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The Role of Amenities and Other Factors in Influencing the Location of Nonmanufacturing Industry in the United States

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ABSTRACT

Consumer and producer services, the latter in particular, are expected to become an important means of diversification and employment growth to the economy of the Nevada. It has been suggested that the siting of the nuclear waste repository at Yucca Mountain, Nevada, will lead to a significant reduction in the amenity value of the state and, consequently, the ability of the state to attract these nonmanufacturing industries. This report reviews the literature dealing with factors important to the location of services, with an emphasis on producer services, to determine whether amenities, which have been shown to be an important locational consideration for some manufacturing firms, similarly affect the location of services. The report finds little substantive evidence to link amenities with the location of service firms, although the process by which these firms' locations are chosen is not well understood. Research in this area is comparatively recent, and although a number of theories of service location have been developed, the majority of research is exploratory in scope.

SUMMARY

In Nevada, nonmanufacturing industries (also called service firms), particularly producer services, have been identified as a fertile source of employment growth and as an important part of the state's attempt to diversify its economy away from the gaming and hospitality industries. Because many manufacturing firms are highly flexible in their locational requirements, they may choose new locations on the basis of their amenity (aesthetic) value. It has been suggested that the siting of the nuclear waste repository at Yucca Mountain, Nevada, will adversely affect the amenity value of the state. Therefore, some service firms may view Nevada locations in a different light with the completion of the repository. This report investigates possible links between the location of service firms and locational amenities in comparison with other siting factors.

A distinction is made between consumer services -- those that sell to final demand (the general public) -- and producer services -- those that sell to intermediate demand (other firms). Attempts to place service activities within one of these categories can be problematic. Four classification schemes are identified and described.

The locational analysis of consumer services is based on Christaller's central place theory. According to this theory, the level of provision of services in a settlement or urban area is determined by market thresholds (minimum population/income density) necessary for service firms to remain in business. The more specialized the service offered, the larger the market and settlement size that is needed for a firm to be profitable.

Analyses of the location of producer services have often focused on offices, which are largely occupied by producer service firms. Offices have traditionally been located in central cities to take advantage of agglomeration economies where the cost of face-to-face contacts can be minimized. Recently, however, advances in telecommunications have allowed the decentralization of some office functions to the suburbs and hinterlands of urban areas.

In the literature, it has often been suggested that amenities are considered to be important influences on where manufacturing industries are being located. In a review of this literature, amenities were found to be significant factors for industries that are highly flexible or footloose in their locational requirements, particularly high-tech industries. Results of a joint industrial-location survey by West Virginia University and the Economic Development Administration seemed to show that Nevada amenities were important to the decision to locate for a small sample of manufacturers that conducted both regional and local searches for suitable locations. Respondents did not think that the waste repository would affect the amenity value of their locations or compel them to move elsewhere. Much less evidence exists to suggest that amenities influence the location of service firms, although amenities are rarely included in locational analyses.

The majority of research on locational factors for service firms centers on the relative importance of supply versus demand factors to the growth and location of service activities. The globalization of some service activities, such as finance, accounting, property, and advertising, has led to their concentration in a number of "world cities," such as New York, Chicago, Los Angeles, and San Francisco. The increasing technological sophistication of manufacturing has led to the externalization of many service activities by manufacturing firms and the growth of many specialized service firms, and each firm has its own locational requirements. Because firms in both sectors are becoming more interdependent and integrated, the service provision in a location is a significant locational pull for manufacturers (and vice versa). Expansion and diversification by manufacturing and service firms, either through internal growth or through mergers and acquisitions, have also changed firms' locational requirements as they reorganize and rationalize the location of their activities. Many firms now provide services to other firms from increasingly separate (spatially and functionally) operations. These developments began with changes in corporate structures and have been exacerbated significantly in the last two decades by advances in telecommunications.

Changes in the geographic distribution of service activities that have resulted from these developments are considered from two perspectives: first, by examining changes in the spatial distribution of service employment, and second, by relating changes in the pattern of service provision to the functional structures associated with corporate organizations that have been identified by Noyelle and Stanback (1984).

1 INTRODUCTION

The siting of a nuclear waste repository in Nevada may have several effects on the state's economy, and it has been suggested that such a facility might make the state less attractive to new industry. If the Office of Civilian Radioactive Waste Management (OCRWM) is to understand the potential impacts of a proposed high-level nuclear waste repository on the attractiveness of the state for new business, it must first understand the process by which decisions are made to select locations for new industrial facilities, the methods that are used in selecting sites for new industry, and the influence of amenities and perceived risk of noxious facilities on a location decision.

Calzonetti (1990) evaluated methods used by the manufacturing sector to select new sites and the importance of amenities (aesthetic quality) in such decisions. The purpose of the current study is to consider nonmanufacturing industry (producer and consumer services), which is expected to be more important to Nevada's economy than manufacturing industry. In this report, we attempt to determine if those responsible for choosing sites for manufacturing firms are sensitive to factors that are related to amenities and to locations perceived to have certain risks (relating to natural or man-made hazards). To determine if previous research has found amenities or risk to be important siting variables, we surveyed the literature dealing with why a non-manufacturing industry selects a particular location.

For the purposes of this report, the nonmanufacturing activity that is analyzed is restricted to services. Services are generally divided into (1) producer services -- firms that sell to manufacturers, other service firms, and to the public sector (intermediate demand); and (2) consumer services -- firms that sell to the general public (final demand). A third category, public services, is not considered in this report. Analysis of the location of consumer services has received relatively little attention in the literature, because it is assumed that the location of consumer service functions reflects the spatial distribution of population or patterns of disposable income. Analysis of the location of producer services is a much more complex issue, reflecting the increasingly international nature of some service activities, the increasingly sophisticated nature of manufacturing processes, and the increasing integration of manufacturing and service firms. Changes in corporate organization and developments in telecommunications have led to considerable functional and spatial separation and decentralization of service provision.

As a result of these developments, the importance of traditional location factors, such as proximity to raw materials and inexpensive transportation systems, has declined. A large number of inputs and products to both manufacturing and nonmanufacturing industries have a high value compared with their transportation costs, allowing many industries to become highly flexible, or footloose, in their locational requirements. Consequently, many new firms are tied only to sources of highly qualified professional labor, and they often tend to locate in areas that are rich in amenities.

The remainder of the report is organized into six sections. In Sec. 2, the service industry is defined and the problems with classification systems for such industry are discussed. In Sec. 3, an overview of the theoretical contributions to the literature on the

location of the service industry is provided. In Sec. 4, the role of amenities, as a factor influencing the location of industry, is described. Section 5 discusses the role of supply and demand factors in the growth and location of services, and Sec. 6 discusses changes in the spatial distribution of service activity. Section 7 offers a number of conclusions and comments on the role of amenities in the decision to locate service industry facilities.

2 DEFINITION AND CLASSIFICATION OF SERVICE INDUSTRY ACTIVITY

2.1 INTRODUCTION

Analysis of the location and growth of services is complicated by problems of definition and measurement. Services have traditionally been perceived as a residual to other activities in the manufacturing sector. Changes in the organizational structure of industries and the nature of service output have also complicated the definition and measurement process. An increasing number of functions traditionally performed by manufacturing firms are now provided externally to the firm by specialist producer service firms. An increasing number of services are concerned exclusively with service provision through information technologies that are not related to any physical product. Four approaches have been developed to define and classify service activities: traditional, output-based, activity- and function-based, and occupation-based.

2.2 TRADITIONAL APPROACHES

Industries have traditionally been classified according to the physical characteristics of their product, and this classification has often been extended to apply to service activities. Hence Clark's (1940) definition of primary (extractive), secondary (manufacturing), and tertiary (services) characteristics* has remained the standard system. In this system, service activities are treated as residuals to primary and secondary activity and are a function of activities in the primary or secondary groupings for their existence.

2.3 OUTPUT-BASED APPROACHES

Services are provided as both an intermediate and final product, and this distinction clearly needs to be recognized in classification systems. To recognize this distinction, Singelmann (1979) proposes a classification system that is based (shown in App. A) on Standard Industrial Classification (SIC) codes. Two-digit industries are separated into groups according to whether they contain services that are primarily intermediate or final outputs. Singelmann's framework also distinguishes services that are provided by the private and public sectors and by nonprofit parts of the economy. Six groups of service activities are identified: distributive, corporate, retail, consumer, nonprofit, and government services.

Distributive services (transportation, communication, utilities, and wholesale) are provided primarily to meet intermediate demand, but retail services cater to final consumers. Corporate services are specific producer services and service functions provided to or within corporate organizations. Corporate services include finance, insurance, real estate, accounting, legal, advertising, consulting, and similar services provided within corporate structures. Consumer services include hotels, movie theaters,

*A quaternary (offices) sector is often added to the classification.

repair services, and personal services. However, problems arise with this schema, because it classifies the output of service activity by type of output rather than the use to which the service is put. Many services are provided to both producers and consumers (restaurant, legal, and accounting services, for example) or to government and nonprofit organizations.

2.4 ACTIVITY- AND FUNCTION-BASED APPROACHES

Increasing interdependence between the manufacturing and service sectors has become commonplace as the production of goods and service involves more and more service functions (Bailly et al. 1987). An important manifestation of this increasing interdependence is that service functions may be provided within the firm as internal services or by an independent firm as an external service. The extent to which the service provision is internalized is shown by the proportion of employment by manufacturing firms that is not directly related to production. This proportion has steadily risen in the United States and other industrialized countries; it is now between 25% and 30% (Bailly et al. 1987) and has reached more than 35% for a number of high-tech industries (Coffey and Polese 1986). Internalized services are primarily management, marketing, research and development, and corporate planning.

Manufacturing firms may choose to buy a number of services from legally independent firms for various reasons, in particular to increase profitability, flexibility, or efficiency. Expertise in the form of new methods and ideas and innovative capacity provides inputs to production processes. Typical services provided externally are transportation, financial services, insurance, and a number of producer services, such as engineering, management consulting, accounting, legal services, and advertising. These producer services have grown substantially since the 1950s, and by 1977, they represented 12% of all service sector employment in the United States (Stanback and Noyelle 1984) and 7% in Canada (Coffey and Polese 1986).

Bailly et al. (1987) propose a two-dimensional typology of firm activities and functions (App. B) to take into account high levels of interdependence between service and manufacturing activities. The authors envisage a production system encompassing four main activity groups: fabrication, circulation, distribution, and regulation. Firms can be classified within this system according to their functional classification. The following seven functional types are included: research and development, supply and stocks, organization, execution and operation, management and control, maintenance, and sales and trade.

2.5 OCCUPATION-BASED APPROACHES

Occupations that primarily involve the production, processing, and distribution of information have grown significantly. For example, by 1981, between 40% and 50% of the labor force in Organization for Economic Cooperation and Development (OECD) countries worked in these occupations or in those immediately affected by innovations in information technology. Hepworth (1986) found that 60% of net national growth in the Canadian economy was concentrated in information occupations. Forty percent of the

manufacturing labor force was involved in information occupations, and this percentage was higher for a number of industries within manufacturing (petroleum and coal products 58.2%, chemical and chemical products 57.0%, electrical products 51.2%, and nonelectrical machinery 49.3%). Hepworth (1986) and Hepworth et al. (1987) have devised a service classification scheme that attempts to identify the extent to which occupations are combined with information technologies. The definitional scheme devised by Porat (1977) is combined with Singelmann's categories to classify labor as information producing, processing, distributional, or infrastructural (App. C).

3 THEORIES OF SERVICE INDUSTRY LOCATION

Attempts to provide a theoretical basis for the location of services have been made in two areas: theories of location of consumer services and theories of office location. Theories of location that can be applied specifically to consumer services are discussed in Sec. 3.1. Theories that have been developed to address the issue of producer service location, specifically the location of office functions and office employment, are discussed in Sec. 3.2.

3.1 THEORIES OF LOCATION OF CONSUMER SERVICES

Christaller (1966) developed the central place theory to explain the size and spatial organization of service activities according to factors that determine the size of the market each firm can develop. According to Christaller, the size of a firm's market depends on the economies of scale available to it, the extent of demand, and transportation costs for both inputs and outputs (Stanback 1979). Scale economies in the production of a service dictate the size the firm must attain if it is to compete successfully, and minimum sizes vary widely among types of service activity. The population density in an area (i.e., its purchasing power) dictates the size of the market in which the firm must compete in order to (1) sell sufficient output, (2) achieve scale economies, and (3) minimize production costs necessary to stay in business. Transportation costs may also delimit market areas if some areas are relatively inaccessible or if certain modes of transportation are not available.

The central place theory establishes a minimum size necessary (or threshold) for the market of a service. Services with small thresholds (such as gas stations, grocery stores, and restaurants) may be able to locate in many small settlements or suburban centers. For these services, establishment size will be small, and they will tend to be fairly ubiquitous. Services with larger thresholds, such as department stores and hotels, may need to locate in towns or small cities to reach their threshold market, and these services will be fewer. More complex and specialized services must locate in large urban centers to maintain the necessary economies of scale to compete.

According to Christaller's central place theory, service activities are organized hierarchically, and location reflects the need to achieve a threshold market size. Therefore, cities have a functional basis as service providers (Stanback 1979). Urban places sell services to their hinterland (including places lower down the hierarchy to centers that have less-specialized service output) and buy services from centers higher up the hierarchy that have a more specialized provision. Central place theory can explain the provision of service activity in areas where population is spread evenly over a large area (Berry and Garrison 1958). In areas where population is distributed less evenly, service firms may be able to locate near their competitors, compete in the same markets, and still maintain their economies of scale through product differentiation and specialization.

3.2 THEORIES OF OFFICE LOCATION

In addition to establishing a market area of sufficient size, producer service firms, in particular, benefit from locating close to major customers and suppliers. The consequent external economies are important for the location of many new service activities, which may need to develop linkages with competitors or external services to reduce start-up risks (especially for small firms). Start-up risks may increase rapidly with distance from potential markets. Larger service firms may need to be in larger markets to take advantage of agglomeration economies that come from the intense variety of information sources and the specialized, highly skilled pool of labor resources available in urban centers. Therefore, agglomeration economies are external economies generated through interaction among large numbers of firms and their personnel (Tauchen and Witte 1983).

Malamud (1971) suggests that firms seek an administrative configuration that maximizes interaction potential. Within this framework, the location problem has two aspects: (1) how administrative work is to be distributed among locations (at the plant[s] or at the headquarters) and (2) how facilities are to be situated at a certain site. Malamud uses a conventional gravity function to model the location of administrative and managerial services of manufacturing firms. The volume of interaction between categories of executives increases less than proportionally with their number, which reflects that most executive interaction is among a small number of high-level administrators and managers.

For the manufacturing firm, the problem of where to locate office functions is, to a large extent, influenced by the distribution of manufacturing establishments. Office functions of small firms tend to be located alongside production facilities, and in larger organizations, activity is concentrated in specialist centers. More than 60% of 92 United States multiplant firms in 1970 had headquarters in the same city as their largest plant (Malamud 1971). Administrators are drawn toward headquarters locations to maximize the weighted sum of internal interactions.

However, agglomeration economies in central locations are available to service functions of manufacturing plants, and these functions may outweigh the costs of separation of office and production facilities. Agglomeration greatly encourages external contacts because the physical distance between them is reduced, even if internal contacts need to be stretched. Malamud's model uses rents for office space inside the city to establish locations within city center agglomerations. The adjustment process is iterative, and it eventually leads to an equilibrium state where no firm wants to change the location of its offices. Although Malamud's model identifies interaction potential as the key factor, it is only inferred, not explicitly measured, as a by-product of the agglomeration of administrative workers, defined in terms of rents and accessibility. The model cannot specify the allocation of service functions between headquarters and branch plants.

More recent attempts to analyze the location of offices using equilibrium techniques focus on the role of communication. Clapp (1983), for example, attempts to model the cost effects of changes in office location in response to changes in public policy. The characteristics of office locations are closely dependent on spatial patterns

of contact (face-to-face, documentary, or via telecommunications) and their associated costs. Costs are determined by the intensity of contact (number of trips per unit of time) and the variety of contacts (the pattern of interdependency among activities). Policies to relocate office activities will alter the spatial pattern of contacts, which will lead to changes in transportation costs for contacts between personnel and for journeys to work for employees. Transportation costs for activities (a), their locations (h), and contacts (x) are $f(a, h, x)$; contact intensity between a and the contact x is $c(a, x)$; and total transportation costs per time period for a contact x are $f(a, h, x)c(a, x)$.

Transportation costs depend on the point of origin (h) and the contact (x). The $f(a, h, x)$ term depends on the activity initiating the transportation: travel by executives or by clerical employees. Contact intensity depends on the two activities, not the distance between them, and contact variety depends on the initial pattern of locations.

Transportation costs F , for a and h, are, therefore, the sum of activities contacted by a; thus:

$$F(a, h) = \sum_{x=1}^N f(a, h, x)c(a, x) \quad (3.1)$$

Changing the location of activities changes total transportation costs for the system, where:

$$T(h_1, h_2, \dots, h_n) = \sum_{a=1}^N F(a, h_a) = \sum_{a=1}^N \sum_{x=1}^N f(a, h_a, x)c(a, x) \quad (3.2)$$

Clapp uses the model to estimate new transportation costs for relocation policies that attempt to promote development in depressed areas to reduce congestion costs.

Clapp, following earlier work by O'Hara (1977), assumes that contact patterns are specified exogenously and all firms benefit from access to information in the Central Business District (CBD). Tauchen and Witte (1983), however, suggest that contact patterns are determined endogenously as part of a firm's profit maximizing calculus. Contact and location decisions are made simultaneously, taking into account the level of interdependency among firms and the effect this interdependency has on land values. Tauchen and Witte set up a model for a hypothetical CBD that is square, has a rectilinear road network, and has contacts between firms limited to the CBD. Net revenue (V), which results after payment of all costs except rent and contact costs, depends on the number of contacts a firm at (x, y) has with other firms (u, v), thus:

$$f[V(x, y; u, v)] \quad (3.3)$$

Net revenue (V) is nonnegative, although it may eventually decrease and turn negative, reflecting that the value of additional contact time may be counterproductive in terms of employee time (Goddard 1979).

Total net revenue of a firm at (x, y) is the aggregate benefit from all contacts:

$$\iint f[V(x, y; u, v)]G(u, v)dv, du \quad (3.4)$$

where G is the firm density function. Round-trip costs, C per unit-distance, to a firm at (x, y) for a contact with a firm at (u, v) are:

$$t(x, y; u, v) = c(|x - u| + |y - v|) \quad (3.5)$$

Total contact costs for a firm at (x, y) are:

$$T(x, y) = \iint t(x, y; u, v) V(x, y; u, v) G(u, v;) du, dv \quad (3.6)$$

The long-term cost of providing office space for G firms on one unit of land is $K(G)$, which Tauchen and Witte refer to as the facility cost curve.

In Tauchen and Witte's model, there are no barriers to entry or exit for office firms or on the construction of office space. Office firms choose their location and the number of contacts to maximize profits. Likewise, property developers determine how much office space to provide at each location to maximize their profits. The result is an equilibrium allocation of resources, with each firm choosing a profit-maximizing number of contacts; the rental rate for office space is the marginal cost of providing it. Each firm has zero economic profits, which discourages relocation in or outside the CBD. Lower contact costs at the center of the CBD are balanced by higher rents.

Tauchen and Witte solve their model for hypothetical parametric values representative of U.S. cities with populations between 1 and 2.5 million people and calculate the effects of changes in technology, prices, public policy (specifically changes in the contact-benefit function), transportation costs, and the land area of the city.

Kutay (1986) presents a model of optimal office location that identifies access to labor market costs rather than space or contact costs as the dominant cost component. He suggests that rents are primarily location rents in return for access and are, therefore, a function of transportation costs that are saved. Transportation costs are incorporated into the model as a component of access to labor markets. In Kutay's model, business contacts are endogenously determined by offices trying to minimize access to labor market costs and distributing information costs. The number of contacts is assumed to be proportional to the value of the information produced by the office.

Kutay develops his model under two scenarios. In the first, computers and telecommunications do not significantly affect office operations; in the second, the effects of computers and telecommunications are considered. Under the first scenario, the office location problem is one of minimizing access (transportation) costs (S_a, S_b) of two broad categories of employees (clerical and professional) living in separate areas of the city and minimizing face-to-face contact costs (S_c) with other firms in the CBD. The location problem is therefore expressed as:

$$\text{Min} T = \alpha(P_a + r_a \cdot S_a)A + \beta(P_b + r_b \cdot S_b)B + i_0[nx]S_c r_c \quad (3.7)$$

where:

$$i_0 = F(A, B);$$

i_0 = the value of information produced by clerical and professional employees;

P_a, P_b = nonsalary benefits to compensate for commuting;

r_a, r_b = commuting costs;

n = the number of employees traveling to the CBD for information distribution;

x = the average number of trips to the CBD/employee/unit of information; and

α, β = weights for professional/administrative and clerical/secretarial personnel in information production, respectively.

Kutay assumes that the information production function has a Cobb-Douglas form. The first-order conditions that yield optimal solutions for A , B , and S come from the Langrangian:

$$L = \alpha(P_a + r_a \cdot S_a)A + \beta(P_b + r_b \cdot S_b)B + i_0[nx]S_c r_c + \lambda[i_0 - F(A, B)] \quad (3.8)$$

Kutay's model provides a mathematical description of the decentralization of offices to office parks, middle- and high-income residential neighborhoods, airports, and shopping centers that has occurred since the late 1960s and early 1970s. The optimal office location in this framework may change, depending on the character of the information production function. If office functions exhibit increasing returns to scale, they may move farther toward the CBD as the costs of distributing information increase faster than those of accessing labor markets. If the function shows decreasing returns, the office will move toward suburban areas.

Communications technologies may have reduced the need for agglomeration because of developments in information transfer and time-sharing techniques for data-base access to remote locations. To Kutay, the office location problem is still one of access to the labor market, but time-sharing techniques for data-base access are now expressed in terms of access to a multicentered system of possible locations rather than one central CBD. The office location problem becomes:

$$\begin{aligned} \text{Min} T &= \alpha(P_a + r_a \cdot S_a)A + \beta(P_b + r_b \cdot S_b)B + i_0 \sum_{i=1}^N S_{ci} c_{tele} \\ \text{subject to } i_0 &= f(A, B, \phi) \end{aligned} \quad (3.9)$$

where c_{tele} is the cost of transforming a unit of information and ϕ is the investment resources available to the office other than for telecommunications; thus:

$$c = \sum_{i=1}^N s_{ci} \quad (3.10)$$

Kutay then sets up a new Lagrangian and defines new first-order conditions for N , ϕ , and c .

Coffey and Polese (1987) develop a model of service employment that is driven by trade in service inputs and outputs among firms. Because communication costs for inputs and outputs are essential to the location of service production, multilocal firms may place services that have the highest communication costs closest to clients, with the remainder of the production process located elsewhere. Inputs are then transferred through intrafirm channels. Communication costs may be very sensitive to face-to-face contact, although not all communication costs contain this element, which allows firms to divide service production and its accompanying costs among urban centers. The less important communication costs are, the more the firm will minimize input costs and export the finished product. Engineering services and software production may follow such a pattern and rely on extensive distribution networks.

Trade in services may be in the form of direct service exports: services produced in one region and exported to another. These services may be significant when

- Communication costs are low,
- Production costs vary significantly between locations,
- Demand is unpredictable, and
- Barriers to the establishment of a local office exist.

Service trade may occur within the firm if there is expansion in outside markets or if service firms have to establish local offices. Service exports to other regions may be undertaken by firms that provide only producer services or by manufacturing firms dispensing producer services with services provided internally. Producer service trade may also be conducted by multipoint manufacturing firms with service provision by head and administrative offices activities to manufacturing and other service activities.

In their choice of a location, Coffey and Polese suggest that producer service activities attempt to minimize total production costs. Total office production costs (TC) for a given set of service outputs are determined by the following:

$$TC = ACS + SMR + CR \quad (3.11)$$

where:

ACS = the cost of advanced corporate services;

SMR = the cost of skilled management resources (wages, commissions, and direct payments); and

CR = communication costs (travel, telecommunication, and courier costs) and recruitment costs (hiring and retention costs and nonsalary compensations, such as housing and transportation).

Skilled management resources are inputs external to the establishment and are related to specialized, established fields of skill. Although they may be highly qualified, they are involved in production processes that are standardized (i.e., labor requirements are well-defined and predictable). Computer services and specialized engineering services are within this group and may be complemented by external labor on limited occasions.

Advanced corporate services (ACS) are highly differentiated and specialized human resources that do not occur internally, except within large multilocal firms. The existence of ACS in a location constitutes an important part of external agglomeration economies associated with large city sizes. Advanced corporate services are a large component of total service cost in cases where output is unstandardized and input structures are constantly changing. General consulting, management consulting, and advertising are ACS inputs.

The choice between ACS and SMR is essentially one between internalizing and externalizing inputs. Because service outputs are relatively unstandardized and demand is unpredictable, input mixes are often unique combinations of services from a variety of locations, both inside and outside the firm, increasing a firm's locational flexibility. The relative contribution of a region's ACS and SMR varies significantly among services, with each having a unique cost function and associated communication costs for inputs and output.

The location of producer services can therefore be seen as a trade-off among market pull factors, specialized labor needs, and externalities, each with its own associated communication cost. Coffey and Polese found that in the Canadian urban system, the point of minimum communication costs is often also the point where ACS communication costs are lowest.

4 AMENITIES AS A FACTOR INFLUENCING THE LOCATION OF INDUSTRIES

4.1 INTRODUCTION

The role of amenities and factors related to the natural environment have often been noted by researchers dealing with manufacturing and nonmanufacturing location decisions. For example, in the early 1950s, Ullmann (1954) suggested a direct relationship between the shift in population to the South and Southwest in response to the superior climate and recreational amenities compared with those found in the traditional population centers in the Northeast and Midwest. The rise in per capita incomes, the growth of tourism, the location of retirees, and the decline in the importance of traditional influences over location decisions made possible the substantial shifts in population that began to occur during the 1950s and 1960s in response to the distribution of amenities.

Changes in the importance of industrial location factors have been particularly important. Changes in transportation, technology, and telecommunications have reduced the need for firms to locate close to inputs, and wage differentials among regions have narrowed substantially. Sharp decreases in employment have also occurred in primary production, where the location of production and organization is dominated by the distribution of natural resources.

Because of these developments, a larger proportion of economic activity is highly flexible in its locational characteristics. This flexibility (combined with developments in corporate organization toward the separation of corporate activities into functionally distinct units, each with its own factors affecting location) has made industries increasingly footloose. Birch (1984, p. 14), reporting the results of a Massachusetts Institute of Technology (MIT) study of innovation and growth in 5.6 million business establishments over a 12-yr period, found that "no employment growth is taking place in manufacturing where traditional location factor costs make a significant difference." Instead, employers are moving their businesses to areas that have better educated and trained labor forces, efficient public service delivery, state-of-the-art telecommunications, high-quality university research, and a high quality of life.

With the decline in importance of the traditional factors influencing location choices, the role of amenities to the attraction and growth of both manufacturing and nonmanufacturing industry seems to be increasingly significant. In this report, we use the following definition of amenities suggested by Stanback and Knight (1970, p. 230): "environmental factors such as favorable climate, attractive physical surroundings, access to parks and recreational facilities, as well as the availability and quality of educational, medical, financial, entertainment and retail services."

Davis et al. (1980) suggest that amenities may be important locational influences for decision makers in a number of respects. First, amenities may influence a firm's capital and operating costs if it must bear high heating and cooling costs in severe climates. Consistent, mild, clear weather has been advantageous to a number of industries that have located in southern California, such as the aircraft and aerospace products and motion picture industries.

Second, amenities may influence location decisions indirectly through their increased importance with respect to the locational preferences of professional and technical labor. The transition from heavy manufacturing to high-tech manufacturing and information processing has increased the demand for pools of highly specialized labor. Certain functions of firms (corporate headquarters, research and development, high-tech manufacturing, and offices in particular) may be drawn to areas with high amenity values.

Third, the personal locational preferences of decision makers may play a role in the locational choice for some firms, and these preferences may be influenced by the amenity value of some locations (Logan 1966; Smith 1971).

4.2 AMENITIES AND INDUSTRIAL LOCATION

Amenity characteristics of locations have often been cited as important to industrial location decisions (see, for example, Chisholm 1964; Eversley 1965; Hall 1970; Stanback and Knight 1970; Smith 1971; Committee on Agriculture and Forestry 1974; Quante 1976; Svart 1976; Keeble 1976, 1978, 1988, 1989; Kale and Lonsdale 1979; Ballard and James 1983; Hoare 1983) and have been promoted by planners and local authorities as a means of attracting new industry (Burgess 1982; Raitz 1988). Nevertheless, comparatively little empirical work on the importance of amenities to industrial location decisions has been undertaken. Existing work has used both multivariate analysis and industrial location surveys.

4.2.1 Multivariate Analysis

Early attempts to measure the effects of amenities on industrial location were limited by difficulties in defining amenity concepts and collecting data for them (Davis et al. 1980). Fuchs (1962), for example, attempts to explain the comparative growth in value added in manufacturing between 1929 and 1954. Exogenous variables chosen were wage levels, extent of unionization, availability of space (population density), and climate (average monthly temperature). Unionization, population density, and climate showed strong positive relationships with growth in value added. Fuchs concludes that climate has been important to the location of industries in a number of key sectors in the economy, particularly aircraft manufacturing and subsidiary industries and military establishments.

Wheat (1973) attempts to explain absolute employment growth, per capita employment growth, and percentage growth at the state level between 1947 and 1973 in a multiple-regression format. Independent variables tested were markets (population and income density), climate, labor (wage levels, unionization), land resources, and agglomeration economies. Climatic variables were January mean temperature for each state's largest city and a measure of latitude. Wheat found that climate had the second largest effect on growth in the dependent variables, second only to markets.

Nevertheless, as Davis et al. (1980) point out, the influence of amenities on industrial location extends beyond climatic factors. Amenities may also be important to the location of industry through their influence on the distribution of specialized professional and technical labor and through the personal preferences of those making location decisions. An important part of the measurement of the effects of amenities is therefore the incorporation of corporate residential space preferences into models of industrial location (Keeble 1976).

Keeble (1980), for example, attempts to explain variations in manufacturing growth in Britain using manufacturing employment density, real value of governmental regional policy incentives per unit of private sector investment, and an index of residential space preference. The index is based on a sample of 100 manufacturing firms in which respondents were asked to identify which five of a set of 24 British regions they would most and least prefer to live in. The scores were then subjected to principal components analysis (after Gould and White 1968) and used in the regression model.

Keeble found no relationship between manufacturing employment growth and the preference index. A high negative correlation was found between the index and the measure of investment incentives, which indicates that areas singled out for government assistance in the 1970s were unattractive. Keeble suggested that although residential preferences do not seem to have influenced manufacturing location during the 1970s, this was a period of prolonged industrial decline in Britain. In contrast, throughout much of the 1960s, manufacturing location seemed to be related to the preference index.

The importance of environmental amenities in influencing the migration and residential location of professional and technical labor is also featured in the literature about the location of high-tech industries. Materials and final products of this industrial grouping are typically very high value in relation to their weight, which suggests that production centers are highly footloose (transportation costs are minimally important). Of the traditional location factors, only labor is of significance to high-tech industries. It has been suggested that concentrations of these industries have a bipolar labor market, with a small number of highly skilled professionals and a large number of poorly paid routine process and assembly workers (Storper and Walker 1984; Saxenian 1985). Highly skilled professionals have a critical influence on location because they are relatively scarce and highly mobile among firms, and they tend to put a high value on quality-of-life factors because they are affluent (Markusen et al. 1986). Amenities are also important to many entrepreneurs in these industries (Keeble 1989). It has been suggested that these firms attempt to lure or follow professional workers to high-amenity locations (Rees and Stafford 1983; Joint Economic Committee 1982).

Markusen et al. attempt to model the location of high-tech industries (see App. D for definition) in the United States in a multiple-regression format. Using data from the 264 Standard Metropolitan Statistical Areas (SMSAs) for 1977, the model attempts to explain variations in the following dependent variables: number of plants, change in the number of plants, number of jobs, and change in the number of jobs. Independent variables in the model fall into the following groups:

- Characteristics of the local labor force (wage rates, unionization rate, unemployment rate, and percent black),

- Metropolitan amenities (climate, housing prices, and educational options),
- Access features (freeway density and access to a major airport), and
- Agglomerative features (presence of major business headquarters, range of business services, and research and development funding).

An additional variable measuring research and development intensity and defense spending was also included (see pp. 150-151 in Markusen et al. 1986).

Markusen et al. found that seven of the twelve independent variables contributed to an explanation of plant location in 1977 and six of the twelve variables contributed to an explanation of job distribution. Amenities (housing prices) and per capita defense spending were significant variables for employment distribution, but they were not significant variables for plants. Airport access, presence of Fortune 500 headquarters, and presence of minorities were significant variables for plant location, but they were not significant variables for employment.

4.2.2 Industrial Location Surveys

Oster (1975), after reviewing surveys of industrial location factors, concludes that amenities are of minor importance to the location of manufacturing industries. Earlier work by McMillan (1965) found that amenities played only an intermediate role. Both reviews found that surveys generally ranked market and labor factors as the most significant location determinants.

Nevertheless, incorporation of amenities into industrial surveys has often been problematic, particularly with respect to the validity of responses (Davis et al. 1980); consequently, the role of amenities may be underestimated (particularly when surveys are conducted postmove rather than premove). For example, Matz (1979), in a survey of 2,300 firms in 10 U.S. cities, asked respondents to rate characteristics according to how strongly each was likely to either encourage relocation or expansion at the present location. Three amenity-related responses (crime level, quality of schools, and cultural attractions) were ranked in the top seven. Eighty percent of respondents claimed that these characteristics either strongly encouraged or discouraged future action. A survey by McMillan (1965) yielded similar findings. In the survey, he asked respondents to choose important characteristics of possible new sites for a hypothetical move. Of 30 possible responses, pleasant living conditions ranked 15th (39% of respondents listed it as important), and recreational and cultural facilities ranked 25th (25% of respondents thought such facilities would be important).

The importance of amenities also seems to vary according to the spatial scale at which the location decision is made. Schmenner's (1978) survey of headquarters in the New England region attempted to establish factors important to plant site selection. At the regional level, markets (73% of respondents ranked as important) and labor (wages 49% and labor skills 40%) were most frequently ranked as important. Amenities (aesthetic quality) were important to 9.1% of respondents. At the local level, 17.6% of the respondents ranked amenities as important. No respondents, however, ranked

amenities as the single most important factor at the regional level and only 2.8% did so at the local level.

Nevertheless, Spooner (1973), in a survey of 247 industrial facilities that had moved into the Devon and Cornwall region of Britain between 1937 and 1967, found amenity factors to be more important to the regional search. Eight factors were considered, and 29.5% of the plants indicated that the region was attractive to key workers and management; only 22.5% mentioned the availability of labor supply, and 12% indicated that proximity to other plants in the region was a factor. Amenities also ranked second when the number of plants mentioning a factor was considered. Sixty-five percent of plants cited labor as important and 49% cited amenities. Proximity to other plants and regions and other labor advantages (captive labor market, militancy, and labor costs) were mentioned by 24% of the plants surveyed.

Large samples have been criticized for their subjectivity in the identification of factors. Researchers may, in some cases, have preconceptions of firm behavior that may discourage decision makers from specifying relevant location factors. To overcome this problem, Stafford (1974), in a survey of manufacturing relocation in southeastern Ohio, used evidence from only eight firms. Content analysis was used to reveal and assess the location-decision process. Total responses for all factors were considered on the basis of (1) the complete interview and (2) evaluated responses (where the interviewee was asked to briefly summarize the location decision). Stafford found that local amenities were ranked sixth (61 responses from a total of 1,917), behind personal contacts, labor factors (productivity, rates, and availability), transportation, and markets. Induced amenities, those specifically installed to attract new firms, ranked 13th, with 17 responses. When the decision maker was asked to summarize the location decision (evaluative response), local amenities ranked fourth (49 of 548 responses).

Total responses and evaluated responses were then disaggregated to four spatial scales (national, subnational, regional, and local). For the total responses, induced amenities ranked in the last three at each spatial scale, but local amenities seemed to be more important as the decision process became more localized. At the regional scale, local amenities ranked sixth (22 out of 308 responses), and at the local scale, local amenities ranked third (36 out of 350 responses). At both scales, however, the primary factor, "personal contacts," was clearly the dominant response, with 71 out of 308 responses at the regional level and 109 out of 350 responses at the local level. Similar findings came from the evaluated responses, with local amenities more important at the regional (sixth, 15 out of 172 responses) and local level (third, 32 out of 223 responses). Again, personal contacts seemed crucial to the location decision, particularly at the local scale.

A number of industrial location surveys have been conducted recently that consider the importance of amenities to the location of high-tech industries. McGregor et al. (1986) surveyed 85 high-tech manufacturing and service firms in Berkshire, west of London in Britain. These firms manufactured electronic data processing equipment and telecommunications equipment and offered consulting services. A control group of firms from all firms in the area was established with respect to size of firm, sector, and years at present site. Chi-square tests were then conducted to establish differences in importance for a series of location factors. In descending order of importance, these

factors were communications, accessibility, staff availability, regional policy, and amenities (environment and housing). The result of the survey showed that amenities were perceived as a favorable locational inducement by 51% of the respondents for high-tech firms, compared with only 33% for the control group of firms.

A subsequent survey by Hall et al. (1987) of 40 high-tech firms in the same area of Britain also reveals the significance of amenities to firms in this sector. High tech is defined on the basis of the percentage of the workforce in technical occupations in each SIC group (after Markusen et al. 1986). Hall et al. then extract ten SICs from this list on the basis of research and development intensity (see App. E). Firms surveyed are separated into three groups: United Kingdom based/single site, multisite, and multinational/multisite. Firms were asked which location factors were important, and these were categorized into the following groups:

- Labor (availability and cost),
- Environment (housing cost and availability, cultural and recreational facilities, pleasant place to live, good environment, and social relations with others in the same industry),
- Accessibility,
- Agglomeration (access to government research and development, universities, business services, local customers, and suppliers), and
- Premises (quality, availability, and cost).

Survey results show that environmental factors were considerably more significant for the multisite firms (both United Kingdom and multinational) than for the single-site firms. Forty-four percent of multisite firms responded negatively to housing cost, but these firms viewed other environmental attributes positively, with between 6% and 22% of responding firms specifically mentioning them as factors of location. More than 10% of the single-site firms mentioned pleasant place to live as the only important environmental factor. Of all firms, 20% listed a pleasant place to live and 13% mentioned a generally good environment as location factors.

4.3 AMENITIES AND THE LOCATION OF SERVICE INDUSTRIES

Apart from the work of Hall et al. (1987), which considered the location of telecommunications services as part of a broader study of the location of high-tech industry, no empirical evidence appears to exist that links amenities to the location of producer services. Some evidence, however, has been collected that links environmental considerations to the location of offices and office employment.

Rhodes and Kan (1971) conducted a survey of 60 commercial offices that had partially or completely moved from central London. Factors that apparently influenced office location and movement were those related to cost (primarily operating costs) and

noncost factors (contact with other office firms, key personnel, inertia, company prestige, availability of space and office staff, and environmental factors). Rhodes and Kan found that managers apparently placed considerable value on the quality of the area surrounding their new location, particularly its lack of manufacturing base or the likelihood of one developing in the future.

Pacione (1981) considered the effect of amenities on potential office relocation decisions through an assessment of the residential space preferences of 100 office workers in two government office facilities in central London. Respondents were asked to rank 20 regions in Britain on the basis of residential desirability. Principal components analysis was then used to aggregate the responses and yield a score for each region (after Gould and White 1968). These differences in "psychic income" clearly indicated preferences for southern and central Britain. Respondents were then asked to specify a salary increase required to compensate them for a move from their present location. Salary increase requirements ranged from 10 to 500% (10-25% for the surrounding area, 100% for northern Britain and southern Scotland, and 500% for Ireland).

An open-ended questionnaire then allowed respondents to list factors that were important to their choice of a place to live and work. These factors were grouped into five categories, and the number of times each factor was mentioned was counted. The groups were housing (cost 8.4%, quality 5.5%, and residential environment 2.9%), local facilities (shopping 6.9%, education 6.9%, recreation 5.1%, and entertainment 8.0%), accessibility, economic (journey-to-work costs 5.3%, employment for family 3.8%, and type of work 3.4%) and environmental (access to countryside 10.5%, climate 5.9%, scenery 5.3%, and local people 5.2%).

Burns and Pang (1977) considered the importance of amenities to the decision to relocate corporate headquarters. Thirty-eight headquarters were considered, and decision makers from these headquarters were asked to rank 25 possible factors for two types of relocation decision, between central city locations and between central city and suburb. Four of the six factors that were rated as high for moves between cities were related to amenities (cultural attractions, university facilities, entertainment, and environment). Factors important for central city to suburb moves were cost-related (lower wage and business taxes, rents, space availability, and the opportunity to consolidate office functions).

Ley (1985) compared levels of satisfaction with two locations of headquarters in Vancouver (one downtown, one suburban) in an attempt to establish whether amenity aspects of a suburban location would compensate employees for increased journey times to an outlying location. Two hundred twenty-nine employees were interviewed and asked to identify reasons for preferring the location in which they worked. At the downtown location, of the eight factors cited, five were amenity-related (shops, services and amenities, social and business environment, business and activity centers), and all but business and activity centers were cited by more than 30% as reasons for preferring a downtown location. At the suburban location, of the seven factors cited, three were amenity-related (less traffic congestion, proximity to a park, and a quieter environment), but only one factor -- traffic congestion -- was mentioned by more than 30% of respondents.

4.4 WEST VIRGINIA UNIVERSITY/ECONOMIC DEVELOPMENT ADMINISTRATION SURVEY

The West Virginia University/Economic Development Administration (WVU/EDA) Survey of Industrial Location Determinants (Calzonetti, Halverson, and Wheat 1990) was summarized in Calzonetti and Hemphill (1990) that considered manufacturing industry location. The WVU/EDA study asked plant managers to rate factors that were important to the selection of a region and a locality for their new manufacturing plant. A regional search implies that the decision maker compared large areas, such as different multistate regions, and decided to locate within one area before undertaking an evaluation of alternative localities. Of the 1,034 manufacturing plants responding to the survey, only 19.3% conducted such a regional search. Amenities was one of the regional factors that could have been selected.

Table 4.1 summarizes the ratings of factors that could have been important in the decision to select a region of the country for plants (with at least 20 employees) that conducted a regional search. Markets is rated as the most important factor, followed by labor, land, and resources. Amenities is rated as the 11th most important factor. Nevertheless, manufacturing plants (with at least 20 employees) that located in the West (United States) rated amenities as the sixth most important factor.

Local factor ratings for all 1,030 plants surveyed that reported conducting a local search are listed in Table 4.2. As expected, hometown is the most important local factor reported by the decision maker for selecting a certain community. Markets, roads, existence of a vacant plant, and nonunion labor are also important factors for manufacturers in selecting a particular community. Livableness of the community, defined in terms of the attractiveness of a place, is rated sixth of the 28 local factors considered. Thus, we can conclude that the appearance of a local community is important in attracting manufacturing plants.

It is reasonable to assume that these "softer" factors (amenities or livableness) would be important to the owner or plant manager in choosing a place to live (compared with "harder" factors, such as labor and transportation), but they may also be important factors in finding a location in which highly skilled or educated personnel would prefer to reside. Would a manufacturer be more likely to find a talented and skilled workforce in an area with high amenity value or in a community that is attractive than in a place that is less appealing or unattractive? Such individuals would likely be involved in nonproduction functions (such as legal, planning, and engineering) and would not be classified as production workers.

Responses collected for the WVU/EDA study were used to investigate the relationship between the importance of amenities and livableness of the community to the location decision and the percentage of production workers at the plant. The hypothesis is that amenities and livableness are less important factors to plants with a higher proportion of production workers.

TABLE 4.1 Regional Factor Ratings for 87 Plants with 20 or More Employees^a

Factor	Number of Responses for Each Rating (row percentages in parentheses)					Average Rating ^b
	Single Most Important	Very Important	Im- portant	Unim- portant		
Markets	27 (31.0)	32 (36.8)	18 (20.7)	10 (11.5)		2.18
Labor	16 (18.4)	42 (48.3)	22 (25.3)	7 (8.0)		1.95
Land	6 (6.9)	41 (47.1)	21 (24.1)	19 (21.8)		1.46
Resources	10 (11.5)	30 (34.5)	23 (26.4)	24 (27.6)		1.41
Taxes	1 (1.1)	42 (48.3)	30 (34.5)	14 (16.1)		1.36
Nontax incentives	4 (4.5)	32 (36.7)	24 (27.6)	27 (31.0)		1.20
Electricity	0 (0.0)	32 (36.8)	35 (40.2)	20 (23.0)		1.14
Educational systems	2 (2.3)	32 (36.8)	27 (31.0)	26 (29.8)		1.13
Suppliers	3 (3.4)	21 (24.1)	37 (42.5)	26 (29.8)		1.05
Winters	0 (0.0)	27 (31.0)	24 (27.6)	36 (41.4)		0.90
Amenities	6 (6.8)	13 (14.9)	23 (26.4)	45 (51.7)		0.84
Wind and wetness	1 (1.1)	7 (8.0)	25 (28.7)	54 (62.1)		0.78

^aTable excludes (a) plants with fewer than 20 employees; (b) plants that chose home town, previous location, or headquarters or sister plants as single most important or very important in their location decision; (c) relocated plants that moved less than 100 miles; and (d) plants that did not select a region first.

^bRating uses weights of 4 = single most important, 2 = very important, 1 = important, and 0 = unimportant. The number of responses for each rating (e.g., single most important) is multiplied by the weight; then the weighted (multiplied) counts are summed and divided by the total count to get the average weight ("average rating") for the factor.

Source: Calzonetti, Halverson, and Wheat (1990).

Table 4.3 shows the relationship between the percentage of production workers and the importance of amenities for plants that were sited following a search involving broad regions of the country (Southeast versus Midwest). Note that of the 1,063 plants in the study, only 115 conducted a regional-level search. The table shows that of plants in which production workers accounted for more than 75% of the total workforce, amenities were unimportant in 55.8% of the cases. Amenities, as a siting criterion, was single most important to 3.5% of these plants and very important to 18.6% of the plants. As the percentage of production workers increases, there is no discernable relationship in the importance of amenities as a factor. Thus, amenities appear to be no more important to

TABLE 4.2 Local Factor Ratings for All 1,030 Plants Surveyed

Factor	Number of Responses for Each Rating (row percentages in parentheses)					Average Rating ^b
	Single Most Important	Very Important	Im- portant	Unim- portant		
Hometown	339 (32.9)	230 (22.3)	110 (10.7)	351 (34.1)		1.87
Markets	137 (13.3)	462 (44.9)	145 (14.1)	286 (27.8)		1.57
Roads	37 (3.6)	476 (46.2)	250 (24.3)	267 (25.9)		1.31
Vacant plant	71 (6.9)	341 (33.1)	165 (16.0)	453 (44.0)		1.10
Nonunion labor	44 (4.3)	359 (34.9)	219 (21.3)	408 (39.6)		1.08
Liveability	37 (3.6)	326 (31.7)	281 (27.3)	386 (37.5)		1.05
Local wages	13 (1.3)	349 (33.9)	263 (25.5)	405 (39.3)		0.98
Skilled labor	22 (2.1)	279 (27.1)	305 (29.6)	424 (41.2)		0.92
Labor market	9 (0.9)	181 (17.6)	277 (26.9)	563 (54.7)		0.89
Property taxes	11 (1.1)	271 (26.3)	267 (25.9)	481 (46.7)		0.83
Water/sewage	13 (1.3)	233 (22.6)	298 (28.9)	486 (47.2)		0.79
Metro prefer- ence	25 (2.4)	246 (23.9)	194 (18.8)	565 (54.9)		0.76
Previous loca- tion	127 (12.3)	93 (9.0)	70 (6.8)	740 (71.8)		0.74
Schools	15 (1.5)	198 (19.2)	295 (28.6)	522 (50.7)		0.73
Resources	33 (3.2)	222 (21.6)	166 (16.1)	609 (59.1)		0.72
Freight service	6 (0.6)	225 (21.8)	235 (22.8)	564 (54.8)		0.69
Industrial park	11 (1.1)	202 (19.6)	241 (23.4)	576 (55.9)		0.67
Labor market	9 (0.9)	181 (17.6)	277 (26.9)	563 (54.7)		0.66
Colleges	12 (1.2)	195 (18.9)	229 (22.2)	594 (57.7)		0.65
Electricity prices	10 (1.0)	177 (17.2)	251 (24.4)	592 (57.5)		0.63
Electrical service	9 (0.9)	167 (16.2)	251 (24.4)	603 (58.5)		0.06
Metro avoidance	15 (1.5)	166 (16.1)	182 (17.7)	667 (64.8)		0.56
Air service	8 (0.8)	168 (16.3)	202 (19.6)	652 (63.3)		0.55
Inducements	14 (1.4)	157 (15.2)	172 (16.7)	687 (66.7)		0.53
Near metro preference	6 (0.6)	161 (15.6)	182 (17.7)	681 (66.1)		0.51
Subclimate	10 (1.0)	146 (14.2)	193 (18.7)	681 (66.1)		0.51
Sister plant	69 (6.7)	97 (9.4)	46 (4.5)	818 (79.4)		0.50
Rail service	5 (0.5)	74 (7.2)	94 (9.1)	857 (83.2)		0.25

^aRatings computed as in Table 4.1.

Source: Calzonetti, Halverson, and Wheat (1990).

TABLE 4.3 Relationship of the Number of Production Workers in Manufacturing Plants to the Importance of Amenities as a Factor in the Selection of a Region for the New Plant

Percentage of Production Workers at the Plant	Number of Responses for Each Rating on Importance of Amenities ^a (row percentages in parentheses)			
	Unimportant	Important	Very Important	Single Most Important
>75	63 (55.8)	25 (22.1)	21 (18.6)	4 (3.5)
50-74.9	21 (45.7)	15 (32.6)	7 (15.2)	3 (6.5)
25-49.9	11 (57.9)	2 (10.5)	5 (26.3)	1 (5.3)
10-24.9	3 (33.3)	4 (44.5)	1 (11.1)	1 (11.1)
<10	5 (62.5)	0 (0.0)	3 (37.5)	0 (0.0)

^aBetter access to natural amenities, such as oceans, lakes, mountains, and forests

Source: Calzonetti, Halverson, and Wheat (1990).

plants with fewer production workers as a percentage of the total workforce than to those plants with a smaller percentage of production workers.

Table 4.4 compares the ratings of community livableness with the percentage of production workers. The results are similar to those found in the case of amenities. Of the most labor-intensive plants, amenities were unimportant to 36.8% of the respondents, important to 27.5% of respondents, very important to 31.5% of respondents, and single most important to 4.3% of respondents. For the plants that had the smallest category of production workers, livableness of the community was unimportant to 47.5% of the respondents, important to 27.8% of respondents, and very important to 25% of respondents. No respondent in this category said that livableness of the community was the single most important factor in the choice of the community.

Follow-up telephone interviews were conducted with six manufacturers from the WVU/EDA sample that located in Nevada. Interviewees said that amenities or livableness was single most important or very important in the regional or local search. Only three of these firms conducted a regional search. For two of the firms, outdoor recreation was an important amenity that drew them to Nevada, but for the third firm, outdoor recreation was not important. Both of the individuals who said that amenities were important for choosing Nevada came from California, and they were trying to get away from the congestion and crime.

All six of the respondents who rated livableness of the community as a significant factor in making a location decision said that the towns were safe, easier to

TABLE 4.4 Relationship of the Number of Production Workers in Manufacturing Plants to the Importance of Community Livableness as a Factor in the Selection of a Locality for the New Plant

Percentage of Produc- tion Workers at the Plant	Number of Responses for Each Rating on Importance of Community Livableness (row percentages in parentheses)			
	Unimportant	Important	Very Important	Single Most Important
>75	222 (36.8)	166 (27.5)	199 (31.5)	26 (4.3)
50-74.9	72 (32.0)	70 (31.1)	77 (34.2)	6 (2.7)
25-49.9	23 (31.9)	18 (25.0)	29 (40.3)	2 (2.8)
10-24.9	13 (37.1)	7 (20.0)	12 (34.3)	3 (8.6)
<10	29 (47.5)	17 (27.8)	15 (25.0)	0 (0.0)

Source: Calzonetti, Halverson, and Wheat (1990).

get around in, and more economically prosperous. None of the respondents said that the proposed nuclear waste repository would have any effect on their decision to stay in Nevada. The plant managers were also asked to list the services that they provided at the plant and the services that they purchased from other firms. If the plant managers obtained services from other firms, they were asked if these services were available locally or whether they needed to be obtained elsewhere. The following services were considered:

- Accounting/bookkeeping/payroll,
- Benefits,
- Finance,
- Marketing,
- Advertising,
- Publicity,
- Legal services,
- Design/graphics,
- Production planning,

- Engineering/testing,
- Computing services, and
- Shipping.

The plants that were considered were relatively small (all less than 50 employees), and they tended to offer as many services in-house as possible because small communities did not offer many business services. All of the firms did their own accounting/bookkeeping/payroll, but some firms did have outside and local assistance. Most other services were provided externally, with the assistance of someone from outside the local area. The only business service for which plants sought outside help was legal services. Most plants had a local law firm that provided assistance, but one plant had to go outside the local area to obtain legal help.

Because of the small sample, it is difficult to draw meaningful conclusions from these results. It does appear that certain regions of the country are sought because of their amenity value; Nevada is one of these regions. Also, community livableness is an important industrial location factor, and Nevada communities are highly livable. Nevada communities, however, appear to lack important business services.

5 OTHER FACTORS IN THE GROWTH AND LOCATION OF PRODUCER SERVICES

5.1 INTRODUCTION

The increasingly international basis to most advanced economies has led to significant changes in their internal structure and, consequently, to the location of industries. As a result of these developments, the location of service industries, producer services in particular, has become a highly complex issue. A number of producer services (financial, property, advertising, and accounting) have become global rather than national in terms of the markets they serve and the location of their inputs. Developments in telecommunications have become crucial to the growth of these services, which have been able to decentralize large portions of their activities that do not rely on face-to-face contact for information transfer. The increasing sophistication of manufacturing activity has led to increased integration and interdependence between manufacturing and services, because the separation of tasks often involves larger numbers of specialized small firms. Other firms have expanded and diversified their service provision through internal growth and through mergers and acquisitions, which has led to increasing functional and spatial separation of activities within the United States and overseas.

As a result of these developments, research that considers the locational patterns of service industries has been emerging rapidly, but this research is highly exploratory. No attempt has been made, to date, to build a fully comprehensive theory of producer service location that can be empirically verified. Instead, much of the work discusses the relative importance of supply versus demand factors to the growth and location of service activities in regional economies.

A number of developments suggest that supply factors have made a significant contribution to the location and growth of producer services. Growth in service-sector employment is often related to the relatively slow rate of service-employment productivity compared with that of manufacturing employment. Changes in the location and growth of services have also been related to developments in information technology and networking. The latter may have stimulated a new spatial division of labor in the production of goods and services with increasingly decentralized service provision.

On the demand side, changes have come in both the final and intermediate demand for services. There has been a relative decline in the demand for goods and an increase in the demand for services against a background of growing incomes. The intermediate demand for services has also increased over the last three decades, partly because firms are externalizing services previously provided in-house. More significant, however, are changes in the corporate environment, such as the increasing size and complexity of firms and the increasing interdependency between manufacturing and producer services. Competition in such an environment has meant that firms allocate more resources to planning, management, and control; consequently, their activities have become more service oriented.

This section considers the role of supply and demand factors in the growth of services in a regional context. First, changes in service-employment productivity and

export growth, information technology, and the spatial division of labor are considered. Second, changes in the pattern of demand for services (namely the interdependency with manufacturing) and the development of large corporate enterprises and their functional structures are considered.

5.2 CHANGES IN SERVICE-SECTOR PRODUCTIVITY AND EXPORT GROWTH

Kirn (1987) has suggested that trends in service employment growth show that supply factors are the most significant influence on the expansion in the service sector. The most important of these trends is the slow rate of increase in service-sector productivity (output per person) compared with that in the production of goods. During periods when productivity differs across sectors, those with lower productivity will tend to increase their share of total employment (given constant levels of consumption), and employment in sectors with higher levels of productivity will tend to decline. Shifts in consumption toward services, which may occur with increasing incomes, will intensify these employment shifts.

Changes in service-sector productivity allow services to provide a greater contribution to a region's economy through trade with other sectors within the region and with other regions. Services may be a more important component of regional exports than has been traditionally assumed. Economies have traditionally been characterized as having a basic, or exporting sector, usually made up of manufacturing sectors and a nonbasic, or supporting sector, made up of firms that produce goods and services for domestic demand. In response to demand from outside the region, increases in basic sector activities lead to increases in output of the nonbasic sectors through multiplier effects. Although the exporting sectors are seen as a source of regional expansion, the nonbasic sector may also include significant export industries and may be equally as important (Thompson 1968).

For example, Beyers et al. (1985), in a survey of more than 2,000 producer service firms in the Seattle and central Puget Sound region, found that over 50% of these firms had at least 10% export sales. In addition, these firms were interviewed in more detail about changes in sales over time, factors determining orientation toward export markets, corporate history, and rationale for choice of present location. The results of these interviews showed that 56% of sales were to places outside Seattle and 34% of sales were outside Washington state. Sales to manufacturers made up only 12% of output, and sales to other services were 36%. Small indigenous firms have been successful in penetrating export markets. More than 50% of export-dependent jobs in Washington state were tied to services in 1986. Decisions by manufacturers to externalize services may, therefore, no longer be the key to the growth of producer services, a finding of earlier case studies by Marshall (1982) for Britain and by Polese (1982) for Canada.

Services can also contribute to a region's internal development by providing a means of increasing regional productivity (Coffey and Polese 1986). Changes in technology and information are significant to service-sector growth. According to Denison (1985), advances in knowledge have been fundamental to productivity growth in the United States between 1929 and 1983, contributing 55% of growth in real GNP per

employed person (education per worker constitutes an additional 27%). Services are vital to the advancement and spread of information, in educating and training the labor force, in research and development, and in the dissemination of information technology. Services are also essential to a region's ability to encourage growth in existing firms (Hirschhorn 1979). Goddard (1979), for example, documents an association (measured by innovation and diversification) between lack of office firms and poor competitive performance in local industries. Centers with strong producer services are likely to generate job growth, because advanced service centers control diffusion in innovation and flows of capital (Noyelle 1983).

5.3 INFORMATION TECHNOLOGY AND THE DECENTRALIZATION OF PRODUCER SERVICES

The importance of trade in information and the role of information-intensive industries have become major focuses in the analysis of the location of producer services and regional growth. On the basis of evidence from the Canadian economy, Hepworth (1986) suggests that spatial systems of information technology may lead to the reorganization of manufacturing and office activities. The importance of spatial divisions of information labor may mean that regions depend increasingly on information-intensive services.

Hepworth examines the role of the spatial distribution of information technology in an analysis of computer networks in 10 multilocal firms. Computer networks are particularly important in the transformation of patterns of service provision: they can potentially overcome time and distance constraints on production and distribution through the control of dispersed operations and the conversion of material-intermediate inputs into electronic form for telecommunication transmission. Thus, networking gives firms considerable potential to decentralize decision making.

Telecommunications have two key functions: (1) they enable organizations to share centralized computer resources among dispersed users and (2) they enable increases in labor productivity in both locations that generate networked information and those that receive it (productivity transmission). In the Canadian economy, computing resources of multilocal firms are highly centralized; 90% of those resources are located in head office cities, and regional and local centers access these resources over telecommunication lines. Therefore, regional variations in productivity may not reflect levels of capital investment.

Head office concentrations of computer power indicate that networks are important means of organizational control, particularly through strategic network applications, such as decision support analysis (which has grown relative to more routine applications, such as payroll processing and electronic mail). Most companies are pursuing central networking strategies, although distributed processing systems are also feasible. Centralized networks, which are often based on mainframes, allow economies of scale in data processing where computers are accessible to dispersed users. Costs of accessing and information transfer are apparently unimportant, and these costs can be minimized with various telecommunication technologies. Networks based on powerful minicomputers at remote locations do not seem to be as important, except in specialized applications or where public networks and service facilities can be shared.

Hepworth (1986) investigated the development of networking systems for 10 multilocal firms by gathering information through in-depth telephone and personal interviews on the scope of decision making and competitive environment and the geographic configuration of hardware and telecommunication links. He concluded that although technological developments in distributed processing may indicate that large companies will decentralize the entire decision-making process, Canadian evidence suggests that companies are using information networks to maintain centralized organizational structures.

5.4 DECENTRALIZATION AND THE SPATIAL DIVISION OF LABOR

Analysis of networking has been used by Hepworth et al. (1987) to establish a spatial division of information labor that they suggest, has both a passive and active role. The active role includes the distribution of information in the form of work tasks, and the passive role includes the control and integration of work processes at a firm's various locations. Network innovations may be used to reduce overall labor costs by allowing firms to establish offices in low-wage markets for information labor. This process is facilitated through the deskilling of certain occupations by fragmenting and standardizing work tasks and reassessing the need for face-to-face contacts in certain occupations.

Hepworth et al. used employment data on information and noninformation occupations to examine the spatial division of information labor in the British economy. Within the manufacturing sector, patterns of information (as opposed to noninformation) labor suggest patterns of interregional dependency. Both types of jobs and different functions are unevenly distributed because of (1) the development of management and control hierarchies that reflect spatial hierarchies in the relations of ownership and (2) the development of a technical division of labor where production and conception are functionally and spatially separated. Hepworth et al. show this to be true not only for the spatial distribution of information and noninformation work, but also for interoccupational differences in the spatial division of labor. The southeast of England, for example, was found to be overrepresented by high-order information production occupations, but interregional differences in the relative importance of information-processing activities were less marked. The concentration of information activities in the southeast of Britain and in London has apparently reinforced the concentration of information-based producer services in some areas.

Hepworth et al. argue that although information technologies (especially computing and telecommunications) have allowed the decentralization of routine activities, cost savings lower down the urban hierarchy do not compensate for the increased communication costs for high-level information activities. The majority of office decentralization has been to sites less than 60 miles from the capitol.

Existing information jobs in the private sector in peripheral regions may be vulnerable to restructuring through changes in technology. These changes include replacement of on-site managerial and control functions within manufacturing, creation of networks, establishment of new business services on the basis of imported information from core areas, reduction in clerical employment in banking and insurance, nationally

coordinated ordering through computer-controlled stock control, and reduction of jobs in distribution and retailing. Technological developments for information employment are also likely to reduce public sector employment in peripheral areas. Networking technologies are also leading to the internationalization of information services, particularly in the financial sector, favoring large centers (world cities) such as London and New York.

5.5 GROWTH IN PRODUCER SERVICES AND INTERDEPENDENCY WITH MANUFACTURING

Marshall et al. (1987) emphasize the relationship between services and other sectors and the contribution that services make in the development of this relationship. Although the role of services in structural change has been interpreted from two perspectives, Marshall et al. suggest that neither perspective provides an adequate explanation of changes in service activity location.

The "postindustrialization" thesis, based on the work of Bell (1974) and Porat (1977), suggests that services play a positive role in development. Declining manufacturing output and employment reinforce the emphasis on services, and the growth in knowledge, skills, and information in the production process contribute significantly to the growth in producer services. The "deindustrialization" thesis, on the other hand, suggests that service activity has grown because of declining competitiveness in the manufacturing sectors. Service employment is growing because of its relatively slow productivity growth compared with that of other sectors.

Marshall et al. (1987) argue that even given growth in labor productivity, increased demand for producer services from other sectors plays an important role in the creation of new employment. They also argue that increases in demand for producer services have occurred for reasons other than an increase in demand for information services. Services and manufacturing have become very closely related; for example, 18.5% of the output of service industries in the British economy is classified as manufacturing, and an increasing share of distribution and other services is purchased by manufacturing firms.

Contraction in the manufacturing sector has prevented growth of service functions through its effect on nonproduction employment. Between 1970 and 1984, the administrative, technical, and clerical workforce (ATC) in manufacturing in Britain declined by 750,000, and the rate of growth of the share of ATC labor in total manufacturing employment also declined. Producer service employment outside manufacturing that was added to ATC employment between 1970 and 1981 shows a decline of 74,000 jobs. Moreover, it seems that at least part of the increase in the number of independent producer service industries is due to manufacturers contracting out former in-house services to reduce fixed costs. Service growth here merely represents the transfer of activities from one sector to another.

Nevertheless, producer services are not entirely dependent on manufacturing; 22% of service output goes to other services, and this output is only indirectly related to manufacturing production. There has been a significant growth in consumer services

consistent with the postindustrialization thesis, although this growth may not be attributable to an increasing share of these services in total consumer demand (Gershuny and Miles 1983). Consumer services in Britain have grown mainly through liberalized credit controls, social security payments, and relatively unrestricted growth in private sector real incomes. Services have also grown as a result of growth in the following areas (Marshall et al. 1987):

- International trade in financial and other business services,
- Specialization in the service sector,
- The number of firms involved in supplying final demand, and
- Mixed consumer-producer markets.

The notion that consumer-demand growth is based primarily on manufacturing exports does not take into account innovations in manufacturing and service activities that also create new demand.

Services may also contribute to improved competitiveness through their inputs to the manufacturing process. However, producer services may help manufacturers outside a region or country (as well as indigenous or domestic firms), which may produce negative direct effects on regional development. It has also been argued that given the international nature of financial services and the search for investments yielding the highest return, domestic industrial expansion may be somewhat restricted.

Marshall et al. suggest that elements of both the postindustrialization and the deindustrialization perspectives are applicable, at least in the British context, although each explanation has a specific geographic element. The characteristics of economic activity in the peripheral areas in Britain seem to be more easily explained by the deindustrialization thesis, because extensive evidence has illustrated the negative aspects of structural change in regions once dominated by manufacturing. The contraction of production in these areas has reduced demand for producer services (particularly those provided internally), and it has also reduced those offered by independent firms, although continuing externalization by surviving manufacturing firms provides some business for service firms. In the core areas of southern and eastern Britain, in-house and external services have experienced stable demand.

The growth of London with deregulation in financial markets and the development of recreational services with higher incomes generated by other services have contributed to a more specialized economic base and employment structure. Marshall et al. emphasize the importance of "spatial dualism" in explaining service location, which is clearly related to changes in demand in business and consumer markets, corporate reorganization to serve new markets, and changes in the labor process. The growth of multilocal firms and the increasingly complex and dynamic business environment have led to structural changes and demand growth in service markets. Manufacturing contraction has affected the demand for some services, but other services, especially those associated with information technology, have grown.

There has also been a growing tendency to externalize services with increased competition and the need to lower costs.

Firms have responded to market pressures through specialization and diversification. Because firms have concentrated on core functions at the expense of those in peripheral areas, small service firms have grown, which encourages larger firms to diversify into the high-growth areas. Many firms have diversified into producer markets through acquisition (Aaronovitch and Sawyer 1985) to take advantage of existing expertise, often creating more complex corporate structures that may lead to reorganization and the decentralization of certain activities. Specialization may also lead to centralization at the expense of local offices. Technological changes have facilitated many of these developments (particularly computerized automation and data processing) and have led to changes in the spatial division of labor. Deskilling, increased part-time labor, rationalization and integration of work tasks, and the reskilling of administrative and clerical jobs are factors that have contributed to the spatial division of labor. The concentration of producer services in capital cities, the decentralization of producer service employment, and the slow growth in peripheral areas may be caused by more than variations in site and communications costs. Structural changes and intensified competition have led to reorganization, which may have been facilitated only through developments in information technology.

5.6 MULTIPLANT CORPORATE ORGANIZATIONS AND THE GROWTH OF PRODUCER SERVICES

The increasing use of capital and technology in postwar industry has created a production environment in which processes are highly routine and costs are closely controlled (Stanback et al. 1981). Consequently, emphasis in manufacturing has gradually shifted from production to planning (timing the introduction of new products and identifying geographic markets), product development, marketing strategy (targeting of specific market segments, pricing, advertising, distribution strategies, and dealer relations), and administration. Developments in the marketplace have also led to increasingly complex management operations. The need to reach even wider markets to achieve and preserve economies of scale in production has led to increased product differentiation, innovation, and specialization to meet specific customer needs in different segments of the market. The increasing size of firms has led to the need for specialized financial services. Growth in regulation has made it more difficult for firms to operate within the legislative framework, and this difficulty has led firms to greatly increase their contact with public sector agencies, public relations agencies, and trade associations. Increased size has also affected management relations, and more emphasis has been placed on cost control at the plant and administrative levels. Management has also expanded into designing recruitment and training programs, salary and promotion policies, and pension plans, and management needs to decide whether to provide these benefits in-house or hire the services of an outside firm.

5.6.1 The Development of Corporate Functional Structures

Changes in the "functional" organizational structure typical of firms before the early 1950s have produced a form of corporate organization based on elaborate "regional-divisional" structures (Noyelle and Stanback 1984; Chandler 1977). These structures have allowed firms to break down long-standing regional barriers to product sales through national promotion and distribution of products and services. Large corporations have also been able to assemble financial and human resources, which has allowed them to vastly improve product development, product differentiation, and advertising.

Stanback et al. (1981) and Noyelle and Stanback (1984) suggest that these shifts indicate that corporations are moving services traditionally performed at the plant level to a level at which they can be dispersed throughout the operation of the corporation to reduce costs through the consequent scale economies. The shift also reflects increased sophistication in management and communication technologies, rationalization in production methods, and increased linkages between many service and nonservice activities.

"Functional" structures developed by single-product, single-market, and often single-location firms concentrate relatively small administrative and managerial staff in one location at the plant or at the headquarters. In addition to the corporate headquarters, "regional-divisional" structures may include numerous divisional head offices, regional sales headquarters, and single-function service establishments based on one operation (research and development and accounts processing, for example).

Corporate (i.e., national) headquarters are often located in a small number of cities, and the choice of location depends on the historical development of the firm and the nature of its business. National headquarters perform strategic planning functions for the corporation, make decisions on mergers and investment policy, raise new finance, oversee auditing, and may share advertising functions with other lower-level units in the organization.

Divisional head offices organize routine service functions related to development and production of product lines and are organized as profit centers (i.e., are required to maintain a certain level of return on investment/equity as distinct from the rest of the organization). Divisions are usually part of the intrafirm structure, although they may be subsidiary corporations, especially if they are former firms merged into the existing corporation. Divisional head offices are involved in accounting, personnel functions, employee relations, coordination of production schedules, relations with supplier firms, and the guidance of research and development units. Divisional headquarters are located in more dispersed parts of the United States city system, where proximity to plants in the division or supplier firms may be paramount.

Regional sales headquarters form the third corporate organizational element in the regional-divisional model. These operations coordinate dealerships and sales and repair service functions in the cities of major regional markets. Regional sales headquarters may oversee the sales of numerous product lines from various divisions of the firm as a means of evaluating new product lines and the extent to which existing

products overlap. Sales headquarters may also serve as intermediaries between dealerships and the financial operation of the corporation in cases where product delivery involves financing.

5.6.2 Multilocal Firms and the Demand for Producer Services

Pred (1977) sees regional growth in the context of the development of a hierarchy of urban centers. The city system has become increasingly interdependent as a result of the growth of large corporations and the increasing number of links in a firm's organizational structure. Large corporations have a larger proportion of their resources allocated to administrative, managerial, and other office activities than do smaller single-plant firms. Expansion at any point in the organization of a multilocal firm (a new plant or unit, for example) leads to corresponding growth elsewhere in the organization, either in the headquarters or at some other level of the administrative structure. Mergers, in particular, may lead to increased activity among corporate service functions as headquarters functions become consolidated in a smaller number of centers. Growth within organizations may also involve increased flows of goods, services, and specialized information between two units that may not necessarily affect the headquarters unit.

Changes in the relationships between organizations have also increased interdependence among cities through changes in technology. Developments in transportation have lowered shipping costs, and telecommunications allow the movement of specialized information, which encourages the growth of specialized financial, insurance, and business services.

Although multilocal corporations have hierarchical structures, their locational patterns may be somewhat different than those predicted by central place theory. Headquarters and administrative units may be spread across the urban hierarchy, not necessarily in the largest central places. Multilocal decisions are made after limited searches, and these decisions usually favor existing centers, a result that reflects the need to reduce uncertainty. Location decisions may, in some cases, be influenced by the availability of information (existing organizational contact patterns), which may favor certain existing corporate locations to form spatial biases. Two feedback loops exist in the process of interurban growth to perpetuate employment and population growth in high-ranking national or regional cities -- one relating to managerial resources, the other to planning and innovation. Interaction through existing corporate linkages is consolidated by new local and interurban linkages that require supporting flows of routine and nonroutine information.

6 CHANGES IN THE GEOGRAPHIC DISTRIBUTION OF SERVICE INDUSTRY ACTIVITY

Changes in the geographic distribution of service activity are examined from two viewpoints: (1) changes in the spatial distribution of service employment are considered and then related to changes in population and (2) changes in the spatial pattern of service provision are related to the functional structures associated with corporate organizations.

6.1 GROWTH IN SERVICE-SECTOR EMPLOYMENT AND CHANGES IN THE DISTRIBUTION OF POPULATION

Population growth and regional shifts in population, particularly in the late 1960s and early 1970s, led to changes in the location of economic activity. Changes in the patterns of growth in manufacturing are well documented, and they have often been presented as evidence of an emerging sunbelt economy based in the southern states, which are growing at the expense of the northern or snowbelt states (Sternlieb and Hughes 1975, for example). Kirn (1987) examined trends in the location of services from 1958 to 1977 and attempted to link changes in their distribution across the urban hierarchy with population growth.

Kirn expected changes in service location to be more marked in producer than in consumer services; he also anticipated that these changes would have tended to be more rapid during periods of faster population growth, particularly in nonmetropolitan areas, in the late 1960s and early 1970s in the South. Kirn also expected that places that specialized in producer services would have grown more rapidly than those that specialized in consumer services. Consumer services would be more important to the growth of metropolitan than nonmetropolitan areas if they followed patterns of population and income growth. Kirn measured changes in the spatial structure of service employment in terms of service industry share of total employment, its concentration in urban areas, and in the Northeast, Northcentral, South, and West (Tables 6.1 and 6.2).

Regional employment growth from 1958 to 1977 ranged from 20.5% in the Northeast to 92% in the South, and employment growth by size group ranged from 33.5% for small nonmetro places to 70.7% for small metro places. Between 1958 and 1977, growth in most business and professional services was greatest in the South, particularly in the metro areas. In large, southern SMSAs, business services grew 410%, compared with 130-180% growth in SMSAs in other regions. High rates of growth in the West were also measured for the subset of business services, including management, consulting, public relations services, and legal services. For finance, insurance, and real estate (FIRE), employment changes were less pronounced. Between 1967 and 1977, banking grew fastest in the Northeast, insurance grew fastest in the Northcentral, and real estate grew fastest in the South and West (the fastest-growing regions).

TABLE 6.1 Normalized Percent Change in Service Employment: 1958-1967

Industry	Change in Employment (%) by Size of Place				Change in Employment (%) by Region			Significance	
	Large Metro	Small Metro	Large Nonmetro	Small Nonmetro ^a	Northeast	North-central	South	West	Size Region
Services									
Banking (60) ^b	15.6	22.6	12.1	--	16.1	14.5	16.5	21.3	
Insurance (63,64)	-2.2	-6.1	-16.9	--	-2.7	3.6	-6.1	-5.9	
Real estate (65)	-15.9	-10.0	-8.8	--	-16.3	-16.4	1.9	-12.3	
Hotels, etc. (70)	-14.7	9.9	-34.3	--	-23.4	-19.1	1.9	9.1	
Personal (72)	-22.7	-22.6	-17.3	--	-24.7	-19.3	-23.0	-21.8	0.10
Business (73)	49.7	102.5	83.0	--	50.6	42.9	83.1	56.5	
Advertising (731)	-23.8	-22.0	-11.2	--	-9.8	-33.8	-39.4	-39.9	0.05
Management, consulting, and public relations (737,7392)	164.1	301.8	226.7	--	137.6	138.3	400.4	267.5	
Auto and repair (75,76)	-13.1	-15.8	-28.4	--	-11.3	-13.0	-18.0	-20.8	0.10
Amusement and recreation (78,79)	-16.3	-25.7	-37.0	--	-15.6	-30.8	-40.9	-9.2	
Health (80)	44.3	37.8	57.5	--	41.6	49.7	47.5	41.8	
Legal (81)	19.7	23.4	15.8	--	14.9	19.4	33.1	36.2	
Membership organizations (86)	7.1	21.4	-2.9	--	7.1	5.8	25.8	13.1	
Miscellaneous (89)	21.4	65.1	41.7	--	28.1	22.1	65.1	3.1	
Engineering and architectural (891)	33.9	42.7	227.1	--	29.8	24.2	67.7	40.3	0.05
Accounting, etc. (893)	10.5	32.8	65.8	--	10.9	17.5	19.0	4.9	0.05
Eating and drinking places (58)	11.7	14.7	20.6	--	5.5	19.6	16.2	15.2	
Transportation, communications, and utilities	0.6	-10.6	-4.3	-0.3	5.4	-7.2	-7.3	-2.9	0.10
Wholesale trade	-1.1	-6.7	4.1	0.2	1.5	-0.8	-3.6	-8.7	
Retail trade	-13.4	-12.5	-15.5	-5.8	-14.0	-11.0	-17.8	-13.1	0.05
Finance, insurance, real estate	2.8	0.8	3.2	22.7	-1.7	-0.3	-1.0	3.8	0.05
Government: federal	3.8	-2.9	17.7	5.1	-3.1	8.6	-4.8	7.2	
Government: state	50.1	41.5	40.3	41.2	42.8	59.4	46.1	45.6	
Government: local	27.0	28.6	30.8	7.9	29.6	30.0	45.1	36.9	0.05
Total services	4.3	4.4	4.6	4.8	5.3	1.2	3.1	5.4	
Manufacturing	-6.8	-2.3	1.7	16.7	-8.9	0.0	-4.2	-3.5	0.05

^aFor the small nonmetropolitan size group, data were unavailable at the two-digit SIC level.^bNumbers in parentheses are SIC numbers.

Source: Kirn (1987).

TABLE 6.2 Normalized Percent Change in Service Employment: 1967-1977

Industry	Change in Employment (%)				Change in Employment (%) by Region				Significance		
	by Size of Place								Size	Region	Inter-action Effect
	Large Metro	Small Metro	Large Nonmetro	Small Nonmetro ^a	Northeast	North-central	South	West			
Services											
Banking (60) ^b	29.6	16.6	46.3	--	34.4	29.3	19.5	24.9	0.05	0.05	
Insurance (63,64)	7.0	8.5	-0.6	--	4.3	23.5	-0.2	2.4		0.10	
Real estate (65)	13.3	21.7	67.3	--	-2.6	-0.1	60.5	55.4	0.05	0.05	
Hotels, etc. (70)	7.5	17.8	25.7	--	-6.6	4.8	25.6	19.8			
Personal (72)	-32.3	-28.7	-23.9	--	-31.5	-29.5	-40.5	-31.5		0.05	
Business (73)	58.5	67.3	57.1	--	47.9	52.8	121.2	59.2		0.05	
Advertising (731)	-11.2	4.8	132.3	--	-8.6	-8.9	6.8	-3.1	0.05		
Management, consulting, and public relations (737,7392)	143.0	146.4	392.5	--	104.6	97.3	279.7	220.0			
Auto and repair (75,76)	13.8	11.4	35.9	--	7.5	18.5	15.0	12.6	0.10		
Amusement and recreation (78,79)	13.9	28.4	28.5	--	0.5	18.5	12.5	23.2			
Health (80)	58.2	55.2	60.6	--	59.4	62.0	62.6	50.9			
Legal (81)	67.1	80.6	40.6	--	55.3	69.6	87.3	91.3	0.05		
Membership organizations (86)	-14.0	-3.6	19.4	--	-12.6	-4.3	-19.5	-10.9	0.05		
Miscellaneous (89)	7.0	-11.5	38.5	--	4.2	10.3	28.4	-7.1	0.05		
Engineering and architectural (891)	23.7	5.8	-4.8	--	11.2	33.0	67.2	5.9	0.05		
Accounting, etc. (893)	34.0	27.5	62.0	--	30.9	38.8	55.0	22.1			
Eating and drinking places (58)	36.7	62.9	77.6	--	18.8	54.0	57.7	51.4	0.05	0.05	
Transportation, communications, and utilities	-9.5	-8.6	-16.1	-9.8	-9.5	-10.1	-5.2	-13.9	0.05	0.05	
Wholesale trade	-3.9	-1.7	26.6	51.1	-4.4	-3.8	-1.2	-3.2	0.05		0.05
Retail trade	3.1	6.0	12.5	-0.7	1.2	5.2	4.5	3.2	0.10		
Finance, insurance, real estate	15.4	18.4	24.7	42.2	16.1	20.3	23.4	29.2	0.05		
Government: federal	-22.3	-30.1	-60.5	-16.4	-16.0	-19.6	-36.6	-37.7		0.10	
Government: state	10.7	2.8	5.8	13.5	16.9	4.3	11.1	-0.4		0.05	
Government: local	24.5	18.8	23.7	3.6	19.0	16.6	20.2	16.6			
Total services	11.3	9.1	13.0	11.9	10.3	14.0	11.1	8.7		0.05	
Manufacturing	-24.9	-25.8	-20.3	-7.1	-21.3	-23.2	-29.8	-26.3	0.05		

^aFor the small nonmetropolitan size group, data were unavailable at the two-digit SIC level.

^bNumbers in parentheses are SIC numbers.

Source: Kirn (1987).

For business services, the characteristics of growth differed among regions. In the South, growth tended to be centralized in large metro areas, but in other regions, the largest growth occurred in small and large metro places, and the smallest growth occurred in large nonmetro places. The North showed the strongest decentralization tendencies with growth in small metro and large nonmetro places. Between 1967 and 1977, these patterns continued in all regions except the West, which had experienced strongest growth in small metro places between 1958 and 1967. However, the West began to experience growth in large metro places between 1967 and 1977.

Kirn found very little regional variation in employment in transportation, communications, utilities, wholesale trade, and most consumer services. Growth in employment in a number of consumer services was found to be negative between 1958 and 1967 and positive between 1967 and 1977, particularly in retail trade, auto and repair services, amusement and recreation services, and hotels.

Between 1958 and 1977, business and professional services and FIRE had become more concentrated in large urban centers, although business services, miscellaneous services, engineering and architectural services, and real estate were less urbanized. Generally, business and professional services and FIRE became less urbanized, yielding a more even distribution of employment between large and small centers. A number of services (advertising, banking, management, consulting, public relations services, and legal services) maintained their locations in large urban centers.

Kirn concluded that the regional distribution of services was influenced by the growth of business and professional services and FIRE in the South and by the development of large SMSAs in the South into major urban centers. Consequently, by 1977, the national distribution of services had become more homogenous. The Northeast continued to dominate business, professional and financial services (particularly banking), advertising and legal services, and the northcentral region replaced the South as the region with the smallest service employment.

6.2 PRODUCER SERVICES AND CORPORATE FUNCTIONAL STRUCTURES

Noyelle and Stanback (1984) suggest that the locational patterns of services provided within the organizational structure of large corporations should be considered separately from those of financial and corporate service firms. To study trends in the location of corporate offices from 1959 to 1976, they considered the shares of national headquarters, divisional head offices, and regional sales headquarters of the top 1,150 Fortune firms in the largest 51 SMSAs in the United States. The SMSAs were classified into national regional and functional (based on a locationally specific activity) nodes, with three subdivisions in the latter two nodal groups (see Table 6.3 and App. F).

National nodal centers New York, Los Angeles, Chicago, and San Francisco, despite relative losses between 1959 and 1976, remained strong centers of headquarters and divisional head office locations. Almost 40% of the top 1,150 Fortune firms had

TABLE 6.3 Distribution (numbers and shares) of the National Headquarters, Divisional Head Offices, and Regional Sales Headquarters of the Largest U.S. Corporations among the Largest Nodal and Functional Nodal Centers, 1976 and 1959

Item	SMSA Size	Number of SMSAs	1976												1959				
			Headquarters Fortune 500			Headquarters 2nd Fortune 500			Headquarters Fortune 150			Regional Sales Headquarters Sample: Fortune 650			Divisional Headquarters Fortune 650		Headquarters Fortune 500		
			No. ^a	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Pop. Share (%)	No.	%
National nodal	1	4	179	35.8	140	28.0	51	34.0	16	12.5	2,840	24.7	12.42	217	43.4				
Regional nodal	1	8	83	16.6	95	19.0	33	22.0	31	24.2	1,792	15.0	10.38	78	15.6				
	2	11	30	6.0	36	7.2	18	12.0	32	25.0	868	7.6	6.72	21	4.2				
Subregional nodal	3	10	14	2.8	20	4.0	7	4.7	12	9.8	410	3.6	2.94	13	2.6				
Functional nodal	1	3	35	7.0	24	4.8	8	5.3	9	7.0	651	5.7	4.05	44	8.8				
	2	3	16	3.2	13	2.6	0	--	6	4.7	260	2.3	1.72	10	2.0				
	3	12	53	10.6	37	7.4	15	10.0	3	2.3	782	6.8	4.02	31	6.2				
Summary: all size 1 through 3, nodal and functional nodal		51	410	82.0	365	73.0	132	88.0	109	85.2	7,603	66.3	42.25	414	82.8				
All remaining SMSAs and nonmetropolitan areas			90	18.0	135	27.0	18	12.0	19	14.8	3,874	33.7	57.75	86	17.2				
Total			500	100.0	500	100.0	150	100.0	128	100.0	11,477	100.0	100.00	500	100.0				

^aNo. = number.

Note: The Fortune 150s include the Fortune 50 largest transportation, 50 largest retailing, and 50 utility companies. The Fortune 650s include the Fortune 500 industrials and the Fortune 150s. The "Divisional Headquarters Fortune 650" column includes a full count of all the head offices of all the divisions of the Fortune 650. The "Regional Sales Headquarters Sample Fortune 650" column includes all of the regional sales headquarters of an eight-firm sample of the Fortune 650. The eight firms included in the sample are Continental Group, Clark Oil, Deere & Co., Borgs & Co., Exxon, Procter & Gamble Corp., Chrysler, and AT&T. Information on Chrysler comes from *The Chrysler Corporation Financial Situation*, Hearings Before the Subcommittee on Economic Stabilization, United States House of Representatives, 96th Congress, 1979, Part 2: Appendix. Information on AT&T comes from the *Directory of Corporate Affiliation*, 1976. Information on remaining 6 corporations comes from *Large Corporations and Urban Employment*, Subcommittee on the City, United States House of Representatives, 95th Congress, February, 1978. The distribution of the national headquarters of the Fortune 150s and the divisional head offices of the Fortune 650s is not tabulated for size 4 SMSAs (blank cell).

Source: Noyelle and Stanback (1984).

headquarters in these centers, and 25% of the top Fortune 650 had industrial divisions based in these centers in 1976. Regional, subregional, and government centers were favorable locations for corporations needing control over regional markets and for regionally consumer-oriented firms (foods, beverages, retailing, and distribution) needing to locate their headquarters. Functional nodes attracted service activities on the basis of manufacturing control over production processes (automobiles, computers, office equipment), which were national headquarters or major divisional offices not necessarily located close to major markets. Concentration of national and divisional offices of the largest United States firms was largely in the national nodal and functional nodal centers of the manufacturing belt of the Midwest and Northeast.

In the last 20 years, many corporations have become involved in markets once dominated by independent producer service firms. Insurance services and short-term loans, for example, were once provided by financial institutions, and these services are now often within the realm of the large corporation. However, large corporations remain important clients of financial institutions, and commercial banks now provide a wide variety of financial services (leasing, cash management, foreign exchange trading, for example). This expansion has produced an increasingly concentrated system of financial services in a smaller number of metropolitan centers.

Noyelle and Stanback (1984) considered the locational patterns of financial (commercial banks, life insurance companies, and financial subsidiaries of nonfinancial firms) and corporate services (accounting and advertising). They found well-established hierarchical structures in the location of these services, partly related to city size. The four national nodal centers (New York, Los Angeles, Chicago, and San Francisco) offered the most diversified services, followed by regional nodes. However, some unevenness exists in the regional nodes, especially in the distribution of commercial banking and advertising. At the subregional level, specialization exists, especially in banking and accounting. Inadequately developed corporate complexes were found in functional nodes, particularly in banking, accounting, and advertising, indicating specialization in customer corporate complexes for producer service firms. Advanced producer services were found to be lacking in production or consumer-oriented centers.

7 CONCLUSION

Although the importance of nonmanufacturing industries (services in particular) as a fertile source of job generation and employment growth has only recently been recognized, literature dealing with the factors that influence their locational choice is emerging rapidly. Nevertheless, compared with the literature on locational choices of the manufacturing sector, much of the work is exploratory, and theoretical development is relatively limited. This lack of information is symptomatic of the traditional dominance of manufacturing in many regions of developed countries and the consequent emphasis on manufacturing firms as targets for regional development assistance. Service industries have often been perceived as passively dependent on manufacturing for growth prospects and locational requirements. Substantial evidence, however, suggests that services are not only significant employers in many regional economies, but services may also be leading industries. Adequate provision of service industries has been shown to be an important location factor for manufacturing industries that want to improve regional productivity and contribute to the growth of exports. A number of service industries have been in the forefront of the increasing internationalization of advanced economies, and others have contributed to the increasingly technologically sophisticated manufacturing base.

Attempts to describe patterns of location of service firms and the factors important to their location have so far only been partially successful. For some time, the work of Christaller on the characteristics of service provision within a hierarchy of settlements, outlined in Sec. 3, remained the only significant attempt to develop an empirically testable model of service location. Planners of consumer service location also recognize the importance of agglomeration economies to the location of some consumer service activities. This concept has become central to the analysis of office location, the occupiers of which are mainly producer services. For many of these services, minimizing the cost of contact and communication has been the essential factor in choosing an office location. Offices have traditionally preferred downtown locations because they can take advantage of external economies available through nearby suppliers and markets for office products. These factors, and the decentralization available through the increasing array of telecommunications services, are recognized by the theoretical models presented in Sec. 3.

Advances in telecommunications technology and the increasing sophistication of manufacturing processes described in Sec. 5 have diminished the importance of traditional location factors. Consequently, many more firms are footloose in their locational requirements. Apparently, as a result, some firms can narrow their location choice process to areas that have high amenity values. Evidence outlined in Sec. 4 for both manufacturing and service firms suggests that some firms have chosen locations on the basis of climatic factors to minimize overhead costs. However, the primary basis of selection may be the appeal of amenity aspects of locations to entrepreneurs or highly qualified professional and technical workers whose skills have become the most important location factor to many manufacturing and service firms.

It has been suggested that the location of the nuclear waste repository at Yucca Mountain will contribute significantly to a deterioration in amenity value of the state and, consequently, adversely affect the progress of industrial development in the future. The findings of an emerging literature on the locational determinants of service industry activity suggest a link between high-tech manufacturing industry, which contains a growing service element, and locational amenities. A tenuous link was also found between office location, particularly headquarters location, and certain amenities. However, little substantive evidence was found linking producer services with amenities, but this lack of evidence may be a result of the exploratory nature of much of the research.

Problems arise with the definition and measurement of amenities. In this report, amenities included aspects of both the natural and man-made environment. Amenity aspects of the former relate primarily to aesthetic qualities of the physical environment, although it is not clear if these qualities are compromised by amenity-related capital investment. The man-made environment encompasses cultural, educational, and recreational aspects, as well as crime rates, urban decay, and pollution. Clearly, the relationship between each amenity concept and each individual decision maker is important. Researcher subjectivity may also be present in the initial choice of concepts and specification of amenity variables.

More work is needed for a more definitive statement on the relationships among amenities, perceived amenity loss, and the locational behavior of firms resulting from the siting of the repository. Despite the uniqueness of the repository, it may be possible to identify existing facilities in numerous industries, nuclear or otherwise, that may have had the potential to severely undermine locational amenities before they were developed. A thorough investigation of other case studies and a more systematic inquiry into the relationship between perceived amenity value and the siting of industrial activity is needed before valid conclusions can be drawn on the negative impacts of the Yucca Mountain facility.

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APPENDIX A:
CLASSIFICATION OF SECTORS FOR GROSS NATIONAL PRODUCT
AND EMPLOYMENT ANALYSIS

Industry Type	Category	SIC
Agriculture, extractive and transformative	Agriculture	01 to 09
	Extractive and transformative	
	Mining	10 to 14
	Construction	15 to 17
	Manufacturing	20 to 39
Services	Distributive services	
	Transportation, communications and utilities	40 to 49
	Wholesale	50 and 51
	Complex of corporate activities, central administrative offices and auxiliary (CAO&A) establishments	CAO&A of each one-digit SIC grouping
	Producer Services	
	Finance, insurance, and real estate	60 to 67
	Business services	73
	Legal services	81
	Membership organizations	86
	Misc. professional services	89
	Social services	83 ^a
	Nonprofit services	
	Health	80
	Education	82
	Retail services	52 to 59
	Mainly consumer services	
	Hotel and other lodging places	70
	Personal services	72
	Auto repair, services, and garages	75
	Misc. repair services	76
	Motion pictures	78
	Amusements and recreation services	79 and 84
	Private households	88
	Government and government enterprises	91 to 97

^aAfter 1974.

Source: Noyelle and Stanback (1984).

APPENDIX B (Cont'd)

Activity	Function ^a					Total
	R&D	Supply	Organization	Execution	Management	
1.4 Building and engineering						
1.4.1 Construction						
1.4.2 Planning						
2 Circulation						
2.1 Flows of persons and material						
2.1.1/2.1.2 Wholesaling						
2.1.3 Commercial agents						
2.1.4 Transport						
2.2 Information and communication flows						
2.2.1 Transmission of information						
2.2.2 Processing of information						
2.3 Financial flows						
2.3.1 Banks						
2.3.2 Insurance						
2.3.3 Financial institutions						
3 Distribution						
3.1 Health						
3.2 Education						
3.3 Retailing						
3.4 Hotels and restaurants						
3.5 Repair						
3.6 Personal services						
3.7 Leisure						
3.8 Domestic services						

APPENDIX B (Cont'd)

Activity	Function ^a				
	R&D	Supply	Organization	Execution	Management
4 Regulation					
4.1 Public administration					
4.1.1 National					
4.1.2 Regional					
4.1.3 Local					
4.1.4 Other public organizations					
4.2 Private organizations					
4.2.1 Social work					
4.2.2 Religious, social, cultural					
4.2.3 Collective interest					
4.2.4 Waste and purification					
4.3 International diplomacy					
Total					

^aThe functions are research and development; supply and stocks; organization; execution and operation; management and control; maintenance; and sales and trade.

Source: Bailly et al. (1987).

APPENDIX C:
TAXONOMY OF INFORMATION OCCUPATIONS

Occupation	Examples
A Information producers	
A1 Scientific and technical	Chemists and engineers
A2 Market search and coordination	Salespeople and buyers
A3 Information gatherers	Surveyors and quality inspectors
A4 Consultative services	Accountants and lawyers
A5 Health-related consultative services	Doctors and veterinarians
B Information processors	
B1 Administrative and managerial: government	Senior civil servants
B2 Administrative and managerial: corporate	Production managers
B3 Managers and proprietors	
B4 Process control: supervisory	Office supervisors
B5 Process control: foremen	Factory foremen or forewomen
B6 Clerical and related	Clerks and bank tellers
C Information distributors	
C1 Educators	School teachers and university lecturers
C2 Public information disseminators	Librarians and archivists
C3 Communications workers	Newspaper editors and television directory
D Information infrastructure	
D1 Printing and publishing	
D2 Information machine workers	Computer and printing press operators
D3 Postal and telecommunications	Mail carriers and telegraph operators

Source: Hepworth et al. (1987).

APPENDIX D:

STANDARD INDUSTRIAL CLASSIFICATIONS OF
100 HIGH-TECHNOLOGY INDUSTRIES
(after Markusen et al., 1986)

SIC	Industry Name
<hr/>	
2812	Alkaline & chlorine
2813	Industrial gases
2816	Inorganic pigments
2819	Industrial inorganic chemicals, NEC ^a
2821	Plastic materials, synthetic resins
2822	Synthetic rubber
2823	Cellulosic man-made fibers
2824	Synthetic organic fibers, except cellulose
2831	Biological products
2833	Medical, chemical, botanical products
2834	Pharmaceutical preparations
2841	Soap, other detergents
2842	Special cleaning, polishing preparations
2843	Surface active finishing agents
2844	Perfumes, cosmetics, toilet preparations
2851	Paints, varnishes, lacquers, enamels
2861	Gum, wood chemicals
2865	Cyclic crudes, intermediates, dyes
2869	Industrial organic chemicals, NEC
2873	Nitrogenous fertilizers
2874	Phosphatic fertilizers
2875	Fertilizers, mixing only
2879	Pesticides, agricultural chemicals, NEC
2891	Adhesives, sealants
2892	Explosives
2893	Printing ink
2895	Carbon black
2899	Chemicals, chemical preparations, NEC
2911	Petroleum refining
3031	Reclaimed rubber
3482	Small arms ammunition
3483	Ammunition, except small arms, NEC

APPENDIX D (Cont'd)

SIC	Industry Name
3484	Small arms
3489	Ordinance, accessories, NEC
3511	Steam, gas, hydraulic turbines
3519	Internal combustion engines, NEC
3531	Construction machine equipment
3532	Mining machinery equipment
3533	Oilfield machinery equipment
3534	Elevators, moving stairways
3535	Conveyors, conveying equipment
3536	Hoists, industrial cranes, monorail systems
3537	Industrial trucks, tractors, trailers, stackers
3541	Machine tools, metal cutting types
3542	Machine tools, metal forming types
3544	Specialty dies, die sets, jigs fixtures, industry molds
3545	Machine tool accessories, measuring devices
3546	Power-driven hand tools
3547	Rolling mill machinery equipment
3549	Metalworking machinery, NEC
3561	Pumps, pumping equipment
3562	Ball, roller bearings
3563	Air, gas compressors
3564	Blowers, exhaust, ventilation fans
3565	Industrial patterns
3566	Speed changers, industrial drives, gears
3567	Industrial process furnaces, ovens
3568	Mechanical power transmission equipment, NEC
3569	General industrial machinery equipment, NEC
3573	Electronic computing equipment
3574	Calculating accounting machines, except electrical computer equipment
3576	Scales, balances, except laboratory
3579	Office machinery, NEC
3612	Power, distribution special transformers
3613	Switch gear, switchboard apparatus
3621	Motors, generators
3622	Industrial controls
3623	Welding apparatus, electric
3624	Carbon, graphite products
3629	Electrical industrial apparatus, NEC

APPENDIX D (Cont'd)

SIC	Industry Name
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3651	Radio, TV receiving sets, except communication types
3652	Phono records, prerecorded magnetic tapes
3661	Telephone, telegraph apparatus
3662	Radio, TV transmitting, signal, detection equipment
3671	Cathode ray tubes, NEC
3674	Semiconductors, related devices
3675	Electronic capacitors
3676	Resistors, electronic applications
3677	Resistors, electric apparatus
3678	Connectors, electronic applications
3679	Electronic components, NEC
3721	Aircraft
3724	Aircraft engines, parts
3728	Aircraft parts, auxiliary equipment, NEC
3743	Railroad equipment
3761	Guided missiles, space vehicles
3764	Guided missiles, space vehicles, propulsion units
3769	Guided missiles, space vehicles, parts, NEC
3795	Tanks, tank components
3811	Engineering, laboratory, scientific, research instruments
3822	Industrial controls for communications and environmental applications
3823	Industrial instruments for measurement and display
3824	Fluid meters, counting devices
3825	Instruments, measuring, testing, electrical, electrical signals
3829	Measuring, controlling devices, NEC
3832	Optical instruments, lenses
3841	Surgical, medical instruments apparatus
3842	Orthopedic, prosthetic, surgical applications
3843	Dental equipment, supplies
3861	Photographic equipment, supplies

^aNEC = not elsewhere classified.

APPENDIX E:

STANDARD INDUSTRIAL CLASSIFICATION DEFINITION
OF 10 HIGH-TECHNOLOGY INDUSTRIES
(after Hall 1987)

Activity	Heading
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2570	Pharmaceutical products
3302	Electronic data processing equipment
3441	Telegraph and telephone apparatus and equipment
3442	Electrical instruments and control systems
3443	Radio and electronic capital goods
3444	Components other than active ones, mainly for electronic equipment
3453	Active components and electronic subassembly
3454	Electronic consumer goods and other electronic equipment
3640	Aerospace equipment manufacture and repair
7902	Telecommunications (excluding post office, broadcasting, and cable)

APPENDIX F:

LOCATION OF NATIONAL HEADQUARTERS, DIVISION HEAD OFFICES, AND REGIONAL SALES HEADQUARTERS
OF SELECTED LARGE CORPORATIONS, 1976

Type of Center and Node	SMSA Size	National Headquarters Fortune 500		National Headquarters 2nd Fortune 500	National Headquarters Fortune 150	Divisional Headquarters Fortune 650	Regional Sales Headquarters Sample Fortune 650
		1976	1959				
Diversified Service Centers							
National							
New York, N.Y.	1	100	137	62	23	1,173	4
Los Angeles, Calif.	1	21	17	18	6	558	3
Chicago, Ill.	1	44	50	46	16	780	6
San Francisco, Calif.	1	14	13	14	6	329	3
Regional							
Philadelphia, Penn.	1	11	21	13	3	252	3
Boston, Mass.	1	9	6	12	3	225	4
Dallas, Texas	1	8	8	19	4	161	5
Houston, Texas	1	10	1	12	6	327	3
St. Louis, Miss.	1	12	16	7	4	220	5
Baltimore, Md.	1	2	1	6	3	116	4
Minneapolis, Minn.	1	13	6	10	7	232	3
Cleveland, Ohio	1	18	19	16	3	259	4
Atlanta, Ga.	2	4	0	9	4	102	3
Miami, Fla.	2	2	0	4	3	68	1
Denver, Col.	2	3	4	3	3	131	3
Seattle, Wash.	2	2	2	0	0	62	2
Cincinnati, Ohio	2	3	4	5	2	94	4
Kansas City, Mo.	2	2	4	4	3	75	5
Phoenix, Ariz.	2	2	0	2	0	48	1
Indianapolis, Ind.	2	3	4	1	0	65	3
New Orleans, La.	2	2	1	0	1	65	2
Portland, Ore.	2	6	1	3	2	78	4
Columbus, Ohio	2	1	1	5	0	80	4

APPENDIX F (Cont'd)

Type of Center and Node	SMSA Size	National Headquarters Fortune 500		National Headquarters 2nd Fortune 500		National Headquarters Fortune 150		Divisional Headquarters Fortune 650		Regional Sales Headquarters Sample Fortune 650	
		1976	1959	1976	1976	1976	1976	1976	1976		
Subregional											
Memphis, Tenn.	3	2	0		1	0	50	2			
Salt Lake City, Utah	3	0	0		3	1	28	0			
Birmingham, Ala.	3	1	2		3	0	27	1			
Nashville, Tenn.	3	1	1		1	0	65	0			
Oklahoma City, Okla.	3	1	2		1	0	50	1			
Jacksonville, Fla.	3	1	0		1	1	36	0			
Syracuse, N.Y.	3	2	2		2	1	46	2			
Richmond, Va.	3	3	4		3	2	37	1			
Charlotte, N.C.	3	1	0		3	1	41	1			
Omaha, Neb.	3	2	2		2	1	30	4			
Mobile, Ala.	4	1	0		1			0			
Little Rock, Ark.	4	0	0		0			0			
Shreveport, La.	4	0	0		0			0			
Des Moines, Iowa	4	0	0		1			0			
Spokane, Wash.	4	0	0		0			0			
Jackson, Miss.	4	0	0		1			1			
Specialized Service Centers											
Functional											
Detroit, Mich.	1	15	15		8	4	306	4			
Pittsburgh, Penn.	1	14	21		11	2	200	2			
Newark, N.J.	1	6	8		5	2	145	3			
Milwaukee, Wisc.	2	11	7		7	0	138	4			
San Jose, Calif.	2	1	1		2	0	44	1			
Hartford, Conn.	2	4	2		4	0	78	1			
Raleigh-Durham, N.C.	4	0	0		0	0		0			

APPENDIX F (Cont'd)

Type of Center and Node	SMSA Size	National Headquarters Fortune 500		National Headquarters 2nd Fortune 500		National Headquarters Fortune 150		Divisional Headquarters Fortune 650		Regional Sales Headquarters Sample Fortune 650	
		1976	1959	1976	1976	1976	1976	1976	1976	1976	1976
Fresno, Calif.	4	0	0	0	0	0	0	0	0	0	0
Austin, Texas	4	0	0	0	1	0	0	0	0	0	0
Lansing, Mich.	4	0	0	0	0	0	0	0	0	0	0
Oxnard-Ventura, Calif.	4	0	0	0	1	0	0	0	0	0	0
Harrisburg, Penn.	4	3	0	0	1	0	0	0	0	0	0
Baton Rouge, La.	4	0	0	0	0	0	0	0	0	0	0
Columbia, S.C.	4	0	0	0	0	0	0	0	0	0	0
Utica, N.Y.	4	0	0	0	0	0	0	0	0	0	0
Trenton, N.J.	4	0	0	0	0	0	0	0	0	0	0
Madison, Wisc.	4	1	0	0	0	0	0	0	0	0	0
Stockton, Calif.	4	0	0	0	0	0	0	0	0	0	0
Education-											
Manufacturing											
New Haven, Conn.	3	4	2	2	2	0	0	57	0	0	0
Springfield, Mass.	3	0	1	2	2	1	1	32	0	0	0
Tacoma, Wash.	4	1	1	0	0	0	0	0	0	0	0
South Bend, Ind.	4	0	1	1	1	0	0	0	0	0	0
Ann Arbor, Mich.	4	0	0	3	3	0	0	0	0	0	0
Production Centers											
Manufacturing											
Buffalo, N.Y.	2	2	5	1	1	0	0	62	1	0	0
Providence, R.I.	3	2	2	2	2	0	0	61	0	0	0
Worcester, Mass.	3	2	2	2	2	1	1	54	0	0	0
Gary, Ind.	3	0	0	0	0	1	1	17	0	0	0
N.E. Pennsylvania	3	0	0	0	0	0	0	16	0	0	0
Grand Rapids, Mich.	3	1	0	2	2	0	0	44	0	0	0

APPENDIX F (Cont'd)

Type of Center and Node	SMSA Size	National Headquarters Fortune 500		National Headquarters 2nd Fortune 500		National Headquarters Fortune 150		Divisional Headquarters Fortune 650		Regional Sales Headquarters Sample Fortune 650	
		1976	1959	1976	1976	1976	1976	1976	1976	1976	1976
Youngstown, Ohio	3	0	0	2		0		16		0	
Greenville, S.C.	3	1	0	2		0		40		0	
Flint, Mich.	3	0	0	1		0		6		0	
Rochester, Minn.	3	4	2	1		0		44		1	
Louisville, Ky.	3	0	0	5		0		26		2	
Dayton, Ohio	3	4	3	5		0		69		0	
Bridgeport, Conn.	3	23	3	12		3		156		0	
Toledo, Ohio	3	7	6	1		0		83		0	
Greensboro, N.C.	3	5	3	2		2		61		0	
Akron, Ohio	3	4	4	2		2		67		0	
Allentown, Penn.	3	1	2	1		1		24		0	
Tulsa, Okla.	3	4	2	2		0		73		0	
New Brunswick, N.J.	3	2	1	3		2		73		0	
Jersey City, N.J.	3	0	2	3		0		24		0	
Wilmington, Del.	3	3	3	0		0		82		0	
Paterson, N.J.	4	3	2	4		5				1	
Knoxville, Tenn.	4	0	0	0						0	
Wichita, Kans.	4	2	2	3						0	
Fort Wayne, Ind.	4	1	2	0						0	
Peoria, Ill.	4	1	2	6						0	
Kalamazoo, Mich.	4	1	1	0						0	
Government and Education											
Washington, D.C.	1	2	0	2		5		119		3	
Sacramento, Calif.	3	0	0	0		0		13		2	
Albany, N.Y.	3	1	2	1		0		27		0	
New Bedford, Mass.	4	0	0	0						0	

APPENDIX F (Cont'd)

Type of Center and Node	SMSA Size	National Headquarters Fortune 500		National Headquarters 2nd Fortune 500		National Headquarters Fortune 150		Divisional Headquarters Fortune 650		Regional Sales Headquarters Sample Fortune 650	
		1976	1959	1976	1976	1976	1976	1976	1976	1976	1976
Canton, Ohio	4	2	2		4					0	0
Johnson City, Tenn.	4	0	0		0					0	0
Chattanooga, Tenn.	4	0	0		2					0	0
Davenport, Iowa	4	1	1		1					1	1
Beaumont, Texas	4	0	0		0					0	0
York, Penn.	4	0	0		1					0	0
Lancaster, Penn.	4	1	1		0					0	0
Binghamton, N.Y.	4	0	1		0					0	0
Reading, Penn.	4	1	0		1					0	0
Huntington, W. Va.	4	1	2		0					0	0
Evansville, Ind.	4	0	0		0					0	0
Appleton, Wisc.	4	2	1		1					0	0
Erie, Penn.	4	1	0		2					0	0
Rockford, Ill.	4	1	1		0					0	0
Lorain, Ohio	4	0	0		0					0	0
Industry-Military											
San Diego, Calif.	2	1	2		2		1	26	1	1	1
San Antonio, Texas	3	3	0		1		0	30	0	1	1
Norfolk, Va.	3	0	0		2		0	16	0	0	0
El Paso, Texas	4	0	0		1		0		0	0	0
Charleston, S.C.	4	0	0		0		0		0	0	0
Newport News, Va.	4	0	1		0		0		0	0	0
Lexington, Ky.	4	0	0		0		0		0	0	0
Huntsville, Ala.	4	0	0		0		0		0	0	0
Augusta, Ga.	4	0	0		1		1		1	1	1
Vallejo, Calif.	4	0	0		0		0		0	0	0
Colorado Springs, Colo.	4	0	0		1		1		0	0	0
Pensacola, Fla.	4	0	0		0		0		0	0	0
Salinas, Calif.	4	0	0		0		0		0	0	0

APPENDIX F (Cont'd)

Type of Center and Node	SMSA Size	National Headquarters Fortune 500		National Headquarters 2nd Fortune 500		National Headquarters Fortune 150		Divisional Headquarters Fortune 650		Regional Sales Headquarters Sample Fortune 650	
		1976	1959	1976	1976	1976	1976	1976	1976	1976	1976
Mining-Industrial											
Tucson, Ariz.	4	0	0	0	0					0	0
Bakersfield, Calif.	4	0	0	0	0					0	0
Corpus Christi, Texas	4	0	0	0	0					0	0
Lakeland, Fla.	4	0	0	0	0					0	0
Johannstown, Penn.	4	0	0	0	0					0	0
Duluth, Minn.	4	0	0	0	0					0	0
Charleston, W.Va.	4	0	0	1	1					1	1
Consumer-Oriented Centers											
Residential											
Nassau-Suffolk, Fla.	1	1	3	6	2	81	1			1	1
Anaheim, Calif.	2	1	1	4	0	121	1			1	1
Long Beach, Calif.	4	0	0	0			0			0	0
Resort-Retirement Tampa, Fla.	2	1	0	2	1	38	2			2	2
Riverside, Calif.	2	1	0	1	0	24	1			1	1
Ft. Lauderdale, Fla.	3	1	0	0	0	10	0			0	0
Honolulu, Hawaii	3	1	1	1	1	46	1			1	1
Orlando, Fla.	3	0	1	0	0	19	1			1	1
West Palm Beach, Fla.	4	0	0	0	0		0			0	0
Albuquerque, N.M.	4	0	0	0	0		0			0	0
Las Vegas, Nev.	4	0	0	0	0		0			0	0
Santa Barbara, Calif.	4	0	0	0	0		0			0	0
United States		500	500	500	150	11,477	128				

APPENDIX F (Cont'd)

Note: The Fortune 150s include the Fortune 50 largest transportation, 50 largest retailing, and 50 utility companies. The Fortune 650s include the Fortune 500 industrials and the Fortune 150s. The "Divisional Headquarters Fortune 650" column includes a full count of all the head offices of all the divisions of the Fortune 650. The "Regional Sales Headquarters Sample Fortune 650" column includes all of the regional sales headquarters of an eight-firm sample of the Fortune 650. The eight firms included in the sample are Continental Group, Clark Oil, Deere & Co., Borgwards Corp., Exxon, Procter & Gamble Corp., Chrysler, and AT&T. Information on Chrysler comes from *The Chrysler Corporation Financial Situation*, Hearings Before the Subcommittee on Economic Stabilization, United States House of Representatives, 96th Congress, 1979, Part 2: *Appendix*. Information on AT&T comes from the *Directory of Corporate Affiliation*, 1976. Information on remaining 6 corporations comes from *Large Corporations and Urban Employment*, Subcommittee on the City, United States House of Representatives, 95th Congress, February, 1978. The distribution of the national headquarters of the Fortune 150s and the divisional head offices of the Fortune 650s is not tabulated for size 4 SMSAs (blank cell).

Source: Noyelle and Stanback (1984).

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