Production System Dynamics and Metropolitan Development

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Abstract. This paper offers an analysis of the complex interrelationships between metropolitan development in the United States and the logic and dynamics of the system of economic production. The argument begins with a brief historical review of U.S. metropolitan growth and change since the end of the last century. Following this is a discussion of the recent reversal in the broad pattern of metropolitan expansion over the past several decades. The resulting dispersal of productive activity to suburban and nonmetropolitan areas has now become one of the dominant processes shaping the contemporary economic landscape. This process of dispersal is explained in terms of a theory of capital deepening, restructuring, and reorganization of productive activities. Accompanying this dispersal, a new spatial division of labor of considerable geographical significance has emerged. The paper concludes with a restatement of the developmental logic of the U.S. metropolitan system as a predicament-laden outcome of the logic of labor-process transformations in capitalism.

Key Words: Metropolis, urbanization, decentralization, dispersal, labor process, manufacturing, industrialization, production system, management and control, technology, technical change, division of labor, employment, urban policy.

In this paper I shall argue that the general pattern of metropolitan development in the United States is a structured outgrowth of the dynamics of the production system. This system is seen here as the engine that drives forward the entire spatial and temporal evolution of the modern metropolis. First, I shall show how the metropolis emerged in the second half of the nineteenth century on the basis of highly organized complexes of manufacturing activity. I shall then analyze the progressive dissolution of these complexes over much of the course of the present century and the reconstitution of industrial land use at dispersed suburban and peripheral locations. The effects of this dissolution on the internal structure of the metropolis will be examined. The analysis will indicate how the very processes that underlie this dissolution have also engendered a characteristic modern division of labor in society between blue-collar and white-collar work. This, in turn, has led to a situation in which the economic vacuum caused by the flight of manufacturing activity from the metropolis has been filled, in part at least, by a burgeoning office and service sector. These latter forms of economic activity, however, are also susceptible to disintegration within the metropolis, and they too now show signs of dispersing outward on a massive scale. In the closing paragraphs of the paper I shall attempt to pinpoint the basic policy and planning dilemmas created by the continued control exerted by the production system over the developmental trajectory of large metropolitan areas in the United States.

Theoretical Background: A Brief Statement

The notion that metropolitan development can be comprehended most effectively as a contingent outcome of production system dynamics was discussed in two earlier pieces (Scott 1980, 1982); a further investigation of this basic notion constitutes the main substance of the present paper. The purpose of that earlier work was to outline some of the theoretical foundations for the hypothesized
dependency (however mediated that dependency may be) of urbanization processes in contemporary North American society upon the structure of the mode of production in general and upon the forms of relations of capitalist economic production in particular. Such production, of course, includes not only manufacturing in the narrow sense (essentially processing and assembly work), but also cognate forms of service, office, and managerial activity.

The dependency is twofold. In the first place, and in general, the production system constitutes a primary active core within capitalist society in that the logic and imperatives of this core (including its imbricated system of class relations) continuously structure and restructure in various ways other major forms of social reality: political alliances and alignments, the division of labor, the course of technological change, regional development, the urban process, and so on. These remarks are not intended to deny the possibility of interactive transformations of various sorts (e.g., from urbanization back to the production system). However, they are intended to suggest that the basic driving mechanism of capitalist society is productive activity (i.e., the labor process) in its role as a stubborn set of social and economic relationships through which society is daily reproduced. This claim, of course, still leaves open the question as to how precisely this mechanism operates relative to the rest of society.

In the second place, and more concretely, the inhabitants of large cities gain their livelihoods by means of work within the structured environment of capitalist economic activity. It is essential to stress this truism at the outset in view of the peculiar tendency of many urban theorists to see the city as a purely sociopsychological phenomenon in which people consume housing, shop, segregate themselves into various sorts of neighborhoods, even commute, but in which their work and labor market behavior as such have (until recently, at least) been taken as largely unproblematical. This conventional view is surely questionable. In fact, the labor process is not only the eminently central datum of modern urban life, but, if the theory of modes of production alluded to above is broadly correct, it also provides a basic analytical clue that unlocks some of the most difficult puzzles about the development and internal order of the large metropolis. By the same token, the labor process is also in the end one of the keys to understanding the contextual specifics of housing, shopping, segregation, and commutation.

It is the purpose of the present paper to elucidate and elaborate these theoretical positions and to analyze the recent course of metropolitan change in the United States relative to the broad development of the production system. This development is itself a manifestation of a basic accumulative urge. In capitalism, production is a profit-seeking activity inscribed within a framework of competitive forces. Under the threat of ruin, and the promise of surplus profits, producers endlessly plough back their business earnings into productive activity. In this way, producers attempt to increase their efficiency and to confront direct and indirect competition by consistent technical improvement and cost cutting. A major element in this cost-cutting process is the streamlining of production tasks by mechanizing specific labor skills. This then cuts into the labor-market capacity of various fractions of the workforce and reduces their ability to bargain for higher wages. As these events occur, so production technologies advance almost uninterruptedly in association with periodic reorganizations of the labor process. The concomitant transformation of work tasks in capitalism engenders far-reaching shifts in the division of labor, human capital demands, and the location of jobs. As will now be shown, these various shifts have major determinate effects on the geographical pattern and historical evolution of the entire metropolitan system. The analysis begins with a consideration of industrial production in the late nineteenth century metropolis.

**Industrial Production in the Late Nineteenth Century Metropolis: An Overview**

The typical North American metropolis in the late nineteenth century was par excellence a focus of industrial production. Two specific forms of industrial enterprise appear to have dominated the metropolitan scene at
this time. First, the metropolis was a center of large-scale materials-intensive manufacturing activity, as typified by steel production in Pittsburgh, slaughtering and meat packing in Chicago, sugar refining in New Orleans, and flour milling in Minneapolis. Second, the metropolis was also markedly a center of small-scale labor-intensive manufacturing activity, such as clothing, printing, leather, jewelry, watches and clocks, furniture, and specialized metal working. Not all kinds of late nineteenth century urban industry can be neatly fitted into this simple bipartite classification (cf. Laurie and Schmitz 1981), yet both kinds seem to have occupied a predominant position within the metropolitan economy at this time. Let us deal with each of these forms of industrial production in turn.

Large-Scale Materials-Intensive Activity

Large-scale materials-intensive manufacturing activity in the late nineteenth century metropolis has been effectively analyzed by Fales and Moses (1972) in their study of industrial activity in Chicago after the Great Fire of 1873. Fales and Moses correctly invoke Weberian locational principles in their attempt to explain the geography of manufacturing in Chicago after 1873. They show that major materials-intensive activities such as brick making, foundries, blast furnaces, and meat packing sought out locations in close proximity to central rail and water terminals. Fales and Moses go on to show that this locational outcome can be explained by the circumstance that the costs of transporting commodities through the city by horse and cart were some 25 to 30 times greater per ton mile than the costs of transport by rail car and barge. Hence materials-intensive industries clustered tightly around main rail and water transport facilities, where they could efficiently assemble the raw materials they required, exchange inputs and outputs among one another, and then efficiently dispatch final products back to the metropolitan hinterland and beyond (cf. Pred 1966). Around this emergent industrial core of the metropolis there then sprang up a dense congeries of working-class residential districts.

Small-Scale Labor-Intensive Manufacturing Activity

Just as materials-intensive forms of manufacturing activity clustered at the core of the late nineteenth century metropolis, so also did small-scale labor-intensive industries, though for different reasons. One of the essential characteristics of this latter form of industry is that it tends (both then and now) to produce outputs for direct final consumption and is locked into deeply competitive struggles for markets. These struggles give rise to elaborate and constantly evolving forms of product differentiation. In addition, final demands are almost always varying and uncertain. Thus, methods of production in these kinds of industries resist standardization and mechanization, and production tasks are performed predominantly by live labor. In the nineteenth century, the labor-intensive qualities of these industries were often compounded by the widespread use of the putting-out system and sweating labor. Furthermore, as the theoretical analysis of Stigler (1951) suggests, the growth of markets for this type of manufacturing leads not so much to a growth in the size of individual firms as it leads to increases in the number of firms, combined with a further elaboration of the division of labor and a proliferation of highly specialized producers.

The circumstances described in the preceding paragraph have two major locational consequences for small-scale labor-intensive industry in large metropolitan regions. First, because it is characterized by an elaborate division of labor, this type of industry tends to form labyrinthine complexes of economic activity. Within these complexes, interplant linkages are generally highly developed, but because plants are small, individual flows of inputs and outputs are usually also small in magnitude. As these flows are small, economies of scale in the transport process are not obtainable and therefore unit transport costs are high. In addition, because of their constantly varying design specifications in matters of finish, form, color, fit, and so on, inputs and outputs must frequently be mediated by personal interventions ("face-to-face contact") at high cost. As a result, small-
scale labor-intensive activities have a propensity to cluster in distinctive functional areas.

Second, because these activities are by their nature labor-intensive, the overall demand for labor in any given functional cluster of firms can be extremely high. In the garment district of New York today, for example, this demand runs into many tens of thousands of workers. Accordingly, there is strong pressure on clusters of these firms to centralize and occupy locations close to the urban core, i.e., at the point of maximum accessibility to the urban population. Here their upward pressure on wage rates is reduced to a minimum. Further, at central locations wage rates can be held back even to the point where labor turnover rates begin to rise rapidly, for the probability of quickly filling vacancies is high at the core of the city, given that accessible central employment locations are likely to be insistently searched by workers looking for jobs.

Evidently, then, small-scale labor-intensive manufacturing activities in large cities have a strong tendency both to cluster and to centralize. These two different spatial processes emerge directly out of the internal logic of the production process.

The Late Nineteenth Century Metropolis in General

From the above it is evident that the industrial core of the large metropolis in the late nineteenth century made its historical appearance as an internally differentiated amalgam of both large-scale materials-intensive and small-scale labor-intensive producers. As already suggested, this core was surrounded by densely populated residential quarters in which the main work force was housed. Travel between home and work could then be accomplished predominantly on foot. In Chicago, Philadelphia, and other major cities, many of these residential quarters were connected to the industrial core by means of horse-drawn tram (cf. Moses and Williamson 1967; Hershberg et al. 1981) and later by electric trolley, which toward the end of the nineteenth century provided cheap and efficient means of mass transport for workers. This broad pattern of industrial and residential land use constituted a doubly determinate system of locational outcomes (cf. Vance 1966). On the one hand, industry of all kinds occupied central locations, where it was at once accessible to major transport terminals and to the total urban labor force. On the other hand, the labor force crowded in to the core of the city or settled in dense corridors along major horse-car and commuter rail lines so as to be as close as possible in distance and in time to central work places. In the crucible of human activity brought forth in this way, labor skills were continuously created and recreated, and the large metropolis became, as it remains today, a major repository of human capital.

The land use pattern described above was characteristic of the large metropolis well into the twentieth century. Even by the time of World War II, the cores of large cities in the United States were still typically given over to a considerable degree to industrial production. Nevertheless, from the very beginning of modern industrial development, and even as far back as the middle of the nineteenth century, there was a slowly accelerating tendency for industry to decentralize from the metropolitan core and to locate in suburban and peripheral areas. It would seem that this process of decentralization was characterized from the start by more capital-intensive forms of productive activity. This is evident, for example, from the work of Fales and Moses (1972), as well as from the extended account that Allen (1929) gives of the reconstruction and relocation of military gun production in Birmingham, England, in the 1860s. Certainly, by 1929 in the case of Philadelphia, manufacturing activities were marked by a tendency toward increasing mechanization (i.e., increasing amounts of installed horsepower per worker) with augmenting distance from the city center. If we define $p_i$ as the proportion of Philadelphia's workers in industry $i$ who were employed in the suburban ring in 1929, and $x_i$ as the city-wide average horsepower per worker in industry $i$, then $p_i = 17.5 + 3.9x_i$ ($r = 0.75$), as Erickson and Yancey (1979) show. They also indicate that $x_i$ itself correlates with the average distance $(d_i)$ of workplaces in industry $i$ from the center of the city, via the equation $x_i = -17.4 + 6.7d_i$ ($r = 0.48$). As capital intensification in industry proceeded in the late nineteenth and early twentieth centuries, increasingly routinized, high-productivity technologies were put into place. This freed many kinds of manufactur-
ning plants from the need to be close to major pools of labor, particularly skilled and craft labor, thereby allowing plants to escape from skyrocketing land prices in the core and to move out along rail, water, and, later, highway transport routes.

This decentralization and dispersal of manufacturing activity is today more than ever one of the most significant processes underlying the dynamics of metropolitan development in the United States. At a later stage we shall probe further into the basic analytics of the problem. For the moment, we turn our attention to a simple statistical description of the phenomenon of industrial decentralization as it has made itself manifest in recent decades.

**Recent Trends in the Decentralization of Industry**

Since the end of the Second World War, manufacturing activity and other sorts of productive activity have decentralized from the cores of large metropolitan regions in the United States. This decentralization has assumed the form of both the migration of industrial plants from inner-city areas to the urban periphery and, more importantly, the growth of new industry and employment opportunities in peripheral areas and the decline of old industrial activities in core areas (cf. Bluestone and Harrison 1980). Until recent years, the suburbs were the main recipients of new units of industrial capital and, accordingly, suburban areas grew very rapidly in both absolute and relative terms. Nowadays, however, in most of the largest SMSAs, industrial growth of the suburbs has tended to moderate somewhat, and has actually been reversed in many instances as industry has started to move into the metropolitan hinterland and to disperse outward on a hitherto unprecedented scale. Much of this expanded form of dispersal has consisted of a stream of new capital flowing toward the cities, small towns, and rural areas of the South and Southwest.

These various trends are exemplified and made concrete in Tables 1, 2, and 3. Table 1, which is taken from Muller (1981), shows percentage changes in employment in central cities and suburban rings in a sample of eight large U.S. SMSAs in the period from 1970 to 1977. For comparison, Table 1 shows changes both in manufacturing employment and total employment. In the sample SMSAs, central-city areas have been losers of total employment in recent years. This observation applies more emphatically to manufacturing employment. As Table 1 indicates, even suburban ring areas have recently started to lose manufacturing employment as the centrifugal pressures on industrial location have gathered momentum. By contrast, total employment in suburban ring areas still seems to be growing fairly rapidly.

Table 2 illustrates in a more elaborate way some of the main trends evident in Table 1. Table 2 provides data on changes from 1972 to 1977 in total manufacturing employment in a sample of 17 Sunbelt and Snowbelt SMSAs (selected on the basis of size and data availability). Remark, once more, the overall tendency for central-city manufacturing employment to fall, and the evidence of incipient decline in suburban ring areas. The

**Table 1.** Percentage Changes in Central-city and Suburban-ring Employment, Eight Large SMSAs, 1970–1977

<table>
<thead>
<tr>
<th>Central City</th>
<th>Suburban Ring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employment</strong></td>
<td><strong>Employment</strong></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Total</td>
</tr>
<tr>
<td>Philadelphia</td>
<td>–39</td>
</tr>
<tr>
<td>New York</td>
<td>–31</td>
</tr>
<tr>
<td>Baltimore</td>
<td>–29</td>
</tr>
<tr>
<td>St. Louis</td>
<td>–27</td>
</tr>
<tr>
<td>New Orleans</td>
<td>–26</td>
</tr>
<tr>
<td>Washington</td>
<td>–23</td>
</tr>
<tr>
<td>San Francisco</td>
<td>–22</td>
</tr>
<tr>
<td>Denver</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 2. Manufacturing Employment in Thousands, Central city and Suburban Areas, Seventeen Large SMSAs, 1972–1977

<table>
<thead>
<tr>
<th></th>
<th>Central City</th>
<th></th>
<th>Suburban Ring</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>New York</td>
<td>757.5</td>
<td>609.7</td>
<td>-19.5</td>
<td>191.5</td>
</tr>
<tr>
<td>Miami</td>
<td>25.6</td>
<td>20.7</td>
<td>-19.1</td>
<td>60.4</td>
</tr>
<tr>
<td>Atlanta</td>
<td>48.7</td>
<td>39.9</td>
<td>-18.1</td>
<td>83.7</td>
</tr>
<tr>
<td>Chicago</td>
<td>430.6</td>
<td>366.0</td>
<td>-15.0</td>
<td>479.0</td>
</tr>
<tr>
<td>Detroit</td>
<td>180.6</td>
<td>153.3</td>
<td>-15.0</td>
<td>371.2</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>106.3</td>
<td>91.4</td>
<td>-14.0</td>
<td>93.7</td>
</tr>
<tr>
<td>Boston</td>
<td>59.0</td>
<td>50.9</td>
<td>-13.7</td>
<td>207.5</td>
</tr>
<tr>
<td>Buffalo</td>
<td>53.2</td>
<td>46.4</td>
<td>-12.8</td>
<td>98.5</td>
</tr>
<tr>
<td>Pittsburgh</td>
<td>62.3</td>
<td>55.3</td>
<td>-11.2</td>
<td>200.5</td>
</tr>
<tr>
<td>Minneapolis-St Paul</td>
<td>57.9</td>
<td>52.0</td>
<td>-10.2</td>
<td>141.1</td>
</tr>
<tr>
<td>Cleveland</td>
<td>131.2</td>
<td>120.8</td>
<td>-7.9</td>
<td>137.7</td>
</tr>
<tr>
<td>Cincinnati</td>
<td>68.2</td>
<td>64.4</td>
<td>-5.6</td>
<td>89.4</td>
</tr>
<tr>
<td>Kansas City</td>
<td>20.4</td>
<td>20.2</td>
<td>-0.9</td>
<td>98.8</td>
</tr>
<tr>
<td>Dallas-Fort Worth</td>
<td>107.2</td>
<td>112.7</td>
<td>5.1</td>
<td>122.8</td>
</tr>
<tr>
<td>Seattle-Everett</td>
<td>54.9</td>
<td>61.2</td>
<td>11.5</td>
<td>53.7</td>
</tr>
<tr>
<td>Los Angeles-Long Beach</td>
<td>280.1</td>
<td>315.6</td>
<td>12.7</td>
<td>498.8</td>
</tr>
<tr>
<td>Houston</td>
<td>108.0</td>
<td>147.4</td>
<td>36.5</td>
<td>54.7</td>
</tr>
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</table>


Employment data presented in Table 2 represent aggregates of both production and non-production workers in manufacturing; the amount of general decline indicated by the data would undoubtedly be significantly greater if only production workers were taken into account. SMSAs located in the Northeast are consistently characterized by declining central-city manufacturing employment and by a mixed employment performance in suburban ring areas. Outside of the Northeast, Dallas-Forth Worth, Seattle-Everett, Los Angeles-Long Beach, and Houston show increases in central-city manufacturing employment and, with the exception of Los Angeles-Long Beach, relatively high rates of suburban growth. However, note that two Sunbelt SMSAs (Miami and Atlanta) had remarkably high rates of decline in central-city manufacturing between 1972 and 1977. If we looked more closely at the details of industrial activity in Sunbelt cities, we should undoubtedly find further evidence of persistent plant closures and falling employment (as, for example, in the case of the Los Angeles rubber industry). At a later stage in the argument, I shall propose that these early signs of industrial decline in the major metropolitan centers of the South and Southwest fore-shadow, in all likelihood, a more pervasive development of the process of centrifugal industrial dispersal from those same centers.

Table 3 provides data on changes in manufacturing employment by size class of SMSA for the whole of the United States for the period from 1967 to 1973. Observe that SMSAs with populations in excess of 300,000 were, in aggregate, net losers of manufacturing employment between 1967 and 1973, whereas medium-sized and small centers gained manufacturing employment over the same period. In addition, nonmetropolitan areas were strong gainers of manufacturing employment in the period from 1967 to 1973, and all the evidence suggests that this trend has con-
continued ever more forcefully to the present
time.

What accounts for this pervasive tendency for industry to vacate the cores of large metropolitan regions and to spread progressively outward across the landscape of the United States (if not, indeed, the world)? Here, an effort will be made to show that this tendency can be explained only in relation to the broad internal order and momentum of the production system as such. However, the locational dispersal of modern economic activity is also mediated through a variety of external urban environmental conditions, and these conditions help to regulate the entire process in specific ways.

**Metropolis-Hinterland Dynamics**

Recall that the accumulation of capital is accompanied by improvements in the efficiency of productive activities as well as a corresponding decrease in the ratio of necessary inputs to outputs (cf. Feller 1975). These events bring about a reduction in the locational dependence of industrial plants on the sources of their material inputs and cause spatial margins of profitability to widen. These spatial margins have been extended further by the steady amelioration of transport services over the past several decades. These developments alone have brought about a certain decentering and spreading out of industry; already, by the beginning of the present century, they had encouraged a dispersal of materials-intensive industry. To understand the process of dispersal in its deeply rooted historical fullness, however, we need to inquire more carefully into the dynamics of the process. We need to consider the nature of secular change in industrial technology and the labor process, and to note the implications of this change for the location and relocation of industry.

**The Mainsprings of the Decentralization Process**

As the accumulation of capital moves forward, as capital is progressively, though irregularly, substituted for labor in the production process, and as industrial technology improves (cf. Kendrick 1961; Solow 1957) in the endless struggle between producers to increase their profits, to hold back wages, and to avert bankruptcy, so a number of important changes are wrought in the organizational structure of industrial enterprise.

First, more efficient production technologies, combined with scientific forms of management, enable firms to grow in size, to achieve vertical and horizontal integration of functions, and thus to secure significant internal economies of scale (cf. Friedman 1977). These developments alone encourage the steady decomposition of old centralized industrial complexes made up of small-scale labor-intensive activities. For example, the Northern Ireland linen industry, which was originally organized into an elaborate complex of small specialized plants (concentrated above all in Belfast), dissolved into a few major vertically integrated producers as it was decisively penetrated and restructured in the 1950s and 1960s by international capital (Steed 1971).

Second, as the so-called product-cycle literature indicates (cf. Hirsch 1967; Norton and Rees 1979), technological advances in any given industrial sector tend to lead to greater standardization of production processes, and this leads in turn to greater standardization of linkage patterns. In combination with increases in the magnitude of inputs and outputs, the standardization of interindustry linkages gives rise to dramatic reductions in unit transport costs, for quantity discounts become available on linkages (as demonstrated by Bater and Walker 1970) and the more even flow of materials reduces the need for complex personal intermediation of orders. Consequently, industries come to depend less and less upon one another in purely spatial terms.

Third, and as Braverman (1974) has so forcefully shown, improvements in industrial technology invariably involve both the disintegration of specific skills originally residing in the hands and brains of workers and the re-embodiment of those skills in machinery and equipment. In other words, technological advances in industry tend to be associated with a process of secular deskilling, in which, as capital is substituted for labor, so also, on balance, is less skilled labor substituted for more skilled labor. This means, in addition,
that industries are increasingly freed from reliance upon the pools of labor skills that are typically concentrated in and accessible only through the metropolitan labor market.

Fourth, as industrial firms grow in size through capital deepening, restructuring, and mergers, and ultimately internationalization, geographical specialization of the internal functions of the firm comes about, with the result that blue-collar and white-collar functions within the firm often become spatially separated and assigned to different locations.

The production-system dynamics described above have powerful implications for the location of industry and for the evolution of the metropolitan system. There are two distinctive "moments" in this process: On the one hand, capital deepening and restructuring dissolve old central industrial complexes. On the other hand, in the context of the given geographical conditions in the major capitalist economies, these same processes also encourage the reconstitution of industrial land use at various dispersed locations. The operation of these dynamics is intensified in the context of ever more competitive incursions into the domestic economy by cheap foreign producers (cf. Massey and Meegan 1978).

The Disintegration of Central Industrial Complexes and the Decentralization of Industrial Production

Only the exigencies of tight linkage structures and the need to be close to the center of a maximally fluid labor market (especially insofar as skilled labor is concerned) will hold industrial complexes together on the high-cost land at the core of the city. With the development of enlarged and more efficient units of capital, these clusters begin to disintegrate as functionally organized entities. Simultaneously, as already indicated, capital deepening in industry is associated with standardization of interplant linkages and reductions in linkage costs, combined with the substitution of unskilled and semiskilled labor for skilled labor. Concomitantly, streamlined producers using capital-intensive routinized production technologies and employing unskilled labor begin to bypass accessible but expensive central-city sites and to disperse outward to the suburbs and the metropolitan hinterland, where, under these new conditions of production, relatively high profits can be earned.

This process of decentralization is reinforced by the tendency for blue-collar and white-collar work within the firm to be spatially split up as the firm grows in size. This enables capital-intensive blue-collar functions to disperse outward while labor-intensive white-collar functions remain behind at the core of the city. Decentralization is further encouraged by the circumstance that, when industrial plants vacate the large metropolis, they often take with them a few key supervisory and skilled personnel. Dispersal enables such plants to hoard these critical labor resources, as the opportunities for alternative employment at the new (decentralized) locations are likely to be significantly diminished. This notion is in line with Oi's (1962) insight into labor as a "quasi-fixed factor of production." Also, decentralized industry will often find at the outset that it can secure its main labor requirements at lower wages per occupational category than prevail in core areas of the metropolis. With augmenting waves of decentralization, however, there is a countervailing tendency for wages in the suburbs and beyond to rise relative to central-city wage rates (Scott 1981). Even so, if decentralized industry is indeed capital intensive, then it is by the same token able to confront and assimilate rising labor costs in the periphery with relatively less damage to its profit margins than would be the case with more labor-intensive activities. Furthermore, as wage rates rise on the periphery, these evidently accentuate the hypothesized tendency for the core and the periphery to become locationally specialized foci of labor-intensive and capital-intensive activities, respectively. Note that these remarks are not intended to imply that the spatial disaggregation of industrial production in relation to capital-labor ratios occurs independently of specific sectoral effects. On the contrary, we may well find in practice (depending on other locational influences such as heavy reliance on a particular kind of material input) that some labor-intensive sectors of production are on average more geographically dispersed than some capital-intensive sectors. The point, however, is that once we
hold the effects of other sector-specific variables constant, then, if our hypothesis is correct, we should expect to observe locational decentralization as a function of capital deepening, rationalization, and restructuring in industry.

For the present, this fundamental hypothesis about the dynamic interrelations between metropolitan space and the labor process (i.e., labor-intensive activities at the core, capital-intensive activities in the periphery, and increasing decentralization with capital deepening and technological change) must remain somewhat speculative and largely devoid of the substantive subtleties and complexities that are part of its overall meaning. I have developed some preliminary evidence in favor of the hypothesis (Scott 1980), and have recently reviewed an extensive but scattered literature that provides some evidence that is consistent with the hypothesis (Scott 1982). At the same time, the product-cycle literature referred to earlier points broadly in the same direction. A recent planning report on the Toronto Census Metropolitan Area (Cubukgil and Scott 1980) also has shown how some of the peculiarities of the economic cycle in inner-city and suburban areas can evidently be accounted for in terms of the hypothesis. Nevertheless, it is apparent that we need additional empirical evidence before we can consider the hypothesis to be substantively established. Furthermore, the familiar deficiencies of existing data on intrametropolitan industrial activity are sure to hinder any attempt to subject the hypothesis to rigorous statistical tests. Notwithstanding these various reservations, the theoretical ideas outlined earlier constitute at least a start on the urgent task of rethinking metropolitan system dynamics from the standpoint of the manifold conceptual clues offered by modern theories of production and the labor process.

A Brief Critique of Existing Theories of Metropolitan Industrialization and Disindustrialization

In light of the above, it seems fruitful to append a few preliminary critical observations on existing theoretical accounts of industrial location and relocation in and around the large metropolis. To begin with, the conventional story (as enshrined in innumerable textbooks of urban and economic geography) about the process of industrial decentralization would seem to need reassessment. This story typically invokes such factors as obsolete central plant and equipment, lack of space for expansion, the invention of truck transport, the development of horizontal factory layouts, and management-union conflicts in inner-city areas as contributing to the creation of persistent centrifugal forces ejecting industry from the urban core. To the extent that these factors have any genuine effect, however, it now seems possible to see them as essentially a subsidiary nexus of events. They certainly underpin and accentuate the process of decentralization in various ways, but they are also surely secondary to the process of the historical evolution and continual reconstruction of capitalist production systems.

In this regard, it would seem that the pervasive relative shift of industry to the South and Southwest of the United States is in many ways just one more manifestation of the same process, as is the shift of industry to nonmetropolitan areas generally. In recent years the growth of industry in the Sunbelt has become a dominant element of the emerging new American industrial landscape and, given its idiosyncratic appearances, some location theorists have seemed to treat it as a unique and exceptional case.3 The special characteristics of new industrial growth in the Sunbelt, however, like new industrial growth in the hinterland regions of Canada, or in the so-called Intermediate Areas of Britain, can perhaps be seen more adequately as a case of local geographical and historical conditions, which channel, but do not in themselves engender, the relative shift of industrial activity away from the old industrial centers. Of course, when metropolitan areas in the Sunbelt offer definite locational advantages to industry (e.g., in matters of wage rates, land prices, and tax levels), they do attract much new industrial capital investment. However, as these areas develop and grow, the process of centrifugal locational activity begins to make itself apparent even here (cf. Rees 1978); and, as Lonsdale and Browning (1971) and Till (1973) indicate in their studies of industrial location in the South, much new industry in the South has now begun to bypass
the large cities and to locate at scattered pockets of cheap and politically passive labor in small towns and semirural areas. Clark (1981) has recently written at length on the complex labor market advantages of these locations for standardized forms of industry.

The theoretical and analytical tasks that begin to emerge from the discussion in the previous two paragraphs can now be seen as pointing toward a necessary synthesis of the doubly faceted process involving the dissolution of industrial complexes in large metropolitan regions and the growth of dispersed new industry in suburban and nonmetropolitan areas. These are not two distinct and unrelated phenomena; on the contrary, they are complementary aspects of a single phenomenon, whose roots lie in the historical transformation of the social relations of production in capitalism.

To be sure, some existing theoretical investigations do attempt to confront directly this broad and important task of synthesis. In particular, the product-cycle theory of industrial dispersal and relocation (cf. Norton and Rees 1979) is an attempt to deal coherently with these issues in terms of a basic concept of the development and maturation of final industrial outputs. The theory suggests that metropolitan centers are "seedbeds" of industrial innovations. Firms manufacturing new products are said to be "incubated" at the core of the metropolis, where, it is thought, positive agglomeration effects help to compensate for their otherwise fragile and uncertain economic prospects. Then, as these firms move along the "learning curve"—or alternatively, as their outputs proceed through the product cycle toward maturity and old age—industrial plants are "spun off" from the core of the metropolis. These are plants whose production processes are routinized and whose key human input is unskilled labor; accordingly, they begin to filter down through the system of cities "from places of greater to lesser industrial sophistication" (Thompson 1969, p. 8).

It is evident that this theory runs parallel at certain points to the theory articulated above, whereas at other points the two theories diverge markedly. The problem with the product-cycle theory in general is its formalistic nature. It is a theory that appears not to go far enough or deeply enough into the dynamics of the production system and their spatial consequences. From all that has gone before, it is evident that the relative locational shift of industry from the core of the large metropolis to the periphery and beyond is not so much generated by a product cycle as it is by historical transformations of the labor process involving the deepening and restructuring of capital under the pressure of the drive to accumulate. These transformations may occur whether or not there is a product cycle in the strict sense of a (theoretically privileged) evolution in the form and design specifications of final outputs. To the extent that there is such an evolution, it is itself largely an outcome of these same transformations. It seems clear as well that the whole "seedbed-incubation" notion is really an unfortunate metaphor that prematurely forecloses investigation of more basic issues. Above all, the metaphor conceals the whole analytical dimension of clustering and centralization via the division of labor, linkage dynamics, and local labor market processes discussed earlier.

Thus, although the product-cycle theory comes close at certain points to a determinate analysis, it fails to address coherently the crucial question of the logic of the labor process in capitalism. Because the theory does not seek to appropriate for itself this necessary conceptual foundation, its strictly geographical components remain analytically unresolved.

The New Spatial Division of Labor and the Changing Social Geography of the Metropolis

A Further View of Metropolitan Employment Data

The changes in the production system described above have been accompanied by a marked growth of management and control (i.e., white-collar or office) functions in the U.S. economy. Production (i.e., blue-collar) functions, by contrast, have grown much less rapidly. For present purposes, let us broadly define white-collar occupations as comprising professional and technical workers, managers and administrators, and clerical workers. Blue-collar occupations are defined as comprising craft and kindred work-

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<th>Year</th>
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ers, operatives, and laborers. As Table 4 indicates, the number of white-collar workers in the United States increased by some 69 percent from 24.4 million in 1960 to 41.2 million in 1978. Over the same period, the number of blue-collar workers grew 30 percent from 24.2 million to 31.5 million. This changing occupational structure in the U.S. economy has been associated with important contingent changes in the spatial division of labor. Nowhere have these changes been more apparent than in the large metropolis itself. In particular, whereas production work has broadly declined in recent decades in the central cities of large metropolitan regions, many types of white-collar office employment have actually increased in those same areas. There have also been strong increases in white-collar jobs in suburban areas, and this is all the more marked in relative terms because blue-collar functions have now entered a second stage of dispersal involving the abandoning of even suburban locations for the far metropolitan hinterland. This complex spatial ebb and flow of different sorts of economic activity in the metropolis-hinterland system is concealed by aggregate data, which, for example, simply show that total employment in U.S. SMSAs as a whole grew by some 10 percent from 53.6 million in 1970 to 58.9 million in 1974 (Barabba 1975).

These remarks are highlighted by Table 5, which shows changes in office employment in New York, Los Angeles, and Chicago between 1960 and 1970. Over this period, office employment increased in both the central cities and the suburban rings of these three major SMSAs. In the central cities the increases averaged 5.3 percent, whereas in suburban rings the increases averaged a dramatic 47.9 percent. In spite of the relatively slow growth of office employment in central cities, the continued domination of office functions within the economy of central areas is underscored by persistent increases in office floor space in the core. Thus, Armstrong (1979) indicates that office floor space in the central business districts of New York, Los Angeles, and Chicago has grown by some 38.8 percent on average between 1960 and 1970; and data for Toronto published by the City of Toronto Core Area Task Force (1974) reveal an increase of more than 98 percent in office floor space in the central area from 1963 to 1973. Even with the considerable suburbanization of office activities that has taken place in the recent past, it is evident that central cities have continued to hold their own as foci of office functions, that is, as foci of management and control operations within the national economy as a whole.

The Office Sector and the Metropolitan Economy

It is suggested that the continued significant presence of office activities within the core areas of large metropolitan regions can be accounted for in the same way that the centralization of small-scale labor-intensive manufacturing was accounted for earlier. Thus, many kinds of office activities are non-routine, resistant to standardization, and possessed of extremely variable input-output relations that call for high-cost personal contact between firms. For all of these reasons, office activities also tend to be highly labor
intensive on the whole. As a corollary, offices commonly cluster together at maximally accessible central locations. These locational proclivities of offices are underscored by the very process of geographical specialization of the internal functions of the firm discussed above.

As a consequence of the growth of firms, of the increasing importance of white-collar labor relative to blue-collar labor in the production system, and of the burgeoning tendency for individual firms to divide into locationally differentiated components, the core areas of major metropolitan regions become more and more specialized centers of labor-intensive management and control functions, while capital-intensive branch plants disperse across the landscape of North America, and indeed, the world. This augmenting spatial rupture between management and control activities on the one hand and production activities on the other hand, together with its broad political consequences at the world scale, has been effectively scrutinized by Hymer (1972) in his seminal paper on the locational dynamics of international capital.

The discussion in the preceding paragraphs may be illustrated with a schematic scenario outlining three hypothetical stages of metropolitan development in relation to the production system dynamics described earlier. In a first stage of development, productive activity is predominantly clustered at the center of the city under the pressure of the burdensome costs of commodity and information flows, combined with the need to be accessible to a large pool of labor. At this stage, the management and production phases of each firm are joined together at a single location. In a second stage, there are the beginnings of decentralization of economic activity, as production units substitute capital for labor. In addition, as firms grow in size, locational specialization starts to appear within the firm: labor-intensive management and control functions, which rely upon costly information flows, remain tied to the core of the city, while a few branch plants are established at the edge of the city. In a third stage, blue-collar productive activity is effectively totally decentralized in the form of dependent capital-intensive plants controlled ultimately by specialized labor-intensive management.
and control units clustered at the core of the city.

As further documentation of this tendency toward the continued centralization of high-level managerial activity, Evans (1973), Goodwin (1965), and Goddard and Smith (1978) have shown that head-office functions are at the present time increasing rapidly in the cores of large metropolitan areas in both the United States and Britain. Around these nerve centers of major capitalist economies appears a subsidiary web of financial, legal, administrative, and business service activities, forming the functional composite of the central business district. Even in the case of these nerve centers, however, there is considerable decentralization of functions. Part of this decentralization can, of course, be ascribed to falling information-transfer costs as a result of recent dramatic improvements in telecommunications technology. But much of it can also be attributed to capital deepening, in a broader sense, within the management and control sector; it seems in fact that a large part of decentralized white-collar employment is made up of such capital-intensive elements as routine billing operations, tabulating, data management and computer facilities, and payroll preparation.

Residential Patterns and Population Movements

These changes in the spatial division of labor within and around the modern metropolis have brought with them contingent changes in urban social geography. In the period up to about the mid-1960s, inner-city neighborhoods were typically and predominantly centers of blue-collar housing, as contrasted with suburban communities, which were typically given over to white-collar residential activity. However, with the increasing suburbanization of industry and the increasing domination of economic activity in core areas by white-collar functions, this differentiated pattern of jobs and residences gave rise to a process of daily commutation in which blue-collar and white-collar workers crossed one another in their respective journeys to and from work. Then, the pattern itself started to be effaced as the economic tensions created by this irrational structure of commutation began to give way to an exchange of population between core areas and the suburbs. This process of exchange is as yet far from complete. Already, however, it has produced significant transformations of the social space of many large metropolitan areas. Witness the growth of white-collar residential communities in many inner-city areas through the process of gentrification (with concomitant reductions in overall central population densities), and the emergence of blue-collar suburbs, often characterized by forms of working-class structure and society that were previously thought to be uniquely endemic to central-city areas (cf. Muller 1981).

Furthermore, as both blue-collar and white-collar productive activities have spread far into the metropolitan hinterland, there has been, in part at least, an associated outward spread of population into the small towns and rural areas of North America. Of course, the recent widespread phenomenon of population decentralization has also in part been caused by secular reductions in the real costs of personal travel and commutation, the out-migration of retirees from large metropolitan areas, and the growth of dispersed recreation centers. The primary growth of both jobs and population at nonmetropolitan locations has subsequently induced secondary rounds of growth (most especially in the service sector) through various multiplier effects. These complex interactions could presumably be effectively analyzed with the aid of some sort of reconstructed Lowry model.

One final comment is apposite at this point. Many researchers (e.g., Greenwood 1980) have claimed that the decentralization of manufacturing jobs from the cores of large metropolitan regions has been a consequence of the preceding migration of population to suburban and nonmetropolitan locations. For all the theoretical reasons laid out earlier, the strong version of this claim is viewed here with some skepticism, in that the argument developed in this paper ascribes a privileged role to transformations of the labor process as the driving mechanism of locational redeployment in production. This notion concerning the analytical priority of production system dynamics relative to simple population shifts is echoed in the empirical work of Norton and Rees (1979). But once this has been said, it must be added that there are
no doubt complex interdependencies between the nonmetropolitan growth of production on the one hand and population on the other hand. In brief, the contingent nonmetropolitan growth of population, in its turn, encourages new rounds of industrial decentralization by ensuring a more ready and accessible supply of labor at dispersed locations; however, the mainsprings of this process continue to reside in the endemic underlying tendency toward rationalization of the labor process in capitalism.

Conclusion: The Fundamental Coordinates of Metropolitan Development

The manifold changes described in this paper have created serious stresses within the U.S. metropolitan system. Above all, the steady drain of jobs and population away from the inner-city areas of many large cities has been so persistent that, in several cases, serious crises of municipal finance have ensued. In recent years, many suburban communities have also begun to show signs of the job-loss and plant-closure syndrome. In metropolitan areas throughout the United States, workers' organizations have started to spring up in response to both the personal and communal predicaments created by this syndrome. At the same time, in an effort to stave off some of the worst effects of the syndrome, many municipalities are now actively seeking to attract new industrial and commercial activities back to the city by means of more generous zoning arrangements, property tax allowances, subsidization of land costs, and so on. Nevertheless, in view of the interrelations between the internal dynamics of the production system and the location and relocation of economic activity discussed earlier, it appears doubtful that purely localized initiatives of these sorts can stem the tide of economic decentralization and dispersal. This is all the more the case given the likely boost to the whole process that will assuredly occur as a result of continued incursions of electronic and microprocessor technologies into assembly, processing, and clerical functions.

The future course of metropolitan change in the United States is likely to be governed by two basic forces, both rooted in the dynamics of industrial development (cf. Berger and Piore 1980). On the one hand, a continuing division of labor will in all probability bring into existence new forms of small-scale labor-intensive economic activity, with a tendency to congregate into vertically and horizontally disintegrated clusters of productive employment. Such clusters would be likely, at least in part, to seek out centralized locations within the large metropolis. On the one hand, continued capital deepening and restructuring will tend to bring about deskilling and the streamlining of labor processes at ever higher levels of technical autonomy; these processes will simultaneously tend to encourage successive waves of decentralization and dispersal of economic activity. It is, of course, a hazardous task to attempt to predict the relative future pace of these two tendencies (and hence to predict the likely future course of metropolitan development in the United States). One thing that does seem clear, however, is that any meaningful attempt to deal with the predicaments created by this twofold metropolitan dynamic will call for policy and planning initiatives at the highest level of government. Should these initiatives indeed eventually be forthcoming, they will also need to be an integral part of an overall national economic policy that addresses in some coherent way the interdependent problems of production, employment, trade relationships, and urban and regional development.

Notwithstanding the reservations expressed in the previous paragraph, it does not seem too farfetched to predict that the large metropolis in the United States is likely to continue to develop as a sort of command and control point embedded within a progressively dispersed and internationalized production system. It remains to be seen whether this development will be accompanied by a process of long-run secular decline in jobs and population within the metropolitan system, or whether it will be punctuated by periodic bursts of new business activity and new growth. Whatever the case, it is likely to be governed in practice by the basic structural condition described above, in which the evolution of the metropolitan system is caught between the intertwined but antithetical locational effects of the division of labor.
on the one side and the resynthesis of labor processes on the other.

This last condition reminds us of our initial point of departure, namely, the proposition that the dynamics of metropolitan development in the United States are intrinsically geared to the forms, relations, and momentum of capitalist economic enterprise. As this fundamental structural relationship begins to change its outward form (while its inner rationality, production for accumulation, remains effectively intact), a new and largely unforeseen generation of urban and regional problems unfolds. There remains the vital task of formulating durable and progressive policy responses to these problems.

Notes

1. The term “decentralization” is used throughout this paper to designate general increases in suburban or peripheral manufacturing activity levels relative to activity levels in the core. This involves a compound process of in situ changes in manufacturing activity, births and deaths of plants, and the actual migration of plants from the core outward.

2. Erickson and Yancey’s equations have been algebraically transformed in conformity with the immediate purposes of the present account.

3. That is, they seem to regard it as an unmediated consequence of a peculiar combination of local endowments, of which the more commonly mentioned are cheap labor, the presence of raw materials, a favorable business climate, and mild winters. Among others, see McLaughlin and Robock (1949) and Nicholas (1974). In this connection, see also the critique by Sayer (1982) of Keeble’s (1980) invocation of “rurality” as a causal factor in recent locational shifts in British manufacturing.

4. Some possible examples are advanced forms of financial operations or certain kinds of research and developmental work.

References


