cut employment even further in the coming decade as they continue transforming their production processes.

Corresponding to these employment cuts have been relative declines in wage rates in the supplier industry. The U.S. Department of Labor estimates that wages in unionized supplier companies have fallen from almost 80 percent of Big Three wages in the early 1980s to about 65 percent by 1990. In nonunion plants, the ratio has fallen from 60 percent to about 50 percent.¹²

Despite employment cuts, the value of domestic suppliers' shipments actually grew slightly in constant dollar terms over the 1980s and now exceed the levels of the 1970s. In combination with employment cuts, this growth indicates impressive productivity gains among suppliers over the period. As figure 6 shows, output per worker rose in excess of 40 percent over the last twenty years, and particularly in the 1980s.¹³ By the late 1990s, productivity as measured by the shipment-to-labor ratio may have risen further to \$210,000 per worker, or 50 percent above the 1970 level of \$140,000.

Operational and functional realignment

In an attempt to improve productivity and quality at the same time, auto suppliers followed the lead of the Big Three and introduced lean production techniques into their production processes. Features such as just-in-time inventory and statistical quality control have increasing-



ly become the norm. This transition was complicated by the fact that at the same time, the Big Three were moving away from the production of parts they had traditionally made in-house. By the early 1990s, Ford and Chrysler had reduced in-house parts operations to 50 percent or less of the entire manufacturing process in terms of value added. GM still produces a majority of its parts in-house but has also begun shifting this task onto suppliers.

As the Big Three passed parts production on to suppliers, they also pushed the design and engineering of parts downstream. Unfortunately, they have not always raised their compensation rates to suppliers to cover the additional costs and risks. Consequently, suppliers have had to accept increasingly more responsibility at increasingly declining compensation rates. In this environment, suppliers had no choice but to realign their production processes further in order to do more with less.

Problems at GM complicate restructuring

Throughout the early 1980s, GM lacked the overwhelming financial burdens that Ford and Chrysler bore. GM remained confident of its position in the North American market and thus was less aggressive about cutting costs, jobs, and excess capacity. Eventually, the company fell behind its two domestic competitors, not to mention its Japanese counterparts.

Even when auto sales peaked in the mid-1980s, GM continued losing market share, especially in some core product lines such as mid-size sedans. Over the decade, the company lost over 10 percentage points of market share.¹⁴ This erosion became a crisis by 1990, when the recession and a weak economy dampened the overall vehicle sales market and further eroded GM's position.

In this crisis, it finally became clear that GM was (as it still remains) less competitive than other automakers by most measures. Productivity levels at GM lagged those of all its competitors, domestic and foreign. One study estimated this differential at perhaps \$800 per vehicle, and even higher for specific segments of the market. Combined with perceived quality deficiencies, these cost differentials were major factors in the erosion of the company.¹⁵

Since late 1991, GM has been trying to make up for lost time. It has closed facilities, reduced employment, and substantially altered its parts divisions and supplier network. The company is still highly integrated, with at least 70 percent of its parts produced in-house.¹⁶ Announced closings and division sales will reduce this number somewhat. Additionally, GM has reduced its number of outside suppliers and elicited price concessions from those remaining. More internal streamlining is on the way, with a significant portion of parts facilities and activities slated to be closed or sold. In fact, GM plans to be involved only in "core" parts operations by the mid-1990s.

Current operating environment

In the current operating environment, it is important to differentiate between cyclical and structural change. Sluggish sales over the last five years have clearly required the Big Three and the supplier industry to accelerate their pace of adjustment—especially GM. Yet even if sales bounce back to some "normal" level, the domestic auto industry can never return to some former condition. International competition, restructuring at the Big Three, and technical change have permanently changed the rules of the game. The relationship between the Big Three and their suppliers has especially changed. Pricing issues dominate it more than ever before, and pricing concessions and reductions have become the norm. The industry may continue to consider long-term contracts, but such agreements are meaningful only if they clearly specify

any eventual price concessions. Moreover, at least at present, the Big Three continue to exert considerable leverage over suppliers by canceling agreements.

Still to be addressed is the continuing problem of overcapacity in the North American marketplace. Although this is largely confined to the Big Three, it remains an issue with suppliers as well, especially if auto sales do not rebound back to some level of normalcy. Partly in response to this overcapacity, some suppliers are taking on increasing responsibility for designing and engineering parts and components. Others have shifted to producing components instead of parts.

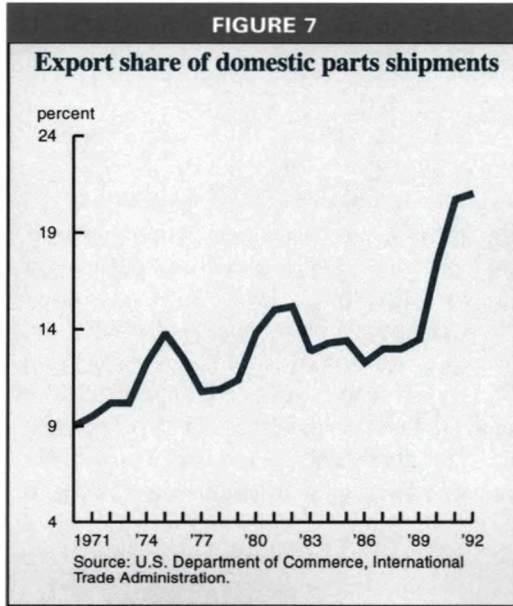
The present outlook for market growth for domestic auto suppliers is somewhat uncertain. If sales remain weak and if the current trends in the structure of the market continue, suppliers are likely to adjust capacity further and speed up their downsizing. Apart from Mexico, the potential for export offset may be minimal, since the barriers to foreign markets are high. Therefore, local sourcing (using supplies produced locally) is the preferred mechanism for permeating new and expanding markets.

Bright spots in the changing market

In spite of the painful restructuring, several factors do suggest some bright spots in auto suppliers' future. First, their primary customers—the Big Three—are much better positioned today than ten years ago. Ford and Chrysler have recaptured market share, and GM has stabilized its slide. More importantly, domestic automakers are closing in on the productivity and product quality of their foreign competitors. The popular new models being rolled out by the Big Three reflect this new vigor.

Suppliers will continue to face price constraints and other burdens associated with industry restructuring. But suppliers' improved productivity, quality, and responsiveness should help cushion these shocks. Moreover, political persuasion and a weakening dollar against the yen have renewed suppliers' competitiveness and slowed the penetration of foreign transplants. In addition, transplants are increasingly using parts produced in the U.S. While some of these parts are coming from other foreign transplants, domestic parts producers are beginning to reach beyond the traditional market of the Big Three.

Auto suppliers have also become more export-oriented in the last few years. As figure 7 indicates, over 20 percent of total shipments of



domestically-produced parts is exported, at a value of over \$18 billion annually. A significant portion of this trade is with Canada, but growth in non-North American markets has also been robust. The North American Free Trade Agreement should enhance the prospects for further export growth. The Mexican domestic market has been sheltered from international competition for many decades and is likely to experience

robust growth in the future. These factors bode well for certain portions of the supplier industry.

Overall, because of the ongoing restructuring and productivity gains made by suppliers over the last decade, surviving auto suppliers should be lean and well-positioned to increase their market share domestically and internationally in the years ahead. Although there will be new challenges as the auto market continues evolving, even potentially adverse trends, such as the shift of design and engineering onto suppliers, may represent opportunities to the supplier industry.

Conclusion

The auto industry, including its supplier network, is a bellwether of the nation, an important industry in the global trading environment, and the foundation for much of the Midwest's manufacturing economy. For these reasons, changes in the auto industry can affect much of the rest of the U.S. manufacturing base.

As the nation moves further toward flexible manufacturing and other new production processes, firms throughout the production chain in other industries will be struggling to keep pace with rapid change. By understanding how auto suppliers have adjusted to changes in the auto industry, we may see a blueprint of what lies ahead for many other industries.

FOOTNOTES

¹The U.S. Department of Commerce defines the auto supplier industry to include standard industrial classification (SIC) 3465 (automotive stampings), 3592 (carburetors, pistons, piston rings, and valves), 3647 (vehicular lighting equipment), 3691 (storage batteries), 3694 (electrical equipment for internal combustion engines), and 3714 (motor vehicle parts and accessories).

²Dominance of this market was important, since even by the late 1960s, half of all production and sales in the world occurred in North America.

³Womack et al. (1990).

⁴The relative dominance of the Big Three in total world vehicle sales eroded substantially after 1965. In 1965, the Big Three accounted for 61 percent of all sales worldwide. By 1975 the level was below 40 percent; by 1990 it was 31 percent. During this period, GM lost over 16 percentage points of world market share, and Chrysler's world market was cut in half. At the same time as the Big Three were failing to penetrate the expanding markets abroad, they were also losing market share at home. Throughout the 1980s, annual domestic shipments of domestically produced vehicles never exceeded the pre-1980 high of 12.6 million units.

⁵See Klier (1993).

⁶The American Automobile Manufacturers Association (1992) estimates that approximately 3 million jobs in the Midwest are motor-vehicle related. This level does not include the impact the industry has on jobs in the service sector. Studies on the impact of plant closings indicate that the linkage between the industry and area service activities is extremely strong.

⁷Ibid.

⁸Transplant facilities also helped diffuse some of the trade friction due to the level of foreign investment and an eventual leveling off of import levels.

⁹Figures represent a comparison of actual sales with what the domestic auto producers and suppliers' share of total industry sales would have been if they had retained their earlier market share.

¹⁰Fleming (1993).

¹¹GM's demands on suppliers in the early 1990s were even more extreme, requesting price cuts between 15 and 20 percent.

¹²U.S. Bureau of Labor Statistics (1993) and University of Michigan, Institute of Public Policy Studies. These wage declines are partly explained by a shift of auto parts employment away from the Midwest toward the Southeast U.S., which has encouraged additional growth of nonunion facilities.

¹³Other studies have confirmed these productivity gains. For instance, Boston Consulting Group (1993) and Economic Strategies Institute (1991).

¹⁴The numbers are somewhat deceiving because of GM's aggressive program (fleet) car plan; the actual erosion was worse.

¹⁵See Harbour and Associates (1990).

¹⁶Ward's Communications (1991).

REFERENCES

American Automobile Manufacturers Association, *Motor Vehicle Facts and Figures: 1992*, Washington, DC, 1992.

Boston Consulting Group, "Context of U.S.-Japan automotive issues," March 1993.

Economic Strategies Institute, "The future of the auto industry," January 1991.

Fleming, Al, "Ford to cut 400 more suppliers," *Automotive News*, November 15, 1993, p. 1.

Harbour and Associates, *The Harbour Report a Decade Later: Competitive Assessment of the North American Automotive Industry, 1979-1989*, Berkley, MI, 1990.

Klier, Thomas H., "Lean manufacturing: understanding a new manufacturing system," *Chicago Fed Letter*, No. 67, March 1993.

U.S. Bureau of Labor Statistics, *Compensation and Working Conditions*, January 1993.

Ward's Communications, *Ward's Automotive Year Book*, Detroit, 1992.

Womack, James P., Daniel T. Jones, and Daniel Roos, *The Machine that Changed the World*, New York: Rawson Associates, 1990.

The geographic distribution of financial institutions in Chicago

George G. Kaufman
and Larry R. Mote



Financial institutions provide a number of important services, including checking accounts or other means of payment, a variety of media for savings, safekeeping, and credit of various types, that are essential to the efficient functioning of a modern economy. The quality of these services and the terms on which they are available have a major effect on consumer welfare. Among the key attributes of financial services is their accessibility, that is, the ease or convenience with which they can be obtained. This, in turn, depends on the number and geographic distribution of offices of financial institutions. Numerous studies have affirmed the importance of distance and travel time in determining where consumers and small businesses purchase their financial services. A majority of such customers list convenience of location as the most important factor in deciding where to “bank”—using that term in a generic sense—with roughly equal numbers of customers choosing a financial institution close to their residence and their place of work. Surveys conducted two decades ago revealed the surprising fact that over half of all customers visited their banks at least once a week.¹ Recent improvements in the convenience of banking by mail or by telephone, direct deposit of payroll checks, point of sale transfers, and the enormous expansion of automated teller machine networks have undoubtedly reduced the frequency with which customers visit their financial institutions. Nonetheless, a large number of households still deposit their paychecks and require such services as check cashing and loans that do not involve

accessing a prearranged line of credit by credit card or check. These households find it necessary to make frequent personal visits to their financial institutions. Consequently, the number and geographic distribution of offices of financial institutions are matters of considerable significance to consumers.

Although convenience is also important to purchasers of other vital goods, such as food, that fact is not the subject of a great deal of study and concern. We generally leave it to the market to decide how many supermarkets and convenience food stores should be established and where they should be located. Financial services are different in that, because of concerns over, among other factors, the safety and soundness of financial institutions, government policy restricts both the chartering of new institutions and the number and location of branch offices. Moreover, it is widely believed that the ready availability of financial services, particularly credit, has important effects on the level of economic activity in a community. Thus, knowledge of how the number and location of financial institution offices respond to demographic, economic, and regulatory forces is important in the formulation and execution of public policy.² This article

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is the first output from a broader study of the availability of financial services in urban areas. An earlier study by Kaufman used regression analysis to analyze the determinants of the number and geographic distribution of financial institution offices in Chicago in 1956, 1960, and 1966³. Taking that study as its point of departure, this article examines how and to what extent demographic, economic, and regulatory forces have affected the number, type, and geographic distribution of financial institution offices in Chicago.

In the next section we discuss the types of financial institutions included in the study and the geographic units of observation used to analyze the distribution of financial institution offices. Then we describe the fundamental demographic and economic changes that have taken place in Chicago over the past several decades, as well as several regulatory developments that may have affected the number and distribution of financial institution offices. This is followed by a broad overview of the number, type, and distribution of financial institution offices in Chicago in 1970, 1980, and 1990. Finally, we analyze the important economic, demographic, and social variables that may affect the location of financial institutions, and we present the results of a statistical analysis designed to identify the determinants of the number and distribution of offices in each of those years.

Types of financial institutions considered

Four types of financial institutions are the focus of this article: commercial banks, savings and loan associations, credit unions, and currency exchanges. A good case could be made for including other types of financial institutions, such as consumer and commercial finance companies, mortgage companies, and other sources of credit to businesses and consumers. However, the criteria for inclusion were that an institution provide some means of payment—checking accounts, money orders, or utility payment services—and that it serve as the primary financial institutions for some large class of customers.

Of the four types of institutions under consideration, commercial banks are clearly the most important. The oldest type of financial institution in the United States, commercial banks are also the largest in terms of total industry assets. As their advertising for “full service banks” has long emphasized, they provide the

widest variety of financial services, on both the liability and asset side, of any of these financial institutions, and they serve the widest variety of customers, including large and small businesses as well as individuals. Consequently, the number of commercial banking offices is itself an important measure of the availability of the widest range of financial services in an area. The data on commercial bank offices used here include head offices and branches, but not drive-in facilities and automated teller machines (ATMs). Because many customers conduct the greater part of their banking business at drive-in facilities and ATMs, a strong argument could be made for including them in the analysis. We did not do so, however, because of the difficulty of obtaining accurate data.

Until the early 1980s, legal restrictions required savings and loan associations to specialize in raising funds through the issue of savings deposits and residential mortgage loans. However, the deregulation legislation of the early 1980s expanded their powers on both the asset and liability sides. Savings and loans received authority to offer negotiable order of withdrawal (NOW) accounts and to make consumer and business loans, and thus moved closer to the role of commercial banks. But savings and loans still tend to emphasize thrift and home ownership—some describe themselves as “consumer banks”—and only a few have made serious inroads in the market for loans to businesses. Nonetheless, from the standpoint of individuals they are increasingly close substitutes for commercial banks.

Credit unions, though smaller on average than banks or savings and loans, are much more numerous and are the most rapidly growing type of depository institution in the United States. They are organized as mutuals and have long been subject to “affinity group” limitations on membership; some of them were organized to serve only the employees of a particular company. However, their low interest rates on consumer loans, attractive dividends on member shares, and relatively new authority to offer checking (share draft) accounts, in combination with the liberalization of affinity group restrictions, have made them attractive to a growing number of consumers.

The total number of offices of the three types of depository institutions described above is of interest because it represents the number of

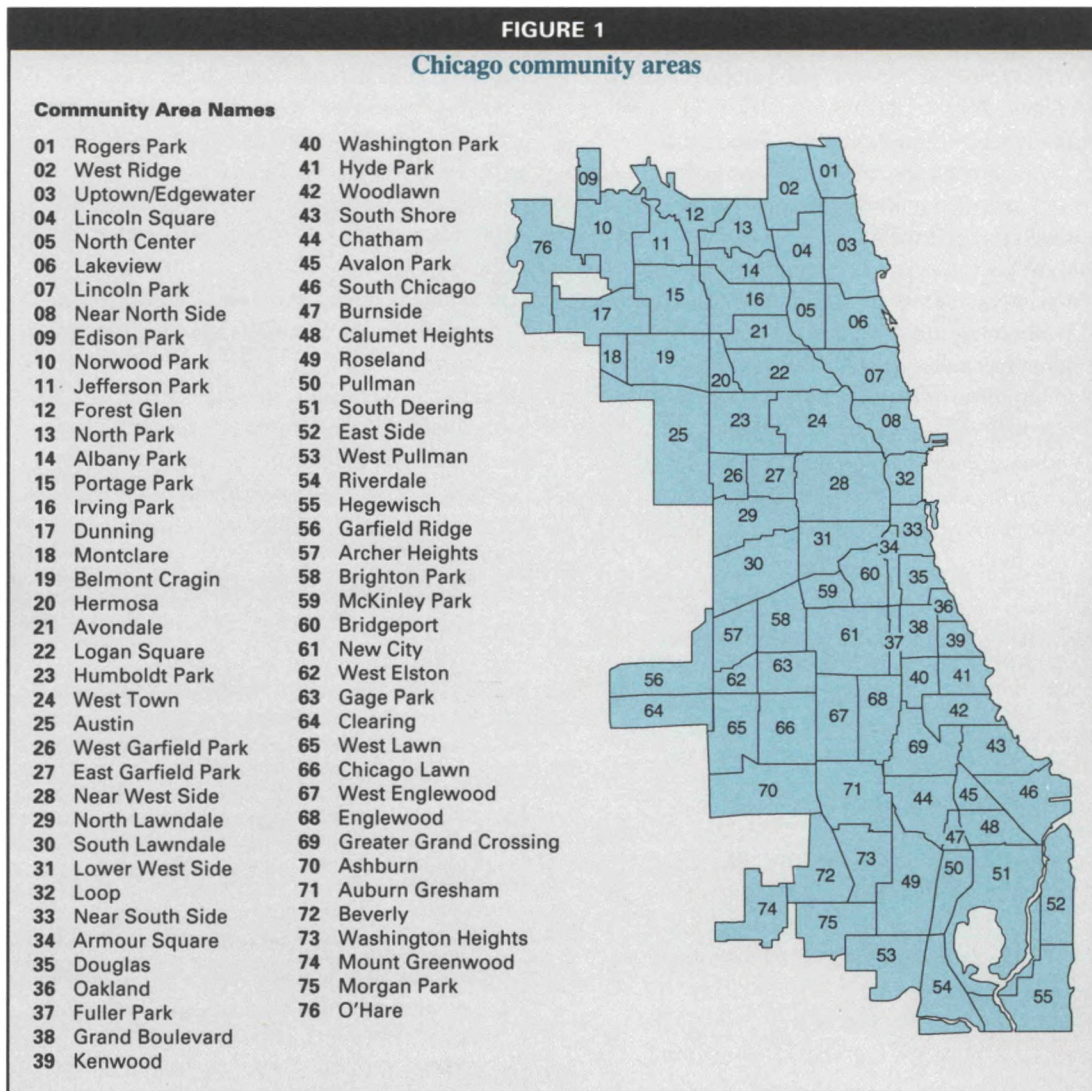
locations at which both deposit and credit services are readily available. To the extent that the services of banks, savings and loans, and credit unions are close substitutes to consumers—and the evidence suggests that this is increasingly true—it is meaningful to aggregate them into a single number.

Currency exchanges, often referred to as “the poor man’s bank,” provide neither loans nor deposit accounts, but do offer a variety of financial and other services such as check cashing, money orders, utility bill payment, and automobile license renewal. Thus, despite their inability to offer credit services, currency exchanges should be included in any analysis of the distribution of financial institution offices.

The simple sum of the offices of these four types of financial institutions is the most comprehensive measure of the availability of financial services in a community used in the analysis. Although it is clearly desirable to have such a summary measure, the equal weight that it gives to each type of institution is open to question. Nonetheless, lacking firm empirical support for any particular weighting scheme, we chose the simplest alternative.

Chicago community areas

It is a simple matter to count the number of financial institution offices of a given type in Chicago. However, in order to analyze the distribution of offices it is necessary to disaggregate



the city into a number of smaller areas and observe the number of offices in each of those areas. As in the earlier study, we chose community areas as our units of observation. Chicago, perhaps more than other cities, has been a city of strong communities. The community areas in Chicago were defined in 1920 by the Social Science Research Committee of the University of Chicago with the help of local agencies and the U.S. Bureau of the Census. These areas originally constituted true communities in the sense that each "could be regarded as having a history of its own as a community, a name, an awareness on the part of its inhabitants of common interests, and a set of local businesses and organizations oriented to the local community."⁴

Because each community tends to have one or more well-defined shopping areas, there is some presumption that residents would look first to financial institution offices in the community to obtain financial services. However, there is no evidence to support a conclusion that community areas constitute either complete "banking markets" or "bank service areas" in the sense in which those terms are used by economists. Many residents use financial institution offices outside their community, either because offices in adjoining communities are closer to their home, because they commute to work in another community, or because they bank by mail or telephone. Clearly, many residents of Chicago and its suburbs who commute to work in the Loop (the Central Business District) find it convenient to use financial institutions located there. Nonetheless, for those who do not commute and/or prefer to bank near their homes, the number of financial institution offices in their community is a significant measure of the convenience with which financial services can be obtained.

A map of the community areas in Chicago is shown in figure 1. The community areas differ greatly in both population and size, as measured in acres or square miles. The largest, South Deering, is 7.87 square miles, while the smallest, Burnside, is only 0.53 square miles. For communities with the same number of financial institution offices, such variation in land area implies large differences in the average distance that residents must travel to obtain financial services. Consequently, the number of offices of one or more types of financial institution within a community, in and of itself, is a poor measure of convenience. To convert those

variables into more meaningful measures of the adequacy of financial institution offices, we simply divided each of them by the area in square miles of the community in which they were located. We used these transformed numbers to construct the maps showing the distribution of financial institution offices (figures 4, 5, and 6).

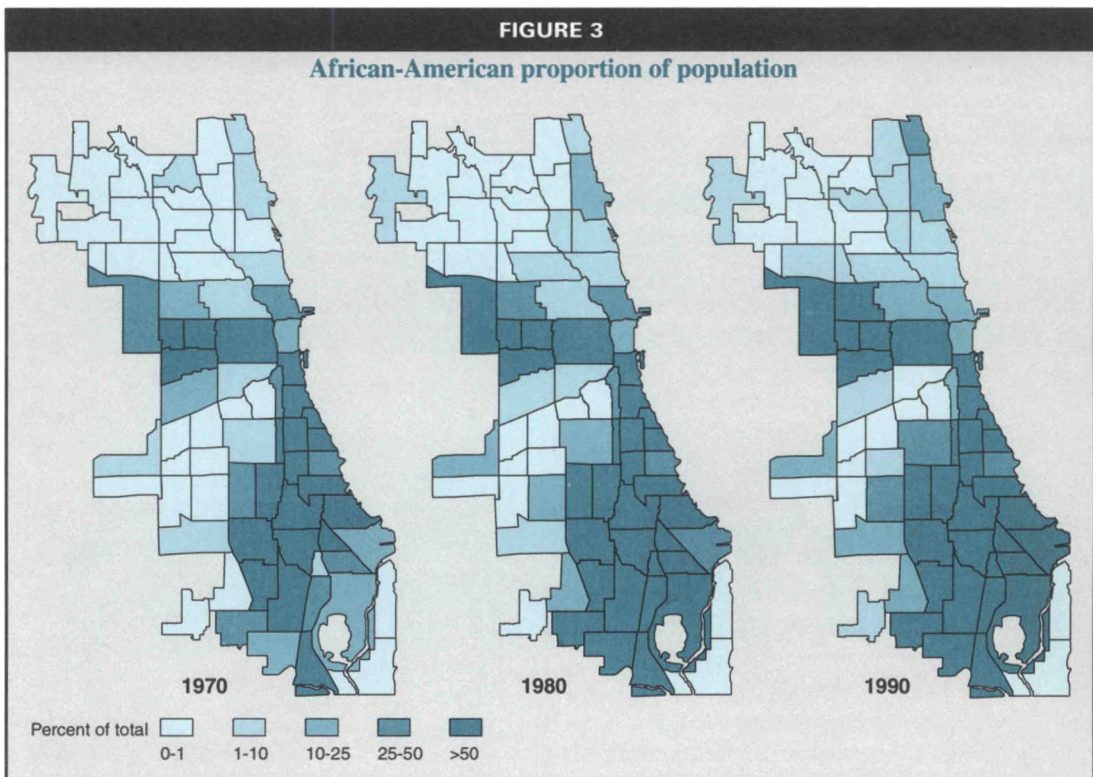
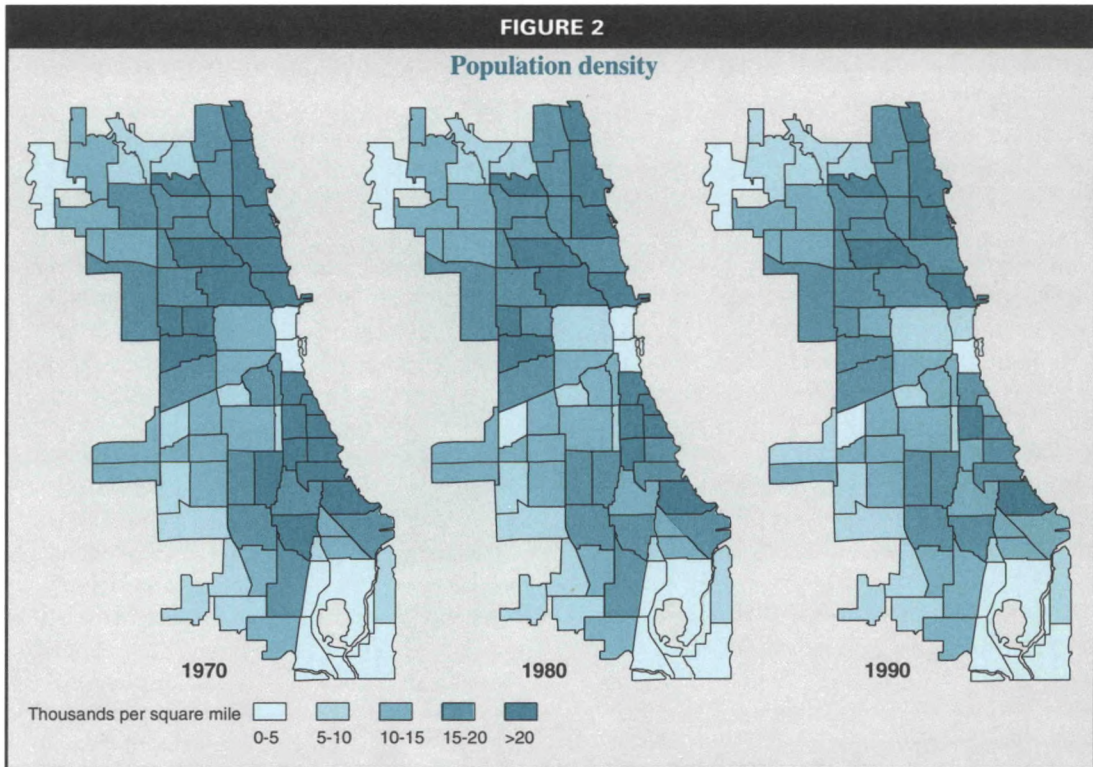
Each community area is made up of a number of census tracts, which are smaller areas defined by the U.S. Bureau of the Census for purposes of the decennial national census of population. Consequently, one can obtain data for a given community by aggregating data from its constituent census tracts. Although there have been a few minor changes in the definitions of the areas since 1970, adjustments were made to obtain a set of 75 consistently defined communities for each of the years 1970, 1980, and 1990.⁵ The community areas used in the statistical analysis encompass the entire city of Chicago, with the exception of area 32 (Loop) and the portion of area 76 (O'Hare) consisting of O'Hare Airport. We excluded these two areas because the demand for financial services, and therefore the number of financial institution offices, in either area is largely independent of the size or economic characteristics of the resident population.

Recent economic and demographic developments

The question of how financial institution offices are distributed has taken on new importance in recent decades. As previous issues of *Economic Perspectives* have noted, the economy of the Seventh Federal Reserve District has undergone massive structural changes as a consequence of the interaction of new technologies, improved transportation systems, and enhanced communications with intensified domestic and international competition.⁶ Rapid changes in the racial, educational, and economic characteristics of Chicago's population in the 1960s and 1970s exacerbated the social and economic consequences of this restructuring.⁷ While the population of the Illinois portion of the Chicago Consolidated Metropolitan Statistical Area (Cook, DuPage, Kane, Lake, McHenry, and Will Counties) increased from 6.2 million to 7.3 million between 1960 and 1990, the population of the city of Chicago, which had declined slightly from 3.6 million in 1960 to 3.4 million in 1970, fell sharply to 2.8 million in 1990. How that

decline was distributed among community areas in Chicago can be seen in the maps in figure 2. The African-American share of Chicago's popu-

lation rose from 14 percent in 1950 to 32 percent in 1970 and 40 percent in 1980 before declining slightly to 39 percent in 1990. The distribution



of this change among community areas is shown in the maps in figure 3.

Legal and regulatory changes

Perceiving that the failure of financial institutions to lend in areas undergoing rapid racial and economic change was accelerating the exodus of existing residents and the decline in property values, community activists persuaded Congress to enact three related pieces of legislation in the 1970s—the Equal Credit Opportunity Act (ECOA) of 1974, the Home Mortgage Disclosure Act (HMDA) of 1975, and the Community Reinvestment Act (CRA) of 1977. These acts were designed, respectively, to prohibit depository institutions from discriminating by race, gender, or national origin in lending; to require public disclosure of data that would enable regulators and the public to identify discrimination in lending and failures of depository institutions to serve low-income and minority areas; and to provide incentives for such institutions to serve their local communities. Although the primary emphasis in CRA enforcement has been on lending by existing offices of depository institutions, community groups and regulators have shown increasing concern over decisions of financial institutions that affect the number and

distribution of financial institution offices. Depository institutions attempting to close branches in low- and moderate-income or minority neighborhoods have faced community protests and increased regulatory surveillance. Increasingly, institutions under regulatory pressure to improve their CRA ratings have opened new offices in such areas.

Another regulatory change that has had a major effect on the number and geographic distribution of financial institution offices in Chicago is the liberalization of branching and bank holding laws in Illinois that has occurred over the past two decades. Until 1960, Illinois was a “unit banking” state—that is, commercial banks were permitted to operate only one office. In that year, foreign banks were first authorized to establish branches in Illinois, but only in the Chicago Loop. Beginning in 1967, Illinois law has also permitted domestic banks to branch. Initially, the law authorized the establishment of only one additional office, which was required to be within 1,500 feet of the head office. Since then, the law has been progressively liberalized. In 1993, banks gained permission to establish an unlimited number of branches and ATMs anywhere in the state.

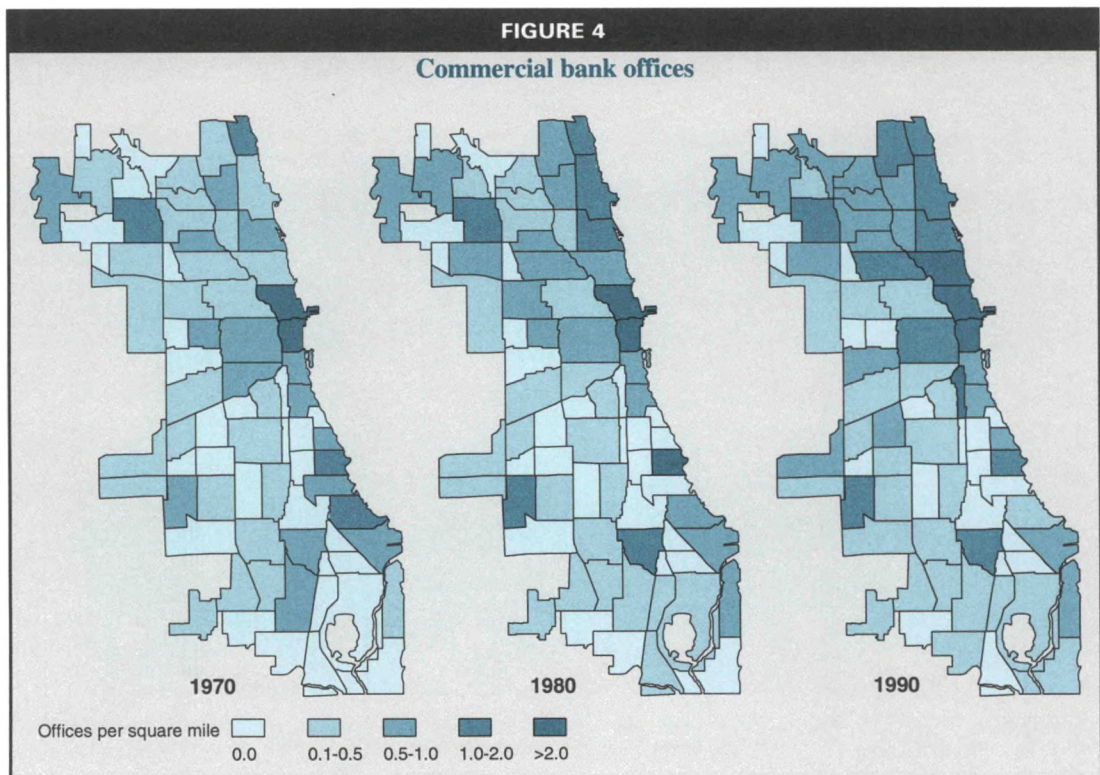


TABLE 1

Offices of financial institutions in Chicago community areas

Areas	1970				1980				1990			
	Banks	S&Ls	Credit unions	Currency exch.	Banks	S&Ls	Credit unions	Currency exch.	Banks	S&Ls	Credit unions	Currency exch.
01	2	1	2	4	2	1	2	4	2	1	2	4
02	1	2	1	6	2	5	1	6	4	6	4	5
03	2	2	7	8	5	2	7	15	6	3	6	15
04	2	1	1	7	2	2	1	7	2	1	1	7
05	1	1	1	8	1	3	1	7	2	2	3	8
06	2	3	7	15	5	4	6	14	6	3	3	11
07	1	2	4	13	3	3	4	13	10	3	3	10
08	7	2	21	23	15	6	19	17	16	5	14	17
09	0	0	0	1	0	1	0	0	0	1	0	0
10	1	2	3	3	3	6	3	2	3	6	1	3
11	0	1	4	1	1	3	4	1	1	3	2	1
12	0	0	2	2	0	2	2	1	2	3	1	2
13	1	0	1	0	1	2	1	0	2	1	3	0
14	1	0	2	5	1	2	2	5	2	1	0	6
15	4	5	3	8	5	8	2	6	5	10	1	7
16	1	2	2	7	1	3	2	5	2	2	2	5
17	0	2	2	2	0	5	2	1	0	6	0	1
18	0	1	0	1	0	1	0	1	0	1	0	1
19	1	5	4	5	2	6	3	7	3	6	3	6
20	0	0	0	4	0	0	0	4	0	0	1	5
21	1	3	2	6	1	3	2	7	1	5	3	7
22	1	2	6	15	2	3	5	16	5	3	3	13
23	1	2	4	12	2	2	3	11	1	1	6	11
24	2	6	10	20	2	5	9	19	2	5	5	18
25	2	6	7	21	3	4	7	20	3	3	8	18
26	0	0	3	8	0	0	3	5	0	0	3	6
27	1	0	2	10	1	0	1	9	0	0	2	8
28	4	0	17	31	4	1	12	27	6	2	22	25
29	0	1	6	13	0	0	5	13	2	0	1	12
30	1	15	1	10	1	12	1	9	1	9	1	10
31	2	5	4	8	1	5	3	8	1	4	2	8
32	19	9	52	36	59	23	51	26	107	24	48	21
33	1	0	2	6	1	0	0	4	1	0	2	5
34	0	1	2	2	0	1	2	2	2	2	2	2
35	1	1	2	7	1	1	2	5	1	1	4	1
36	0	0	0	1	0	0	0	2	0	0	1	0
37	0	0	1	3	0	0	1	4	0	0	1	2
38	0	1	4	18	0	1	4	14	0	1	7	13
39	1	0	0	4	0	0	0	2	1	0	0	2
40	0	0	3	6	0	0	3	6	0	0	6	5
41	2	1	5	3	4	1	5	4	2	1	3	3
42	1	0	2	8	0	0	2	7	0	0	0	5
43	3	1	0	8	2	0	0	7	1	0	0	6
44	2	0	2	11	3	2	2	9	3	1	3	9
45	0	0	0	1	0	2	0	1	0	2	1	1
46	2	5	1	5	2	5	1	6	2	4	1	6
47	0	0	0	0	0	0	0	0	0	0	1	0
48	0	0	3	0	0	0	2	0	0	0	1	0
49	2	3	4	6	1	1	5	7	1	0	3	6
50	0	0	2	1	1	0	3	1	1	0	1	1
51	0	0	5	3	1	0	6	3	1	0	1	3
52	1	1	1	2	2	4	1	2	2	4	0	2
53	0	2	2	3	0	3	2	3	1	0	0	3
54	0	0	5	1	1	1	5	1	0	1	3	1
55	0	2	3	1	0	3	2	1	1	3	1	2
56	1	2	3	5	1	4	3	5	2	4	0	5

TABLE 1 (continued)

Offices of financial institutions in Chicago community areas

Areas	1970				1980				1990			
	Banks	S&Ls	Credit unions	Currency exch.	Banks	S&Ls	Credit unions	Currency exch.	Banks	S&Ls	Credit unions	Currency exch.
57	1	1	2	1	1	3	3	1	1	2	5	1
58	0	6	5	6	0	7	4	4	2	6	4	4
59	0	4	6	4	0	3	5	4	0	3	2	3
60	1	3	3	5	1	4	3	6	1	5	3	6
61	1	9	4	9	1	5	4	9	1	5	5	11
62	0	0	0	1	0	0	0	0	0	1	0	0
63	0	4	1	3	0	5	1	2	1	4	0	3
64	1	0	5	3	1	1	5	3	1	1	5	3
65	2	1	6	2	3	3	6	1	3	6	5	1
66	1	4	0	6	1	7	0	5	1	6	3	5
67	0	2	5	8	0	0	4	8	0	0	3	9
68	1	0	3	10	1	0	2	9	1	0	1	9
69	0	0	7	11	0	0	6	10	0	0	7	13
70	0	3	3	4	0	5	2	4	1	4	4	4
71	1	2	2	7	1	1	1	6	1	0	1	8
72	1	2	3	0	1	0	3	0	1	1	2	1
73	1	0	1	4	1	0	1	4	1	0	2	4
74	1	1	1	2	1	1	1	2	1	2	1	2
75	0	2	2	4	0	1	2	3	0	2	1	3
76	2	0	1	0	2	2	1	0	2	2	1	1
Total	92	145	300	516	160	200	274	466	238	194	254	447

In 1981, the legislature enacted a law permitting multibank holding companies in Illinois. The law divided the state into five districts and initially restricted holding companies to acquiring banks within their home district and one adjacent district. The 1986 revision of the law permitted acquisitions anywhere in the state and authorized reciprocal interstate banking between Illinois and five contiguous states. Restrictions on branches of savings and loan associations were also eased over the past two decades, first by the Federal Home Loan Bank Board for federally chartered institutions and later by the Illinois legislature for state-chartered institutions.

Experience in other states that have liberalized their branching and holding company laws suggests that these changes should have led to a decline in the number of independent banking and savings and loan organizations in Chicago as existing institutions merged and holding companies acquired formerly independent institutions. At the same time, the lower costs of establishing a branch as compared with chartering a new institution should have led to an increase in the total number of commercial bank and savings and loan offices.

Financial institution offices in Chicago, 1970, 1980, and 1990

Details on the number and geographic distribution of financial institution offices in Chicago in 1970, 1980, and 1990 are shown in table 1. Figures 4, 5, and 6 provide a visual overview of the changes in the distribution of commercial banks, savings and loan associations, and the total number of financial institutions over the two decades. The number of offices of commercial banks in Chicago increased from 92 in 1970 to 238 in 1990. Excluding the Loop, the increase was from 73 to 131. The total number of financial institution offices showed little change over the period, rising from 1,053 in 1970 to 1,133 in 1990. Indeed, excluding the Loop, the number actually declined slightly, from 937 to 933. Because the increase in offices in the Loop is more closely related to that area's development as a financial center servicing a much broader area than Chicago than to the economic characteristics of its resident population, the figures discussed in the remainder of this study exclude the Loop.

The combined number of bank and savings and loan offices increased from 209 in 1970 to

301 in 1990, while the number of offices of credit unions and currency exchanges declined from 728 to 632. It is not surprising that the increases in numbers of offices were concentrated among commercial banks and savings and loans; almost certainly, they were largely a consequence of the liberalization of Illinois's branching and holding company laws described earlier. That conclusion is strongly suggested by the fact that all of the net increase in offices of these two types of institutions consisted of branches. While the number of branches of banks and savings and loans combined increased from 1 in 1970 to 156 in 1990, the number of head offices actually declined from 208 to 145. Although the increase in the number of commercial bank offices was roughly the same in the 1970-1980 and 1980-1990 periods, the number of savings and loan offices increased substantially in the earlier period and then fell slightly in the second period. The declines in the latter period were largely the result of failures of institutions during the savings and loan crisis of the late 1980s.

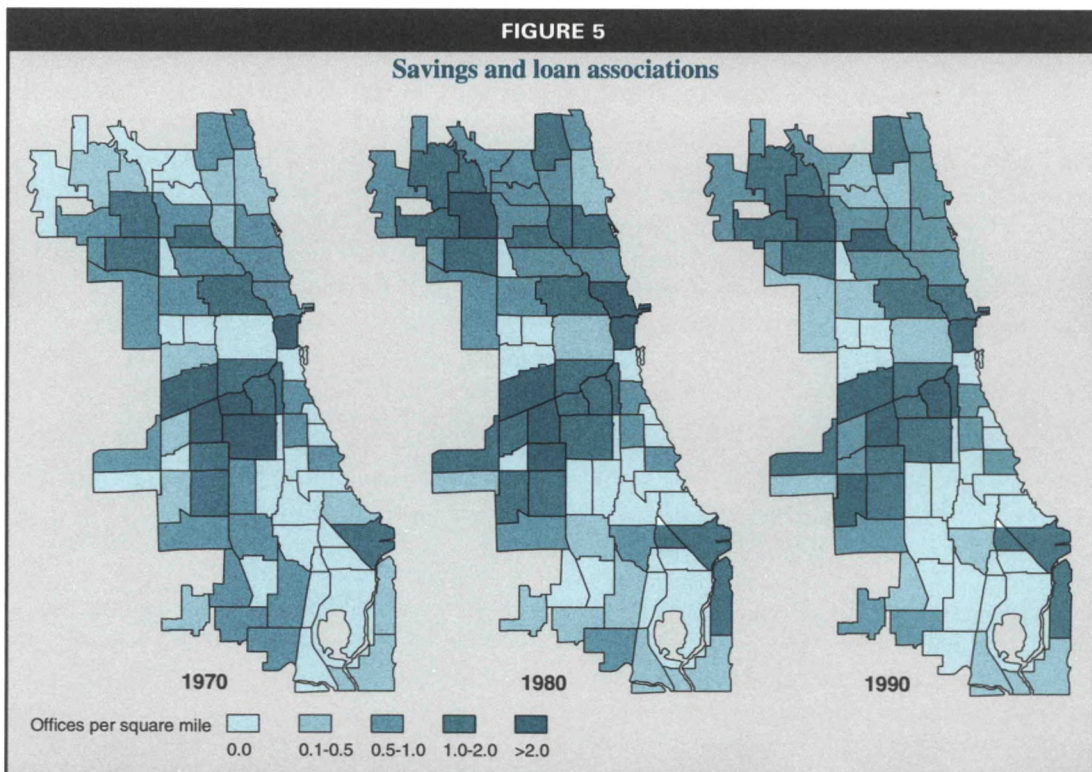
The number of offices of credit unions declined from 248 in 1970 to 206 in 1990, while currency exchanges declined from 480 to 426.

The declines in credit union offices were spread broadly over community areas of varying income levels, with declines in 38 areas, no change in 17, and increases in 20. Much the same pattern was evident for currency exchanges, with decreases in 32 areas, no change in 30 areas, and increases in only 13.

These summary measures of the changes in the number of financial institutions in Chicago are of considerable interest as a broad description of overall trends. However, they do not tell us much about either the underlying determinants of the number and distribution of offices of each type of financial institution or the relative adequacy of such offices in different parts of the city. Those questions are addressed in the following section.

Regression analysis of the distribution of financial institution offices

We use regression analysis to identify empirically the key economic and demographic determinants of the distribution of offices of financial institutions among the 75 community areas, excluding the Loop, that make up the city of Chicago. First, we estimate separate regressions for each type of institution for the years



1970, 1980, and 1990 to see how various economic and demographic variables affected the distribution of offices among the communities. Second, we do the same for all depository institutions and then for the sum of all four types of financial institution.

Dependent variables

The dependent variables, or variables to be explained, in the analysis are several alternative measures of the number of financial institution offices in each of the 75 community areas. They are

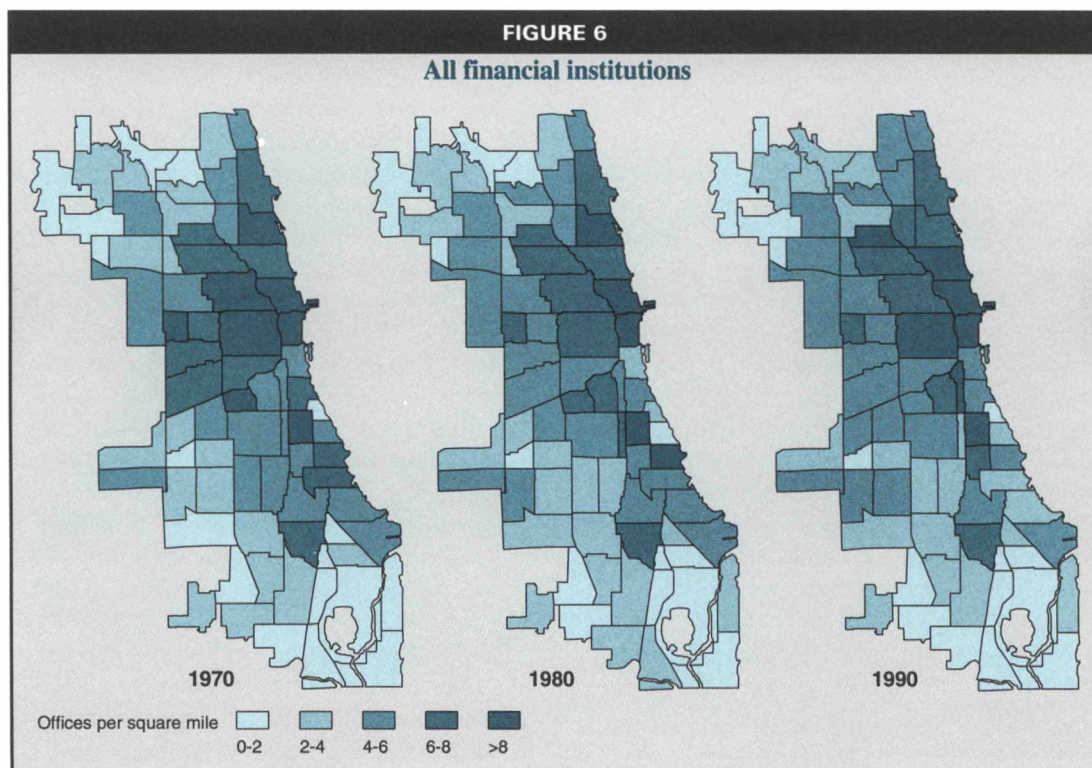
- 1) the number of commercial bank offices, including both head offices and branches;
- 2) the number of savings and loan association offices, again including both head offices and branches;
- 3) the number of credit unions;
- 4) the total number of offices of depository institutions—i.e., commercial banks, savings and loan associations, and credit unions;
- 5) the number of currency exchanges; and
- 6) the total number of offices of all four types of financial institutions combined.

The four types of financial institutions are analyzed both separately and in combination because there are not only strong similarities but important differences among them in the services they provide, the nature of their customers, and the regulation to which they are subject.

Explanatory variables

Economic theory suggests that the major determinants of the location of financial institution offices should be variables closely related to the demand for financial services. These variables include such basic attributes of each area as its size and population, its average income and wealth, the financial sophistication of the population, the prices of financial services within the community and in nearby communities, and the prices of substitute services or products. For reasons of simplicity and data availability, we ignore differences in prices. Descriptions of the specific explanatory or independent variables used in the analysis are presented below.

Population or households. Measures of population or the number of households are likely to be the most important variables determining the demand for personal financial services such as checking and savings accounts or



mortgage and consumer loans. Given the virtually universal demand for a convenient means of making payments, a medium for saving, and a source of credit for major purchases, there is a strong tendency for each person, or at least each household, to have a relationship with at least one financial institution.

Income and wealth. Income and wealth are widely acknowledged to be among the key determinants of spending for all kinds of goods and services, including financial services. The most representative income variable available by community area for each of the years under consideration here is median family income. Wealth, which in principle should include both human capital (potential earning power due to investment in education, etc.) and other forms of wealth, is much more difficult to measure, particularly at the community area level. Consequently, only income was used in the regressions. Because income and wealth measures are subject to inflation over long periods of time, median family income was converted to constant 1982 dollars by dividing it by the Consumer Price Index for the appropriate year.

Home ownership. A factor often believed to be important in determining the demand for mortgage loans is the extent to which residents in a community own their homes rather than rent. This, in turn, would be expected to be related to the presence of depository institutions, particularly commercial banks and savings and loans. Home ownership may also serve as a proxy for wealth. Consequently, we included the ratio of owner-occupied housing units to total occupied housing units as an explanatory variable.

Financial sophistication. The quantity of financial services purchased will vary with the level of financial sophistication of the community's population. Although financial sophistication cannot be measured directly, it seems reasonable to assume that it is positively related to level of education. Thus we used two alternative proxies: the proportion of the population with at least a high school education, and the proportion of the population employed in professional or technical jobs.

Competition. In deciding where to locate a new office, a financial institution will consider not only the actual and potential demand for financial services in an area, but also the existing competition from other providers of financial

services. To capture this effect, we included in the regressions for each type of institution the ratios of the number of offices of each of the other types of institutions in the area to the total number of financial institutions offices in the area. Offices of other types of institutions were entered as shares of the total number of financial institution offices rather than as simple levels to minimize collinearity with the other explanatory variables. The shares of each type of institution were included separately to take account of likely differences in the degree of substitutability between the services offered by different institutions. Thus, because of the much greater overlap in the services that they offer, it was expected that the number of banks in an area would be affected more strongly by the share of savings and loan offices than by the share of currency exchanges.

Racial and ethnic composition. There are a number of factors other than economic and demographic variables that may affect the number and type of financial institutions. Among them is the racial and ethnic makeup of the population. There are essentially two ways in which racial and ethnic composition may affect the number and type of financial institutions in a community. First, it is frequently argued that some institutions systematically avoid areas heavily populated by particular minority groups. Second, certain types of financial institutions may be more or less heavily represented in areas populated predominantly by a particular ethnic or racial group, either because members of that group tend to have a stronger demand for particular financial services than most other groups, or because they have historically been associated with the ownership and management of those institutions.⁸ In order to determine whether, after taking account of as many relevant economic variables as possible, the distribution of financial institutions is related to the composition of the population, we included three racial and minority composition variables in the regressions: the percentages of African-Americans, Asians, and Hispanics in the population.

Land area. As noted above, one would expect the size of a community area to have an important effect on the number of financial institution offices located there. Thus area in square miles is included among the explanatory variables in the regressions. However, the precise nature of this relationship is not as simple as

it might appear. We examine this question further in the next section.

The form of the relationship

Basically, land area and population affect the number of financial institution offices through their impact on the demand for financial services at each potential office location, given the travel costs and/or subjective disutility associated with distance and the nature of any economies of scale in the provision of financial services. In the polar case in which a community's area is near zero—that is, its population is concentrated at one point, as would be approximated by a community in which most of the residents lived in high-rise apartment buildings located in the same block—travel costs are minimal and the population would be most efficiently served by a single financial institution, as long as it is smaller than the size at which diseconomies of scale begin to appear. Of course, the possibility of differentiating financial services by means other than location means that additional offices may be established by competitors even before the output of existing offices reaches the minimum cost point. But as long as the population remains concentrated at that point, increases in population should be associated primarily with increases in the size of financial institutions up to the point of minimum average cost and increases in their number beyond that point.

However, if the same population is spread over a larger and larger land area—say, as in a neighborhood dominated by low-rise apartment buildings and single-family homes—the costs to at least a portion of the population of traveling to that single financial institution will increase until, at some point, it becomes economic to establish one or more additional financial institution offices. Moreover, to the extent that the lower travel costs associated with using a nearby financial institution outweigh the lower prices associated with the reduction in unit operating costs from concentrating production of the services at a single location, this will be true even if economies of scale in production are significant and continue to be realized at very large sizes of financial institution offices.⁹

Under simple but plausible assumptions regarding the relationship between customers' utility and the distance traveled to obtain financial services and the relationship between output and operating cost in banking, and assuming that

customers attempt to maximize their utility and financial institutions their profits, the relationship between the number of financial institution offices, population, and land area may be approximated by the general form

$$N = a + bP - cP/A,$$

where N is the number of financial institution offices, P is the population (or, alternatively, number of households) of the community, A is the land area of the community, and a , b , and c are positive constants to be estimated in the regression procedure. This formulation has the property that, for a given land area, changes in population are linearly related to changes in the number of offices. An increase in area will increase the number of offices associated with a given population, but at a decreasing rate.

Although this equation is nonlinear in A , it is linear in P and P/A (population density) and can be estimated using ordinary linear regression techniques. We experimented with several other forms, including one that was linear in logarithms, but found the explanatory power of the above formulation to be consistently superior to that of the alternatives. In the absence of clear theoretical grounds for choosing a nonlinear form, we also entered the other explanatory variables in simple linear form.

Empirical results

The regression results are shown in table 2. Final regressions for all the dependent variables contained the same explanatory variables: the number of households, number of households per square mile, median real family income, the proportion of the working population employed in professional and technical occupations, the proportion of occupied housing units that are owner-occupied, the variables measuring the presence of competitive financial institutions, and the three variables reflecting the racial composition of the population. It should be noted, however, that the specific competition variables included in the regressions varied according to the type of financial institution being explained.

On balance, the regressions do a reasonably good job of explaining statistically the distribution of financial institution offices among community areas in Chicago. The adjusted coefficients of determination, or \bar{r}^2 s—which measure the percentage of the variation in the dependent

TABLE 2

Regression results

Independent variables	Dependent variables					
	Banks	S&Ls	Credit unions	Currency exchanges	Depository institutions	Financial institutions
1970						
Intercept	1.570 (1.273)	12.975 (1.839)	12.403 (3.245)	12.845 (4.478)	13.499 (4.322)	21.735 (7.643)
Households	0.525 (0.154)	0.931 (0.229)	1.960 (0.434)	4.480 (0.611)	3.71 (0.609)	8.240 (1.085)
Households per square mile	-0.929 (0.629)	-2.141 (0.937)	-3.723 (1.775)	-8.024 (2.500)	-7.004 (2.533)	-15.454 (4.177)
Real median family income	4.210 (4.700)	-0.802 (7.100)	-12.140 (13.400)	-10.350 (18.800)	-15.670 (18.900)	-26.150 (34.100)
Professional and technical	2.678 (2.003)	-1.618 (2.984)	6.104 (5.654)	0.607 (7.966)	6.597 (8.016)	8.103 (14.297)
Home ownership	-2.434 (1.165)	-1.788 (1.735)	-2.961 (3.288)	-7.506 (4.632)	-4.605 (4.587)	-12.089 (8.196)
Ratio of banks		-11.567 (1.565)	-8.527 (2.512)	-5.097 (3.289)		
Ratio of S&Ls	-1.406 (1.050)		-8.627 (2.829)	-5.232 (3.906)		
Ratio of credit unions	-1.832 (0.890)	-11.821 (1.493)		-3.472 (2.584)		
Ratio of currency exchanges	-1.706 (0.827)	-11.537 (1.463)	-6.595 (1.834)		-4.897 (2.277)	
African-American population	0.097 (0.506)	-0.361 (0.754)	-1.377 (1.429)	0.314 (2.013)	-2.255 (1.907)	-1.741 (3.363)
Hispanic population	0.090 (0.796)	2.671 (1.186)	-0.492 (2.248)	0.295 (3.167)	2.088 (3.200)	2.180 (5.765)
Asian population	-5.642 (4.595)	-8.068 (6.845)	-15.728 (12.969)	-23.737 (18.273)	-26.137 (18.436)	-48.424 (33.148)
\bar{r}^2	0.371	0.683	0.413	0.608	0.472	0.567
Root mean square error	0.922	1.373	2.601	3.665	3.723	6.709
1980						
Intercept	0.951 (1.688)	6.940 (1.626)	11.547 (2.344)	11.061 (2.446)	10.049 (4.030)	14.727 (5.067)
Households	1.050 (0.262)	1.050 (0.258)	1.790 (0.378)	4.570 (0.483)	3.980 (0.714)	8.620 (1.040)
Households per square mile	-0.866 (1.064)	-1.570 (1.047)	-2.030 (1.536)	-6.850 (1.963)	-5.110 (2.879)	-13.460 (3.977)
Real median family income	9.240 (7.700)	3.960 (7.600)	-18.260 (11.200)	-29.290 (14.300)	-6.370 (21.100)	-28.850 (29.800)
Professional and technical	3.878 (2.771)	-2.123 (2.727)	6.305 (4.001)	6.627 (5.113)	8.964 (7.499)	17.383 (10.861)
Home ownership	-4.218 (2.283)	-2.132 (2.246)	0.775 (3.296)	0.444 (4.212)	-5.084 (6.239)	-4.992 (9.080)
Ratio of banks		-5.640 (1.286)	-6.887 (1.909)	-3.233 (2.345)		
Ratio of S&Ls	-1.868 (1.306)		-7.574 (1.842)	-4.079 (2.612)		
Ratio of credit unions	-1.139 (1.322)	-5.934 (1.256)		-2.439 (2.331)		
Ratio of currency exchanges	-2.523 (1.271)	-6.351 (1.393)	-8.454 (1.824)		-7.596 (2.918)	

Note: Standard errors are in parentheses.

TABLE 2 (continued)

Regression results

Independent variables	Dependent variables					
	Banks	S&Ls	Credit unions	Currency exchanges	Depository institutions	Financial institutions
1980 (cont.)						
African-American population	-0.109 (0.733)	-0.779 (0.721)	-1.594 (1.059)	-0.935 (1.353)	-2.260 (1.908)	-3.326 (2.753)
Hispanic population	-0.562 (1.417)	3.448 (1.394)	-0.637 (2.046)	3.086 (2.614)	2.626 (3.868)	5.587 (5.631)
Asian population	-4.961 (3.805)	-4.968 (3.744)	-7.761 (5.493)	-5.845 (7.020)	-15.824 (10.323)	-20.536 (15.028)
\bar{r}^2	0.463	0.620	0.461	0.732	0.480	0.629
Root mean square error	1.502	1.478	2.169	2.772	4.112	5.991
1990						
Intercept	6.051 (2.619)	6.753 (1.357)	8.497 (2.487)	9.592 (2.708)	10.250 (3.446)	13.725 (5.238)
Households	1.290 (0.283)	1.340 (0.300)	2.310 (0.538)	4.700 (0.578)	4.920 (0.843)	9.350 (1.303)
Households per square mile	-1.240 (1.092)	-2.420 (1.158)	-6.070 (2.077)	-9.560 (2.235)	-9.770 (3.226)	-18.430 (5.006)
Real median family income	12.770 (4.500)	2.530 (4.800)	-10.120 (8.500)	-1.680 (9.200)	5.580 (13.500)	0.980 (20.900)
Professional and technical	-1.762 (3.098)	-4.940 (3.283)	12.964 (5.892)	8.468 (6.338)	5.971 (8.941)	10.880 (13.575)
Home ownership	-4.895 (1.618)	-1.698 (1.715)	-2.049 (3.078)	-5.715 (3.311)	-9.140 (4.803)	-14.300 (7.449)
Ratio of banks		-0.946 (2.488)	-11.182 (4.558)	-15.784 (5.354)		
Ratio of S&Ls	-6.316 (2.348)		-5.798 (2.385)	-6.814 (2.663)		
Ratio of credit unions	-5.872 (2.396)	-4.082 (1.329)		-5.581 (2.020)		
Ratio of currency exchanges	-7.308 (2.617)	-5.873 (1.379)	-3.412 (1.878)		-6.108 (2.799)	
African-American population	0.990 (0.878)	-0.799 (0.931)	-2.964 (1.671)	-0.516 (1.797)	-2.886 (2.319)	-2.944 (3.319)
Hispanic population	-0.398 (1.280)	1.882 (1.357)	-1.717 (2.435)	2.712 (2.620)	0.112 (3.849)	2.593 (5.887)
Asian population	-1.839 (2.724)	-1.234 (2.887)	-1.525 (5.181)	0.096 (5.573)	-4.415 (7.914)	-7.330 (12.341)
\bar{r}^2	0.651	0.573	0.299	0.660	0.462	0.533
Root mean square error	1.435	1.520	2.729	2.935	4.379	6.831

Note: Standard errors are in parentheses.

variables explained by the regression equations, adjusted for degrees of freedom—range from just under 0.30 to 0.73. In many respects, these results are similar to those found by Kaufman (1970) for 1956, 1960, and 1966, with some differences in the importance of individual explanatory variables.

The explanatory power of the regression equations for currency exchanges is much greater than that of the equations for the other types of financial institution. The adjusted \bar{r}^2 s for 1970, 1980, and 1990 are 0.61, 0.73, and 0.66, respectively. In large part, this is a result of the importance of convenience in explaining the

demand for the services of currency exchanges and, consequently, the importance of the number of households and the density of households in the equations. A standardized regression coefficient, or beta coefficient, is calculated by multiplying the estimated regression coefficient by the ratio of the standard deviation of the associated independent variable to the standard deviation of the dependent variable. It provides a measure of each variable's statistical contribution to the explanation of the variation in the dependent variable; the larger the absolute value of the coefficient, the greater the contribution. The beta coefficient of the number of households ranges from 0.88 in 1970 to 0.99 in 1990, and that for the density of households from -0.44 in 1980 to -0.61 in 1990. Median real family income enters the currency exchange office equation with a negative sign, supporting the widespread perception that such institutions provide a mix of services that is primarily demanded by low-income households; however, it is statistically significant only in 1980.¹⁰

The regressions for commercial banks and savings and loan associations have very similar explanatory power, with adjusted r^2 s ranging from 0.37 to 0.68. Again, number of households is the most important explanatory variable, with a beta coefficient ranging from 0.44 to 0.61. Household density within the community is significant in the savings and loan equation but not in that for commercial banks, probably reflecting the fact that banks typically draw customers from a somewhat broader area than do savings and loans. Median real family income is significant only in the commercial bank equation for 1990. The explanatory power of the racial composition variables is discussed below.

The poorest job of explanation is done by the credit union regressions, which have adjusted r^2 s in the three years of 0.41, 0.46, and 0.30. In all probability, this reflects the affinity group restrictions on such institutions and the likelihood that these institutions are located at one of the offices of the affinity group rather than in the communities where the group's members reside. As in the case of currency exchanges, the most important explanatory variables are number of households, density of households, median real family income (again entering with a negative sign), and the professional-technical occupation variable, which enters significantly and positively.

Important variables

In view of its expected close relationship to the demand for financial services, it is not surprising that the variable with the greatest explanatory power in all of the regressions is the number of households. Its regression coefficient is consistently positive and its t value and beta coefficient are greater than those for the alternative variable, population. Its superiority over population is probably due to the fact that in most families, financial business is consolidated at the household level and does not vary greatly with the number of family members. Household density, although not significant in the regressions for commercial bank offices, is statistically significant and has the expected negative sign in all the other regressions.

The competition variables consistently enter the equations with the expected negative sign and are statistically significant in the great majority of cases. The beta coefficients range from 0.10 to over 0.90 and average between 0.20 and 0.30. The coefficients of the variables do not show the expected pattern of substitutability among the different types of institutions; that is, the share of savings and loan offices does not have a much stronger effect on the number of commercial bank offices than does the share of currency exchanges. Similarly, the number of currency exchange offices appears to be at least as closely related to the share of banks and savings and loans as to the share of credit unions. The adjusted r^2 s of most of the regressions actually increase when the shares of the individual types of institutions are aggregated into a single number. The regressions with the individual shares are shown because of the interest that may attach to their coefficients.

Of the two measures of financial sophistication used in the analysis, the proportion of the population employed in professional or technical occupations has the greater explanatory power. In many of the equations, its inclusion eliminates the significance of median real family income, with which it has a simple correlation of 0.53. The proportion of the population with a high school education or better does not enter significantly in most of the regressions and was dropped from the final specification.

Liberalization of branching and holding company laws

An important test of the reliability of regressions estimated at different points in time

is the stability of their coefficients and explanatory power over time. By and large, the regressions estimated here appear to be reasonably stable over time. In most cases, the coefficients on the same variables for each of the years 1970, 1980, and 1990 have the same sign and are of the same general magnitude. An important exception is the gradual increase in the size of the coefficient on number of households in the equations for bank and savings and loan offices over the two decades covered by our analysis. Thus a community with a given number of households tended to have a larger number of such offices in 1980 and 1990 than in 1970. Although a number of factors may have contributed to this result, the liberalization of Illinois's highly restrictive branching and holding company laws, which made it easier for the number of offices to respond to economic and demographic forces, probably played an important role. This greater responsiveness to market forces was also evident in the explanatory power of the equations for commercial banks; the r^2 s rose from 0.37 in 1970 to 0.65 in 1990.

The effect of racial composition

The regression results for each of the years 1970, 1980, and 1990 indicate that when relevant economic and demographic variables are accounted for, the racial and ethnic composition of a community's population is not significantly related to the number of financial institution offices. This tends to confirm Kaufman's finding for 1966. The only exception is in the equations for savings and loans for 1970 and 1980. The proportion of the population that is Hispanic enters these equations significantly and with a positive sign, indicating that savings and loans are over-represented in areas populated heavily by Hispanics. However, the coefficient is not significant in 1990.

Conclusions

This study has found that the geographic distribution of financial institution offices in Chicago is determined largely by a relatively few basic economic and demographic variables. By far the most important of these is the number of households in a community area. Nearly as important, because of its close relationship to convenience of access, is the area over which those households are spread, as measured by the number of households per square mile. Median real family income is significantly and positively related only to the number of commercial bank offices and only in the regression for 1990. Competition, as reflected by the relative importance of other types of financial institution in the community, consistently has the expected negative effect on the number of offices.

The study found a positive relationship between the Hispanic proportion of the population and the number of savings and loan offices in 1970 and 1980. Otherwise, the statistical results failed to show any effect of racial or ethnic composition on the number of financial institution offices once relevant economic and demographic variables were taken into account. This finding suggests either that financial institutions do not generally base location decisions on racial factors, that adjustments of offices to such factors are very slow, or that competition in the financial services industry to establish offices in minority areas may be more intense than is typically believed. The findings of the study are preliminary, apply only to Chicago, and cannot be generalized to other urban areas. There is a clear need for research to see whether the conclusions reported here are supported by data from other cities.

FOOTNOTES

¹The surveys were conducted in Appleton, WI; Cedar Rapids, IA; and Elkhart, IN (Kaufman 1967).

²One of the early studies of this question took states as the unit of observation and used multiple regression analysis to estimate equations relating the total number of banking offices to such economic and demographic variables as personal income, employment, population, and population dispersion (as measured by the ratio of agricultural to total employment), and a dummy variable indicating whether the

state prohibited branching, permitted limited branching, or permitted statewide branching (Lanzillotti and Saving 1969). An unpublished paper by an officer of a large Chicago bank used similar methodology, but data for every county in the continental United States, to study the same question (Woods 1970). An economist at the Federal Reserve Bank of Chicago conducted a similar but more refined study using county data for a more recent date (Evanoff 1988). See also Savage and Humphrey (1979) and Seaver and Fraser (1979 and 1983).

³The study examined the number and distribution of offices of commercial banks, savings and loan associations, and currency exchanges among community areas in Chicago (Kaufman 1970).

⁴Kitagawa and Taeuber (1963), p. xiii.

⁵Area 76 (O'Hare) was added in 1960 following the annexation of land for O'Hare Airport. Area 3 (Uptown) was divided into two areas in 1976—the northern part, which kept the same number and designation as the original and the southern part, which was given the new number 77 and named Edgewater. The numbers for the two new areas were recombined in the tables and statistical analysis for 1980 and 1990 in order to maintain comparability with the data for 1970.

⁶See, for example, Federal Reserve Bank of Chicago (1987).

⁷For a more detailed description of the process of urban change, see Kasarda (1976).

⁸In Chicago, specifically, it is often asserted that savings and loan associations tend to be concentrated in communities heavily populated by people of eastern European descent, primarily because of the important role they played in the organization and management of those institutions. However, as H. Morton Bodfish noted in his well-

known history of savings and loans in the United States, many other nationalities, including Lithuanians and Swedes as well as Czechs, Slovaks, and Poles, formed their own associations (Bodfish 1931). Several variables measuring the concentration of national or ethnic groups in the population added little explanatory power to the regressions for savings and loans and were dropped from the analysis.

⁹This is why, even though most studies indicate that economies of scale can be realized by banks at least up to an asset size of \$100 to \$200 million, farm states with populations dispersed over a wide area may have hundreds of banks, few of which are large enough to realize minimum unit operating costs. As land area continues to expand with a given population—that is, the population density becomes ever lower—the number of institutions will increase at a decreasing rate and will actually turn down at some point, when it becomes difficult to find locations with enough demand to support an office.

¹⁰Kaufman found median family income to be unrelated to the number of commercial bank offices and significantly inversely related to the number of savings and loan associations, currency exchanges, and total financial institutions in his simpler regressions, but not significant in any of his equations that also contained the ratio of employment to population and retail sales as measures of economic activity (Kaufman 1970).

SOURCES

Economic and demographic data in this article were obtained from the *Local Community Fact Book for Chicago* for 1950 and 1960, prepared by the Chicago Community Inventory of the University of Chicago and from the *Chicago Statistical Abstract: Community Area Profiles* (the title varies), prepared by the Department of Planning of the City of Chicago for 1970, 1980, and 1990. Both of these publications rely heavily on data provided by the U.S. Bureau of the Census. Data on the number of commercial banking offices were obtained from the *Summary of Deposits* prepared by the Federal Deposit

Insurance Corporation, *Polk's Bank Directory*, and the *Rand McNally Bankers Directory*. Data on offices of savings and loan associations, credit unions, and currency exchanges were obtained from the *McFadden American Savings Directory*, the *Rand McNally U.S. Savings Institution Directory*, the *Ameritech Pages Plus Consumer Yellow Pages* for Chicago, the *Illinois State Chartered Credit Union Directory*, the *National Credit Union Administration Directory*, and the Illinois Credit Union League.

REFERENCES

Bodfish, H. Morton, *History of Building and Loan in the United States*, Chicago, IL: United States Building and Loan League, 1931.

Evanoff, Douglas D., "Branch banking and service accessibility," *Journal of Money, Credit, and Banking*, Vol. 20, No. 2, May 1988, pp. 191-202.

Federal Reserve Bank of Chicago, *Economic Perspectives*, Vol. 12, No. 5, September/October 1987.

Kasarda, John D., "The changing occupational structure of the American metropolis: apropos the urban problem," in *The Changing Face of the Suburbs*, ed. Barry Schwartz, Chicago: University of Chicago Press, 1976.

Kaufman, George G., "Bank markets and services: three surveys," in *Commercial Banking: Structure, Competition, and Performance*, Federal Reserve Bank of Chicago, August 1967, pp. 28-32.

Kaufman, George G., and Roberta K. Detz, "A profile of banking in Chicago," *Staff Memoranda*, Federal Reserve Bank of Chicago, November 1970.

Kitagawa, Evelyn M., and Karl E. Taeuber, eds., *Local Community Fact Book, Chicago Metropolitan Area, 1960*, Chicago: Chicago Community Inventory, University of Chicago, 1963.

Lanzillotti, Robert F., and Thomas R. Saving, "State branching restrictions and the availability of banking services," *Journal of Money, Credit, and Banking*, Vol. 1, November 1969, pp. 778-88.

Savage, Donald, and David Humphrey, "Branching laws and banking offices," *Journal of Money, Credit, and Banking*, Vol. 11, May 1979, pp. 227-30.

Seaver, William, and Donald Fraser, "Branch banking and the availability of banking services in metropolitan areas," *Journal of Financial and Quantitative Analysis*, Vol. 14, March 1979, pp. 153-60.

_____, "Branch banking and the availability of banking offices in nonmetropolitan areas," *Atlantic Economic Journal*, Vol. 11, July 1983, pp. 72-78.

Woods, Jack H., "Branch banking and the adequacy of banking facilities," unpublished manuscript, 1970.

The Role of Banking

Declining?

On May 11-13, 1994, the Federal Reserve Bank of Chicago will hold its 30th annual Conference on Bank Structure and Competition at the Westin Hotel in Chicago. The Conference is generally considered one of the leading forums for public policy issues related to the financial services industry.

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- *Is commercial banking truly in decline or is the composition of its activities simply evolving?*
- *What institutions are replacing banks in performing the traditional "banking" functions?*
- *What are the causes of this decline or evolution?*
- *How should bank managers respond?*
- *Does the alleged decline create problems related to monetary policy, systemic risk, social objectives including credit allocation programs, the efficiency of the intermediation process, or the payments system?*
- *If so, how should those problems be addressed?*

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