FINDING FIRMS FOR JOINT DEVELOPMENT SITES:

AN ALGORITHM FOR INTEGRATED

BUSINESS LOCATION PLANNING

by

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ABSTRACT

Business location decisions play an integral role in determining the physical form and economic function of an area. Until quite recently, however, the ability to incorporate locational behavior into effective development planning policies has been all but precluded by the primitive state of theoretical and empirical understandings of the phenomenon. This has resulted, in turn, on reliance upon hit-or-miss, incentive-oriented firm-attraction strategies which typically rely on publicity and other promotional tactics to cast a wide "net" in the hope of bringing in the "big fish" that local economies want or need.

The dilemma of locator identification is particularly germane to problems associated with successful joint transit-real estate development policy and planning, as past experience has indicated. Here, the existence of a transit facility and the scale economies resulting from agglomeration of activities can provide a uniquely attractive combination of locational resources. Yet joint development efforts have, on the whole, been less than successful in fulfilling their mandate by capitalizing upon these assets; a failure which can be attributed, in part, to their inability to identify the firms which can exploit these resources in an appropriate and timely manner, by locating on the joint development site.

This thesis will describe the design and implementation of a procedure which provides one means of overcoming this problem, in the form of a technique for identifying high-potential occupants for specific development locations. This procedure is comprised of three basic steps: In the first, empirical data are used to

determine the factors which are most critical to the location decision, on both site- and firm-specific bases. The results of these analyses are then used in Step II to develop profiles of location-appropriate industries and high-relocation-potential firms, respectively. In the third and final step of the process, these profiles are merged and operationalized into a filtering program, which sorts through over five million firms to identify those which are most likely candidates for location on the target site. The final output of the process is a list of the names and addresses of these firms, which can then be contacted directly by the user as a part of the latter's development strategy.

An application of the procedure, which was developed for the city of Indianapolis, is presented as an illustration of the form which this highly portable methodology took, in one specific case. This example also provides the basis for an analysis of the procedure's technical and theoretical strengths and weaknesses, as well as for an evaluation of its potential as a general-use development tool.

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CHAPTER ONE:

INTRODUCTION

Business location decisions play an integral role in the economic and spatial development of a city. The placement of industry and commerce on the cityscape influences, to varying degrees, demand for a diverse range of infrastructure and goods - housing, utilities, public and social services, transportation, and more business. An understanding of the business location decision, however cursory, is thus critical to the success of both short and long-range public planning and policy efforts; from those aimed at providing jobs today to the provision of transportation facilities tomorrow.

Yet despite (or perhaps because of) the complex and critical role which private sector location decisions play in public sector planning, our empirical and theoretical understanding of the phenomena remain poor. This basic weakness hampers our ability to target and to control ongoing development, as well as to forecast long-term growth patterns. As a result, urban development efforts, such as joint development plans, are generally characterized by hit-or-miss strategies (e.g., "Make it in Massachusetts") which rely on publicity to cast a wide net in the hope of bringing in the "big fish" that they need. In the absence of sufficiently specific tools and data, the planner lacks a credible basis on which to identify and/or approach potential developers. Instead, he can only throw out a few tax or zoning incentives as bait, and then wait for the "right" developer to swim by. In practice, this means that the best a development planner can frequently do is to identify and attempt to court individual members of broad industry

groups which might intuitively be interested in and appropriate for a particular city or site. It also means that the success or failure of even the best-planned development effort is ultimately left to the vagaries of the very market which it is attempting to influence.

Nowhere is this more true than in the case of joint transit/land development planning. The term "joint development" initially evolved from efforts to minimize the negative effects of highway facilities. Today, it is most commonly used to the multiple use of transit corridors and station areas for real estate projects and transit facilities.[1] It is thus characterized by real estate projects that are closely linked to public transportation services and stations, and which rely to a considerable extent on the market and locational advantages provided by the transit facility.[2] The benefits which can potentially be reaped from joint development are therefore both significant and obvious: economic efficiencies, improved returns on investment, and enhanced property values can all be achieved through complementary capital improvements.

But the implementational barriers to the type of private/public partnership which joint development implies are equally impressive, and prime among them is the problem of developer identification. Once the type and scale of desired development have been determined, suitable developers must be found, and means of attracting them to the site(s) devised. As the BART experience indicated only too well, however, the simple availability of developable parcels bordering transport facilities is not a sufficient condition for development to actually occur. Regardless of the physical structural relationships between land use and transport, joint development requires close

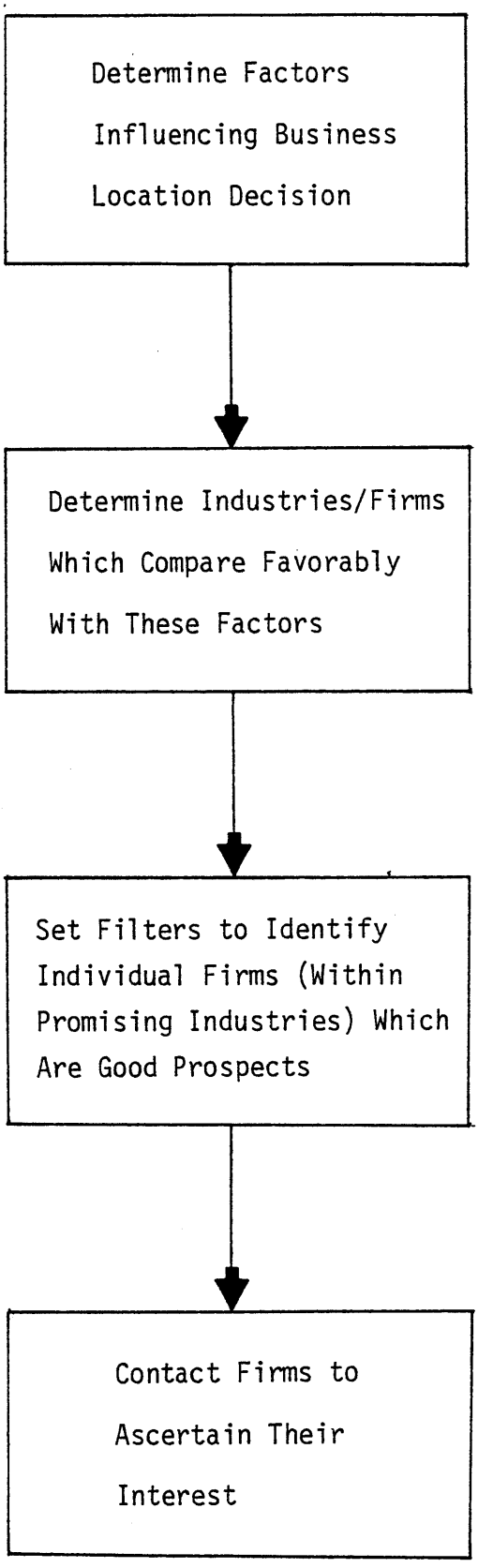
cooperation among private real estate developers, public transit authorities, and urban development agencies. And before such cooperation can possible be achieved, the "right" type and number of developers must be found.

1.1 An Introduction to the Finding-Firms Process

This thesis will describe the design and application of a business location forecasting algorithm which can solve this primary barrier to successful joint development plan implementation. By identifying individual companies which have a high probability of being interested in developing or location on a particular site, or in a particular city, it relieves the planner of his uncomfortable position on the waiting end of a "don't call us, we'll call you" relationship. In doing so, it has the potential for increasing the workability of joint development policies, to the extent that they can better result in enhanced and efficient real estate and transport investment patterns.

Figure 1 illustrates the basic structure of the firm-finding procedure which will be described in detail in Chapters Five and Six. As this simplified flow chart indicates, the method, in its current form, consists of three basic steps: 1) determination of critical growth and locational factors; 2) identification of industries/firms which compare favorably with these factors; and 3) operationalization of these factors into a filtering and sorting algorithm. The final output of the process is a list of the names of individual firms which are likely candidates for location in the site/city in question. The selection and order of the filters are critical to the output of the methodology, inasmuch as they define the prioritized characteristics

Figure 1


Determine Factors Influencing Business Location Decision
Determine Industries/Firms Which Compare Favorably With These Factors
Set Filters to Identify Individual Firms (Within Promising Industries) Which Are Good Prospects
Contact Firms to Ascertain Their Interest

which are used to identify and rank potential developers. Steps 1 and 2 are thus primarily analytical in nature, consisting of initial sets of tabulations (of economic growth, industrial labor demand, commuting patterns, etc.) which allow determination of the appropriateness and relative importance of site-related factors in locational decisions. Step 3, in contrast, is primarily computational in nature. It proceeds, from the background data provided in the previous analyses, to the actual construction and application of the filtering algorithms.

The technique's basic strength for generalized use lies in its flexibility, and thus in its adaptability to the site-specific characteristics of an almost limitless range of applications, through the ability to set and reset the filters and sorts through which potential developers are identified. As an indication of the degree to which the firm identification procedure can be fine-tuned to the demands of a specific planning context, the thesis will describe its implementation in two quite different cases (as parts of the Southwest Corridor Joint Development Project, and the emerging economic development plan for the city of Indianapolis). It will also examine a range of possible alternative forms and settings of the process in an effort to evaluate the potential for its generalized use as a tool for joint development planning.

A second strength of the procedure accrues from the extensiveness of the data which it utilizes, and the resulting specificity of its output (i.e., the names and addresses of individual firms). These data will be described in detail in Chapter Five, but an overview of them is useful at this point as an indication of the true power of the

filtering algorithm.

The primary data bases are provided by two versions of the Dun and Bradstreet Market Indicators file which have been specially edited for use in micro-economic analysis. The first file contains detailed information (including the size, age, industry type, employment, sales, location and corporate affilication) on about 5.6 million individual establishments for the period from 1969 to 1976, and is used to trace corporate growth and investment trends. The second file is a subset of the first, and traces establishment affiliation and ownership through "family trees" of firms. This file is used to identify the growth and investment patterns of individual firms. Demographic data with respect to labor pool composition and hiring patterns, as well as transport usage, are drawn from two subsets of the 1970 Fourth Count Census (pending availability of the 1980 Census), and from information provided by project contractors.

1.2 Business Location in a Planning Context

Business location decisions impact transportation and economic development planning from two basic angles: 1) given an expected rate of business growth, where are firms likely to locate?; and 2) given a specific commercial site or a city, what firms are likely to locate there? The first question underlies the long-term dynamics which shape the interplays between supply and demand for multiple goods and which are, in turn, assumed to ultimately result in a redefined, equilibrium-state urban system. It is thus an integral component of any attempt to predict urban growth patterns, and concurrent changes in demand for support services such as transportation. The second

question indicates a more immediate concern; the comparative static-type problem of determining individual decisions within a given set of physical, social, and economic relationships.

This thesis will be concerned with the second aspect of applied business location and with the issues and possibilities raised by it, through the technique of joint development. Joint development is a concept which provides an innovative approach to transport planning, in its concern with optimizing the economic impacts of transit investments through coordinated public and private decision-making. As such, it implies a rather novel and unconventional (but not indefensible) view of the role of transit planning; a view which reflects the growing perception that the transportation "problem" is no longer merely an issue of mode or technology. To quote Altshuler:

> "...the broader shifts in political orientation have had a marked effect on policy debate and planning in urban transportation. Most notably, they have led to a dramatic reduction in emphasis on the need for new expressways and rapid transit systems and towards much greater concern with means of improving the utilization of existing highways, with allocation of scarce resources among multiple claimants, and with devising low cost strategies that promise to serve multiple objectives simultaneously."[3]

In our society of increasingly scarce resources, the ability to make most efficient use of investments -- both past and future, private and public -- will be paramount. Transportation planning can no longer be simply synonymous with transportation system planning, but with planning the entire range of integrated activities which transporation enables and/or facilitates. This thesis will provide one aid for achieving this objective.

1.3 Contents and Structure of the Paper

This thesis begins with an overview of the general problems associated with forecasting business location, specifically in the contexts of joint development planning and the algorithm. Chapter Two commences this effort by taking a look at the "macro" side of the land-transport relationship -- to wit, the development patterns which have historically been associated with particular transportation systems -- as a basis for understanding the sources of and prospects for joint development as a generalized approach to transit investment planning. Chapter Three focuses on the "micro" side of this relationship, concentrating on the locational behavior of the individual firm in an effort to evaluate the premises upon which the algorithm is based. This chapter is thus primarily empirical in nature, although the theoretical underpinnings of the business location issue are also discussed. Chapter Four ties the "macro" and "micro" together in an analysis of the joint development concept. This chapter evaluates the approach's history and experiences, in order to develop a basic planning methodology for joint development implementation, and to propose an appropriate place for the finding-firms process within it.

The firm-identification methodology is, itself, examined in Chapters Five and Six. Chapter Five serves an introductory function, by presenting an overview of the procedure's sources and basic structure, the premises upon which it is based, and characteristics of the data which it utilizes. Chapter Six then provides a detailed examination of the procedure's application in the Indianapolis case. This being the implementation by means of which the process's current

generic form was developed, the Indianapolis example will provide both an explanation of the process by which the current structure of the methodology was defined, as well as providing an illustration of the types of discrete tasks of which it is comprised. The thesis will conclude in Chapter Seven, with an analysis of the finding-firms process and its products, a look at the implications of these findings for existing development techniques, and an examination of the potential role which the procedure might play in the systematic coordination of land and transit investment policies, through joint development planning.

CHAPTER TWO:

TRANSIT INVESTMENT AND LAND DEVELOPMENT: A REVIEW OF THE ISSUES AND THE LITERATURE

The fundamental nature of the land-transport relationship would appear to make its existence an undisputed fact. One need not be an expert in the field of spatial economics to notice that gas stations and fast-food restaurants cluster at highway interchanges; that the rents for central city apartments are higher than those in the suburbs; and that "strip"-type commercial development seems to occur anyplace where it is not prohibited by zoning. However, while few would dispute the intuitive obviousness of the concept of access-enhanced land values, continued research into the relationship between transport and land investment patterns has made claims with respect to the magnitude, form, and policy implications of the relationship increasing arguable. In short, the concept is clear, but its components are not; and it is the latter which provide the necessary ingredients for useful public planning and policy.

The land-transport relationship is particularly problematic in the case of fixed-guideway mass transit, the problems being a function both of the mode -- its ridership, its historical role as a form of urban transport -- and the methodologies used to measure its economic impact. Yet it is clear that a better understanding of the influence of public transit investments on private investment decisions could provide the tools which are necessary to promote development patterns which are more efficient, equitable, and/or aesthetic than those which

would occur naturally in the marketplace. The planner is thus confronted by insufficient and inconclusive theory, on the one hand, and by powerful incentives to take positive action, on the other. Under these circumstances, the land-transport relationship presents a challenging dilemma: a situation in which the "do-nothing" alternative of a laissez faire land market would appear to be a cowardly, and potentially costly, solution; but one in which an incomplete understanding of the underlying forces could quite possibly result in weak or misguided policies.

The three chapters which follow will attempt to resolve some of these issues through a discussion of the relevant literature. This chapter will begin the survey with a review of the issues and research regarding the land-transportation relationship. The following two chapters will then examine the practical and policy implications of this relationship in terms of the location decisions of firms (Chapter Three), and the prospects of joint development planning as a value capture strategy (Chapter Four), respectively.

2.1 Overview of the Issue and Approaches to Understanding It

As indicated above, continued development of an understanding of the land-transport relationship offers significant potential for the design of methods for integrated planning of urban structure and activities. In general, it can be noted that:

> "...[for] possible solutions of the "Urban Problem", we must first identify the elements of urban structure, then ascertain their space requirements and their desired relationships to one another and, finally, clarify how the individual urban elements can best be aggregated into a pattern or model which avoids most of the disadvantages of unregulated development."[1]

But in order to complete this process of dis- and re-aggregation of the components of urban structure, serious questions about the nature of the relationships of the urban structures component parts to each other, and to the whole, must be resolved. Many of the barriers to developing an understanding of the land-transport issue are products of the nature of the relationship, itself, and of its dynamic role in defining the form of a functioning city. Clearly the supply of and, demand for, land and transport services are but single elements in an elaborate array of urban interrelationships. The potential for non-transport impacts of transport decisions, as they reverberate through the general urban structure, is thus too great to be ignored, making the task of designing research methodologies which produce results from which causal inferences can be made is a formidable one, indeed.

Of equal importance, however, is the fact that these impacts, by their eclectic nature, demand an interdisciplinary approach to the land-transport problem. This attitude is reflected in Altshuler's previously-cited observation that transport problems can no longer be considered merely issues of mode and technology, but must take into account more general economic, physical, and social effects.[2] It indicates a view which is being supported by increasing numbers of transportation professionals. For, while technological advances may change the character of transport services, they do little to diminish the complexity of transport's role in the urban structure as a whole. Thus,

> "[The importance of transport research to developed industrial societies] lies not only in examining transport's "nation-building" role (as with lesser-developed economies) but increasingly with tackling the conflicts it causes with activities, with other

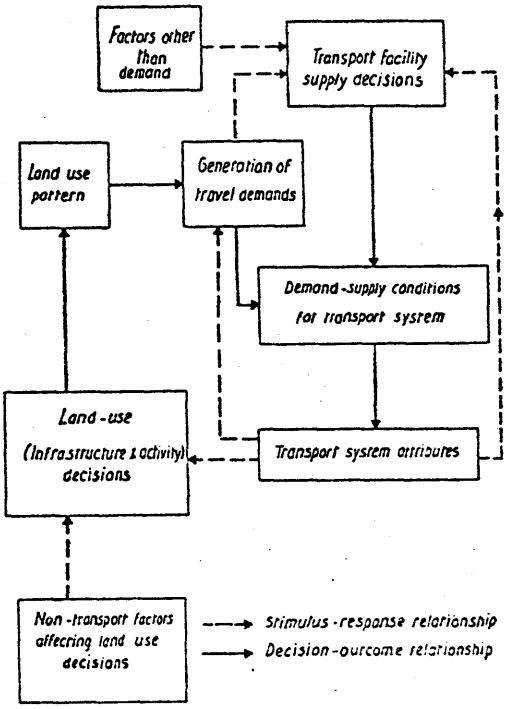
> claims on scarce resources, and with the intricate fabric of the urban environment. Current social concerns -- e.g., the aftermath of the energy "crisis" of 1973, the depletion of key resources, the plight of disadvantaged groups within otherwise affluent societies, etc. -- lead us away from the purely technological considerations of transport into much more complex investigations of social and economic impact."[3]

The range of relevant non-transportation impacts of a transport investment (or pricing) decision can thus be nearly as wide as we would wish it to be defined. In practice, then, the real issue lies in the political and professional processes by which a minimum acceptable range of relevant policy impacts is determined. Here again, the issue takes on a conundrum-like form: Is transportation a cause of planning problems or is it an effect? Or both? In any case, it is too important a component of the urban structure to ignore:

> "It is clear that there is not simply one urban transportation problem, just as there is not one urban problem. Transportation problems represent a number of the constituent factors of a complex of urban problems. In fact, in many respects transportation may be considered one of the major causes of present urban problems and also one of their symptoms... Because of the central role that transportation plays in the proper functioning of our highly industrialized and commercialized society, it is deserving of a considerable amount of attention, effort, and investment to improve its performance in this vital role."[4]

Putting non-economic issues aside and focusing purely on the land use question may thus do much to reduce the scope of the problem at hand. However, as Figure 2 indicates, it scarcely improves upon its analytical complexity. As this schematic diagram illustrates, even a simplified representation of the land-transport relationship implies a complicated system of feedback loops with multiple incidences of impact, adjustment, and readjustment throughout. It therefore comes as little surprise to note that attempts to identify (let alone

Figure 2



A simplified representation of land use-transport interrelationships

From Bonsall, et al. Urban Transportation Planning.

measure or model) these impacts have presented researchers with difficult (and often, as yet unanswered) questions with respect to the causality, distribution, and magnitude of effect.

Some have taken the inconclusiveness of research on this topic to be an indication of the existence of a non-relationship between land use and transport investment. As the following sections will indicate (more by omission than otherwise) this position, being relatively recent in appearance, has yet to become well articulated in the literature -- perhaps also implying that it is more a product of discontent with previous methodologies, or of a frustration with the unmeasurability of the relationship than the result of substantive proof of its non-existence. In any case, this is a point worth consideration prior to examining the literature in the field.

A more commonly held view with respect to the strength of this relationship is represented by Ingram, who notes that:

> "The role that transportation investments and transport service levels play in determining land-use patterns is subject to debate in many quarters. Some observers believe that the transport system is the dominant force shaping urban development; others argue that transport investments are required to serve travel demands arising from settlement patterns that are, in turn, determined by other forces. Both theoretical models and empirical studies suggest that the truth lies somewhere between these two extremes. The transport system is one of several important variables influencing urban land-use patterns, and urban land-use patterns are one of several important variables influencing transport choices..."[5]

If, for the time being, we continue to assume that a causal relationship between transport and land use does indeed exist, what can we say about its general form? Perhaps the most obvious observation that can be made is that transport facilities, themselves, constitute a land use, and a proportionally significant one at

that.* As such, they are clearly bound to have effects upon the levels of usage, intensity of activities, economic growth, and other features of the remaining land uses in an urban (or, to a lesser extent, rural) area.[6]

With respect to the nature and strength of these effects, time horizon begins to play a determinant role -- in effect, adding a third (but often unrecognized) variable to the relationship (the other two variables being land use and transport). As Altshuler notes:

> "In the short run, the direction of influence is predominantlyfrom land use to travel. That is, trip-making patterns, volumes, and modal distributions are largely a function of the geographic distribution of activities... What is more relevant in the current context, however, is that accessibility -- both immediate and estimated over the economic lives of real property investments -- is a vital consideration as locational decisions are made. Thus, over time, transportation is a significant factor in shaping land use."[7]

A fourth factor to add to this framework for understanding the land-transport relationship is geographic scale. For as Meyer notes, while the importance of transport's effect on land use at the site-specific (or corridor) level is relatively clear, the impact of transportation investment on development at a regional or metropolitan level is much less obvious.[8]

With these general observations regarding the context, importance, source and direction of the land-transport relationship in mind, we can begin to examine the relationship in detail through a review of the literature. We will begin with an overview of theoretical

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*For example, 25% of the surface area of Boston is taken up by auto-related transport facilities (roads and parking), alone.[9]

approaches to the topic. The primary emphasis in this and following chapters will be on the locational consequences of the land-transport relationship, and thus on the empirical literature. This notwithstanding, it is the theory which enables us to turn empirical observations into a conceptual model of the whole, and against which the validity of applications such as the algorithm must ultimately be weighed. Of course, the theory achieves this universalistic view by assuming a form which is sufficiently abstract and aggregative as to nullify its explanatory potential -- a necessary evil, perhaps, but an evil just the same. An initial survey of the theoretical literature will thus serve two purposes: 1) to aid the reader, by providing an analytical framework for evaluation of the assumptions underlying the firm-identification procedure's form; but 2) to caution the reader, by making clear the explanatory weaknesses of economic theory which necessitate taking a behavioral approach to the location issue, through primary reliance upon the substance of the empirical literature.

2.2 A Review of the Theoretical Literature

Initial efforts to understand the relationship between transportation facilities and land use or value patterns developed from within the field that we now refer to as regional economics. True to the historical context from which this branch emerged, the longstanding focus of the theory has been on the spatial distribution of agricultural producers. But as society has evolved, so has the theory; its setting from urban to rural, and its subject from agricultural to industrial, and most recently, to residential and non-manufacturing commercial location behavior. A chronological approach to the literature thus

provides valuable insight with respect to the sources of the theory's present form.

Ricardo was the first to deal explicitly with the issues of land use and price, noting that the rent on the most productive land is based on its advantage over the least productive plots, with competition among farmers insuring that the full advantage go to landlords in the form of rent.[10] Von Thünen added a spatial factor to this observation, finding that the rent at any location is equal to the value of its product less production and transport costs.[11] Marshall refined the relationship even further, defining the price of land in terms of its "situation value" (the sum of the money value of the situational advantages of the site) and "site value" (the sum of situation value and agricultural rent). He also drew the first direct parallel between the markets for urban and agricultural land noting that, in both situations, potential users of land make bids for alternative sites based on their respective location advantages, with the highest bidder capturing the land in each instance.[12]

It was not until the 20th century that the concept of spatial economics, and its urban applications, began to develop into a recognized field of study, culminating in Isard's Location and Space Economy in the late fifties, and Alonso's residential counterpart (Location and Land Use) in 1962. Again, while it is these works which are of greatest interest to us, their conceptual sources should not be ignored.

For example, Hurd was the first to clearly argiculate the space-value relationship, with the seemingly simple observation that land value is a function of nearness. To wit:

> "Since value depends on economic rent, and rent on location, and location on convenience, and convenience on nearness, we may eliminate the intermediate steps and say that value depends on nearness."[13]

Haig articulated upon this idea, developing the complementarity of rents and transport costs into a conception of transportation as a device for overcoming the "friction of space". Thus, while improvements in transport systems work to minimize access cost, they may do so by increasing land value since site rentals and transport costs represent the cost of that friction which remains.[14]

However, it was Isard who brought the industrial application of the theory to its present basic form by adding the utility concept as the discriminating factor in the location choice. His complex model for developing an equilibrium distribution of land prices and uses reduces to three basic steps: 1) for each potential land user, derive a family of bid rent functions such that the user is indifferent to his location along any one of the functions; 2) determine the equilibrium price at any location by comparing the bids of the prospective users and choosing the highest; and 3) determine equilibrium quantities of land through selection of the proper bid rent function for each user. In the solution, steps two and three are brought into agreement simultaneously; thus, the bid rent rent curves guide the "allocating hand" of the market through the interdependence of quantity and price.[15]

Transport plays a role in this model's determination of the equilibrium to the extent that relations to transportation facilities and systems are critical to the definition of effective economic distance.[16] The primary factors determining the rent of an urban

site are thus: 1) effective distance from the urban core; 2) accessibility of the site to potential customers; 3) the number of competitors, their locations, and the intensity with which they vie for sales; 4) the proximity of land devoted to use(s) which is(are) complementary in terms of both attracting potential customers and cutting costs (i.e., the so-called "tertiary" sector producers).[17]

Chamberlain, presenting a modification of Isard's model for the retail case, focuses on the concept of market area, i.e., the extent to which sales volume is a function of relative location, rather than of distance. Drawing an analogy to the agricultural case, he observes that the farmer pays for the productive ability, and the retailer for the selling ability of land. He also adds fifth and sixth factors to the list of those determining the rent of a site: 5) the prices that are charged for the good being sold; and 6) the type of business which can "best" be conducted on the location.[18] The major implication of his analysis is thus that the different market concerns of different types of firms imply inter-sectoral differences in location behavior, as a product of the relative importance of access and market share in determing the individual firm's profitability.

Alonso draws heavily on both Isard's model of industrial rent, and Beckmann's mathematic model of residential land values to develop an anlaysis of the process of residential land value determination and household location.[19] Using Beckmann's observation that each household chooses its location so as to maximize the amount of living space that it can occupy for its housing expenditure, and the constraint that the average expenditure on housing plus commuting costs is a well-defined function of income,[20] he develops a bid rent model of

residential location behavior not insimilar to Isard's industrial version.

Finally, we must consider Wingo's attempt to deal explicitly the land use-transportation issue, through a theoretical analysis of traffic flows and land economics. He develops a model of the residential land market in which rents and transportation costs are viewed as complementary, their sum being equal to a constant defined by the transport costs to the most distant residential location under occupation. Noting the "the quality of location, or 'accessibility', is the dominant factor in determining land uses and intensity,"[21] he conceives the analytical forerunner to operationalizable concepts such as the "travel savings" hypothesis, which was tested by Boyce et. al. in an attempt to measure the land use impacts of the Lindenwold High Speed Line (see Section 2.3.2).

Before moving into an examination of the empirical literature, it must be noted that the field of economics has not been the sole source of insight into the relationship between economic factors and settlement patterns. At about the same time as Haig developed his concept of the "friction of space" urban sociologists, particularly the "human ecologists" of the University of Chicago, developed an extensive literature on the subject of urban structure focusing on an entirely different source of friction -- social class. Using a biological analogy, theorists such as Park and Burgess developed a general model which viewed land values as the result of bidding process by potential users, by which the pattern of location of land uses in the city is determined. Thus, in contrast to the economic models of that period, which saw price as a function of use,

they viewed price as a given, therefore identifying use as the determining factor;[22] an emphasis which is completely consistent with their concern not with price per se, but with its manifestation through settlement patterns of segregation by land use and social group.

Most important, however, was the sociologists' recognition, in light of imperfections in the functionings of the land market, of the importance of non-economic factors in influencing the settlement pattern. As Quinn notes, "... the concept of cost has a very broad meaning... It embraces whatever of value is given up or is enjoyed in lesser degree in obtaining any pattern of adjustment."[23] This expansive definition of cost implies that the location decision is a compromise entailing consideration of not only economic costs (such as travel and housing quality), but also a set of less easily quantifiable social, cultural, and/or aesthetic factors. Thus, while leaving unanswered the important question of land value determination, the ecologists provide an interesting prelude to the economic behavioralists' subsequent attempts to incorporate a modified "economic man" into rational models of locational behavior, through their recognition of the possibility that a "rational" location decision may indeed be one which is economically sub-optimal.

2.3 Review of the Empirical Literature

As Ingram notes, empirical studies relating land use patterns to transportation systems changes are typlified by comparisons of development patterns before and after a particular highway or transit investment has occurred.[24] In some cases, this means time series

studies which span even a century or more of urban growth. As the problems inherent in this approach have risen to the fore, however, more sophisticated techniques for examination of the relationship have evolved. Today, we find four basic types of empirical study: 1) historical; 2) case study; 3) cross-sectional and inter-urban comparison; and 4) simulation using empirical estimates of behavorial parameters.

At this juncture, it bears mention that, in contrast to the theoretical literature in which residential applications are relatively lately come, empirical discussions of the interactions between transport and land use have historically focused on residential location and household behavior. This emphasis is quite likely the result of the ends which such information has typically served, i.e., long-range residential location forecasts which form the basis of urban transport demand models.

But it can just as easily be argued that changes in the transport system affect the locational choices of firms (see Chapter Three for a detailed discussion of this issue), not to mention the fact that employment location is itself an important determinant of residential choice. So, while the major emphasis in this, and following chapters will be specifically on the relationship between transport and commercial land development, the paucity of literature in the field necessitates examination of some of the more generalizable impacts through residential examples.

2.3.1 Historical Studies

This historical case study seems to be the literature's most

pervasive approach to the land-transport issue. For while the generalizability of these studies and their findings is highly questionable, they have a basic attractiveness in that they reflect the commonsensical qualities of the land-transport relationship in its simplest form.

It was Warner's study of streetcar line construction and the subsequent suburbanization of the southern portion of Boston which set the tone for numerous subsequent studies. He introduced the notion that the first suburbanization was not the result of some sort of "natural" growth process (as per the Urban Ecologists), but the product of a loose cooperation between public utility agencies and private entrepreneurs. With the blessings of the utlity companies (which were always interested in creating new markets), the private developers first extended streetcar lines well beyond the existing urban fringe of cities such as Boston (where pedestrianism was the theretofore dominant form of transport). They the proceeded to create demand for transit services (and public utilities) by constructing residential developments along the streetcar routes, capitalizing upon the proclivity of urban residents for rural residential settings.[25]

A number of subsequent studies have reiterated and expanded upon this basic observation, in cases such as Los Angeles (Banham) and Cleveland's Shaker Heights (Harwood). Some give the ultimate catalytic credit to the Industrial Revolution, itself -- both through its unprecedented demand for large numbers of urban workers, and through its production of increasingly efficient forms of mass transit.[26] In any case, the common elements in these studies are their

historical settings, their focus on transit as an expansionary tool, and their resulting conclusions about the role of transit as a determinant of post-industrial urban form.

The situation changed dramatically in the twentieth century as the automobile, with its inherent and quickly-capitalized-upon competitive edge over public transit, rose into position as the dominant form of urban transport in the U.S. and other industrialized countries. Perhaps the first to recognize the automobile's potential as the impetus for a new urban form were the Italian Futurists, who combined the speed and access offered by the auto with new architectural styles (recently enabled by the invention and widespread availability of structural steel) to create a then-radical conception of an urban structure based on mobility.[27]

Although the Futurist ideal survives only on paper, it can be credited with foreseeing more than a few of the qualities of urban structure and lifestyle common to today's automotive cities. Thus, we find those empiricists who would argue that the land-transport relationship has remained more or less sacred through the years, but that the auto has simply replaced transit as the determinant mode. Their arguments are particularly persuasive in the case of the U.S., where a combination of factors -- a high standard of living, inexpensive cars and gasoline, low-interest home mortgages, and the decision to invest unprecedented levels of public funds in an interstate highway system -- created a situation of rampant expansion. The result, as Altshuler points out, was that:

> "...the coming of the automobile and truck, combined with dramatic improvements in street and highway systems, has permitted a filling in of the spaces

> between transit lines, a radical deconcentration of commerce and industry along with residential settlement, and a further extension of the settlement radius as large numbers of urban residents have found employment in the suburbs and beyond."[28*]

This type of development, which has been referred to as having the physical characteristics (and implied desirability) of an "oil slick"[29] has spread, with the automobile, throughout the industrialized world. To some, (e.g., Paschetto), the pervasiveness of the pattern would indicate proof of the predominance of the auto as a determinant of urban form. To others, it leaves unresolved such important issues as that of causality -- in terms of both direction (e.g., the simultaneity of employment and residential location decisions and mode choice) and source (e.g., the simultaneous growth of highways and real personal income).

The historical approach's ability to identify effect, but not cause, become particularly apparent when the results of these studies are considered in a policy context. In practice, far too many have made the fallacious transition from observation to extrapolation without consideration of the spuriousness of the "missing" third variable, time. That is to say, while transit may have had a strong influence in the determination of 19th century urban form, current transit investments take place in an urban environment which cannot be considered a generic equal to early industrial society. Thus, studies such as Warner's

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*This is not meant to imply that Altshuler, himself, falls in this camp. His statement is purely meant as an explanation of the forces and conditions which have led others to identify the automobile as the pivotal factor in shaping current urban form.

(which makes no pretense of being anything but historical) which plot the effect of transit investments in open countryside are misguidedly used to rationalize the development potential of modern transit investments being placed in heavily developed urban areas -- and planners are surprised when the effects are not the same.

Not only has the urban context changed, however; so has the relative importance of transit as a transportation mode. As DeLeuw, Cather, and Co. note, the pre-auto situation was very different from the current one, in one very important way: only in certain circumstances to today's transit improvements provide the kind of drastic impacts on overall accessibility which were typically associated with earlier transit investments. The auto provides a superior competitive alternative for most travelers in all but a few American cities. Consequently, despite what others may claim, in today's world the lesson of the past is that the potential for transit-induced land use impact can only reach pre-war proportions in two ways: first, through now-unforeseen innovations which create major improvements in transit accessibility (or deterioration in auto accessibility); and second, through increased coordination of transit with other complementary market forces.[30]

2.3.2 Case Studies

The 1970's saw the emergence of a number of before-and-after type case study analyses of the land use-transportation relationship. By that time, recognition of the predictive weaknesses of the historical approach had made obvious the fact that a new methodology was needed if the relationship were ever to be satisfactorily under-

stood. These case studies thus differ from the historical ones in two ways: 1) with respect to the temporal context of the case under study; and 2) with respect to the techniques used to measure cause and effect, these case studies being more quantitative (rather than observational) in nature. Earlier studies of this type do exist, most notably Spengler's 1930 analysis of value capture potential in New York.[31] However, the situation in the seventies developed in a manner such as to facilitate both completion of, and sensitivity to, the conclusions of studies of this genre Specifically, a series of massive rail transit investments (Washington, San Francisco, Montreal, etc.) created the opportunity for in-depth time analyses, while the dramatic and highly publicized findings of a few initial studies, in combination with a resurgence of general interest in transit per se, brought the issue and the approach to political and professional attention.

The four best-known cases give a good indication of the development of the method, its approach to and revelations about the land-transport issue, and the controversies surrounding each. Initial interest was spawned by reports of significant land use impacts resulting first from the Yonge Street subway in downtown Toronto, and then from Philadelphia's suburban Lindenwold High-Speed Line. Somewhat later, Montreal's Metro and Place Bonventure development rose to attention as an example of highly successful joint development, and thus of a "capturable" land-transport relationship, while the San Francisco region's disappointing experience with BART offered what some considered to be substantial evidence to the contrary. A brief discussion of each of these cases provides the basis for understanding

the sources of the tandem rise and fall of expectations with respect to the case study's approach to and conclusions regarding the land-transport issue.

Several authors (Heenan, Kearns, Wacher) have written about the pre- and post-transit development of Toronto. They note, in particular, the effects of the radial Yonge Street line upon commercial development in the city's central business district. Over the five-year period which is generally acknowledged as the beginning of Toronto's transit-related development period (1959-63), over 48% of all high-rise apartment development in the city occurred in four planning districts (of 24) which are all centered on the subway line, just north of downtown.[32] Heenan (whose writing have been quoted most frequently with respect to the Toronto case) summarizes the impact by asserting that "...two-thirds of all new development in a five-year period was put in place within five minute's walk from the Yonge Street subway... There is no doubt that a subway has a tremendous impact on land use and consequently land values."[33] Although quite likely true in principle, in fairness this dramatic conclusion must be tempered by several factors not mentioned by the author. These include the fact that the Yonge Street corridor had been heavily travelled and populated prior to the transit development and that, subways aside, Toronto had been growing rapidly ever since the end of World War II.

Following studies have thus reiterated the trend, although not necessarily the magnitude, of Heenan's initial report. Kearns, for example, focused on the fiscal significance of the new development, finding that incremental tax growth along the line exceeded the carrying costs of the line's construction bonds.[34] Abouchar (1973)

and Dewees (1973) completed regression analyses of residential values (similar to the type developed by Boyce for use in the Lindenwold Line anlaysis) with inconclusive results, while Davies' 1972 study of residential density changes indicated a significant impact in the initial years of transit operation.[35]

Perhaps the best-known studies of this type are those which have examined the land use impacts of the Lindenwold High-Speed commuter line, which runs from downtown Philadelphia through Camden to suburban New Jersey. Here, the focus was not on the line's development impact in the two major urban areas through which it passed -- apparently, only one formal study has attempted to deal with this issue (Gannon and Dear), doing so by looking at employment and office construction in the region[36] -- perhaps as a reflection of the multi-causality complaint weighed against the earlier Toronto analyses. Instead, the emphasis in this case has been on the transit line's effect upon suburban residential land values.

Specifically, these studies (which emerged from the Wharton School at the University of Pennsylvania) sought to test the appropriateness of the "travel savings" hypothesis of land value, which states that savings in journey-to-work costs afforded by the transit improvement will be capitalized as value added to the residential property. Mudge used a cross-corridor regression model to find evidence not only of the existence of a positive impact on residential properties in the transit corridor (in conformance with the travel-savings theory), but also both spatial and socio-economic variations in the impact's magnitude. In particular, he found that the impact appears strongest among lower- and middle-income neighbor-

hoods -- i.e., among those neighborhoods in which the journey-to-work trip is more likely to be made by transit -- although he also found evidence that at least a portion of the impact was the results of intra-regional transfer (vs. net increase) in residential property values.[37] Boyce, et. al. reaffirm Mudge's finding that the degree of benefit is an inverse of function of distance from the Central Business District (CBD), estimating that each dollar of travel savings converts to increases in the residential sales price of $2,000 and $3,000, during construction and after the initiation of service, respectively.[38] Both studies also found that the market adjusts very quickly to this one-time value increase, clearing within six months after the commencement of service.

As awareness of the potential for value capture increased (due, in large part, to the publicity received by these early cases), so did efforts to include such benefits into the planning and evaluation of new transit construction projects. The Montreal and BART experiences present an interesting comparison in terms of their success in doing so; not so much because the latter system has "failed" to realize significant benefits, but because of the circumstances which made their experiences so different. At face value, there would seem to be a great similarity between the systems -- both were built recently with advanced technology, high budgets, and the primary objective of easing auto congestion. But beyond these superficial similarities, the cases diverge sharply: a comparison of them thus becomes a study in contrasts in terms of both effect, and cause.

While the primary objective underlying the construction of the Montreal Metro was to ease congestion in the city's densely packed

downtown core, decisions related to the design of the system were also predicated on the desire of the city fathers to support and promote the continued economic viability of the city center.[39] The BART system, in comparison, had no such clearly articulated development goals -- it was built for the main purpose of easing rush-hour freeway congestion, along with a set of more general equity, access, and environmental objectives.[40] In terms of design, these goals translated into a short, dense, high frequency system in the Montreal case, and a far-flung BART system with operation problems that have left current frequencies at only half the intended level.

When we look at the differential development impacts of the two systems, the sources of such become quite clear. In the Montreal case, not only was economic development an explicit objective of the transit investment program (whereas in the BART case it appears to have been more of an afterthought), but it was supported by a consistent package of system and station design configurations which facilitated the occurrence of desired types of investment. That is not to say that the BART system has had no land use impacts -- Webber's sharp critique of the system and its effects aside, Gruen, Gruen and Associates have completed a series which highlight the positive development effects which have occurred at some stations[41] -- or, even, that any (latent or manifest) land use impact could be identified as a product of improved access, given the poor track record of this beleaguered system. In comparison, what these two cases make clear is that one of them intended to spur development through transit, and did, and one didn't really, and was rewarded in kind.

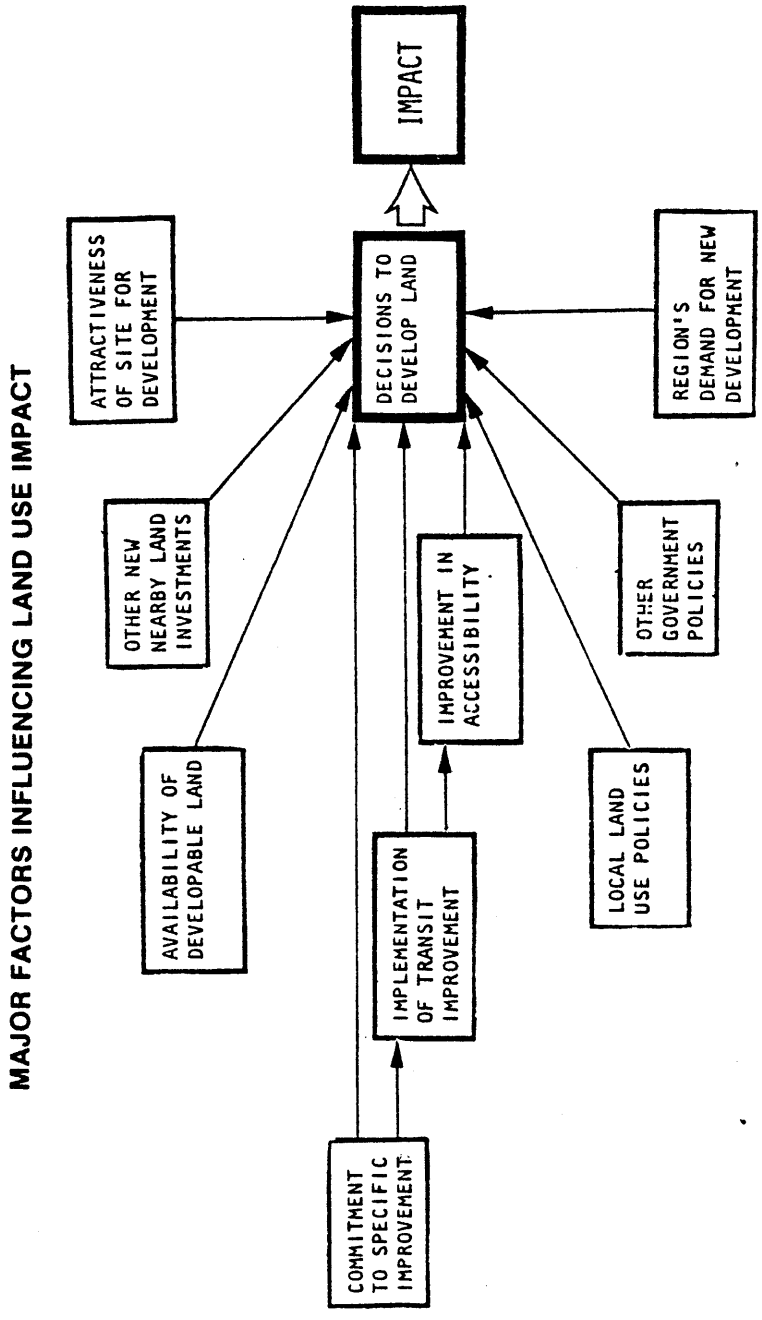
2.3.3 Cross-Sectional and Intra-Urban Comparisons

The DeLeuw, Cather and Co.'s comparison of case studies is not a cross-sectional methodology in the strict sense of the term, and thus differs from the other research efforts which will be discussed in this section. But since it is basically comparative in nature, and differs so significantly from the single-case studies cited above, it bears being treated here.

This study, which was published in 1977, is generally regarded as being the most definitive anlaysis of land use impacts of rapid transit, to date. It is a survey of historical (i.e., pre-World War II) and modern case studies of transit investments and their resulting land effects, in the U.S. and Canada. The objectives of the study were two-fold: 1) to identify the nature and extent of new development potentially influenced by a given transit improvement; and 2) to identify the strength of influence of the various factors involved.[42] Figure 3 presents a schematic representation of some of the basic relationships which they found with respect to the determination of land use impact.

The study's basic finding was that major rapid transit (i.e., conventional rail) improvements have been important inducements to intensified development near stations, with several qualifications. The first of these qualifications is that such development can, and will, occur only when supported by other favorable forces (i.e., economic, political environmental) and conditions (i.e., zoning, taxes).[43] This is a point which was clear to Spengler, as early as 1930. As he notes in his study of transit investments in New York,

Figure 3



From DeLeuw, Cather and Co., Land Use Impacts of Rapid Transit.

"Rather than be considered a cause of land value changes, a transit facility should be more properly be regarded as a construction which permit or facilitates, under certain circumstances, an emergence of land values, the values being determined largely by other factors."[44] The key, it would seem, thus lies in identifying and operationalizing those facilitating factors. For while transit investments are quite likely to enhance the prospects of development in nearby areas, they are not a sufficient condition for such. This finding is perhaps best illustrated by the BART experience, which indicated quite clearly that "value" has no meaning in the abstract; like the tree that falls in the empty forest and therefore makes no noise, the land use impacts of transit occur, by definition, only through the movement of capital.

The second major qualification to the general finding, and an important observation in itself, is that the land use game appears to have a "zero sum" form. To quote the report, "Recent experience provides no evidence that any rapid transit improvements have led to net new urban economic or population growth."[45] This finding is consistent with Mudge's observation about land value changes along the Lindenwold Line,[46] as well as Spengler's conclusion in the case of New York that transit investments are apt only to accelerate existing development trends, thereby operating to transfer rather than to increase values.[47]

Other cross-sectional studies have been more quantitative in nature, attempting to relate the differences in land use patterns among urban areas to transport and other variables. Most have focused on residential, rather than commercial land use, so will be mentioned only

briefly.

Harrison used a series of transportation, household, and urban characteristics in an effort to relate these factors to residential growth in 65 cities. His study found that the density of newly built units increases with city size but decreases with street railway track miles per capita, lending support for a Warner-like model of streetcar-motivated low-density suburbanization in early periods of urban growth.[48] Kain and Fauth reversed Harrison's assumed direction of causality, using the 1970 Census data to look at how auto ownership and commuter mode choice of white single-worker households varied across the largest 125 SMSAs in the United States. Thus, whereas Harrison focused on how household characteristics, housing stock, and transport systems affect incremental changes in land use, Kain and Fauth examined how household characteristics, transport supply, and existing land uses affect the transport choices of households. The major finding of the study was the rather unsurprising result that land use patterns have a significant impact on household transport choices, and mode split in particular.[49]

On the industrial side, two studies are of note, Struyk and James used cross-sectional data for four cities to perform a time series examination of changes in manufacturing employment during the 1965 to 1968 period. They found a remarkable degree of mobility among the corporate population -- slightly over 12% of the firms existing in 1965 relocated during the three-year period -- but little evidence of transportation effects, apart from some clustering near airports and highways.[50] Hamer used cross-sectional survey data to study manufacturing location in Boston (one of the cities covered by Struyk and

James). He also found a high degree of mobility among manufacturing firms (nearly 45% of those located in the suburbs reported having relocated within the past ten years, for example), and identified the major reasons for relocation as being the needs for more space and suitable labor. Since revenues and non-land input costs appeared to be quite insensitive to location within the region, but land costs varied significantly, he concluded that either substantial changes in transport or input good prices would be required to eliminate the preferability of suburban locations for these firms.[51]

2.3.4 Simulation Studies

Two major simulations will be discussed here; ones which assume structurally-comparable cities (monocentric with all workers commuting to the CBD), but emerge with quite different approaches, results, and conclusions. Other simulations exist which include transport components -- it could be difficult to construct an urban model which did not include a transport equation of some sort. However, the two which will be discussed here speak most directly to the issue at hand, i.e., how the form of a transport system influences land use patterns and values.

Mills used a linear programming model (which was originally developed for the purpose of computing optimal urban size) to test three aspects of the land-transportation relationship: 1) how optimum densities of production and housing vary with distance from the center; 2) the optimum level of congestion on the transportation system; and 3) the sensitivity of urban structure to changes in the transportation system. The major implication of the simulation was that urban

structure is quite insensitive to changes in transportation costs and technology. The author then notes three reasons why the model might, in actuality, be understating transport's structural effects[52] -- an issue which is picked up by Rothenberg, who states that the "manifest insensitivity of the model's spatial allocation to hypothetical changes in transportation cannot confidently be generalized to real world systems".[53] Nonetheless, as Mills points out, the simulation does suggest that planners and policy-makers should not preclude the possibility that urban structure is actually quite insensitive to the parameters of its transportation system.

Using quite a different approach, Andersson developed a model to determine, for a given population size, demand for residential space and number of commuting trips per household, the transportation structure, population distribution and overall city form, subject to the constraint of minimizing total (housing and transportation) costs. Transportation costs are assumed to be a function of distance from line haul service, and from the center. He performs the simulation first in the case of a pedestrian city, and finds a densely-packed concentric form to be optimal. When he adds a system of radial bus routes, the emerging form is quite different -- i.e., a starshaped configuration of pedestrian-resident blocks between the arms of the bus routes, which are bordered by various densities of riders. (Fig. 4) Similar, although less dramatic, results are produced when auto commuting is considered, the particular configuration being in each case a function of the number of radial highways.[54] These results are hardly surprising, but do provide an interesting image of household location within the context of a simplified transport system and cost-

Figure 4

City with 100,000 inhabitants

A. City form and modes of commuting

W = walkers

B = bus commuters

From Andersson, R. Study of the Interdependence Between Housing and Transportation in Cities.

minimizing behavior.

2.4 Conclusion

The preceding review has provided an array of postulations and conclusions regarding the land-transport relationship which are almost as varied as the methodologies which have been utilized in efforts to understand this complex and elusive phenomenon. Clearly, no definitive statement has been made to date regarding the strength, sources, and direction of this relationship, let alone to affix it with a dollar value. On the other hand, as inconclusive as they may, in aggregate, be, the findings of these studies bear out a number of consistencies in the relationship's effect. Thus, for example, while no monetary value can be placed upon fixed-rail transit's impact upon the land market in a praticular case, it is clear that such investments do have a positive impact on land values. And while it is debatable whether the effects of a transit investment are significant to the city as a whole, and fairly clear that they do not result in any net economic gain, it is equally clear that the corridor-level impacts of a transport improvement are apt to be substantial. Obviously, more and better findings are required before we reach the point of being able to manipulate the land-transport relationship in a consistently effective manner -- if doing so is, indeed, deemed to be an appropriate action to be taken by transit and/or economic development planners. In the meantime, continued attention to the relationship can facilitate a more integrative approach to transit investment planning while, at the same time, improving our understanding of the issue and its pratical implications.

The following two chapters will take a more applied approach to the land-transport relationship -- in essence, to determine how well the issues raised here have been borne out in practice and in fact. This will be done firstly through an empirical examination of business location decisions, and secondly through an analysis of joint development planning. Only in applications such as these does the usefulness of the land-transport concept become truly clear, thereby providing a general context for evaluation of the sources and prospects of the finding-firms methodology *per se*, and as a tool for aiding joint development efforts.

CHAPTER THREE

TOWARDS AN UNDERSTANDING OF THE BUSINESS LOCATION DECISION

Business location choices affect urban land use and value patterns in two ways: firstly, through their own consumption of land and secondly, to the extent that they affect the location decisions of dependent and supportive activities and infrastructure (housing, transportation facilities, other business, etc.). It is the second aspect of the phenonmenon which is of particular interest to planners, being the source of activities and investment patterns which, in turn, influence the demand for a wide range of urban services. The consequence is a situation in which private and public individuals, authorities, and agencies participate in a continuous game of locational "blind man's bluff", under a constantly evolving set of rules and power relationships, the characteristics and outcomes of which define the physical and economic form of the city.

Amid an increasing scale of geographic concern -- from a site, to a city, to a state, region, or nation -- the significance of the purely physical aspects of business' locational impact begin to pale. This tendency is exaggerated even further during periods of economic hardship and/or upheaval, wherein the short term objective of prosperity overwhelms societal concern for the long term distributional and environmental impacts of private investment decisions. Hence we now find political entities, at levels of geographic aggregation ranging from neighborhood to nation, competing for seemingly scarce private investors, in a contest where survival goes to the solvent.

The amenities offered are often physical (e.g., endless supply of water, cheap power), and the inducements fiscal (e.g., tax credits or breaks). But, in our increasingly urban and industrialized world, the bottom line is jobs.

Under these circumstances, our ability to understand the motivations underlying the business location decision, and to draw upon this understanding to design effective job-creating policies is of paramount importance. Unfortunately, in practice this problem-solving paradigm has all but stalled in the first stage. Considerable effort has gone into the development of theoretical models of location behavior; models whose abstractness precludes their predictive capacities in any but a parenthetical manner. Only quite recently has our empirical understanding of business location behavior begun to reach a level of concreteness from which explanatory inferences, and thus policy, can be confidently drawn.

This chapter will use the empirical evidence to develop a behavioral model of the business location decision, and of its role in urban economic development. The chapter will begin by examining the sources of local employment change, with the expectation that considerations motivating the decision to open, close, expand, contract, or move a firm are significantly different in character, and thus in policy implication. With these observations in mind, the factors influencing location decisions will be examined. This will, in turn, provide a model of locational behavior and a framework for understanding the microeconomic forces which consitute and underlie the spatial distribution of economic change.

3.1. Sources of Net Employment Change.

Recently, the media has paid considerable attention to two phenomena of industrial change: plant migrations and plant shut-downs. However, in fact these occurrences only explain one side of the employment change picture -- the negative one -- and only part of it, at that. Six characteristics of investment behavior can be identified which, in aggregate, produce what we observe as being net employment change. They are: births, deaths, expansions, contractions, in-migrations and out-migrations of firms. Thus, while the movement of a corporate headquarters to the 'sunbelt' (e.g. Georgia Pacific from Portland to Atlanta), or the closing of a factory which is the major employer in a particular town (e.g., the General Motors plant in Anderson, Indiana) may make good press, such publicity provides an incomplete and often-distored view of the forces contributing to economic growth and decline.

What, then, can be said about the sources of employment change? What are the relative contributions of the six change components mentioned above? How do they vary, across cities and industries? And what does it say about strategies for employment enhancement policies? How can we, in essence, begin to "introduce a greater degree of rationality into the processes by which communities and growing businesses get together?"[1]

Only one research operation has been successful in accumulating the data and computive powers necessary to perform, on a nation-wide basis, the types of tabulations implied by these questions; to wit, to be able to tract the location decisions and employment growth patterns of individual firms. Another researcher has been able to

perform similar computations for the state of California, only, with results which are quite consistent with the aforementioned.[2] Efforts are also being made to develop the tools necessary to do this type of analysis in other states and urban areas, as well as for the nations of Canada and England. Suffice it to say that, at this point, general knowledge and expertise with respect to this issue are in their naissance. But as preliminary and incomplete as the results of these pioneering studies are, they do offer valuable information which, being contrary to many working assumptions about the processes of economic change, provide a provocative starting point for the design of new, more effective, development policies.

What, then, can be said about the sources of employment and economic growth? We can begin by looking at the relative importance of the six change components with respect to their contribution to the net. To begin with, Birch observes that very little employment change occurs as the product of firm migration. At the national level, of course, the net effect of domestic movers is nil. Even at the local level, however, the few firms who migrate account for an insignificant portion (about 3%, plus or minus) of the local employment change at either the origin or the destination. In addition, those firms which do move tend to do so for relatively short distances; rarely do businesses leave one area, and relocate their operations in a completely different one.[3] This finding is supported by those of Schmenner, who observes that 80 to 90% of all moves of manufacturers take place with in the metropolitan area.[4]

Secondly, he finds that there is very little geographic variation with respect to overall job loss rates. Noting that about 8% of the

jobs in an area are lost annually (either through firm shutdowns, or contractions), he attributes this turbulence to a natural "churning" in the industrial population. In fact, contrary to conventional wisdom, areas with higher net growth rates (such as Houston) achieve such amid higher rates of employment loss than do areas which, in the net, are faring much less well (such as Worcester and New Haven).[5] Granted, this loss rate is not completely consistent over time (varying about 1% in each direction with the business cycle), industry type (higher among firms in the declining manufacturing sector than among growing service industries), and firm size (small firms dying at a faster rate than large firms, but being much less apt to contract).[6] All in all, though, the critical factor in determining aggregate employment growth is not the rate at which jobs are lost, but the rate at which lost jobs are replaced. As Birch states:

> "The story of net employment growth is thus the story of where businesses choose to start up new facilities and expand existing ones. By choosing some places over others, they cause a redistribution of employment to take place. The migration is thus one of capital (and perhaps management skill) rather than one of existing facilities."[7]

Turning to the particulars of these replacement sources we find that, unlike loss rates, the positive side of employment change does vary considerably with location. Thus, "more often than not, the start-ups and expansions take place in different kinds of places".[8] Some locations are particularly prolific incubators of small new firms (Raleigh, Indianapolis, Houston, Reno, etc.), while others experience especially high levels of small business expansions (Memphis, Fort Wayne, San Antonio, Portland, etc.). There are some exceptions (Savannah, Nashua/Manchester, Dallas, Phoenix), but in general the

groups are not the same. That is to say, while a small number of cities offer conditions which are conducive to rapid employment growth from both sources (births and expansions), most areas offer an environment which is unusually hospitable to one of them, at best.[9]

Similar differences arise when the growth rates of different industries are compared. We thus find a set of areas (usually rural) experiencing unusually high levels of manufacturing growth (startups -- rural Memphis, Great Falls, Sacramento; expansions -- rural Billings, metropolitan Abilene, and Bangor as a whole), others (usually metropolitan) experiencing similarly high rates of service growth (startups -- Buffalo, Indianapolis, Detroit; expansions -- Nashua/Manchester, Raleigh, Billings), and very few which excel in more than one of these respects (Atlanta and Macon, with services growth from both sources; Wichita with both service and manufacturing expansions).[10]

From these results, Birch develops a dichotomous model of places that are prone to economic growth, and those places which firms, for one reason or another avoid. A number of businesses seem to prefer metropolitan areas and, among them, those with large college populations that manufacturers are now avoiding the older industrial-revolution cities within which they once flourished.[11] Specifics aside, however, two major conclusions can be drawn: firstly, that no magic growth formula will work for every area, hence "...knowing thyself involves knowing both what your possess that is appreciated and knowing who appreciates it";[12] and secondly that, thanks to the internationalization of the market and the growth of America's service sector, the future most certainly will not look like the past, thus "...in a far-flung but closely-knit world economy, the making can go on thousands

of miles away from the thinking that went into the design of what was made, and thinking per se can become a very valuable export good upon which healthy local economies can be built".[13]

3.2. Overview of the Nature of the Problem.

Given these observations about the sources of net growth and decline, we can move on to develop a predictive model of business location behavior. In order to do so, a number of analytical distinctions must be made.

First and foremost among them is the difference between the intra-metropolitan versus the inter-metropolitan location decision. The distinction is important, because the type of growth (birth vs. expansion vs. migration), and industrial emphasis (domestic vs. export goods producers) which an inter-metropolitan focus would imply are quite different from those of its internal counterpart. For example, an intra-metropolitan emphasis (e.g., Struyk and James) would necessitate consideration of new firm births and in-house expansions as contributors to overall change, while an inter-metropolitan study (e.g., Birch) would imply concern with firm migrations and expansion through branching activity. In a sense, both types of location may be relevant to the finding-firms process, depending on the particular application, so the following discussion will not be completely limited to one or the other. The inter-metropolitan business location decision provides the basic analytical framework for the algorithm, and is thus of primary importance here. But factors related to intra-metropolitan location prediction might also arise in cases where locators are being identified for a particular site, rather than on a city-side basis.

A second distinction can be made with respect to the firm's industry type, in particular between manufacturing and non-manufacturing firms. As Ingram notes, the heterogeneity of the corporate population creates analytical problems which are typically solved by focusing a study on a particular employment sub-sector, such as manufacturing or retail.[14] For a variety of historical and political reasons, most research and policy efforts have concerned themselves with the locational decisions of manufacturing firms.

This is true with respect to theoretical, as well as empirical investigation of the location question. The conventional spatial-economic model of manufacturing location is thus one whereby businesses choose a location so as to minimize freight transportation costs, subject to given raw materials and market locations. Additional distinctions can be made between 'weight gaining' and 'weight-losing'* production processes, thus weighting and relative importance of location near the market or the materials. Other considerations, such as linearity of transport costs and the existence of competition have been incorporated into models of increasing complexity, ranging from relatively simple equilibrium and cost-minimization formulas to the elaborate linear programming solution of the so-called "Transport Problem" (which models an inter-regional allocation of industries).[15]

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*'Weight gaining' production processes are those in which the final product is heavier (or larger, or bulkier) than are the raw materials from which it is made. Conversely, 'weight losing' processes are those which produce goods which are lighter or smaller than the materials from whence they came (e.g., finished lumber). From a locational viewpoint, the distinction becomes relevant through the consideration of the relative transport costs of the raw materials and goods, and thus the incentives to favor a locations correspondingly.

Empirical studies of manufacturing location have typically borne a heavy-industries bias, with variations in focus which can be quite easily tied to the changing tides of policy concern. Hence, the decline of textile manufacturing in the New England area and the subsequent growth of the same in the South led to a number of studies on interregional capital movements in this industry group.[16] In the late sixties and early seventies, concern with the effects of not only residential, but also industrial suburbanization produced a number of manufacturing location studies framed within a city-vs. -suburb dichotomy.[17] Within the current context of an internationalizing market, industrial location studies have returned to a broadened scale of geographic emphasis with concentration on te perceived pattern of pan-national industrial capital flows.[18]

On the non-manufacturing side, few studies have dealt with any but the locational decision of retail trade firms; the locational decisions of wholesale trade, construction, transport and public utilities, and service firms having been theoretically relegated to subordinance, either to that of manufacturing firms (i.e., 'tertiary sector location' á là Isard) or to technology and geography (i.e., "Central Place' theory). Attempts to theoretically determine retail location patterns have conventionally taken a market-area orientation, postulating that with market share as the ultimate objective the number and distribution of firms is thus a product of price, distance, and density of consumers. Defining location in terms of a spatial competition for buyers, they vary in complexity and spatial configuration from Hotelling's "hot dog stand" analogy[19] (implying central-location agglomeration) to the honeycomb-like distributions of firms in a hierarchical pattern of

spatial monopoly which are the outcome of detailed interregional allocation models which are often oriented towards Developing Countries applications.[20] More recently, with respect to the retail case in particular, attention has also been paid to the informational aspects of clustering and the relative importance of transport costs when they are independent of the consumption of the good (i.e., every purchase does not require a trip to the car or home).[21]

Although the increasing decentralization of retail activity, and the "de-industrialization" of the American economy have provoked increasing interest in the issue of retail location, the literature in this field remains sparse. Studies of this genre typically bear an intra-metropolitan emphasis, also, with the sum result of only marginal applicability to the issues being addressed here. Still, the substantive differences between observed patterns of manufacturing and retail location behavior do bear implications too significant to be totally ignored.

Miller's case study of 181 retail clothing stores in the greater Boston region is not unrepresentative in this respect. He used telephone listings to identify the existence and location of clothing retailers in seven major retail centers within the metropolitan area, in order to develop and test a disaggregate choice model of establishment location. In a test of simple central place theory, he plotted the relationship between number of stores in a community and the community's total income. Finding that the regularity of this relationship was broken in five cases -- i.e., those cities or places which serve as specialized "shopping centers" -- he developed a hierarchical model of local vs. regional activity location concentra-

tion.[22]

3.3. Methodological Considerations With Respect to Locational Analysis

With the foregoing distinctions, and the implications thereof in mind, some mention must be made of the methodologies which have typically been associated with locational analyses, and the resulting limitations of their findings. Regarding the theoretical side of the literature, it can be noted that the vast majority of studies (including those cited above) are the product of neo-classical economics and therefore subject to the weaknesses inherent in that type of analysis. Most important to the business location case are this approach's assumptions regarding the rationality and optimality of the location choice. Numerous authors (particularly those of the 'behavioral economics' school) have articulated the flaws in these assumptions,[23] so there is little reason to dwell on the issue here. Suffice it to say that the "satisficing" nature of empirically-observed location decisions is fundamentally contrary to the absolutely rational behavior of theory's ubiquitous "economic man"; that locational decisions are, in practice, made on the basis of adequacy rather than optimality. To quote one source,

> "... normative models of decision-making and industrial location may be conclusively rejected as inappropriate. Instead, the major parameters of the choice of a general location were found to be 'satisficing' in nature. Firms appear to avoid risky locations and prefer to find a site where costs, profits, and continued operations can be guaranteed to broadly conform to prior expectations."[24]

Similar flaws, though ones of a different sort, are found in the attitudinal survey techniques most commonly used for empirical investigations of business location. Being quite subtle in origin and pro-

ducing intuitively attractive results, these studies raise possibilities which are potentially even more problematic than are those which result from the direct application of theoretical models to development policy. The root of the problem here lies in the survey method's reliance upon the ability and willingness of the respondent to accurately describe his or her motivations and decision processes.[25] In a manner indicative of the common problem of 'psyching' the interviewer, interviewees will often mention reasons for doing things simply because they are perceived as being the right or rational answer, not because they are true descriptors of the decision-making process, thereby often producing self-fulfilling prophecies with respect to postulated theories of cause and effect. By answering this way, respondents hope (though perhaps unconsciously) to lead the researcher into the fallacious conclusions that 'rational' decision-makers with 'rational' reasons for site selection thereby imply 'rational' location decisions, since the former do not want to appear irrational any more than they wish to appear immoral or uninformed. As Birch notes, taxes are a good example of this phenomenon. Many business respondents (who have presumably had some experience in location economics) will mention property tax differences as a factor in the selection of a site. Yet most empirical analyses of the importance of property tax differences have found that they are virtually insignificant inputs into actual location decisions.[26]

Problems arise not only from what is said in interviews of this sort, but also from what is not. Respondents will often neglect to mention important locational factors, such as the existence of markets or materials, simply because they are believed to be so obvious as to

be taken as givens. By the same token, other factors are ignored because they arise ethical and moral issues which are not comfortably discussed. The issue of race is a good example. In a survey conducted on over 900 households in three cities, not a single respondent mentioned race as a factor in their residential location choice; this, despite the fact that none of these households had (or intended) to move to a neighborhood whose population was dominated by another racial group. Race was either so ingrained and implicit that no one through to mention it (despite over an hour of in-depth interviewing) or -- perhaps more likely -- citing race as a locational determinant was a taboo that none of the respondents was willing to break, despite its apparent dominance in the process.[27]

As this example illustrates, many important factors may (because of their perceived sensitivity) be omitted by the respondent, while other less critical factors will (because of their perceived importance) be brought to the fore. The results of this self-censoring-and-selecting behavior on the part of the interviewee is data which, by their omission of the most important factors, lead the analyst to dwell, instead, on subtle differences between unimportant issues and unrealistic behavior.

As these considerations indicate, the business location issue necessitates an approach which is both behavioral in nature and micro in detail. Perhaps most importantly, it must analyze locational behavior "...in terms of actions rather than through the subject's interpretation thereof",[28] avoiding the simplistic assumption that all businesses choose their location on the basis of a universally-defined set of rules. At the same time, the approach must be highly disaggre-

gate in nature since it is through individual decisions that net economic change takes place, and only through them that the decision process of a firm can thus be understood. As Birch states, the firm location process is a phenomenon which demands that actions be defined not on the basis of the characteristics of the array of existing locational choices:[29] in short, through what firms do, not through what they say they do, what theory says that they should do, or what everyone else does.

3.4. The Location Decision of Individual Firms

Cooper's 1975 study of the location choices of British manufacturers provides and appropriate analytical framework from which to consider the location decision-making process. He identifies this process as having two conceptually and substantively different components: 1) the decision of the firm to consider locational alternatives to its present site; and 2) the decision to, in fact, locate on a particular new site. These decisions are based, in turn, on the relative importance of factors which "push" a firm to leave an existing site, and those which "pull" it towards a new site. An examination of the characteristics and policy implications of these factors is therefore in order.

3.4.1. 'Push' Factors and the Relocation Decision

As opposed to the presumed rational model of location theory, experience would indicate that a problem-solving, rather than optimizing, model of decision-making is more appropriate, in the business location case. Hence:

> "...the need for the firm to consider locational alternatives to its present site is found not to originate in a comprehensive review of the relative advantages of different locations, but from a recognition of major problems or 'push' factors that cannot be easily solved in its existing premises."[30]

The divergence of actual behavior from theoretical models is further evidenced by the apparent lack of financial evaluation undertaken by firms which are considering a locational change. Cooper finds that decision-makers appear not to consider costs and profits in relation to the selection of a response or the subsequent search for sites, saving questions of this nature until the location decision has been made and its implementation requirements have become obvious, although larger firms appear to have both the resources and the motivation to approximate economic rationality.[31]

Instead of an ongoing, comprehensive strategy for continued existence on an optimal location, these findings suggest that a picture of "locational inertia" tempered by environmentally induced "parametric shocks" (e.g., failure to renew a lease) and personal perceptions of the firm's performance at its present location is more appropriate. Hence, we find a situation in which few firms suffer from transport, market, or supply problems serious enough to disrupt production at any specific location; greater problems (and thus the decision to relocate) can be expected to arise from restrictions on expansionary space or problems in retaining hold of their present site.[32]

Virtually all of the empirical studies surveyed by Cooper, as well as those found elsewhere, identify the first problem -- lack of space -- as the critical factor in relocation decision. For example, in a study of the location decisions of manufacturers in Cincinnati and New

England, Schmenner found that 80% of the firms which had recently relocated had done so in order to secure additional sapce.[33] Since the space problem most likely implies relocation through the establishment of a new branch, whereas the less powerful 'push' factor of space retainment problems (e.g., termination of lease, public taking of land) implies a migratory reaction, his conclusions in this respect are quite consistent with the relative importance of these two change sources (branching vs. migration), as reported by Birch (see Section 3.1).

This discussion raises a definitional issue with respect to characterization of the branching decision. Birch refers to new branches as 'births', because they entail the establishment of a new operation. Others, such as Cooper, refer to such behavior as 'relocation' because it implies a migration of capital, if not of physical plant. It is the latter (i.e., capital movement) aspects of location which bear sigificance for the firm-identification process. So in order to emphasize this relationship, to separate capital from physical migrations, and to differentiate between branch openings and entrepreneurial start-ups, branch start-ups will be referred to as 'relocations'. Physical movements will be referred to as 'migrations' and independent start-ups as 'births'.

Given that branching activity is the primary source of firm relocation, what more can be said about this phenomenon? Figure 5 provides a breakdown of employment gain -- by source, firm ownership region, and period -- from 1969 to 1976. As these tables indicate, about half of the total job replacement is due to births, and half to expansions. It is in the former category where branches make their biggest contribution, being bested only by the birth rates of

independent firms. In comparison, the employment gains reaped by branches through in-house expansions are quite modest. These observations are supported by Schmenner, who notes that the prevailing practice of the largest corporations is to establish a number of branch plants, rather than to expand existing operations.[34] Since Schmenner's study was based on manufacturers, only, the generalizability of his observation is tempered somewhat by Birch's finding that branching is more important in the manufacturing sector than it is elsewhere in the economy.[35] Even so, in light of the fact that branches appear to be playing an increasingly powerful role as a determinant of economic development patterns, the reproduction-vs. -reinvestment paradigm is clealy one of significant, and increasing, policy importance.

Following establishment of the fact that branching is an economic phenomenon of considerable importance, the obvious question to ask is: Where are these new branches being located? Schemenner provides some initial clues, through his observation that the tendency in branch location is one of geographic diversification, since it is only in rare cases that a firm will locate more than one plant in the same city.[36] The more general effects of this behavior are again evidenced by Figure 5, which indicates that disproportionate numbers of branches (or, more precisely, jobs in branch operations) are being attracted to the South. This, combined with relatively high levels of employment expansion in out-of-state branches (in exception to the pattern of stability noted earlier), implies that definite geographic patterns of capital flows do exist. In light of the negligible impact of outright migrations we can therefore conclude, as does Birch, that it is

Figure 5

Status of Firms vs Employment Gains by Region, 1969-72, 1972-74, 1974-76

Births
Percent Employment Gains in firms that are:

	Time Period	Inde-pendent	Head Quarters	Subsi-diary	Branch/ HQ in State	Branch/ HQ out of State
Northeast	1969-72	39.0	6.1	5.2	20.3	29.5
	1972-74	35.6	4.1	3.9	21.4	34.9
	1974-76	23.6	2.0	1.4	31.9	41.1
North Central	1969-72	39.7	6.3	3.5	16.0	34.5
	1972-74	30.3	3.5	2.5	20.4	43.3
	1974-76	19.9	1.4	1.1	33.1	44.5
South	1969-72	37.1	5.5	4.6	12.8	39.9
	1972-74	36.2	3.9	3.0	13.9	43.1
	1974-76	25.2	1.6	1.4	21.1	50.6
West	1969-72	40.3	5.5	4.1	20.8	29.4
	1972-74	44.0	4.0	2.5	21.5	28.0
	1974-76	24.0	1.7	1.1	31.6	41.6

Expansions
Percent Employment Gains in firms that are:

	Time Period	Inde-pendent	Head Quarters	Subsi-diary	Branch/ HQ in State	Branch/ HQ out of State
Northeast	1969-72	63.1	16.5	4.2	4.4	11.7
	1972-74	56.2	20.2	5.8	5.7	12.0
	1974-76	58.2	21.1	6.7	4.2	9.8
North Central	1969-72	58.3	15.2	3.0	8.1	15.4
	1972-74	55.4	20.7	4.6	6.0	13.2
	1974-76	54.5	20.9	5.0	6.3	13.3
South	1969-72	59.2	13.3	4.8	4.2	18.5
	1972-74	56.0	15.9	5.0	3.7	19.3
	1974-76	54.2	17.4	5.7	4.6	18.1
West	1969-72	60.4	15.6	3.1	7.5	13.3
	1972-74	58.2	21.0	3.7	6.0	11.0
	1974-76	56.9	22.2	4.6	5.3	11.0

From Birch, D. The Job Generation Process.

differential branching, not migration, that causes many of the regional differences in employment growth.[37]

3.4.2. 'Pull' Factors and Location Choice

In terms of character, 'pull' factors can differentiated from 'push' factors in that the latter are generally products of the firm and its activities, while the former drive from attributes of the location site. This is a distinction which bears important analytical implications with respect to the form of the algorithm.

In terms of relative importance in the location decision, Cooper notes that attraction or 'pull' factors appear to be matters of secondary concern, arising only after the decision to move has actually been made. In most cases, pull factors serve to enable a firm to decide between locational alternatives, rather than to promote the locational change, itself.[38] Hence, they represent the stage at which a conventional 'rational' model of decision-making becomes most applicable. Deciding between locations is the point of the locational decision-making process at which a comparison of costs and benefits may first be taken in a comprehensive manner.[39] In comparison to the problem solving nature of the relocation decision, then, the process of location selection can better be seen as one of optimization within constraints.

In a survey of British manufacturers, Cameron and Clark found that the choice between locations is affected by labor supplies, accessibility, social factors external to the firm (i.e., 'quality of life'), the availability of premises, and the amount of local cooperation available. Of these, the overwhelming requirement is for adequate

supplies of labor, with 80% of their respondents mentioning this factor.[40]

The importance of labor's availability, as compared to its costs, is supported by Birch, who states that what really matters to a firm is labor's availability and caliber, not its cost. Observing on the one hand high levels of growth in both high and low wage firms and, on the other, inconsequential variations in land, transport and capital costs,[41] he concludes that some businesses are, indeed, willing to pay a higher price in order to gain a better worker.[42] Hence, while various sectors or firms may have different wage structures and defined levels of acceptable labor cost, on balance the wage differentials incorporated within them are fairly consistent with the productivity levels of varying qualities of workers. This implies, in turn, that the critical link which must be made between a potential developers and those offering a site for development lies in the achievement of a match between the quality of the local labor force and the respective requirements of a particular industry or firm.

That is not to say that other factors, such as transport and land cost, degree of unionism, tax rates, etc. are of no consequence to the location decision-maker. Rather, that these factors, being subsidiary to the labor availability issue, may in general serve a toleranceing, rather than discriminating, function by defining minimum acceptable levels within which a firm can make a "satisficing" location decision. For example, Cooper finds that unless a particular move happens to exploit a new market or source of raw material, most firms do not appear to be at all concerned with the incidence of transport costs in their comparative costings of various sites.[43] Cost considerations

aside, Mandell found that the existence of minimum levels of access were of primary concern to potential locators in the Atlanta and Chicago areas.[44] However, the strongest inference which can be drawn from this latter study being that firms are most concerned with the factors which are most problematic in their existing site (i.e., push factors) the role of pull factors, and non-labor ones in particular, seems most fairly characterized (in the general case) as a filtering one. So although a specific site may offer an amenity or set of amenities which is particularly attractive to a certain locator (e.g., coal for steel plant), the general role of site-specific pull factors lies in enabling a firm to choose among an array of acceptable sites rather than to define a optimal site, the identification and procurement of which then becomes the objective of the locational selection process.

3.4.3. 'Negative Filters' and Location Avoidance

Beyond the issue of better or worse sites lies that which distinguishes between locations towards which a firm is attracted, and those which it avoids. That is to say, there exist sites which are so completely inappropriate that they are never even brought to consideration in the location selection process. For any particular firm many, if not most, sites fall into this category. Yet while they may do so by their omission rather than by their presence, these sites and the factors defining them therefore play a significant, though often unrecognized, role in the location decision.

Hence, we can add to our "push/pull" model the concept of a "negative filter"; a site-related factor, or set of factors which

differentiate between those places which are, and are not, acceptable candidates for location. Among the acceptable sites are those which are more or less optimal, and thus subject to the "pull" factor-based analysis described above. Using only these attraction factors to characterize sites, however, ignores the vast majority of locations which are filtered out even before they reach the stage of conscious consideration of their relative merits. A firm location model which did not incorporate avoidance factors into its analysis would thus omit the basis on which all sites but a few are rejected, by focusing instead on the reasons why one is chosen. Empirically, the existence of "negative filters" is illustrated in various ways, although as often by inference as not. For example, the fact that almost all entrepreneurial start-ups are located in the same city as the entrepreneur's residence would, at the basest level, indicate a negative filter based on proximity to home. On a more general basis, Birch distinguishes between areas which certain types of firm are attracted to and those which they avoid. Noting that the characteristics which make a location attractive to one type of firm may make it equally unattractive to others, and that different types of change (i.e., expansions, vs. births) generall take place in different types of places, he develops matrices of attraction and repulsion on the basis of firm and location type.[45]

3.5. The Role of Public Policy in Determining Location Choice

What conclusions can be drawn from the above discussion, with respect to the merit and potential for business attraction policies? The general consensus is that to date, few public policies or programs

have been successful in achieving their developmental goals, i.e., by attracting firms to sites where development is necessary or desired As one source points out, "There undoubtedly are ways to promote economic development. The state agencies just haven't been very creative up to now..."[46] Hence, "What we need, and have lacked, is the ability to focus our incentives on those who will make good use of them without wasting taxpayers' monies on those who will not".[47] And most would agree that the "smokestack-chasing" mentality which is characteristic of current and past governmental prospecting efforts are of the latter -- i.e., ineffective -- type.

Part of the problem is political in nature. As on observer notes:

> "Politicians love to get their pictures taken doing good things...It is easier to show up at the opening of a new branch plant with 100 employees than it is to visit 100 companies that have each added one employee -- even though the economic impact is the same."[48]

The real problems arise, not from the political mileage which can be gained from a successful job creation program, however, but from the incidental and indirect effects of policies which are designed towards the achievement of that end. Picking on what is perhaps the worst case of misguided economic development policy to come along in quite a few years -- whereby the city of Detroit demolished and entire neighborhood (known as Poletown) in order to create space for parking lots at a General Motors plant which has yet to materialize -- may not be very fair. But it does illustrate, through its extremity, the type of counter-productive outcome to which ill-conceived development policies can lead.

The use of tax incentives provides another, less extreme, case in point. It is fairly common practice for cities and states to offer property or payroll tax breaks to firms, as an inducement for locating within them. In reality, however, for most firms taxes constitute a small percentage of the cost of doing business, with non-federal taxes constituting a trivial portion of the total tax burden. Even in a high-tax state, the state tax burden may amount to only one or two percent of the cost of operation making the benefits of locating in a low-tax state marginal at best, ceteris paribus. This particularly true in the case of the type of high-technology company which everyone seems particularly anxious to attract, due to the high value added to, and export orientation of, their goods.[49] So although the typical policy approach is for a city or state to use such incentives to push firms in their direction, experience would indicate that tax policies are, in general, ineffective devices for firm attraction; at best, they can be expected to operate as 'pull' factors with respect to a particular site, providing a source of locational leverage for the largest firms and little benefit to anyone else.

Further, when push comes to shove, the usefulness to tax breaks as bargaining chips may be even less important to the firm than is the extent to which characteristics such as high taxes are indicative of other, more important, factors which affect the firm's ability to do business at a particular location. As Birch points out, the most rapidly growing areas in the country tend to be those with higher than average tax rates. This is not to say that there is some intrinsic value in high taxes per se, but that they may often be indicative of quality of labor and life of factors which are of greater concern than

are local tax burdens, to the relocating firm.[50] As long as the high taxes takes in these areas are reciprocated by high-quality public services, the price thereof is apparently one that a large number of firms are more than willing to pay in order to be able to attract and maintain a high-caliber labor pool. To quote Miles Freidman, the executive director of the National Association of State Development Agencies:

> "The traditional belief was that a state with high taxes could not attract business...But that is no longer true. You can't rule out a high-tax state. Or a state with expensive labor. States that have high taxes and high labor costs tend to have more skilled workforces and higher productivity. What you have when you look at the incentives and disincentives of doing business in a state like that are a lot of things that tend to cancel each other out.[51]

Apart from the problems of misguided policy, however, other sources of difficulty do exist; ones where the major problems lies in the manner of the policy's implementation. As Schmenner notes, many of the economic develoment programs advanced to date by state and local officials have not reached their intended targets simply because the programs are not marketed well enough. This is particularly true with respect to smaller firms, which often consider themselves (or are considered by government officials) to be too insignificant to merit the attention of city hall or the state house while government, in turn, has been slow to advertise its capabilities to the business community.[52] (The new wave of promotional programs, such as "Make it in Massachusetts" and "Business Loves New York", which offer catchy jingles but little substance, notwithstanding.) The implications of this problem are particularly apparent when we consider the fact that the majority of new jobs are created by firms with

fewer than twenty employees.[53]

The ultimate policy implication to be drawn from these observations is that little is to be gained by throwing public funds after firms which are, in the first place, unlikely to move and, in the second, even more unlikely to be interested in a randomly (or self-) selected location. At the very least, these facts support an urban development policy of "tending one's own garden"[54] by concentrating efforts on facilitating the birth and expansion of local firms (since entrepreneurs tend to locate their businesses in the area of their residence, and smaller companies tend to establish branches within a few hours of the home plant).

In cases where this is not enough -- when external sources of investment must be sought -- the ability to develop effective, accurately -targeted policies becomes essential. As Birch notes, "Nobody's landing any plants" by casting out side 'nets' in the form of promotional packages or across-the-borads tax breaks, because "they're all fishing for whales and whales are practically an extinct species".[55] In the long run, the difference between growth and stagnation therefore lies in an area's ability to identify its unique resources, to identify those industries (or even better, firms) which have needs consistent with those resources, and to develop workable policies for getting the two of them together. In the competition for scarce investors, the victors are determined not by their budgets, but by their brains.

CHAPTER FOUR

JOINT DEVELOPMENT: THE PROSPECTS FOR COORDINATED PUBLIC/PRIVATE INVESTMENT PLANNING

Planners have long recognized the inherently interdependent and iterative nature of public and private investment decisions. This is particularly true in the case of transportation planning where, as Chapter Two indicated, the interplay between transport facilities' location and technology, on the one had, and land development, on the other, can be identified as a major determinant of urban spatial structure. Within this structure, and contributing to it, are the location decisions of individual firms which are, as Chapter Three pointed out, influenced by a set of factors which includes the availability and cost of transportation for their employees, customers, and products.

Attempts to translate these relationships into a general-purpose urban development planning methodology have, however, been constrained by insufficient empirical evidence and limited pratical experience with respect to the land-transport relationship and its components, including business location behavior. Over the past twenty years, considerable progress has been made towards the rectification of this situation, from which has emerged the concept of joint transit-land development planning ("joint development"). However, joint development efforts to date have been only partially successful in overcoming implementational impediments. It is thus an approach which is still in the process of evolution, operating under constraints which originate in the complexity of the relationships which it attempts to

address and the forces which it seeks to control.

These problems aside, the promise of joint development is sufficient to warrant continued effort toward perfection of the approach, and thus toward our ability to manipulate transit investment so as to influence urban development in a positive manner. This goal implies not only an increased understanding of institutional barriers to joint development program implementation, but also an awareness of, and sensitivity to, the economic factors which are the ultimate determinants of a project's developmental success. Most analyses of the joint development concept have focused on the former issue, relegating the latter to secondary concern treating "the market" as an uncontrollable and unpredictable, yet inevitable, element in the development process. Here, however, the emphasis is on the distributive implications of public investment, and thus on the economic factors which determine behaviors such as business location. That is not to say that political and institutional considerations are not important; only that they are, in essence, only one side of the joint development coin, and that failure to recognize this fact will serve only to retard the formulation of effective joint development policies and plans.

This chapter will begin with a definitional overview of the joint development concept. It will then proceed to discuss the strengths and weaknesses of the approach, before examining the techniques and problems which accompany joint development implementation. It will conclude with a brief discussion of the timeliness of the joint development idea, given the political and planning environments of the day.

4.1 Sources and Definitions of the Concepts

As Foster notes, perhaps the most interesting aspect of the land-transportation relationship is the extent to which transport improvements and policies redistribute income towards owners of land.[1] Joint development is, in effect, an attempt to predict such redistributions, and to target them toward socially optimal solutions by maximizing the public benefit (transport and non-transport) accrued from such investment. However, the conceptual simplicity of joint development belies an operational complexity which is fairly well illustrated by the variety of ways in which the joint development idea has been defined, implemented, and evaluated.

At its most expansive, the concept is defined as "...a process of conceiving, designing, and carrying out a combination of urban development activities in a unified way, to the end that benefits are greater than if each individual activity were separately planned and executed."[2] A more specific definition is one which describes joint development as "real estate development that is closely linked to public transportation services and stations, and one which relies to a considerable extent on the market and locational advantages provided by the transit facility".[3] What this definition ignores, however, are the historical sources of the joint development concept, the intent underlying the transport investment decision, and the planning and implementation techniques which such intentions imply with respect to encouraging complementary private and public investment. Thus, for planning purposes, joint development is better defined as "the multiple use of transportation corridors and stops so as to maximize the

economic return on public investment and to achieve an improved environmental relationship between transportation and related land uses."[4]

As the above definition indicates, the effects of and objectives served by joint development are not limited to -- or even necessarily dominated by -- physical revitalization alone. For it is the underlying economic forces controlling the land market which are ultimately responsible for the determination and distribution of the non-transport benefits of a transport investment. Joint development may thus provide the means for serving multiple public objectives -- from increasing transit ridership to encouraging private investments in blighted areas and strengthening city economies, to providing additional transit financing sources through value capture techniques[5] -- in a manner consistent with prevailing philosophies regarding the role of transportation planning in modern urban society.

Neither is the concept of joint land-transport development, or multiple use of transport facility rights-of-way particularly new, although the terminology used to describe it may be. For example, enactment of early enabling legislation (Section III, Title 23 of the Public Roads Act of 1961) led to over 350 requests from 46 states and the District of Columbia for the permissive joint use of highway land for non-highway uses.[6] And although the concept formally originated within the context of highway investment planning, less formal applications with respect to transit considerably predate the automotive alternative. As Warner notes:

> "...the wide extent of settlement in the outer residential area [of Boston] was made possible by the elaboration of a new street railway transportation system, and a

> parallel extension of city services. Here the course of building reflected the movement of successive waves of people out from the center of the city. Here the new houses and neighborhoods demonstrated the economic progress of half of Boston's families and their aspirations for a satisfactory home environment."[7]

The federal government's formal participation in transit-related joint development efforts began much later, with the enactment of the Young Amendment to the Urban Mass Transportation Act of 1964. This participation was realized primarily in the form of financial (and secondarily, through technical) support from the newly-formed Urban Mass Transportation Administration (UMTA) in conjunction with the Department of Housing and Urban Development -- a partnership which continues to represent the federal role in local joint development activities (i.e., demonstration or Urban Development Action Grants [UDAG] as financial support, limited technical assistance, a permissive use of right-of-ways). Subsequent legislation, most notable the Federal Public Transportation Act of 1978, had the result of expanding the federal role of promotion and support for joint development planning and implementation efforts, culminating in President Carter's Urban Initiatives Program.

The current administration has yet to develop a clear position with respect to the approach; when asked about current interest in and attitudes about joint development within the Department of Transportation (DOT), an administrator replied that his response to the question depends on the day he is asked. But experience would indicate numerous good reasons for developing a clear federal policy with respect to the coordination of transportation and urban development planning efforts, if not regarding joint development, in particular.

For although the political and administrative legitimacy of a primary federal role in urban transit policy and planning may be open to debate, the importance of transportation investment and policy decisions in determining the quality of urban life is not. To quote one source:

> "The conclusion to be drawn is that it is most important to try to improve the quality of the transport investment decision. If these are often seriously wrong, in relation to their transportation and environmental effects, then the role of policies and regulations will always be sub-optimal -- they will simply attempt to make the best of a long-run disequilibrium situation. Moreover, a city ... will probably never be able to afford to reverse these investment decisions. In a very real sense, it will have to live with its mistakes."[8]

4.2 Strengths and Weaknesses of the Joint Development Approach

The historical contextual shift of joint development from highway to transit applications led to a corresponding change in planning emphasis which was consistent with the very different physical qualities and environmental impacts of the two modes. Thus, joint development has evolved over the past twenty years from being primarily a means of minimizing the negative externalities of highway overpasses, intersections, and bridges (e.g., Phoenix's Papago Freeway, Interstate Five through Seattle) to being a tool for maximizing the positive externalities of transit station areas (e.g., Montreal's Place Bonaventure, Boston's Washington Station). In the most ambitious programs (e.g., Boston's Southwest Corridor Transit Line relocation), it has been used for both.

The changing role of joint development is reflected both in the types of development which have been proposed or undertaken (e.g., commercial and residential development vs. parking and outdoor recreation areas), and in the type of benefit which they are designed

to achieve (e.g., urban economic revitalization vs. minimizing environmental disruption). In any case, the basic premise of the approach is the same: that coordinated decision-making and investment will lead to more effective and efficient development patterns than would occur in a laissez faire market.

The idea behind the joint development concept is thus very simple and commonsensical. At the very least, for example, joint development could be expected to produce certain types of scale economies, such as in the construction of commercial space in transit stations. Considering this, it would be difficult to weigh the theoretical advantages and disadvantages of joint development and fail to conclude that the positive impacts of the approach far outweigh the negative. Hence we find in practice, as Section 4.3 will indicate, negative impacts of joint development which are sufficiently slight that it is the inability to fully achieve the theoretical benefits which constitute the method's major stumbling block.

Issues of implementation aside, however, some costs must be entered upon the joint development ledger. The major drawbacks of the method derive from the additional time, and therefore cost, which will generally be associated with the more integrative approach which joint development planning implies.

At the same time, experience (and the citation which closed the preceding section) would warn us that the long-term benefits of a wisely made transit decision, no matter how heavily discounted, are likely to far outweigh the costs of short-term precaution. The strength of joint development, in this respect, was noted over a decade ago:

> "...One of the basic concepts, of course, of joint development is that the same public dollar will be made to do double or triple duty. The concept is that if we engage in joint development of multiple use we will be able to construct two or three or four different types of uses together at a lower aggregate than if we did them individually."[9]

So although the expectation expressed in this reference with respect to the magnitude of joint development's economic impact may, in hindsight, seem overly optimistic it is not totally unrealistic. As this example begins to illustrate, the key words in understanding the positive impacts of joint development planning are conservation and cooperation. In short, it is its conservatory nature which is the source of joint development's primary strength -- i.e., the possibility of avoiding sub-optimal social outcomes by increasing the benefit from public and private investment, while simultaneously lowering the cost -- and its cooperative nature which enables its conservatory potential to be realized.

Given the apparent inverse relationship between the amount of public dollars available and the expected impact of each, the real cost of investing extra time and money in joint development planning can thus be expected to decrease in parallel with declining public coffers. Thus, the less money is available, the more necessary integrated planning approaches, such as joint development becomes:

> "Increasingly, joint development is receiving attention because of its potential as a contributor to urban economic health and vitality. As the nation enters an era of limited public resources, it becomes more urgent that public investments in cities have the greatest possible beneficial effect."[10]

Our celebration of the benefits of joint development must be tempered, however, by the previously-cited observation that transport

investments act to transfer land value increases or investments from one part of the urban area to another, rather than resulting in net increases in economic development (see p. 36). Upon closer inspection, though, this observation serves less to diminish the sources of joint development's economic benefit than to define them. For apart from the obvious net benefit accruing to a city from 90% federal financing of transit capital and construction costs, the primary economic benefit which can probably be expected to result from a joint development project is the product of the efficiency of the investment pattern which it promotes -- i.e., the money not wasted in continued investment in inefficient and/or inappropriate development forms; the future mistakes not made. To quote Owen:

> "The root of the problem is that location decisions are based on the economic feasibility of individual structures, and not on the total costs incurred by the community."[11]

To the extent that market failure is a function of imperfect information, joint development can avoid such failures by providing the information and total-cost viewpoint which can facilitate a more optimal market solution. Joint development is therefore not a replacement for the free market, as antagonists might argue, but instead a means of improving upon the efficiency of its operation with respect to urban investment patterns.

The benefit described above is a fairly subtle concept, both in nature and in effect. It is thereby one which is -- given present levels -- nearly impossible to quantify, and which is thus ripe for political ambivalence (making the current administration's indifference understandable, if not defensible). Such problems of benefit quantification are common to most public goods, public transit being

(if, indeed a public good) the rule, rather than the exception.

On the positive side, however, it is true that public goods share other characteristics which are applicable to the transit case; specifically, that their benefits involve society-wide external consumption effects.[12] As the Urban Land Institute points out:

> "Both public and private participants can benefit from joint development. These benefits may include a boost in the economic development of the community, increased returns on investment to the developer, greater use of the transit system, enhancement of urban design, cost efficiencies in the construction of both private and public facilities, a limited recovery of transit capital costs, and the opportunity to manage and control urban growth."[13]

It can thus be noted, to joint development's credit, that while the distribution of its benefits may be as subtle as their sources and magnitude, the former is much more ubiquitous. In fact, the crux of the problem of placing a dollar value on the benefits of joint development may well lie in the universality of its beneficiaries.

4.3 Joint Development Techniques

It is one thing to determine that joint development is good; it is quite another matter to determine exactly how good joint development is done. It is axiomatic that transport and land use patterns are in large part functions of one another. As Chapter Two indicated, however, there is little certainty regarding the strength of their mutual influence relative to the many other environmental forces which bear upon each, and upon land use in particular. And while there is increasing consensus that policy makers should consider the land use consequences of transportation decisions, there is no agreement with respect to the degree to which they should endeavor to shape

development that they should consider desirable.[14]

Putting philosophical considerations aside for the moment, the success of any joint development program is dependent upon the degree to which the planning agency is aware of, and responds to, critical characteristics of the decision-making and investment environment. In practice, joint development efforts are comprised of two distinct but related activities: 1) policy-making; and 2) deal-making.[15]

Planning and development policy-making encompasses the activities of the transit authorities, other public agencies, and possible private entities in preparing for joint development from the beginning stage of route selection and station location, through the selection of station designs and entrance points, to the acquisition of land and the construction of stations and entrances.[16] In essence, this is the coordinating stage of the joint development process. The Urban Land Institute (a primary proponent of the concept) identifies four factors which are critical to the success of any joint development effort within this initial phase: 1) coordination of zoning and land use planning; 2) station location and access considerations; 3) land acquisition and transfer policies; and 4) institutional powers and arrangements.

Looking at these factors individually, we can begin by noting the obvious importance which the coordination of zoning and land-related planning efforts have with respect to the success of any joint development policy; the BART experience (see p. 36) illustrates this point only too well. On the one hand, increased investment in the vicinity of stations was perceived by BART planners as one of the desired outcomes of investment in the transit system, and thus became a factor

determining the particular configuration of system design and station location. On the other hand, however, uncoordinated implementation enabled the residents of at least one area in Oakland to down-zone land adjacent to the station, thus effectively precluding any significant development from occuring.[17]

Tied to zoning and land use considerations are those related to station location and access, and route alignment. As Witherspoon notes, transit will be most effective as an economic development tool when improvements build upon, and are closely linked to existing economic strengths of the community served.[18] Rather than trying to change the context of an area, a joint development effort should (and may be able to do more than) build upon the community's existing economic foundation. In practice, though, transportation planners and political decision-makers have tended to ignore this consideration, and have thus chosen least-cost or politically beneficial solutions in their station and route alignment decisions -- solutions which, from a total cost/benefit perspective, may be very expensive for a community's economy. For example, the use of existing highway or rail rights-of-way for transit arteries is a common practice. But though this approach can reduce land acquisition costs (in terms of money and public opposition to takings), it may at the same time preclude significant station area development because of weak market conditions (including blighting influences from the initial right-of-way), or fragmented land ownership.[19] The lesson to be learned here is thus that the long term benefits of joint development should not be sacrificed for, or measured against, short term opportunity costs and returns.

In the same vein, joint development efforts may be helped or hindered by particular land acquisition and transfer policies. Zoning problems aside, joint development effort may still be doomed to failure if the implementing agency is unable to assemble the necessary parcels of land. When state eminent domain laws allow, land acquisition policies can endorse takings beyond rights of way and station sites to include incremental acquisition for joint development.[20] In other cases, such actions may be illegal or politically infeasible, hence leaving the joint development process at the mercy of individual market decisions. Under circumstances such as these, the willingness of landowners to cooperate with the joint development effort could easily effects as detrimental to the process as do unconducive zoning or market conditions.

The ability of planners to overcome these three barriers is, in large part, a function of the political and administrative environment of the joint development process. Hence, the arrangement of political and institutional powers and jurisdictions plays a critical role throughout the planning, implementation, and management stages of a joint development effort. Without institutional cooperation and/or political assent, the coordination of zoning, financing, and legal powers necessary for joint development cannot be achieved. This issue is particularly germane to planning efforts within the transportation sector, as a whole, where institutional fragmentation, interagency hostility inter-modal competition and community distrust of public officials have hindered previous policy, planning, and

implementation efforts.*

Implicit in this issue are further questions related to the distribution of political and economic power within an urban planning setting, and the implications of these factors with respect to the objectives of the joint development process. It has already been pointed out that joint development has the potential to serve multiple objectives. The questions which must be asked at this point, then, are: whose objectives are they? What do they imply about joint development efforts?

Perhaps the most obvious flaw in the current body of literature in the joint development field is its insensitivity to the political and distributional implications inherent to public investment decisions of this type. To begin with, planning decisions such as are necessary for joint development are unquestionably political because they determine the allocation of scarce public resources and the burden of payment thereof. Secondly, and most importantly, the common sentiment which underlies virtually all joint development literature is the typically middle class assumption that such development is inherently and universally good. This assumption is, quite obviously, very questionable, especially with respect to joint development

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*As evidence of this Meyer cites a 1974 study of the political and planning processes of 12 North American and European cities which, conducted urban transportation planning and programming efforts and concluded that the institutional fragmentation of responsibility and influence had created a decision-making structure which was unresponsive to the needs of urban areas.[21] Given the high degree of inter-agency -- not to mention public/private -- coordination necessary for a joint development project to succeed, this is a condition for serious consideration.

policies in lower-class and/or minority neighborhoods. The BART example previously cited illustrates this point well, because while BART planners simply assumed that everyone would find station area development a desirable by-product of the system, the action of the Oakland residents completely disproved this belief. As Meyer, et. al. point out, assume that the resident population in the surroundings of an investment action would benefit first and foremost from that decision. Alternately, it might be assumed that there has to be a progressive distribution pattern of benefits over all income groups for the effect to be a positive one. The distinction is important, because many revitalization efforts have the consequence of gentrification -- that is, they improve the urban infrastructure to the advantage of higher income (usually white) people, who displace lower income (often minority) families at the same location.[22] It is thus representative of a whole range of distributional consequences which, whether intended or not, must be explicitly considered in the design and evaluation of any joint development plan.

Once the public policy has been designed, "deals" must be struck in order to bring the plans to fruition. This, then, is the implementation stage of the joint development process, and the one in which we are most interested. For, plans and architectural models and value capture financing schemes aside, it is the act of development which determines the ultimate outcome of a joint development effort. And instrumental in this process is the role of the developer; the locator whose behavior the algorithm attempts to foresee.

At this point, it will be useful to define exactly what is meant by the term "developer" and, in doing so, to draw a distinction

between those who prepare a plot of land for occupancy, and those who do the occupying. In some case, they may be one and the same; in many they are not. Regardless, the differential objectives of the land-developer vs. the land-occupant make it necessary to distinguish between the two in order to design an appropriate and successful development policy. For example, size provides a good indicator of which role(s) a firm will be willing and able to fulfill -- larger firms being more apt to have the resources and particularistic space demands necessary to assume the developer role -- and which will be left to the joint development agency. The policy implications of considerations such as this are fairly obvious: zoning or tax incentives would probably thus be insufficient to attract small businesses to a transit station area, while the provision of commercial space within the station would probably be of little consequence to a large manufacturer who might be considering location nearby.

In the course of joint development implementation, the public agency often fills the role of land-developer -- whether out of necessity or of desire. In instances where this is the case, the overriding objective is then to identify firms which would be interested in occupying the site, in the quest for achievement of some defined set of social objectives (providing jobs or services, subsidizing the cost of the transit operation, etc.). The implications of this scenario are clearly different from those of a situation wherein the occupant assumes the locator role himself (developer as equity holder) or leaves it to a third party (developer as landlord, speculator, or colonizer -- depending on one's perspective). In any case, the developer/occupant definition underlies important distinctions and distributional

consequences with respect to the ability and intent which become factors in the identification of participants and designation of responsibilities within a joint development process. For as subtle as the distinction may seem, it is one with significant implications regarding the objectives and powers embodied in both the public and private ends of the joint development partnership.*

Like the policy-making stage, the deal-making phase of a joint development process is constrained by numerous factors. Primary among these constrainst are: 1) the often-conflicting objectives of the major participants; and 2) site-related factors which influence the development potential of the site. Together, these constraints constitute the deal-making environment, and dictate its form in any particular development effort. They create an environment which consists, in sum, of the legal, financial, physical, political and social constraints faced by developers, permanent lenders, transit authorities, and other public and private parties which may be involved in the planning and implementation of a joint development project.

The major site-related factors influencing the joint development process are: 1) market conditions; 2) land ownership situations; 3) station access conditions; and 4) other incidental site conditions (e.g., abutters, soil quality, environmental effect, etc.). The effects and implications of these considerations are fairly obvious, given our preceding discussion of the factors influencing business location decisions, as well as the policy-making aspects of joint

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*In this thesis, the term developer will be used to refer to those who assume the land-improvement function. The terms "occupant" and "relocator" will be used to designate those who actually locate on a site.

development. With regard to their substance and impact, it can be noted that site-related factors such as these can have either positive or negative land use effects, that they may be alterable or completely intransigent. In the case of the algorithm, to extent that they represent identifiable "pull" factors, characteristics of this type will be incorporated into the site-specific filters of the firm selection process (see 5.2). In the abstract, however, little more can be said about these factors than that they exist -- in combinations which are unique to each development site -- and that, in accordance with their market influence, they must be taken account of in the design and implementation of a joint development program.

The second factor which is critical to the deal-making environment is the interaction between the principal parties which are involved (formally or informally) in the joint development process. This, again, raises the types of institutional and political issue which were touched upon in the preceding discussion, for it is within the deal-making stage that all of the assumptions, objectives, etc. underlying the project planning process and predicating the plan's final form are brought to the test. Ultimately, for a joint development effort to be successful, it is important that the principal (and latent) participants in the process be identified and that their objectives be understood. The essence of dealmaking is to arrive at deals or compromises which simultaneously satisfy the objectives of all parties.[23] Thus,

> "The degree of orginality and complexity in joint development deals depend largely on the environment in which the deals are made. The more challenging a development environment for a project, the more intricate the deals will generally be."[24]

Underlying this statement, again, is the implicit assumption that

joint development is inherently desirable and thus, that a well-planned joint development process is bound to be successful in the sense of motivating new investment in the transit corridor. To reiterate, this assumption may or may not be valid, depending upon the specific environment of a particular joint development effort. And secondly, what this approach further ignores is the fact that it is the joint development planning process which is ultimately that which determines the success or failure of the development attempt because it is the output of the policy and deal-making processes (i.e., the joint development plan) which must tie together the constraints of the planning and implementation phases into a salient, workable project.

As mentioned earlier, an important step in this process, and one which has been all but ignored in the literature, is that of developer identification. Joint development provides a context within which a wide range of public-private and public-development-motivating deal types are possible. But how does the joint developer go about the business of identifying the organizations, and the people within them, to whom, incentives can be offered with any reason to believe that they will produce the desired types and amount of development?

As we know, the major stumbling blocks to successful joint development planning occur within the implementation, or deal-making state. Most observers have focused their efforts on the institutional problems of administration and divergent goal orientation among the participating parties in a joint development program. But, as the following quote indicates, the sources of implementational failure are much more diverse and problematic than we might want to admit and are certainly not limited to, or necessarily dominated by,

organizational disharmony:

> "...the main problem in the execution of joint development appears to be that both the private and public sectors lack sufficient knowledge of the complexities of joint development... In short, practitioners are beginning to realize that joint development is not an inevitable result of the establishment of transit facilities. Rather, the successful implementation of joint development depends upon initiatives taken by public and private parties who are aware of a wide variety of techniques, some of which are only now being identified and appreciated."[25]

Table 1 outlines a number of the techniques utilized by joint developers, in terms of their usefulness in varying market conditions. They present a wide variety of inducements to the potential developer, but share one major characteristic -- they are all passive techniques in the sense that, as many attractions as they may offer, it is still left to the developer to make the first move towards a deal. The joint development literature portrays the market, through the actions of private developers, as an active, self-motivating participant in the development process. The result, in turn, is a self-selective process of developer identification which casts the joint developer in a role which is, at best, passive. Under such circumstances, it is thus hard to expect results which are anything but sub-optimal: without a means of identifying potential developers in any but the most general of senses, joint developers are precluded the possibility of marketing their assets most effectively. That is not to deny the fact that the long term perspective of a joint development offers significant potential for improving the functions of the characteristically short-sighted land development market, but rather to simply indicate a remaining weakness in the approach which offers substantial room for improvement.

FIGURE 2

Appropriate Public Actions in Different Market Situation

Public Actions	Market Situation		
	Strong	Uncertain	Weak
Cost Reduction			(2)
Property writedowns			X
Tax exemptions & abatements			X
Demand Creation			(1)
Public lease of space			X
User financing			X
Public improvements (e.g. Convention Center, Fare free concourse Public garages)		X	X
Land Acquisition	(1)		
Supplementary purchase for transit			
Supplementary condemnation for transit			
Holdout condemnation	X	X	
Public financing mechanisms			
Federal grants		X	X
Special tax districts	X		
Tax increment financing	X		
Risk Assumption		(1)	
Loans		X	
Guarantees		X	
Equity participation			X
Special zoning	(2)	(2)	
Special District		X	
Bonus or incentive	X	X	
Floating zones		X	
PUDs		X	
Conditional	X	X	
TDR	X		
Transit related incentives			
Coordinated planning of Transit Access	X	X	X
Coordinated construction	X	X	X
Other			
Public Development			X
Jawboning		X	

Note: The numbers in parentheses represent the most appropriate public actions in the author's view

The algorithm which will be presented in the following chapters provides one specific technique for doing so. In more general terms, if the public developer is to compete successfully against the rest of the market for commercial investment, she/he must first begin to recognize, understand, and develop tools for taking advantage of the critical role which private capital plays in the economy of the city.

The first step in this process is to realize that land development -- let along socially beneficial forms thereof (however they be defined) -- is not the inevitable result of transit investment per se. As previous discussions have indicated, while it is fairly clear that transport facilities do influence development patterns, the extent and causes thereof remain indeterminate. Under such circumstances, the role of transportation-related actions in encouraging urban development is limited. For example, the most significant encouraging action that can be taken, according to private developers interviewed by one author, is the provision of parking facilities for new office or retail space.[26] This is hardly an encouraging observation, considering the types and extent of development which a joint development program might be expected to produce.

The second, and more challenging step in this process lies in moving beyond the stage of problem identification to that of problem rectification. Hence, once the public developer has recognized the degree to which transit facilities do not influence investment, and the degree to which other factors do, his/her real challenge lies in combining this knowledge into a repertoire of techniques for marketing and selling the joint development concept. One means of doing so, which is facilitated by the approach's public/private

partnership, is to employ the latter's expertise with respect to land development. Thus, we find "public agencies looking more often to the private sector's technical and resource capabilities, its understanding of the real estate development process, and its entrepreneurial skills."[27] A second and more permanent means for resolving this technical discrepency is for the public agency to develop some of these self-same skills; not for the purpose of assuming the developer's role, but as a basis for understanding it and manipulating it to their best advantage.

Returning to the problem of developer identification, for example, we find that the basic criteria which determine a developer's investment decision are risk and return.[28] The public developer (whether it be a transit agency, or elsewise), on the other hand, operates under a political mandate which may prescribe an agenda of objectives ranging from beautification, to equity, to economic revitalization. The critical skill which is missing from joint, and other economic development policy portfolios is thus the ability to tie the often-conflicting objectives of the public and private participants into a sphere of mutual concerns, upon which universally beneficial development patterns can be based. With these recognitions and skills, the joint developer can begin to play a more comprehensive and aggressive role than is currently afforded by most transportation bureaus, or by local governments in general.

Granted, this is a role which many such agencies -- and the people of whom that are comprised -- may find troublesome. For as Altshuler points out, the unifying characteristic of most public policy bearing upon the transportation system has been an orientation towards

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accomodating rather than shaping market trends.[29] Joint development, being a policy of the latter sort, thus implies a fairly significant change in the strategic orientation of transportation policy; perhaps more so in this respect than in terms of day-to-day operations.* As uncomfortable as the transition may be, however, it is one which may well be unavoidable if transportation planners are finally to begin to derive satisfactory solutions to the interdisciplinary range of highly interrelated urban problems among which transportation issues lie, and which joint development is an initial attempt to address.

4.4 Joint Development in the Current Political and Professional Environments

Current economic and political climates are particularly conducive to the philosophy and effect of joint development planning. Today, only one thing is missing -- federal funds for the types of transit capital improvements upon which joint development efforts are anchored. However, since alternative funding sources do, and will in the future, exist to varying degrees, the topic is far from moot. For not only does joint development speak to the increasingly-important issue of scarce resources; it also incorporates into its design the potential which private/public partnerships offer as an alternative to financial and technical reliance upon the federal government. The concept's relevance is further bolstered by the economy-wide growth of employment

*As a recent survey of transit officials indicated, for example, most participate in land use-related decisions in the course of present planning practices, although such participation is more likely than not quite informal in nature.[30]

and capital in non-manufacturing sectors of the economy, through the service and trade sectors' continued greographic concentration in the high-density downtown areas that transit serves best. Unlike much of the rest of its legislative inheritance, the joint development concept would therefore appear to be a policy which offers little to which the current federal administration could object. A number of substantive issues with respect to administrative and financial responsibility and the federal government's role in local decision-making are still open to debate. In sum, though, the combination of common sense and resource conservation which underlies the joint development concept would appear to warrant continued effort and attention towards it -- the costs are low, the potential benefits high, and as the Urban Land Institute argues, "the time is right".[31]

Neither is joint development inconsistent with the philosophy of "comprehensive, coordinated, and continuous" transportation planning. Changes within the economic and political environment within which transportation planning takes place (e.g., oil price fluctuations, central city revitalization) have, during the past decade, led (at least temporarily) to escalated levels of transit use and intensified policy concern regarding urban transport services and their distributional consequences. Together, these factors provide support for the joint development approach -- in terms of both philosophy (based on the fact that it sustains the "3C" planning approach) and intended results (to the degree that it is a useful means of coordinating of the constituent elements of urban change into a technique for ameliorating the problems created by the ebb and flow of private investment in the city). The corridor-based planning emphasis of which it is

indicative is, as Meyer et. al. point out, a powerful mechanism for fostering economic development through its explicit treatment of transport and development factors.[32]

Finally, as was noted earlier, the interdisciplinary mode of decision-making the problem-solving which the joint development concept dictates is not one which is totally incongruous with present practices; joint development simply obliges more explicit and consistent assumption of the tasks and strategies implied thereby. As such, it provides a provocative, although far from perfect, alternative to the haphazard results of non-integrated planning approaches to the problems which can result from the interactions between access and activity, and which makes only too clear the structural deficiencies of prevailing urban patterns and development policies.

CHAPTER FIVE:
OVERVIEW OF THE PROCEDURE, ITS DATA, AND APPLICATIONS

The preceding chapters have described current approaches to understanding the land-transportation issue, in terms of both their "macro" (citywide) and "micro" (individual firm) impacts, as well as in respect to the concept of joint development planning. In doing so, they have introduced the empirical and theoretical knowledge upon which useful applications must be based.

This chapter will, for the time being, put aside theoretical concerns such as these, in order to present a general overview of the firm-identification methodology, the objective being to provide the reader with a basic understanding of the process' form and flow, from which the method's strengths, weaknesses, and future potential may be ascertained. The chapter will begin with a brief discussion of the short history of the approach, in order that the evolutionary nature of its form, and the improvements thereupon which were enabled by the second (i.e., present) application of the procedure be understood. This will be followed by a description of the methodology's basic generic form. The third and fourth sections will then describe and analyze the data which the process utilizes, so that the degree to which they influence the form, limitations, and outputs of the process may be established.

5.1 A Brief History of the Approach

As prior discussions have indicated, the finding-firms procedure

has been used to identify prospective occupants for two locations, to date. The first application of the process was undertaken in 1976 as part of the Southwest Corridor Orange Line Transit Relocation project in Boston. At this time, an initial, relatively rudimentary version of the procedure was developed as part of an effort to identify potential developers for a marginally attractive urban renewal site coterminous to a new transit facility.

The second case in which the methodology was used was initiated in June of 1981, as part of an economic development effort on the part of the city of Indianapolis. The version of the procedure which was developed for this application was quite different from the first, in terms of its focus, its substance, and its form. The first of these differences is perhaps the most obvious, but certainly the most inconsequential, since a major advantage of the method is its ability to be adapted to a wide range of applications. This quality leads, in turn and be necessity, to substantive differences in the particular actions and decisions of which the procedure is, in the most detailed sense and in each case, comprised.

More important, however, are the refinements and additions to the procedure's form which a second implementation allowed. In particular, the analytical capability of the second version of the procedure is far superior to that embodied in its initial form. Specifically, these improvements consisted of incorporation into the methodology of a number of new tasks and analyses, as well as the explicit separation of the processes by which site- and firm-related location criteria are identified. These additions and refinements were, in turn, enabled by an improved understanding of business growth and location behavior

which research conducted since 1976 had, in the interim, provided.

Chapter Six will render a more detailed discussion of the contextual differences between the Southwest Corridor and Indianapolis applications of the procedure, as well as a detailed description of the tasks of which it was, in that latter case, comprised. From an analytical, as well as a practical viewpoint, however, it is much more important that the "how" and "why" of the differences between the two versions of the procedure be clearly understood, than it is that the reader have a complete grasp of the substance of the process in particular applications. That is to say, the firm-identification approach taken by the finding-firms procedure provides a dynamic, and still-evolving tool for development planning: by definition, its computational structure and content will be redefined, to a certain degree, with each application, while still retaining a consistency of approach and general form which makes it a uniquely structured methodology. The following sections will address this claim, through an introduction to the procedure's basic generic form.

5.2 Basic Structure and Intent of the Procedure

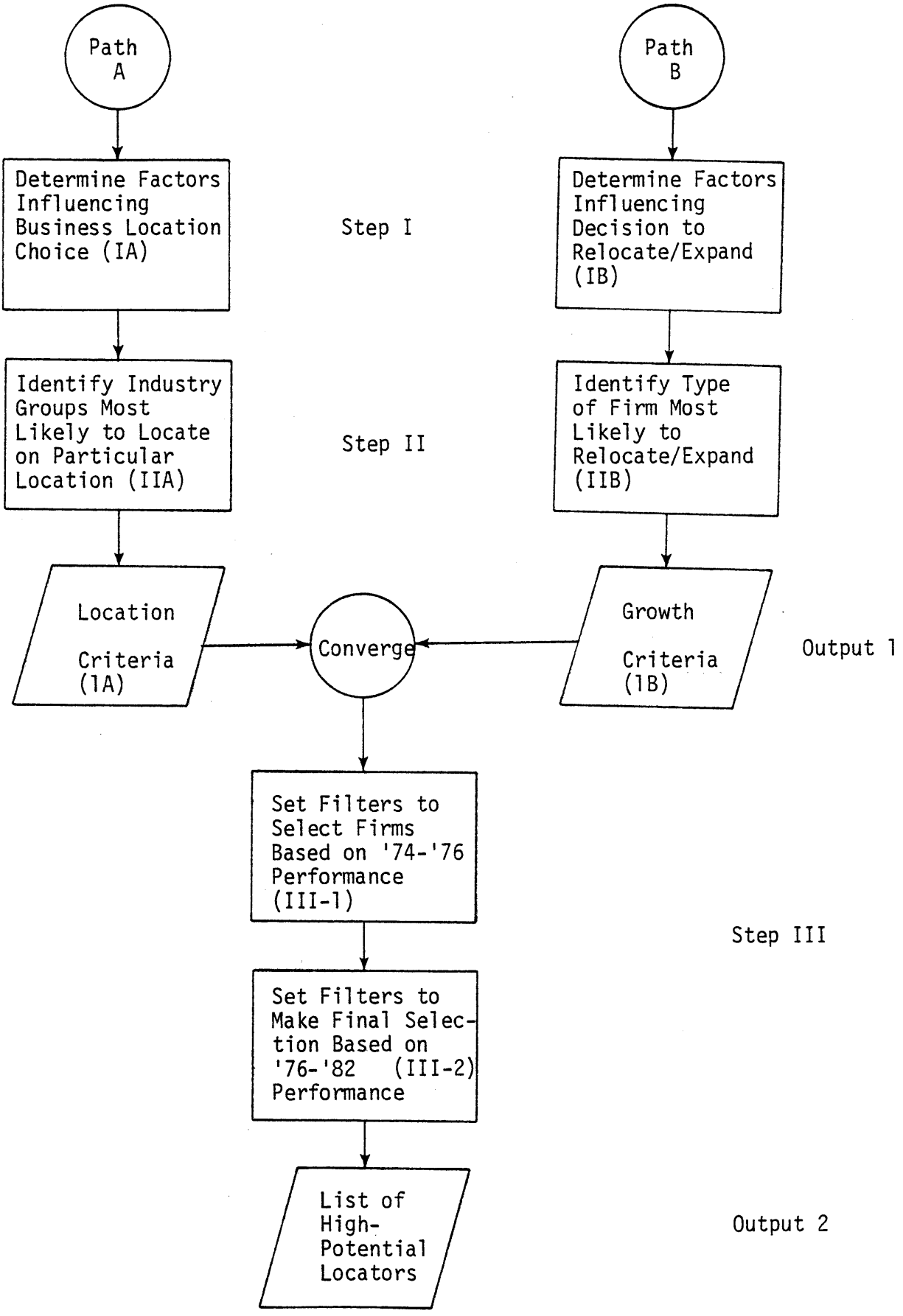
The purpose of the procedure is to identify individual firms which have the greatest chance of being interested in locating in a particular community, or on a particular site. Its approach is based on two primary premises: 1) that the unique combination of characteristics offered by a praticular site or city is conducive to the location and growth of particular types of firms; and 2) that particular businesses -- those with growth trajectories which indicate imminent expansion or relocation -- are likely to be looking for development

sites at any given point in time. In short, not all industries, and not all firms within a given industry, are equally attracted to a particular site. The key, then, lies in identifying individual firms which are in both the "right" industries, and the "right" condition to be considering relocation, at the "right" time.

For a diagram of the basic form of the procedure, the reader is again referred to Figure 1 (page 9). As this figure indicated, the firm identification process consists of three basic steps: 1) identification of critical locational/growth factors; 2) identification of industries/firms which compare favorably with these factors; and 3) operationalization of the preceding steps (I and II) into the firm-selection algorithm. The first two steps are thus analytical in nature: their tasks are to identify the factors which influence locational decisions and patterns with respect to a particular city or site, and to use these factors to define the types of business which have an apparently high probability of locating in the given area. The third step (III) is, in contrast, purely mechanical in nature. For it is the point at which the analytical findings of Steps I and II are used to construct a series of filtering programs which then perform the actual task of identifying individual high-potential firms.

With this general overview of the purpose and design of the procedure in mind, we can begin to look at the process in somewhat greater detail. Turning to Figure 6, we see firstly that Steps I and II of the procedure consist of two parallel sets of operations: A) those which identify critical locational factors, and favorably comparable industries; and B) those which identify critical growth factors, and favorably comparable types of firm. The rationale under-

Figure 6


Path A
Path B
Determine Factors Influencing Business Location Choice (IA)
Step I
Determine Factors Influencing Decision to Relocate/Expand (IB)
Identify Industry Groups Most Likely to Locate on Particular Location (IIA)
Step II
Identify Type of Firm Most Likely to Relocate/Expand (IIB)
Location Criteria (1A)
Converge
Growth Criteria (1B)
Output 1
Set Filters to Select Firms Based on '74-'76 Performance (III-1)
Step III
Set Filters to Make Final Selection Based on '76-'82 (III-2) Performance
List of High-Potential Locators
Output 2

lying this bilateral approach to location prediction becomes quite clear when we refer back to the behavioral model presented in Chapter Three. Hence, the objective of the first -- i.e., site related -- of the twin flows (Path A) is to identify and define the "pull" factors which determine the attractiveness (or, conversely, the "negative filters" which determine the repulsion) of the location to firms within particular industrial sectors. Complementarily, the objective of the second -- i.e., firm-related -- flow (Path B) is to identify and define "push" factors, in order to develop reliable indicators of individual firms' relocational potential.

The convergence of the "push" and "pull" factors and firm types occurs in Step I where they are incorporated into the firm selection process. Step III is also composed of two major tasks, but for reasons and in a structure quite different from those underlying Steps I and II In brief, the purpose of this step (3) is not to identify two groups of moderate-potential firms (one group being likely to be interested in the location, and the other being likely to open a new branch), but to blend these two groups into a hybrid selection of high-potential, growing and site-compatible firms. The results is thus a two-stage filtering process which selects firms in terms of their characteristics and growth performance in two periods (1974-76 and 1976-82) through sequentially, rather than simultaneously, performed tasks.

The flows, modules, and tasks outlines above are further broken down into hierarchical series' of manual and computational operations of increasing specificity and detail. Chapter Six will describe and analyze the form that these operations, and the firm-finding process as a whole, took in the Indianapolis case, as an example of the

possibilities and problems which are raised by an actual application. Leaving such specifics aside for the time being, it will be useful at this point to present a more detailed description of the procedure's general structure and flow. This approach -- one by which the process is explored in a gradually more detailed and specific manner -- is aimed at making the interrelations between the various actions, and between the actions and their theoretical and empirical bases more obvious to those who are unfamiliar with it, without obscuring the sources and implications of each. At the same time, presenting a farily specific explanation of the process's structure at this point provides the reader with an understanding of it which is sufficient for consideration of its application (proven and potential) and data requirements, and for precursory evaluations of the appropriateness of each, in Sections 5.3 and 5.4.

5.2.1 Identification and Definition of Site-related "Pull" Factors (Path A)

In terms of their general structure, the two analytical portions of the firm identification process (Paths A and B) are quite similar. That is to say, they both begin by determining critical location-related factors (Step IA with respect to sites and Step IB with respect to firms), and conclude by using these factors to develop a profile of high-potential types of firm (defined, in Step IIA by industry group, and in Step IIB by firm characteristics). Beyond this general similarity, however, the two paths of anlaysis and their products assume very different forms, ones which are consistent with their quite separate, though complementary, roles in the definition of

high-potential firms.

Of the two paths, that which focuses on identifying site-related factors (Path A) is the most computationally involved. Being, by definition, a direct function of the location in question, it is also the less generalizable of the two. That is to say, the combination of factors which is determined to influence the decision to locate in a particular place will quite likely be different from that affecting the decision to locate elsewhere. For example, it may become obvious that a certain environmental factor (e.g., the availability of limitless fresh water, or dustless air, or sun) has an overwhelming influence on locational decisions with respect to a particular site, while fiscal (e.g., property or business tax rates), capital (e.g., the existence of an appropriate building or equipment), market (e.g., distance to, or density of consumers of the product), resource (e.g., raw materials, energy), transportation (e.g., accessibility with respect to freight and/or passenger movement), or labor (e.g., quality, price and supply or degree of unionism) concerns may be paramount in others.

Chapter Three discussed empirical and theoretical approaches to understanding the relationships between such factors as these and the locational decision of the firm. The objective of this module, in turn, is to take this knowledge and to use it to determine the characteristics of the project site which are most likely to play an influential role in attracting business to the location, and which can thus be used to identify industry groups which are likely to be interested in this particular place. As Chapter Six will indicate in greater detail, the two existing applications of the procedure both focused on the labor aspect of the location decision, but with different

points of emphasis. In the prior (i.e., Southwest Corridor) case the issues of race and accessibility were deemed to be of greatest importance. The version of the algorithm developed there thus evaluated the locational "pull" of the site in terms of the demographic characteristics of the labor pool ("person types") at various distances from the site ("commuter rings"). The present (i.e., Indianapolis) application, in contrast, focused on the distribution of labor characteristics at a city-wide level, ultimately identifying two very different trends in demographic and economic growth.

The so-called "critical factors" can be identified either inferentially (through empirical tests) or politically -- or through a combination of both -- depending on the agenda of the client and the availability of data. From an academic viewpoint, the empirically-based method is to be preferred. But experience would indicate that some sensitivity to the political concerns and intents of the client is also a necessity, and that the eventual solution is usually a compromise combination of the two.

Once the critical location factors have been determined (Step IA), these factors are utilized in Step IIA to identify the types of firm which can be considered to be high-potential candidates to occupy all or part of the project location. This step thus produces a set of industry (S.I.C.)* codes (output IA) which are used in Step III to set

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*Standard Industrial Classification (S.I.C.) code. This is a set of standardized definitions, identified by numbers of up to four digits, which are used to categorize businesses in terms of their productive functions. At the single digit level, the definitions are quite inspecific, defining general sectors such as "manufacturing" and "trade"; increasing specificity is achieved through second, third, and fourth level refinements of definition. For example, S.I.C. code 4 represents the transportation and public utilities sector, 42 is trucking, and 4231 refers to trucking terminal facilities.

location-related criteria in the firm-selection filters. In the Indianapolis case, for example, tabulations were performed in Step IA to determine employment growth by industrial sector in the city, and in places "like" it. In Step IIA, these tabulations were juxtaposed with comparisons of industrial hiring patterns and characteristics of the local labor pool. The result was a ranking of industry types in terms of the similarity between their labor demands and Indianapolis' labor supply, from which desirable prospects could be selected on the basis of their apparent appropriateness for the location in question.

5.2.2 Identification and Definition of Firm-Related "Push" Factors (Path B).

The firm-focused module, like the site-related one, consists of two steps, i.e., identification of critical factors (IB) and incorporation of them into criteria for identifying high-potential locators (IIB). The objectives of this analysis is to identify the factors which provide the impetus for a relocation decision; its focus thus lies on the characteristics of a particular firm, rather than on the generic characteristics of its industry group as a whole.

As the preceding chapters have indicated only too well, the locational decision-making process at its most extreme level of disaggregation -- that of the individual firm -- is inherently complex, quickly made, and may ultimately rely on no more than a personal preference of the chief decision-maker. The task of the firm-related analysis is thus to take what we know of the "rational" or predictable aspects of the relocation decision, add in any factors which may be particularly relevant for a particular case (e.g., the fact that small

businesses start-ups in Indianapolis exceed the national average), and mold them into a predictive model of decision-making from which a profile of the high-potential relocator may be derived. The operational definition of the archetypical firm, as incorporated into the filters, may include variables such as business size, geographic location of the headquarters or branches, number of new branches opened recently, etc.

The basic assumption underlying this analysis is that the future behavior of individual firms can be predicted on the basis of past experience. The approach which has been taken in this module, as conceptualized to date, is very extrapolative in nature; i.e., it assumes that firms which have shown consistent growth patterns of a desirable type are likely to continue such behavior in the present and near future, and are thus likely candidates for relocation. This is obviously a very simplistic assumption with respect to firm health and behavior, and one which could well be improved upon in the future. In fact, since one of the major findings of Birch and MacCracken was that the firms most likely to expand in a given period are those which had contracted in the preceding period,[1] one could foresee the incorporation of a sinosodal, rather than extrapolative, growth model into this part of the analysis (although the problems one could be expected to encounter, in trying to convince a client that the most attractive firms are those that have been declining, raise logistical and political issues regarding this more radical -- though perhaps more realistic -- approach).

Assumptions related to the shape of growth tragectories aside, this module defines its high-potential expansionary firms by asking three

basic questions: which firms are the most dynamic job creators? Which firms are the most dynamic locators? And which firms are likely to have an interest in doing either of these things in the general geographic area of the project site? The answers to these questions are used to select firm-identification criteria, based on the following premises: 1) that firms with rapid employment growth will have expanding space needs; 2) that the decision to open a new branch bears implications which are very different from that to merely expand an existing facility; 3) that plant migrations play a negligible role in regional investment patterns; but 4) that regional patterns and preferences do, to a measurable extent, exist and influence locational behavior. The result is thus a list of criteria (output 1B) which can then be incorporated into the filters (Step III), setting standards for firm performance and growth potential in preceeding periods and thereby separating prospective relocators from the less attractive bulk of the business.

5.2.3 Setting Criteria into Filtering and Sorting Programs

The final two modules of the procedure (Steps III-1 and III-2) put the findings of the prior modules into operation, through the construction and application of the filtering algorithm. Whereas earlier phases of the process were anlaytical in nature, these modules produce the actual results -- they identify the firms. In the Indianapolis case, two sets of filters were used -- one for the 1974-6 period (III-1), and a 1976-82 update (III-2) -- primarily because of the existence and costs of various forms and amounts of data (See Sections 5.4 and 5.5). As the Dun and Bradstreet files are made more

current, one set of filters may, alone, be deemed sufficient (as was the case in the Southwest Corridor version). In practice, through, the issue of whether one or two (or three or four) filtering programs is used to select the firms is analytically unimportant -- the only factors which the number of filters affect are the time and cost involved in implementing the procedure. For whatever their number, the filters ultimately do one essential thing, and one thing only -- they select firms. And they do it on the basis of the location and growth criteria developed in preceeding stages of the analysis.

The final output of the filters, then, is a list of unique numbers ("Dun Numbers") which are used to identify the data records of particular firms (Output 2). The name, address and chief executive officer of the company, along with any additional sectoral, size, geographic, or sales information which may be of use, are then provided to the client for incorporation into its development efforts. The final product consists, in short, of an extremely detailed and data-rich list of firms which have a high probability of expanding in the near future, and very good reasons to be interested in the project site. As such, it gives the client an unprecedented level of detail and degree of confidence with which to approach potential locators: it enables him, in a sense, to pick the needles out of the haystack, and to do so at a reasonable cost.

The procedure bespeaks, through its ability to access and analyze extremely disaggregate (i.e., firm-level) data, a wide range of potential applications. For example, it can be used to identify firms for geographic areas ranging from census tracts to states, for purposes ranging from joint development to job creation. Its order

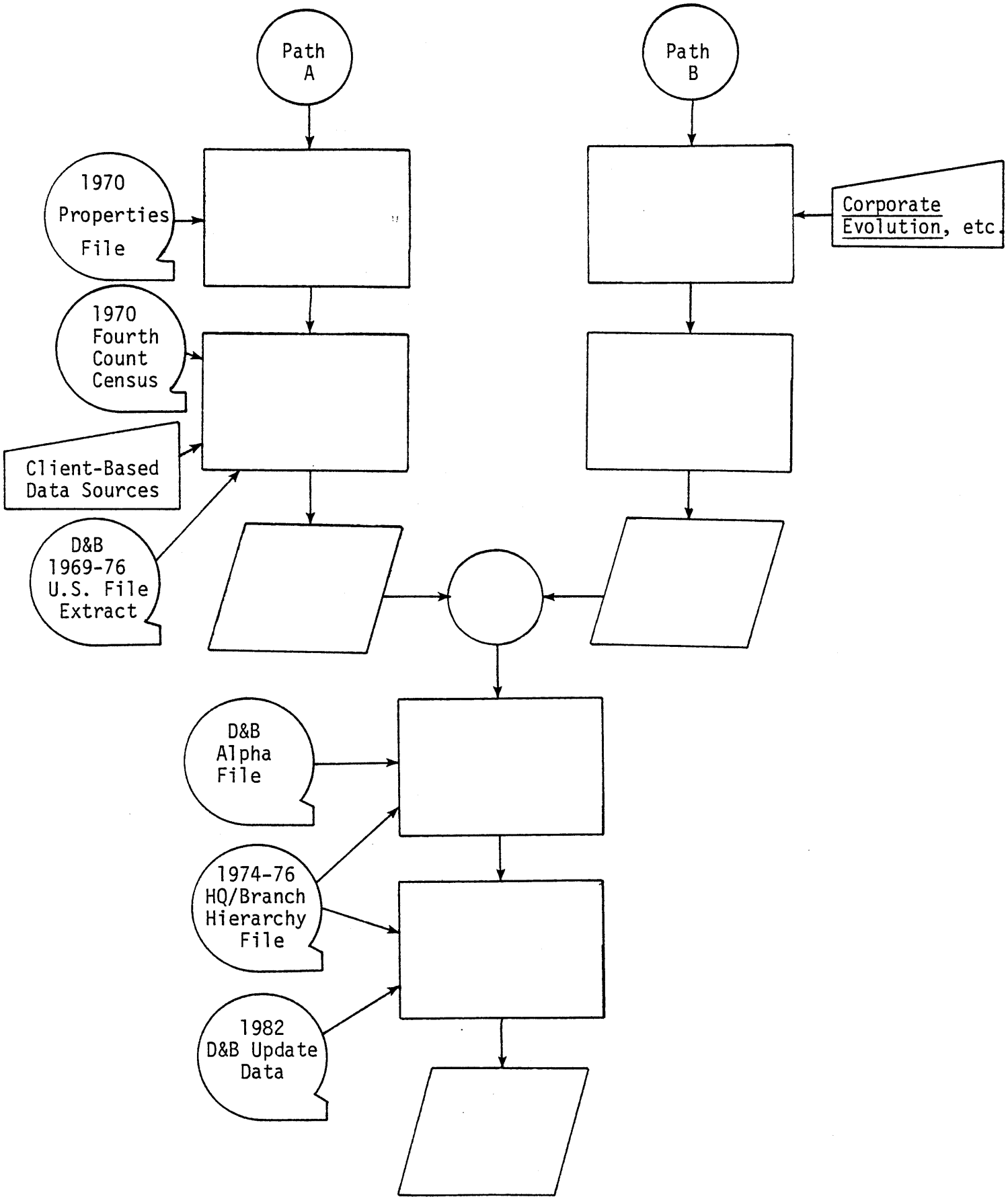
can also be shifted so that it identifies sites for developers, rather than vice versa. The firm-identification approach has the potential to do all of this, and for one very simple reason; through its ability to manipulate highly disaggregate data, it begins to put the market into the marketer's hands.

5.3 Data Requirements and Descriptions

The quality of a conclusion cannot surpass the quality of the information upon which it relies. Before considering the detailed substance of the firm-finding procedure, an examination an evaluation of its data demands is therefore both useful and necessary. Figure 7 illustrates the sources and incidences of the process's data requirements. One observation is initially obvious: the demands are substantial. Not only does the algorithm require several data sets (or, more precisely, several versions of two primary data sources); the files which it utilizes are extremely disaggregate and, as a result, usually very large. The details of how the procedure manages these data from a computational standpoint will be set forth at a later stage; our primary interests at this point are in their availability and quality.

As noted earlier, the method relies primarily upon two data sources: 1) the 1970 Census; and 2) the Dun and Bradstreet Duns Market Indicators (DMI) file. The former, household-level, data are used to determine employment, travel, and similar types of behavior, along with demographic characteristics of the local population. The latter is used for tabulations of individual firm behavior. Each of these two major files enters the filtering process in the form of extract

Figure 7


Path A
Path B
1970 Properties File
Corporate Evolution, etc.
1970 Fourth Count Census
Client-Based Data Sources
D&B 1969-76 U.S. File Extract
D&B Alpha File
1974-76 HQ/Branch Hierarchy File
1982 D&B Update Data

filters which have been edited for particular uses. The Census file appears primarily in the form of a regional extract of the Fourth Count 5% Public Use Sample. The Dun and Bradstreet data is utilized in a wider variety of forms, most notably the 1969-76 Region file (an extract of the U.S. file), the 1974-76 Headquarters/Branch "Squashed Hierarchy" file, and an update file which is created from raw 1982 D.M.I. records for the firms passing the initial filters. A hybrid of data from both sources appears in the form of the 1970 "Property" file. In accordance to their unique uses, these files offer a diverse selection of data and computational properties; individual review of them are thus in order.

5.3.1 The 5% Public Use Census File

We can begin with an examination of the Census extract, a subset of the 1970 5% Public Use Sample file, which is used in the industry-identification phase of the firm-identification process. The file is used to compute standardized distributions of the labor pool by specified characteristics (defined as "person types"), and to tabulate sectoral employment patterns in order to determine the appropriateness of particular industries with respect to the composition of the local labor force. That is to say, these are the primary uses to which these data have been put in the two prior applications of the procedure: however, this source offers a range of information sufficient to approach the business location issue from numerous other angles. For example, data on car ownership and commuting time could be used for an approach which focused heavily on worker access considerations (as the Southwest Corridor case did, to a certain extent), while income,

occupational and other socioeconomic information could be used for a market-area approach.

The source file is, itself, an extract of the national 1/100 Public Use Sample; one in which selected fields from the household record and the person record have been merged into a single record for each respondent. Containing over 2 million individual records, the national file is a random sample of 1% of the U.S. population in 1970. More specifically, it is a 20% sample of a randomly selected 5% of the total population, who were asked a series of special questions in addition to the basic census queries. In provides detailed socio-economic, geographic, and demographic data on the respondents, for a total of 56 variables. For the Indianapolis application, a special subset of this file was created containing only the records of Mid-western respondents (416,500 records); in the Southwest Corridor case, a New England subset of the file (108,610 records) was used.

5.3.2 The Dun and Bradstreet Files

As the above discussion indicates, the Census files offer a wide variety of household data, implying an equally diverse range of approaches in determining factors which influence the locational decisions of particular industries. But since the real power of the methodology lies in its ability to single out for analysis the behavior of individual businesses, it is natural that it is the firm-level data which most directly affects the structure and output of the algorithm. A clear comprehension of the substance and format of the Dun and Bradstreet data is thus c cial to one's ability to understand and evaluate the procedure's processes and products.

The raw Dun and Bradstreet D.M.I. file provides extraordinarily detailed data including the employment and sales sizes, geographic location, age, industry type, and corporate affiliation for individual firms, in both the U.S. and abroad. Its conception and primary uses have long laid within the private sector; the file is commonly used by investors to determine the credit-worthiness of potential clients, and by market analysts to identify potential customers. More recently, researchers have discovered the wealth of information which this massive file (which covers over 80% of all formal, private-sector firms in the U.S.) offers for microeconomic analysis. But it is the size of the file which creates both its problems and its powers; thus, few have been able to overcome the barriers of cost and management which are inevitably associated with any attempt to use it for large-scale (i.e., nationwide) economic research.

A group of researchers at the Program on Neighborhood and Regional Change at M.I.T. have succeeded in overcoming these barriers, however, and in doing so have created a version of the file which is both extensive and relatively easy and inexpensive to use. In order to do this, data covering the years 1969, 1972, 1974 and 1976 (about 12 million records on over 120 reels of magnetic tape) were reduced into a relatively compact set (9 reels of tape). The records for individual firms (identified by unique "Duns Numbers") for each of the four years were merged into single records to permit analysis of changes in the status of each of the 5.6 million firms which existed on the file at some point during the 1969-76 period. The edited U.S. files thus offer not only the year-specific data derived directly from the raw D.M.I. file, but also several new "change" variables which were

computed and added to the file as part of the merging process.[2]

Three main subsets of this file are used in the finding-firms process: 1) an extract of the U.S. merged file for selected metropolitan areas; 2) a regional extract of the U.S. merged file; and 3) the 1974-76 Headquarters/Branch "Squashed Hierarchy" file. In addition, raw 1982 D.M.I. data on selected firms is acquired from Dun and Bradstreet for the computation of updated performance measures. A fourth subset file, an extract of the original 1976 D.M.I. files, is used to retrieve alphabetic data (such as names and addresses of firms) which have been deleted from the merged U.S. file.

The metropolitan-area extract file was created in order to do tabulations of employment change in Indianapolis and comparable areas as part of the industry-identification analysis. It is a subset of the U.S. file and includes data for all firms which were located either in Indianapolis, or in a set of comparable cities (21, in all) at any time during the 1969-76 period. It contains complete merged records for nearly 500,000 (497,258) firms, including D.M.I. geographic indicators, employment and sales measurements, S.I.C. code and corporate affiliation as well as the special employment and status change variables. The regional files, which are also used to do background tabulations for the industry-selection process, contain similar data, considering the nation in terms of five geographic regions. The North Central file was thus used in the Indianapolis case, while the New England file (a subset of the Northeast region file) was used in the Southwest Corridor application.

The 1974-76 Headquarter/Branch "Squashed Hierarchy" file is employed in the filtering modules of the algorithm. It is an extract

of the 1969-76 U.S. file which has been specially edited for use in analysis of firm behavior by corporate affiliation. This particular version contains data for all headquarters and branches which existed in the U.S. file during the 1974-76 period. Individual firm records have been sorted and organized into hierarchical "families" of branches ("children") and headquarters ("family heads"). Each record in the file contains not only firm-specific data, but also a set of specially computed variables which provide information about the behavior of other members of the family, and the corporate family as a whole. Specifically, it provides five types of data regarding an establishment and its family: 1) information about the individual establishment (age, geographic location, employment, etc.); 2) information about the headquarters of the family; 3) information tying the individual establishment to its family (e.g., status); 4) information describing the individual establishment's contribution to the family's change during the period; and 5) aggregate information about the family (number of members and employees in each year, number of establishments gained or lost by source of change, etc.). This file thus provides a powerful tool for looking not only at the behavior and performance of an individual firm, but a means of tying its actions, together with those of its "relatives", into a picture of the investment and location decisions of a corporate whole.

5.3.3 The 1970 Migration Area Property File

The so-called "property" file is used in an early phase of the industry location module to identify cities/sites which have characteristics similar to those of the project site, in order to do

comparative analyses of employment and investment trends. As mentioned previously, this file is a hybrid of sorts, containing data from several sources: the 1970 Fourth Count Census of Population Summary file; the 1960 County Components file; County Business Patterns, the Social Security Continuous Work History Sample, the 1956, 1967, and 1972 City and County Databooks; and 1972 and 1974 Dun and Bradstreet D.M.I. files; and the U.S. Census Bureau's 1975 "County Population Estimates". It contains a large number of variables (135) which outline pertinent characteristics of 317 "migration areas".[3] As per the sources from which they were derived, each record contains a majority of 1970 data, in combination with lesser amounts of information with respect to earlier and later years. Each record thus presents a fairly detailed profile of the physical, social, economic, and fiscal characteristics of a particular settlement area.

5.4 Evaluation of the Data

In order to evaluate the quality of the files used in the firm-identification procedure, we must return our attention to the two primary sources of data -- the 1/100 Public Use Sample (Fourth Count), and the Dun and Bradstreet U.S. merged file. For, apart from any random editing or recording errors which may have entered the extract files in the process of their creation, any errors within these data may be assumed to be consistent with those in the original files. Just as the natures of the data differ, however, so do the natures of their problems. The particular weaknesses of each data source will thus be examined in turn, and before we consider the more general issues of timeliness and availability.

5.4.1 The U.S. Census of Population Files

Since the Census Public Use Files are so commonly employed as a data base for social science research, errors in their content and problems associated with their use have been documented extensively. The primary sources of error within these data are of four types: 1) sampling; 2) misrepresentation; 3) non-reporting; and 4) clerical. The Census Bureau provides detailed descriptions of the sampling method used and resulting degrees of error, by variable and by size of sample, in its technical documentation and the reader is referred there for particulars of the issue.[4] For our purposes, it is sufficient to note that the variables used in the algorithm are among those which are least prone to sampling distortion. Further, the 1/100 file contains the largest sample available to the general user. Since the proportion of total error which is attributable to sampling discrepencies is an inverse function of sample size, this source of error can therefore be considered to be at its practical minimum.

Other errors in the data can be attributed to the reporting techniques used: respondents are formally obliged to return their census forms, but by a law which has not been enforced for over a hundred years (thus, leading to non-reporting errors); they have even less obligation to tell the truth (misrepresentation). The issue of whether these two collection-based problems result in random or systematic patterns of error (and therefore, the steps that can be taken to rectify them) remains open to political and statistical

debate.* What is important, for our purposes, is to note that they do exist.

Finally, we can consider the issue of clerical error, and again conclude with little more than an acknowledgement of its existence. Scrutinous editing and logical testing of the data have been used to minimize this potential source of trouble. But as long as interviewers and keypunch operators exist, so will the possibilities of random clerical error.

5.4.2 The Dun and Bradstreet Merged Files

The Dun and Bradstreet file provides a remarkable degree of coverage, and highly detailed disaggregate data on firm characteristics and behavior. But how good a file is it?

Problems associated with using this file for economic analysis are also quite well documented.[5] The first issue which can be raised is that of the quality of the data. With respect to this problem, it can be noted that the Dun and Bradstreet Corporation has strong built-in incentives to insure that the information contained in its file is accurate, for it can be -- and frequently is -- sued if the information is wrong. The data are collected by a full-time staff of 1700 reporters assisted by 500 part-time employees (in comparison to the Census Bureau, which employs most of its workers sporadically), and

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*Although observations such as: that income is overreported, on the average, by $3,000 and that two-thirds of the people who migrate within the country never report it to the Census Bureau;[6] and that significantly lower percentages of Hispanic and Black residents receive (let alone return) their forms would imply some degree of predictability in collection error patterns.

are updated on monthly and semi-annual bases (depending on the particular data field). In addition, to help minimize its legal vulnerability, the Dun and Bradstreet Corporation has established an extensive centralized quality-control system to monitor the reports filed by their reporters prior to entering the data into the file. Extensive logical testing is also done at M.I.T. when the raw records are received as a final measure of quality control. The result is thus a file which, if used properly, is one of the more accurate and extensive in use for economic reaearch.

The potential for improper use of the file does exist, however, primarily because it was simply never intended to be a census of the corporate population, nor a tool for economic analysis. Difficulties which the researcher must therefore be aware of when using the file fall into five general categories: 1) coverage; 2) biases inherent in the reporting system; 3) misrepresentation; 4) geocoding below the county level; and 5) clerical error.

The coverage problem is perhaps the most important, and has several component issues. To begin with, the user must be aware that the file makes no pretense of covering all businesses, although it does in actuality make reports on an extremely high percentage (>80%) of all formal, legitimate operations in the U.S. Thus, "What is remarkable is that the file is as large as it is; not that it is incomplete."[7] Apart from overall coverage, it must also be noted that certain patterns of underreporting do exist. For example, coverage in the trade, service, transportation and utilities sectors has

historically been much poorer than that in manufacturing,* although Dun and Bradstreet is placing increased emphasis on expanding coverage in these areas. At the extreme, coverage of establishments in the governmental S.I.C. range (9000's) has been (and remains) so poor that the researcher is wise to ignore firms in this sector when doing industry-specific tabulations.

To test the file's coverage of Indianapolis, tables were generated -- one each for firms and for employment in 1974, by size class and 2-digit S.I.C. code -- and compared to figures for Marion County in the 1975 County Business Patterns. The total counts for firms and jobs were, in this case, remarkably accurate; overall, the Dun and Bradstreet data ran about 2% low, and as such represented about 85% of total employment in the SMSA (313,000 vs. 320,000).** At the level of specific industries, the file's coverage of manufacturing was equal or superior to that of County Business Patterns (CBP) at the 2-digit level of industrial aggregation, but tended towards expected levels of underreporting in the trade, service, and finance sectors. Since these patterns were consistent with previous observations about the reliability of the data, and at the same time offer the greatest accurcay in the city's historically dominant industry

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*The file's coverage of manufacturers is exceptionally good, and often exceeds that of governmental business censuses, such as County Business Patterns (CBP). Page 6 of D. Birch, Using the Dun and Bradstreet Data... provides sample coverage comparisons for these two data sources.

**Marion County is the central county of Indianapolis, housing about 71% of the SMSA's population and 87% of its jobs.

group (manufacturing), it was felt that the file showed no troublesome deviations which might hamper its use in the Indianapolis case.*

Two final coverage issues are those of size and items reported. With respect to the former, it can be noted that the file's coverage of smaller firms is quite high (contrary to what many might believe), probably because these businesses generally pose such high credit risks. In terms of data coverage, the user should be aware that systematic weaknesses in the file do exist. The data which are most likely to be absent from a particular record are those of a financial nature: sales estimates are available for only about 80% of firms (thus, any filter using a sales criteria would drop about 20% of all firms from consideration, simply because the data were not available); net worth estimates are sufficiently infrequent and unreliable that they have been dropped from the file altogether.

Bias problems in the file are of two basic types: under-reporting of new firms, and intervals between reporting measurements. The first creates problems in identifying the births of new firms, and is particularly troublesome for any attempt to identify the births of new branches (see next paragraph). To compensate for this weakness, special calibration algorithms must be used to impute firm births, using a variety of variables and tests. Without any such adjustment, 30-60% of all births may not be captured, leading to employment estimates which are similarly inaccurate. The second problem, that

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*One exception was S.I.C. #43 (U.S. Mail), which is just for the process of being added to the file. The tests indicated inconsistencies in the records within this sector, and the decision was made to delete it from further tabulations.

of the time interval between measurements, has the result of under-reporting the births and deaths of short-lived firms. Fortunately, this problem is of minimal consequence for the uses to which the data is put by the algorithm.

Of much greater consequence, however, are the problems presented by branches, since the pattern of branch openings is an important measure of the locational preferences of a particular firm. Branches, in general, present particular problems for the user of these data. Since the accounting and financial functions of corporations are typically centralized in the headquarter establishement, the Dun and Bradstreet file variously omits certain variables from branch records, lags in capturing records of new openings, and generally understates them in terms of both number and employment.* (See next page) Conscientious attempts have been made, of late, to rectify this situation, but it is still one which presents significant difficulties for the unwary user.

Just as in the case of the Census files, respondent misrepresentation poses problems for the Dun and Bradstreet data user. However, in this case a powerful incentive -- i.e., the possibility of legal recourse -- for truthful disclosure does exist, and can be expected to help minimize fraudulent reporting. Unfortunately, there is virtually no practical way of measuring the patterns or degree of misrepresentation which are present in these data. One attempt to check

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*For example, the record of one of Indianapolis' largest firms had to be corrected when we discovered that it had credited the entire company's employment to the headquarter.

DISCLAIMER

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coverage found an extraordinary degree of correspondence between what is in the record and what can be found by an on-site review. But the test sample was far too small (40-50 firms) to draw any statistically valid conclusions about the data's reliability in this respect.[8]

The two final problem sources, clerical error and incongruities in geocoding warrant only passing mention. Since present versions of the algorithm make no effort to identify business location below the county level, the geocoding problem is of little concern. It must be noted, however, that this characteristic of the file could become more important in the case of an application of the algorithm to a single site, rather than a city. And finally, we must again confront the problem of clerical errors. The issues and impacts of this error source are basically the same for the Dun and Bradstreet file as for the Census Public Use data although the margin of error is, in the former case, potentially larger. Specifically, the coding system used by Dun and Bradstreet to record employment and sales data is such that a single-place error in the first digit (say, entering a three instead of a two) would result in an error to the power of ten. However, conscientious efforts have again been made, through a series of logical tests and improvement of data input procedures, to lower the probability that any such errors succeed in entering the merged files.

5.4.3 Timeliness and Availability

Particulars of these files aside, two major data-related issues still confront an attempt to implement the algorithm: timeliness and availability of the data. The preceding sections have discussed various factors which affect the reliability of the data; the issue

of timeliness speaks to the question of its validity, and is a function of availability. In short, the data are not as up-to-date as we would like them to be. Their age thus presents validity problems, but ones which are more or less correctable depending upon the timing and geographic concentration of a particular attempt to identify firms.

Existing versions of the Dun and Bradstreet data to which we have access, are at least 5 1/2 years old for any particular record. Under more ideal circumstances, more recent data would be incorporated directly into the Dun and Bradstreet merged file and thus be available for use by the algorithm. In the absence of such, however, the use of a second filter on 1982 data for a selection of firms provides a satisfactory, although more time-consuming and less cost-effective, means of temporarily updating this file to meet the demands of a specific application.

Problems of a potentially more significant nature are posed by the obsolescence of the Census file, especially in cases where demographic changes in the city/site over the past ten years have been drastic (e.g., "Sunbelt" cities, which have had rapid influxes of population; travel behavior which is sensitive to gasoline prices). Pending availability of the 1980 Census (now scheduled for next fall at the earliest), more recent data, acquired from other sources, can be used to update the 1970 Census data in the labor profile phase of the procedure. Unfortunately, such data are often either unavailable or unreliable at the lower levels of geographic disaggregation (i.e., city or county), leaving the researcher with little choice but to rely, in the meantime, on a combination of old data and common sense in the selection of site-appropriate industries (Path A).

5.4.4 Final Evaluation of Data Issues and Implications

It is virtually impossible to affix a numerical value to the "margin of error" which is implicit in the output of the firm-identification procedure. This is true, not only because it is quite often difficult to estimate how inaccurate the data are (since none better exist, in many cases), but also because of the site-specific character of the procedure. That is to say, the flexibility inherent in the process's firm suggests, by way of the particular choice and chronological incorporation of variables in a specific version of the procedure, an error variance which precludes generalized assignment of value. The multiple permutations of the procedure's form, in essence, belie a complementary combination of error possibilities.

Although quantification of the data's effor impacts is not possible at this time, their general effect can, at this point, be ascertained. Since the tabulations which are the most rigorous, and the most critical to the process's output, are those which are performed upon the Dun and Bradstreet data, it is this data source which is the most potentially problematic.

The characteristics of this data set which are most relevant to these concerns relate to its coverage: 1) of non-manfacturing sectors; and 2) of branch firms. The most troublesome type of error which can be expected to result from the procedure's extensive use of this data is thus one of omission; of being unable to identify certain high-growth firms, either because they don't exist on the file, or because their branching behavior cannot be clearly tracked. A fairly complex algorithm is undertaken in order to overcome the problem of new branch

identification. But nothing can be done about a firm which has, for one reason or another, been excluded from the file altogether. To reiterate, however, the objective of the finding-firms procedure is not to identify every "perfect match" occupant for the location in question. Rather, its goal is to identify, and eliminate from consideration, those firms which are apparently inappropriate for, or not in need of the special resources of the target location, thereby producing a list of some -- but by no means all -- high-potential prospects. What makes the procedure notable is not the fact that it will fail to identify all of the "hot" prospects for a particular location, but rather that it can identify any such locators, at all.

CHAPTER SIX:

FINDING FIRMS FOR INDIANAPOLIS

The previous chapters have provided a framework within which we can now examine the substance of the finding-firms procedure, through its application in the Indianapolis case. Through this example, not only will the detailed form of the method become more clear; so too will the problems associated with its use, whether they be a product of the data, the assumptions, or the theory upon which the process' structure and function are based. At the same time, this discussion will make more obvious the procedure's flexibility, and hence the potential which it offers for different contexts and types of application. An examination of this most recent and advanced version of the process will thus provide us with the final pieces of information which are necessary in order to proceed with an overall evaluation of the method and its merits, particularly with respect to joint development planning.

This chapter will begin with an introduction to the Indianapolis application. It will then proceed to take the reader through the firm-identification methodology in a sequential manner, via a discussion of the discrete actions and outputs of which it was, in this case, comprised. It will begin with the presentation and analysis of the tasks involved in the industry-selection process (Path A), and the results thereof. It will then discuss the rationale underlying the selection of firm-based criteria (Path B), and the high-potential locator's profile which it produced. The filters, themselves, will then be examined, along with samples of their output. Finally, some general

observations will be made regarding the process of implementing the procedure, and the implications of such with respect to its future form and uses. A number of political and philosophical issues underlying the objectives and assumptions implicit within it -- many of which became particularly evident during the course of the Indianapolis experience -- will be discussed by way of illustration.

6.1. The Contexts of the Procedure's Applications.

As prior discussions have indicated, the finding-firms process has been applied in two instances, to date. The first application, in which the procedure was originally developed in 1976, was part of the Southwest Corridor Orange Line Relocation project in Boston.[1] Under the auspices of a local community development corporation, a group at the M.I.T. Program on Neighborhood and Regional Change was given the task of identifying potential tenants for a large parcel of land in Boston's South End. This parcel had been marked and cleared as part of an earlier urban renewal effort, but attempts to find occupants for it had failed. When the decision was made to relocate one of the city's rail rapid transit lines in a railroad right-of-way (which had been previously cleared for the construction of a now-cancelled interstate highway) quite near the parcel, it was formally slated for development into the "Crosstown Industrial Park" as part of the Southwest Corridor Joint Development Project.

One of the major goals of the industrial park development was to provide employment for some of the area's many economically-disadvantaged residents (most of whom were black or Hispanic) by bringing much-needed investment into this physically and economically blighted area.

Potential locators in the service and manufacturing sectors were identified through the algorithm, and contacted by the local community development corporation. While several indicated interest in developing portions of the site, one of the companies (Digital) decided to construct a plant which would require the parcel in its entirety. Today, the plant is in operation, and employs several hundred local workers. And although it is hard to claim that the algorithm was solely responsible for this successful outcome, it is probably safe to say that it did succeed in identifying several potential candidates for location on a marginally desirable site, one of whom eventually did locate there.

The second implementation of the procedure was undertaken in 1981 as part of an economic development effort on the part of the city of Indianapolis. Indianapolis is a relatively typical example of a middle-aged, middle-sized, manufacturing-oriented Midwestern city, in terms of its characteristics as well as its problems. Preliminary tabulations indicated slight increases in total employment in the city in recent years, despite decreases in manufacturing employment in both absolute terms and as a percent of the metropolitan total.

As Figures 8 and 9 indicate in greater detail, the slack created by the industrial sector's decline has been more than filled by employment gains in the service and trade sectors. Thus, for a number of reasons -- e.g., the fact that the city's largest employer (Lilly Pharmaceuticals) is still economically sound, and that the city has been an above-average generator of small businesses, especially in the service sector[2] -- it has not fared as badly as some of its neighbors. On the other hand, it is also quite apparent

Figure 8

THE CHANGING JOB MIX IN INDIANAPOLIS

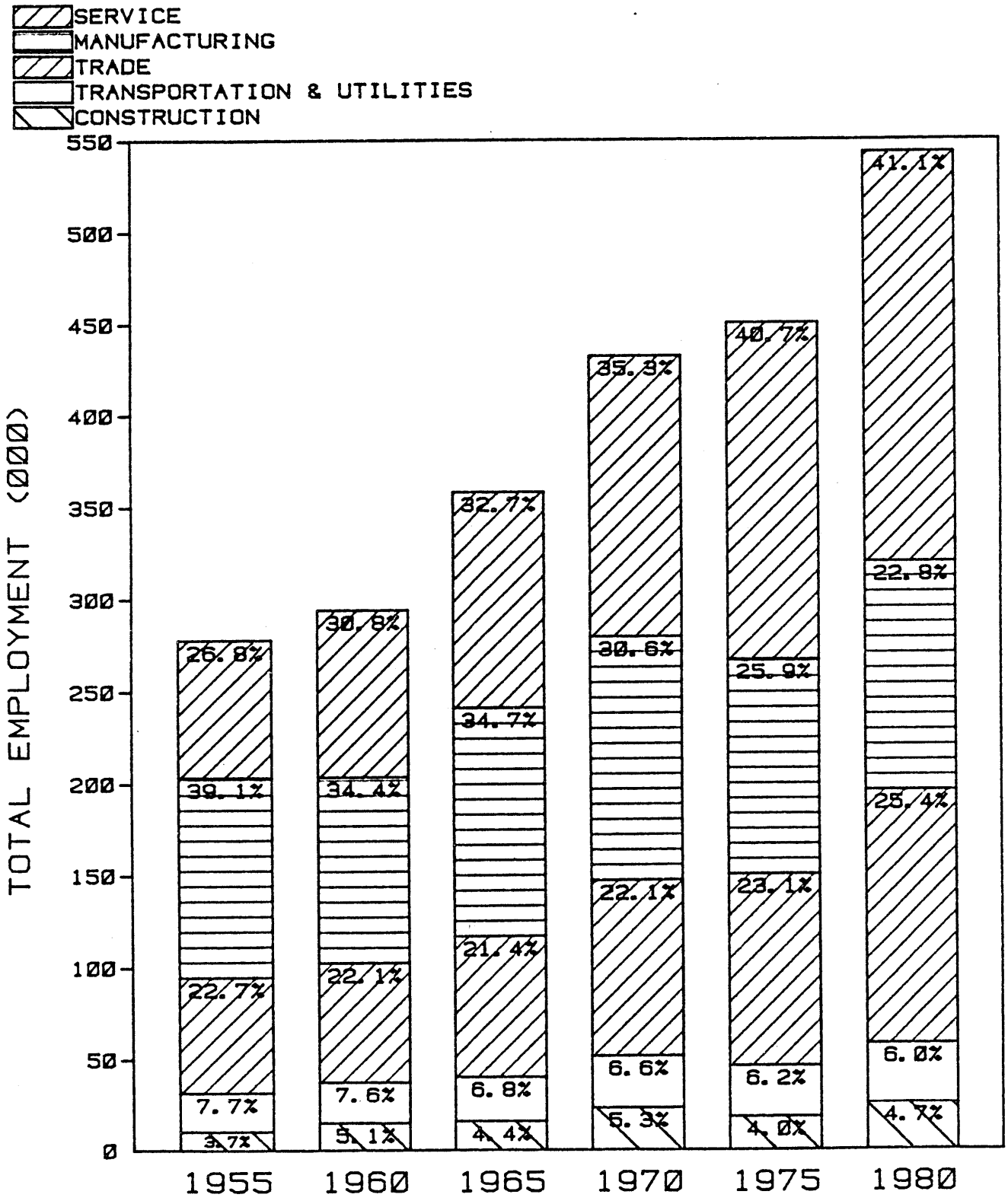
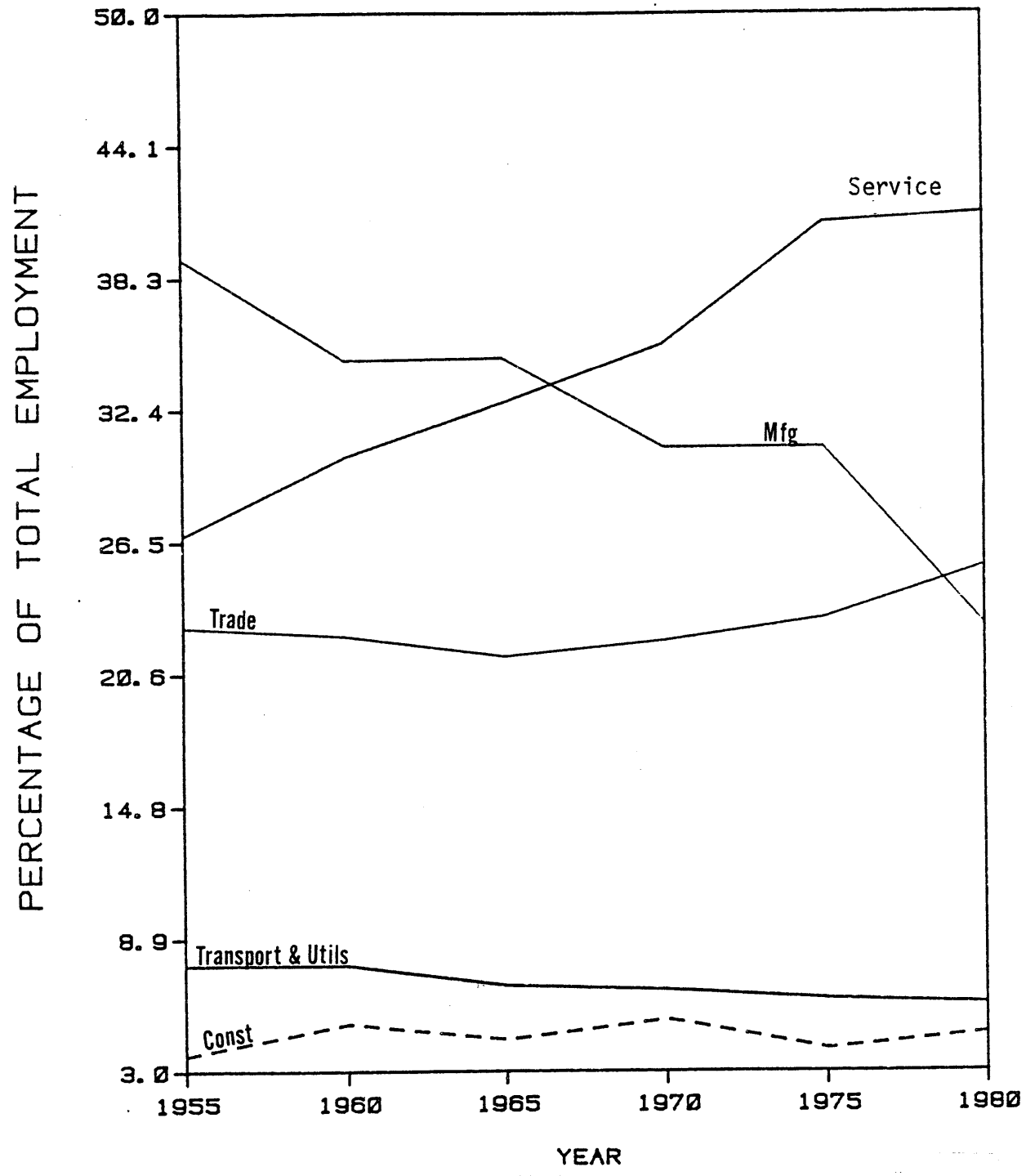


Figure 9

THE CHANGING JOB MIX IN INDIANAPOLIS

BY PERCENT OF TOTAL EMPLOYMENT



this situation could easily change; i.e., that it could quickly become worse (e.g., Lilly's current tendency to invest outside of Indianapolis could turn to one of divesting from its home city altogether), that it could always be better and that, for better or worse, it is undeniably changing. As part of an overall development strategy, then, the city became interested in identifying potential locators. It was through this application that the firm-identification procedure was expanded and refined into its current form.

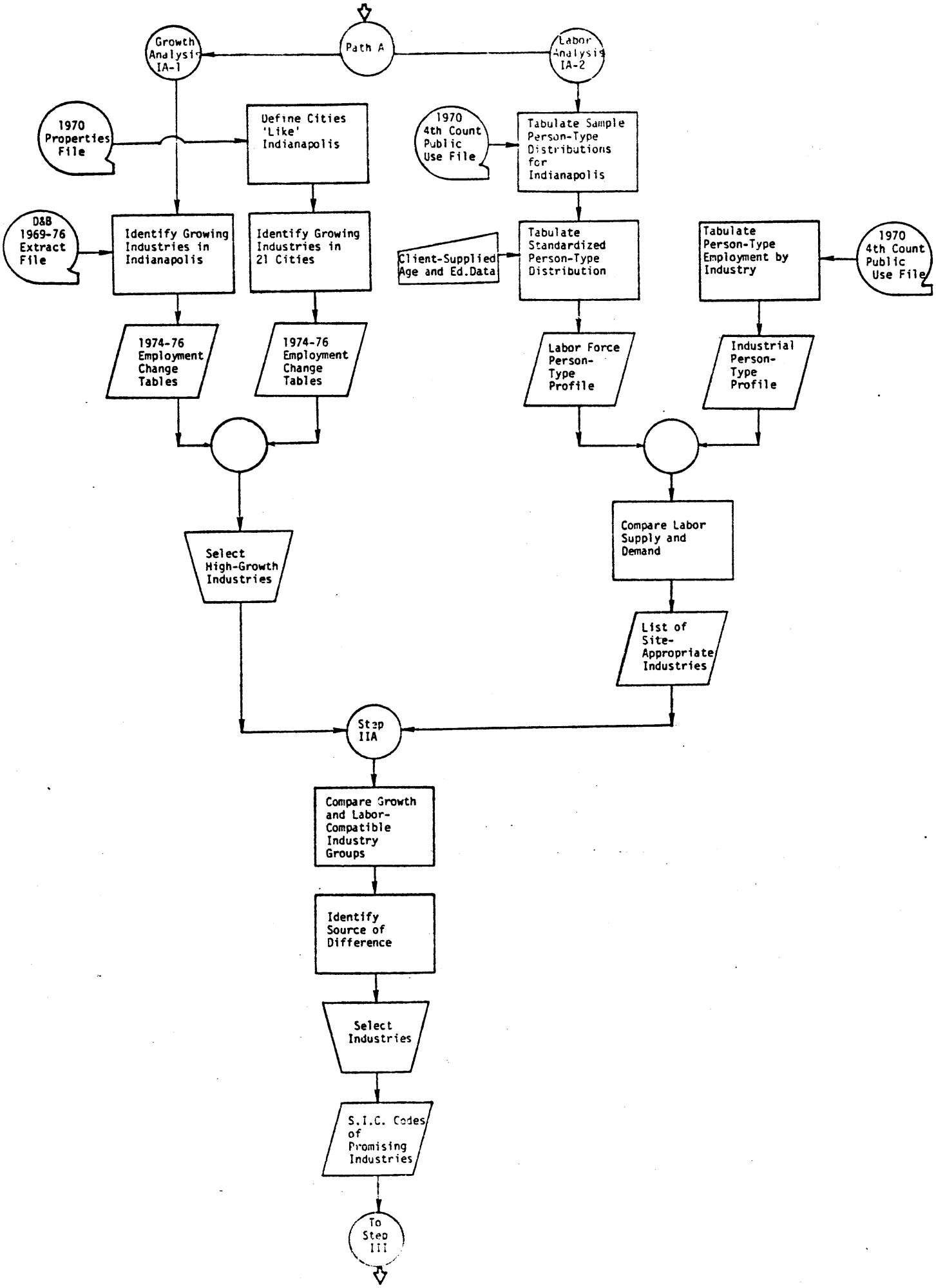
6.2. Identification of Site-Compatible Industries.

Figure 10 presents a flow chart of the industry-identification process developed for the Indianapolis application. As can be seen, it consists of two primary paths (IA-1 and IA-2) which identify high-growth and labor-compatible industry groups, respectively. The lists of industries which these two processes independently produce are then compared, in Step IIA, and merged into a selection of industry types which appear to be the highest-potential candidates for location on the site. Each of these processes will now be examined.

6.2.1 Analysis of High-Growth Industries in Indianapolis and Comparable Areas.

The general objective of this analysis was to develop an understanding of the forces and trends in employment and economic change in Indianapolis, and in comparable places, in order to target the city's firm attraction efforts toward those industry groups which show the highest potential for continued economic vitality and employment creation in that location. Historically, Indianapolis' employment has been concentrated in manufacturing, and in the production of heavy,

Figure 10


Path A
Growth Analysis IA-1
Labor Analysis IA-2
1970 Properties File
Define Cities 'Like' Indianapolis
1970 4th Count Public Use File
Tabulate Sample Person-Type Distributions for Indianapolis
D&B 1969-76 Extract File
Identify Growing Industries in Indianapolis
Identify Growing Industries in 21 Cities
Client-Supplied Age and Ed.Data
Tabulate Standardized Person-Type Distribution
Tabulate Person-Type Employment by Industry
1970 4th Count Public Use File
1974-76 Employment Change Tables
1974-76 Employment Change Tables
Labor Force Person-Type Profile
Industrial Person-Type Profile
Select High-Growth Industries
Compare Labor Supply and Demand
List of Site-Appropriate Industries
Step IIA
Compare Growth and Labor-Compatible Industry Groups
Identify Source of Difference
Select Industries
S.I.C. Codes of Promising Industries
To Step III

durable goods in particular (the major exception to this rule being the pharmaceutical industry, as Eli Lilly Co. is the city's largest single employer). The city's "specialty", for example, is thought to lie in the production offabricated metals products.

Clearly, however, the long-term prospects for these industries -- in America's post-industrial economy, and in an internationalizing world market -- and for the economic vitality of a city whose employment base is maintained by them, are not particularly promising. Given this context, the primary goal of the growth-industry analysis was thus to determine in which directions Indianapolis' economy might best be led.

Detailed tabulations of employment growth in Indianapolis in the most recent period available (1974-76) were undertaken with two goals in mind: 1) to develop a general understanding of the strengths and weaknesses (i.e., sources of growth and decline) with the Indianapolis economy as a whole*; and 2) to identify specific high-growth industries for use as a filtering criterion. Two tables were generated, each categorizing firms in terms of employment size and two-digit S.I.C. code**, from an extract of the 1969-76 Dun and Bradstreet U.S. file (See Appendix A). This first table (Table A-1) tabulates percent net change in employment over the period, thus indicating rates of growth and decline; the second (Table A-2) counts absolute employment gain and loss, thereby providing an indicator of the significance of the net changes, in terms of actual jobs gained and lost.

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*Thereby also producing site-specific economic growth data which could be incorporated into the firm-selection analysis of Path B, also.

**Several S.I.C. groups were even further aggregated, due to the paucity of firms within them.

These tables reflect a number of important trends in Indianapolis' economic and employment growth. To begin with, it is clear that small firms (those with twenty or fewer employees) dominated the job generation process in Indianapolis during this period. Large firms (those with over 500 employees) created jobs at about the citywide average (thus still managing to show positive employment growth), while medium-sized firms declined overall. In terms of absolute employment, this translates into small firms accounting for nearly 71% of all net new jobs, or a total or nearly 6000, versus 2450 for larger firms. These findings are quite consistent with Birch's observations about the job-creating role of small firms in the U.S. as a whole[3], and would appear to be particularly notable in light of the fact that the period under study (1974-76) was a recessionary one (see page for further discussion of this latter issue).

Looking in greater detail at the sources of these general patterns of change, we find that small firms were active (albeit both positively and negatively) in virtually every industry sector, while large firms concentrated their growth/decline in selected industries. In addition, the rate of change evidenced by large firms was not only sporadic, but also much more variable than that evidenced by their smaller counterparts. Those large businesses which showed any change at all were generally big winners or big losers, with about an equal change of either being the case. This type of 'pulsating' pattern of growth and decline is again consistent with earlier findings with respect to economic change in the U.S. as a whole.[4]

With respect to industry breakdowns, the general pattern indicated

by the data was one of decline in the manufacturing, mining, and construction sectors counterbalanced by strong growth in agriculture, finance, and services. Mixed records were evidenced in trade, and transportation and utilities. An important exception to the general decline of manufacturing in the city lay in the strong growth of small firms in the durable manufacturing sectors (S.I.C.s 29 through 39, specifically). Fabricated metals (S.I.C. #34), with additional growth among its large firms, showed a particularly strong rate of expansion.

This latter pattern -- one typified by a resurgence among small manufacturers amid the sector's overall decline -- is one which is also occurring nationally. As such, it may be interpreted as a sign that manufacturing per se is not doomed -- in Indianapolis, or in the U.S. as a whole -- but rather that the future of this sector lies in new directions and markets which are now being developed and exploited not by our corporate giants, but by small, more flexible and innovative firms.[5]

The above analysis provides a fairly good indication of the internal strengths and weaknesses of Indianapolis' economy. However, it does not supply any indication of the city's performance relative to external events. The firm attraction game is not played in isolation; cities compete against each other for scarce investors and job creators. At the same time, as Chapter Three indicated, different types of firms tend to flourish in different types of places, and the key to successful development policies lies in matching them correctly (see page 52). In light of these considerations, the next stage of this analysis was designed to provide us with an understanding of how Indianapolis is

faring relative to its competitors, and more specifically how it compares to areas which attract the same types of firms, and therefore, growth.

In an earlier analysis, Birch developed an algorithm for identifying "like" types of places -- ones which tend to follow similar patterns of economic growth.[6] A slightly modified version of this algorithm was used, in this case, to identify a group of cities whose critical characteristics most closely resemble those of Indianapolis. The tabulationsof employment change performed for Indianapolis were then replicated for this group, in order to identify the former's relative strengths and weaknesses as well as its potential as a job-creator.

The cities were defined in terms of five variables which were previously found to group areas in a logical manner. They are: 1) metropolitan vs. rural (defined in terms of percent rural population); 2) degree of remoteness (number of people within 400 miles); 3) age/growth rate (in 1970, percent housing stock built since 1960); 4) industry mix (percent 1970 jobs in manufacturing); and 5) skill level of labor force (percent 1970 workforce classified as laborers).[7] The sorting algorithm used in this case differed from the original one in that the age/growth criterion was refined from two categories (above- and below-average performance) into three (old/slow, medium, and young/fast). Indianapolis was thus defined as a metropolitan, non-remote, medium-aged, manufacturing, skilled-labor city.

Besides Indianapolis, twenty areas (of a possible total of 317) fell into this category, for a total of twenty-one cities "like" and including Indianapolis. Looking at the list (Figure 11), we find that it

Figure 11

21 Cities Like (and Including) Indianapolis

Nashua/ Manchester, NH
New Haven/New London, CT
Rochester, NY
Baltimore, MD
Roanoke, VA
Bristol, VA/TN
Louisville, KY
Indianapolis, IN
Muncie, IN
Fort Wayne, IN
Cincinnati, OH
Dayton, OH
Parkersburg, WV/ Marietta, OH
Saginaw, MI
Lansing, MI
Davenport, IL
Rockford, IL
Green Bay, WI
Kansas City, KS/MO
St. Louis, MO
Beaumont, TX

is an interestingly diverse mixture dominated -- not illogically -- by middle-aged, middle-sized, Midwestern cities. The Indianapolis tabulations were then replicated for this group in order to : a) isolate Indianapolis' relative strengths and weaknesses as a job creator; and b) to identify industries which might do well in Indianapolis in the future, even if they are not doing so now. In addition, these tables (by virtue of their much larger sample size) provided a check against any statistical aberrations which might be present in the Indianapolis sample.

The general patterns which were observed in the Indianapolis tables are supported by the data in this second set of employment change tables (see Tables A-3 and A-4 in Appendix A). These results are also consistent with previous findings about job creation and the evolving form of the American economy in general, as well as with preliminary observations with respect to Indianapolis' performance in that respect. To wit, Indianapolis' overall growth rate was somewhat lower than the norm for the 21 cities (1% low). But, with a few minor modifications and exceptions, the overall sources of growth and decline were, in both cases, basically the same, thereby providing support for both the validity of the grouping algorithm, and the reliability of the Indianapolis data.

Looking at the results in greater detail, we can initially observe that Indianapolis' proportion of small firm job creation (which was previously pointed out as being a major source of the city's growth) was higher than the average for the 21 cities (8.4% vs. 7.2%). This finding is particularly interesting in light of the fact that the 21-city sample included a number of other cities with above-average records in this

respect (Nashua, NH; Roanoke, VA; and Cincinnati, OH).[8] In the Indianapolis case, this trend may well be attributable to the city's small business start-up rate, which exceeds the national average[9], and which is especially remarkable given the relative geenral hardship suffered by small firms in the tight money market of the 1974-76 recession.[10*] On the other hand, Indianapolis' absolute decline in medium-sized industries and low growth rate in large firms compare unfavorably with the 21-city averages. The inference to be drawn from these findings is thus that Indianapolis is a good place to get started, but a less favorable environment for continued upward growth. This characteristic of Indianapolis' economy is also reflected in its unusually low rate of manufacturing expansion[11] -- an important liability for a manufacturing-oriented city.

On the more positive side, the inability of existing firms to flourish may be no more than a sign of Indianapolis' changing economic character, as comparison with other data would seem to indicate. For example, the impressive growth of the city's service and financial sectors produced over 14,000 net net jobs in only two years**, and is consistent with its above-average rate of service start-ups and expansions.[12]

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*The mixed record of the trades, especially the retail sector, might be attributable to the recession's effect on consumer expenditures, also. To test for any temporal or environmental economic biases in these tabulations, they were also duplicated for the 1972-76 period; 1972-74 being an expansionary period, and thus counterbalancing the recession which followed it. These tables, which are presented in Appendix A, do show some interesting divergences from the 1974-76 tabulations -- stronger growth in medium-sized (21-100 employees) firms, healthier trade, transportation and utilities, and manufacturing sectors. In general, however, the two sets of tables exhibit the same general trends, and thus indicate that no major problems will be encountered as the result of analytical reliance upon a 'non-normal' (i.e., recessionary) period.

**When one considers Dun and Bradstreet's tendency to underreport employment in these sectors, the significance of this statistic becomes even more apparent.

And strong growth among small manufacturers may, as previously pointed out, be indicative of corresponding adjustments in Indianapolis' more traditional employment sector; of movement, not necessarily away from manufacturing altogether, but towards new and different types of manufacturing, instead.

These findings, in sum, suggested that the industry-selection filters of the procedure should concentrate on identifying firms in the service and finance sectors. They also indicated that there might be merit in including some aspects of agriculture, as well as manufacturing industries which posted strong growth among small firms, in our list of promising industries. The final selection would, of course, depend upon how narrowly we wished to define the filter, and what types of criteria we could foresee using for the final process of industry selection (e.g., a size cutoff that would eliminate small firms). Pending such refinements in the criteria, the following industry groups were selected for consideration: 7 (Agriculture), 29-39 (Durable Manufacturing), 60-67 (Finance and Real Estate), 70 (Hotels and other Lodging), and 73-89 (Other Services).

6.2.2. Labor Compatibility Analysis.

The purpose of this analysis was to identify industry groups whose labor demands are compatible with Indianapolis' indigenous supply. Referring back to Chapter Three, we found that the overwhelming majority of firms indicated that the availability of suitable labor was the primary determining factor in their choice of locations. The tabulations which were undertaken in this phase of the process were thus designed to answer the following three questions: What kind of labor skills does the

Indianapolis population possess? What industries hire what kind of labor? And, who would be likely to hire the types of worker which Indianapolis has to offer?

An extract of the 1970 Census Public Use 5% Sample File was used to generate tables showing the demographic composition of private sector employment by industry (Table A-7, Appendix A). The demographic variable was defined in terms of twelve "person types" which represent the categories of a three-by-four age-by-education matrix (Figure 12 describes this variable in further detail).

Age and education were chosen to define the person type categories, based on the belief that they would serve as the best indicators of the characteristics of the city's labor force, by serving as proxies for factors such as experience, skill, and occupation. Other definitions of person types could easily be used, of course, just as a market area or access-based matching process could replace, or be combined with, this one based solely on labor compatibility. For example, race, which was considered to be an important factor in defining the labor pools available to the Southwest Corridor site and therefore used in that analysis, was considered to be a relatively unimportant aspect of hiring practices in Indianapolis.

For consistency and analytical comparability of the industrial classification systems, the Census Industrial Classification Code was recategorized so as to conform to two-digit S.I.C. codes. This resulted in reduction of the industry variable from 222 to a more manageable 69 categories*. In anticipation of finding an insufficient sample size

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*A key to the Census and S.I.C. coding systems is presented as Appendix B.

Figure 12

Person Type Definitions

Type	Description (Age/Ed.)	Matrix Postion
1	20-24/<HS	1,1
2	20-24/HS Grad	1,2
3	20-24/ College	1,3
4	20-24/College +	1,4
5	25-34/<HS	2,1
6	25-34/ HS Grad	2,2
7	25-34/ College	2,3
8	25-34/ College +	2,4
9	35-64/<HS	3,1
10	35-64/ HS Grad	3,2
11	35-64/ College	3,3
12	35-64/ College +	3,4

<HS = Up to 3 years of high school completed

HS Grad = High School Graduate

College = 1-3 years of college completed

College + = At least college graduate

for the detailed person type-by-industry matrix, using only Indianapolis records, the same table was also generated for a sample of Midwestern SMSAs (including Indianapolis). The expectation with respect to the insufficiency of the Indianapolis sample size proved to be true, suggesting that the use of the larger sample would avoid resultant sampling effors, and as such would indeed provide a more appropriate basis for analysis. At the same time, enlargement of the sample appeared not to result in any bias problems: subsequent comparison of the rankings produced for the Indianapolis and Midwestern-sample labor match distributions -- discounting in the former case for industries in which over half of the cells were empty -- yielded very similar results, indicating that the larger sample was quite representative of the Indianapolis case.

In the absence of sufficient data to tabulate the Indianapolis labor force's actual person type distribution, a standardization process was used to simulate these data.[13] Age and education counts were supplied by the client, derived from the most recently available data sources. These marginal (i.e., single dimensional) distributions were used to "balloon" a sample person type (i.e., two dimensional, age by education) distribution, tabulated from the 5% Census Public Use File (Figure 13) up to existing population levels, with a maximum likelihood/minimum distortion result. The result was an estimated age-by-education matrix which, in turn, enabled calculation of the city's person type distribution (see Figure 14).

To determine the labor compatibility of industry groups, the patterns of industrial employment were then compared to Indianapolis' person type distribution to find the "best fits" between business'

Figure 13

TABLE - LABOR PROFILE - AGE BY EDUCATION - INDY SMSA
ROW PER CENTS

	EDUCATN				
AGE	>HS	HS GRAD	>COLLEGE	COLLEGE+	TOTALS
20-24	5.8	14.5	42.1	37.6	1259 0
25-34	8.5	17.7	44.3	29.5	2057 0
35-64	19.2	22.5	38 1	20.2	5005.0
65+	54 2	15 3	17.6	13.0	1458 0
TOTALS	20.5	19.4	36.9	23 3	9779 0

TABLE - LABOR PROFILE - AGE BY EDUCATION - MARION CO.
ROW PER CENTS

	EDUCATN				
AGE	>HS	HS GRAD	>COLLEGE	COLLEGE+	TOTALS
20-24	4.6	15 3	42.6	37.5	582 0
25-34	8.1	19.0	37.7	35.2	1004.0
35-64	18.7	22.1	35.9	23.2	2588 0
65+	51.0	15.5	19.9	13.6	678.0
TOTALS	19.3	19.7	34.9	26.1	4852 0

TABLE - LABOR PROFILE - AGE BY EDUCATION - OTHER COS.
ROW PER CENTS

	EDUCATN				
AGE	>HS	HS GRAD	>COLLEGE	COLLEGE+	TOTALS
20-24	11 0	18.2	45.9	24 9	209 0
25-34	7.4	16.5	51.2	24.9	430.0
35-64	16.6	22.6	44.0	16.8	970 0
65+	50.4	18.1	18.5	13.0	270.0
TOTALS	18.7	20 1	42.2	19.0	1879 0

Figure 14

STANDARDIZED AGE BY EDUCATION DISTRIBUTION FOR INDIANAPOLIS

ABSOLUTE COUNTS

Education*

Age	< HS	HS Grad	College	College+	Totals
20-24	12,798	40,595	18,172	23,022	94,587
25-34	29,190	77,463	29,719	28,005	164,377
35-64	145,168	215,806	56,281	42,310	459,565
Totals	187,156	333,864	104,172	93,337	718,529

ROW PERCENTS

Education

Age	<HS	HS Grad	College	College+	Totals
20-24	13.5	42.9	19.2	24.3	94,587
25-34	17.8	47.1	18.1	17.0	164,377
35-64	31.6	47.0	12.2	9.2	459,565
Totals	187,156	333,864	104,172	93,337	718,530

<HS = Up to 3 years of high school completed

HS Grad = High School Graduate

College = 1-3 years of college completed

College + = At least college graduate

labor demand and the city's supply. To do this, the absolute difference between each industry's person type distribution and Indianapolis' person type distribution was computed, and then summed to produce a measure of each industry's appropriateness. These differences were then ranked in ascending order (i.e., best to worst "fit") to produce a list of industries ranked for best match with Indianapolis' labor force (Figure 15). A second match was performed, defining person types solely in terms of educational attainment, to see if any significant differences emerged from omission of the age variable.

6.2.3. Comparison of Labor and Growth Analyses; Selection of Industry Criteria.

Figure 16 summarizes pertinent characteristics of the top twenty industries from the twelve category (age by education) person type matching process. As can be seen, the closest matches include a wide variety and fairly even mix of business types. If we look at these industries in terms of their growth performance, we find an equally wide range of experiences. Those whose job creation rates were quite high include real estate, law and finance (ranked 9th, ~45% growth in 1974-76), health services (11th, 7.9%), general merchandise stores (13th, 23.0%), business services (15th, 15.4%), and miscellaneous repair (19th, 13.6%). Conspicuous by their general absence from the list are manufacturers although, not too surprisingly, chemical manufacturing (containing pharmaceuticals, and thus, Eli Lilly Co.) shows a very good match rate. Comparison of the rankings produced by the 12-category (age by education) and four-category (education, only) person type distributions showed remarkably similar results, underlining the importance of

INDUSTRIES RANKED FOR BEST LABOR MATCH

47	19	40	41	48	43	20	42	55	50
63	38	44	21	58	30	27	46	60	29
32	28	22	25	45	62	33	26	11	31
9	61	7	24	67	39	57	18	12	51
2	34	10	35	56	54	36	1	59	49
52	3	5	69	37	17	14	8	53	66
23	15	13	16	64	4	68	6	65	

RANKED DIFFERENCES

16 9	17.5	17 7	19 3	19.5	21.2	22.9	23.1	23.9	25.0
25 1	26.2	27 3	27.3	27 5	28.9	30 8	36.0	36.1	37.5
38 3	38 5	40 5	41 9	41.9	42 2	42.3	42.4	42 4	42.6
42.6	43.0	43 7	43 9	44 9	45.7	46 5	47.5	47 7	51.1
53.5	54.1	54.2	55.7	56 0	56.6	57.3	59 5	59 7	61.4
62 9	66 0	66 4	66 8	66.9	67 7	68.6	70 6	71.7	72.6
73 2	74.6	76 2	79 8	82 5	86.0	91.7	92 2	100 8	

Figure 15

Figure 16

Top 20 AGE X EDUCATION MATCHES

Rank	Description	Indy.#	Σ diff.	Growth 74-76(%)	
				Indy	21 cities
1	Clothing stores	47	16.9	-5.1	-3.0
2	Printing & publishing	19	17.5	-13.6	-6.7
3	Electric, gas & sanitary services	40	17.7	0.4	10.4+
4	Wholesale trade - durables	41	19.3	3.5	6.3
5	Home furnishing stores	48	19.5	-2.7	-2.4
6	House & garden supply stores	43	21.2	-0.4	2.2
7	Chemical manufacturing	20	22.9	0.6	-0.4*
8	Wholesale trade - non-durables	42	23.1	4.7	8.1
9	Real estate, law, & misc. finance	55	23.9	~45.	~45.
10	Misc. retail	50	25.0	2.9	5.4
11	Health services	63	25.1	7.9	32.6
12	Transportation services	38	26.2	0.4	10.4+
13	General merchandise stores	44	27.3	23.0	13.6
14	Oil refining	21	27.3	—	— +
15	Business services	58	27.5	15.4	23.0
16	Specialty equipment mfg.	30	28.9	-11.5*	-11.5*
17	Machinery mfg. (except electrical)	27	30.8	-6.2*	-1.2*
18	Car dealers & gas stations	46	36.0	-4.9	-6.2
19	Misc. repair services	60	36.1	13.6	12.1
20	Transport. Equipment mfg.	29	37.5	-12.0*	-2.2*

* Significant growth in small firms

\+ Aggregated group

the role played by educational credentialism (vs. experience) in determining hiring practices.

On the other hand, if we look at the bottom third of the labor compatibility ranking, we find some of the city's most promising growth industries. These include educational services (69th of 69, 100+% growth), legal services (65th, 16.4%), securities and commodities (59th, 65.0%), insurance (46th, 41.6%), hotels and lodging (45th, 16.3%), and banking (40th, 30.0%). The fact that other data sources (such as the Bureau of Labor Statistics' Employment and Earnings) have indicated similarly high growth rates nationally in these industry groups would discount the possibility that their apparent growth in Indianapolis was merely a statistical aberration. Accepting the validity of these results, the remaining issue to be answered therefore pertains to these sectors' ability to expand at such fantastic rates, despite apparent labor mismatches.

One explanation for this phenomenon might be that the 1970 data are too old to be a good measure of the Indianapolis' labor pool's current credentials, since one obvious difference between many of these industries' and Indianapolis' labor distributions results from a scarcity of college graduates among the city's older age groups. On the other hand, since the employment growth tables were generated with data only 3 1/2 and 5 1/2 years more recent than was the labor profile, it seems unlikely that this source could be responsible for more than marginal discrepencies.

A more likely, and provocative, explanation is that two fundamentally different types of firm are growing in Indianapolis, and that they are

doing so by drawing from entirely different labor pools. If banking, for example, hires few people above the age of twenty-five who have less than a college education, yet grows 30% in Indianapolis in a two-year period, it is hiring someone -- but that someone is not an unemployed auto worker. And since firm migrations are so few, it would also appear to be likely that most of the people being hired are, indeed, members of the indigenous labor pool, rather than migrants who move to the city with a new firm. On the other hand, firms in a number of the city's more traditional sectors -- industries which are quite compatible with its existing labor force -- are growing just as strongly as many of the services, small electronics and specialty equipment, and fabricated metals manufacturers, to name a few.

The picture which emerges from these observations is that of a "two pronged" growth pattern; the apparent division of growth industries into two distinct groups, that distinction being based on differential labor demand. Again, the sources and long-term implications of this pattern are open to debate. Those who take a more pessimistic view of the direction in which western capitalist economies are headed would see this as a sign of the breakdown of the "true" middle class, and of a dichotomization of the labor force. This approach is reflected in dual labor market theorists' view of the increased role of small and service sector businesses as a way for the economy to adapt to uncertainty by creating a class of firms which (having low capital requirements) can be started quickly and easily, will fail just as quickly, and which rely on low income, unstable jobs to ensure their profit margins.[14]

In contrast, those who take a more optimistic view of these trends identify the flexibility inherent to small and new firms as a necessary condition for ensuring continuing innovation and job creation. Taken within the context of more general economic trends, they would thus portray the simultaneous growth of white-collar-dominated service jobs and blue-collar-oriented manufacturing positions as an indicator of a basic, but positive, change in the economy, with the common denominator being a general shift from "high-muscle-content" to "high-thought-content" production activities, both among and within industry sectors.

Resolution of these issues, and of interpretations thereof, is clearly beyond the scope and purpose of this analysis. But neither can we afford to ignore the fact that the possible existence of a trade-off between quality and quantity of jobs presents a dilemma with provocative and pertinent implications for economic development planning.

To incorporate the "two prong" growth hypothesis into the selection of firm filtering criteria, further computations were undertaken in order to identify the sources of mismatch between industries and the labor force. In short, industries were sorted into three types: 1) those for which Indianapolis' labor force was overeducated; 2) those for which it was undereducated; and 3) those for which there was no obvious pattern of difference. The results of this process are presented in Figure 17. As can be seen, the majority of industries fall into the first category -- a reflection of the relatively high overall educational attainment level of the city's labor force. Based on the belief that industries which offer the city and its workers a chance for self-improvement (i.e., those for which it was undereducated) are desirable,

Figure 17

SOURCES OF LABOR MISMATCH

IPOLIS LABOR HIGH # 43 LOW # 7 NO PATTERN # 19

INDIANAPOLIS LABOR UNDEREDUCATED

53 54 58 64 65 67 69

INDIANAPOLIS LABOR OVEREDUCATED

1 2 3 4 6 7 8 9 10 11

12 13 14 15 16 17 18 19 22 23

24 25 26 27 28 29 30 31 32 33

34 35 37 40 44 45 46 49 56 57

59 60 68

NO PATTERN TO DIFFERENCES

5 20 21 36 38 39 41 42 43 47

48 50 51 52 55 61 62 63 66

while those which imply underemployment of the city's skills are not, this sort was added as an additional criterion for filter selection.

The process by which industry groups were ultimately selected is represented by the decision tree in Figure 18. The industries which emerged from this analysis as site-appropriate, growth-potential sectors (twenty, in all) are also indicated on the figure, by path of acceptance. Two additional industry groups, banking (60) and insurance (63-64) were accepted for further consideration, despite poor or inconclusive labor match differences, because of their exceptionally high growth rates.* A summary of the characteristics of these industry groups is provided by Figure 19.

Again, the purpose of the industry identification process, and of the labor profile analysis process in particular, was not to isolate a few "perfect matches" between high-growth and labor-consistent industry groups. Rather, its objective was to identify, and eliminate from consideration, those industry types which, while growing, are inappropriate for the special resources of the target site; resources which were defined, in the Indianapolis application, in terms of the characteristics of the local labor pool.

From an analytical perspective, those industries which do not perform well in the resource matching process are therefore as interesting as those which do. In the Indianapolis case, such attention made obvious an interesting and potentially important pattern with respect to the city's economic growth, one which should be kept in mind when considering policies designed to improve its economic future. In a more general sense, this type of "knowledge by negation" analysis offers a

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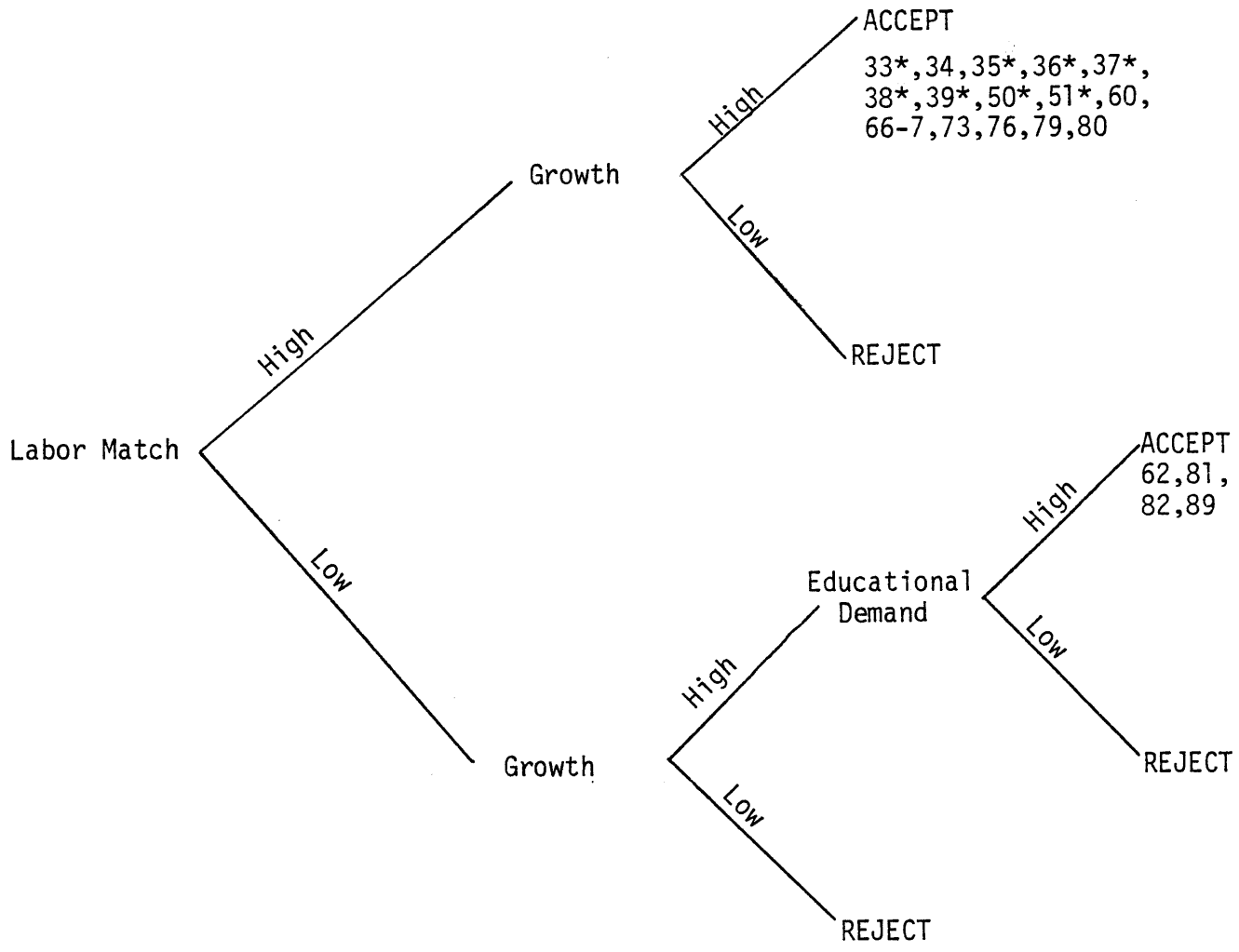
*As the following section will also indicate, further additions and deletions were made to the industry group list, in response to special interests of the client.

Figure 18

DECISION TREE FOR INDUSTRY SELECTION



*low or negative growth rate overall, but high growth rate among small firms.

Figure 19

INDUSTRY-TYPE FILTER CATEGORIES

Industry/SIC #	Description	Growth 74-76	Labor Profile Rank	Education** Demand (if rank 40%)
25/33	Primary metals industries	-9.5*	29	
26/34	Fabricated metals products	32.7	28	
27/35	Machinery (except electrical)	-6.2*	17	
28/36	Electronics	-13.5*	22	
29/37	Transportation Equipment	-12.0*	20	
30/38	Specialty equipment	-11.5*	16	
31/39	Miscellaneous manufacturing	0.1*	30	
41/50	Wholesale trade - durables	3.5*	4	
42/51	Wholesale trade - non-durables	4.7*	8	
51/60	Banking	30.0	40	NP
53/62	Securities & commodities	65.0	59	H
54/63-64	Insurance	41.6	46	NP
55/66-67	Real estate, law & misc. finance	~45	9	
58/73	Business services	15.4	15	
60/76	Miscellaneous repair services	13.6	19	
62/79	Amusement & recreation services	13.4	26	
63/80	Health services	7.9	11	
64/81	Legal services	16.4	65	H
65/82	Educational services	124.9	69	H
69/89	Miscellaneous services	23.1	54	H

* High growth in small firms

** H = Higher than Indianapolis labor force

NP = No consistent pattern

useful, but often-ignored, approach to understanding the development process. As was pointed out in Chapter Three, the ability to "know thyself", which can be so critical to the success of a development effort, is as much one of knowing what a site does not have to offer to potential locators, as it is of recognizing what it does possess. By adjusting the focus of emphasis in this manner -- from concentration on absolute to relative strength and weakness -- governments and development agencies can begin to collect the knowledge and expertise upon which rational and realistic development policies can be based.

6.3. Identification of Potential Relocators.

The objective of this analysis was to develop our model of locational behavior, tempered by a basic understanding of the assets and liabilities of Indianapolis as a location site, into the profile of a high-potential locator, and to derive operational definitions of this archetypical firm which can then be incorporated into the firm-selection filters. To reiterate, it is an attempt to answer three basic questions -- Which firms are the most dynamic job creators? Which firms are the most dynamic locators? And which firms are likely to have an interest in doing either of these things on the project site? -- and to use the results to define firm-specific filtering criteria. As can be inferred from the first two questions, the emphasis of this portion of the analysis is on the characteristics and performance of individual firms. Yet, as the third question indicates, it is not an analysis which is totally devoid of geographic sensitivity. In contrast to Path A's generic industry-type analysis, however, Path B's interest in geographic concerns lies purely in any regional biases which may be observed from

a firm's locational history.

The answers to the above questions, as provided by the model of location behavior which was developed in Chapter Three, were then used to select firm-oriented criteria. This selection was aided by the wide array of highly disaggregate microeconomic data which is provided by the various versions of the Dun and Bradstreet files, and was predicated upon four basic premises: 1) that firms with rapid employment growth will have expanding space needs; 2) that the decision to open a new branch bears implications which are very different from that to expand an existing facility; 3) that firm migrations play a negligible role in regional investment patterns; but 4) that regional patterns and preferences do, to a measurable extent, exist and influence locational behavior.

How these data and premises translate into firm-selection criteria is perhaps best seen by example. For instance, the first premise led to the decision to demand certain rates of employment growth from prospective locators. Sales growth could also have been used as an indicator of expansion, but was omitted from this analysis because this data item is missing from a large proportion (at least 1/3) of the records. The second premise was incorporated into a criterion which demanded that a firm have opened a certain number of new branches (in this case, at least one) in the 1974-76 period, thereby demonstrating a willingness to expand by relocation, rather than by reinvestment in an existing physical plant. The third premise entered the analysis by means of omission; by the absence of any attempt to track potentially-migratory firms. And the fourth was operationalized through the stipulation that the firm have not indicated a locational bias against the

North Central region; hence, that it had not only shown a history of opening new branches, but of locating them within this region.

In sum these, and a combination of other criteria, became the operational definition of the high-potential locator profile which was, in turn, based upon Chapter Three's model of locational behavior. Having been translated into data file variables, these criteria were thus ready for incorporation (along with the industry-type parameters) into the filtering algorithms.

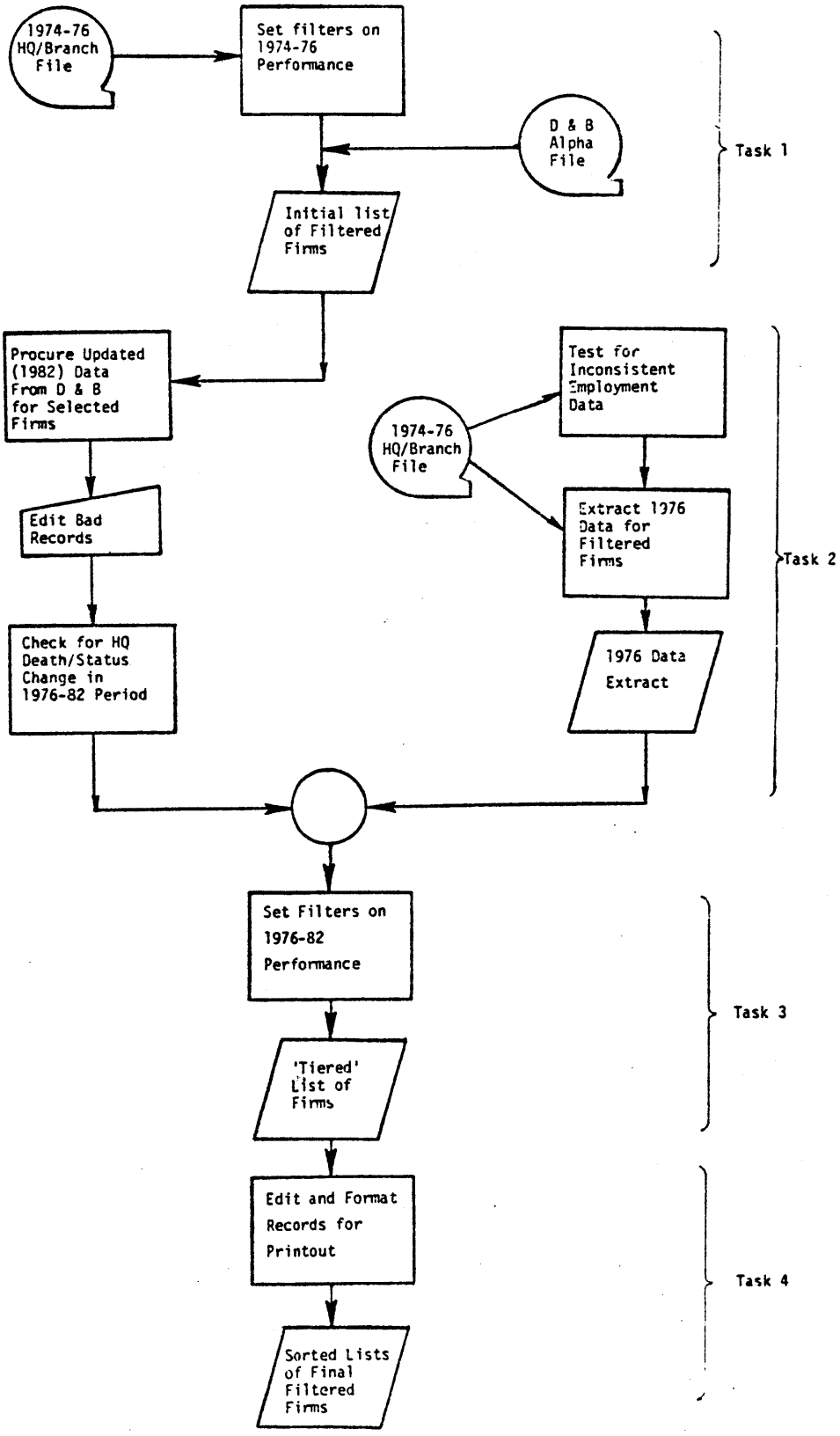
6.4. Design and Implementation of Filtering Programs.

Figure 20 illustrates the flow of tasks involved in the filtering, or firm selection, stages of the finding-firms methodology. For purposes of simplification, these tasks can be grouped into four series of actions: 1) design and implementation of initial filtering algorithm; 2) procurement and preparation of data for updated analysis; 3) design and implementation of updated filtering algorithm; and 4) preparation of final firm lists for delivery to the user. Each of these tasks will now be examined.

6.4.1. Design and Implementation of Initial Filtering Algorithm.

In this step, the industry-identification criteria derived from the Path A analysis were combined with the firm-identification criteria from the Path B analysis, through the construction of a filtering program designed to identify high-potential locators for the city of Indianapolis. The preceding sections have discussed the analytical processes which culminated in the selection of filtering criteria (by which the characteristics of a "high-potential" firm would be defined). In addition

Figure 20


1974-76 HQ/Branch File
Set filters on 1974-76 Performance
D & B Alpha File
Initial list of Filtered Firms
Task 1
Procure Updated (1982) Data From D & B for Selected Firms
Edit Bad Records
Check for HQ Death/Status Change in 1976-82 Period
Test for Inconsistent Employment Data
1974-76 HQ/Branch File
Extract 1976 Data for Filtered Firms
1976 Data Extract
Task 2
Set Filters on 1976-82 Performance
'Tiered' List of Firms
Task 3
Edit and Format Records for Printout
Sorted Lists of Final Filtered Firms
Task 4

to the parameters selected in this manner, a number of industry groups (at the four-digit S.I.C. level) were added for consideration, at the client's request.*

The initial series of criteria which firms were required to fulfill was thus the following:

1. Multi-unit organization;
2. Headquarters was established prior to 1974;
3. At least one new branch established in 1974-76 period and located in Midwest;
4. New Midwestern branch continued to exist in 1976;
5. Headquarter or branch S.I.C. code in proper range;
6. Total family employment >100;
7. Total number of family "members" (headquarter plus branches) increased during period;
8. Total family includes at least two branches;
9. Family employment growth >25% in 1974-76; and
10. Midwestern branch employment growth >25% during same period.

A filtering program was designed, using the 1974-76 Headquarter/Branch "Squashed Hierarchy" file of the Dun and Bradstreet data, to

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*These industries, which were for various reasons, of particular interest to the city, lay in the trucking and membership organization sectors. Earlier in the analysis, the former had been eliminated from consideration because of its modest (1.8%) overall growth rate (although it did indicate a high growth rate among small firms), while the latter, although exhibiting good growth, failed to meet the educational matching criteria (via its demand for less-educated labor).

DISCLAIMER

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Figure 21

Sample Filter Output

```
1-
 1      00190222000054459625 2 SONS OF SACAJAWEA                    RTE 1
              0                          N BRUNSWICK  NJ   08902201245600 0K
                     CIVIC ASSOC SCOUT
 2      00251526000006827522 99 CROOK-STOP  BUSINESS SYSTEMS INC470 MARYLAND DR
              0                          FT WASHINGTONPA   19034215643481 1WARR
        EN V JONES   CHBMFR BUS SYSTEMS
 3      00641328000005252740 63 PAINT-ON  CORPORATION          3939 W 56TH ST
              188220                     INDIANAPOLIS IN   46208317291633 0DONA
        LD C JONES    VPCOATING SPRAYING
 4      00695741900094043225 3 AUTO  MOTOR CREDIT COMPANY*     THE AMERICAN RD
              0                          DEARBORN     MI   48121313322300 0JOHN
         C JONES CHB     FINANCING INSTL SLS
 5      00698605300026011232 4 ARUN JAIN         SALES CORP DEL 5680 S SYRACUSE
        CIRCLE    15108                DENVER       CO   80217306770100 0J A
        MC JONES    PR    PRISMATIC GLWR LTG
 6      00884512500095569604 9  SMITH  TRUCKING CORPORATION    3423 GENOA RD
              0                          PERRYSBURG   OH   43551419837520 0J W
        SMITH   SR CHMN COMMON CARRIER
 7      04516406800002526309 56 SOUND   INDUSTRIES INC          290 MAIN ST
              0                          BUFFALO      NY   14202716854355 0D A
        JONES   CHMN     STL ACCOUSTICAL
 8      04549398800062339761 3 P-TECH  CORP                     5520 RANDOLPH RD
              0                          ROCKVILLE    MD   20852301881815 1K M
        JONES   SR PR    MODEMS RDO TEST
 9      05062070700094043233 3 X Y Z  PLASTICS INC             7565 E MC NICHOL
        S RD      0                    DETROIT      MI   48234313365900 0WESL
        EY R  JONES    PRPLASTIC PDTS PPR
10      05331518000096929825 3 BOVINE BLEND    CORPORATION     224 JACKSON ST
              1868                       SIOUX CITY   IA   51102712277134 0L W
        JONES     PR     MFR & RET FERT
11      05525294400020383641 9 A B C  COMPUTER SERVICES CORP  8TH AVE N & UNIO
        N STREET 0                       NASHVILLE    TN   37250615749191 1D C
        NERD       PR    COMPUTER SERVICE
12      06167042800042593792 7 NEVER-PAYSINSURANCE COMPANY*     1215 4TH AVE
              0                          SEATTLE      WA   98101206292123 4JAY
        D JONES   PR     PROPERTY CSLTY
```

identify only those firms which met all of the above criteria. These firms were then selected, on the basis of each one's unique identifying number ("Duns Number"), from within the mass of firms which failed to fulfill the stringent demands of the criteria. These numbers were then matched to the firms' original 1976 D.M.I. records to procude a list of the highest-prospect firms, a disguised copy of which is presented as Figure 21.

The extreme stringency of the above set of filters is illustrated by the fact that only twelve firms -- of a possible 600,000+ multi-unit headquarter/branch organizations existing on the 1974-76 file -- succeeded in passing them. To test the sensitivity of the output to the filter parameters, subsequent revisions of the algorithm (which relaxed one or more of the criteria) were performed, and produced correspondingly larger lists of firms (see Figure 22). For example, loosening the family employment growth criteria to 10%, and that of branches to 15%, produced 34 firms, while the version of the algorithm which was used to identify the firms which were ultimately sent on for further consideration (family growth >0%, branch growth >5%) produced a list of 84. In contrast, a second version of the filtering program, which dropped all filters on branch characteristics and performance, produced a list of over 4500 "high potential"* firms.

A number of conclusions about the firm-identification procedure, the filtering algorithms,and about firm growth processes in general can be drawn from the above examples. At the very least, these results illustrate the wide range of list sizes which the filtering programs

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*Exactly how high the potential of firms which are identified by filters which are as lax as those used in this latter case is, however, suspect.

Figure 22

SENSITIVITY TESTS OF EMPLOYMENT GROWTH CRITERIA

Midwest Branch Growth	HQ Growth	# of HQs Filtered	# Total Establish-ments (1976)
>25%	>25%	12	237
15	10	34	593
10	5	55	1112
10	0	67	1296
7	5	77	1673
5	0	84	2028

through the selection of more or less rigorous criteria. Of greater consequence, however, is the inference which is to be drawn from the size of the lists produced by the initial (i.e., stringent) Indianapolis filters; to wit, that for any particular site, at any particular time, there exists only a minute portion of the corporate population which we would expect to be considering relocation thereupon. Whether or not the algorithm succeeds in correctly identifying the members of that elite group is quite another issue. But, methodological specifics aside, if the algorithm and its analytical subcomponents do nothing else, they do succeed in indicating exactly how complex the location decision is, how few really "good" external locators (as opposed to local entrepreneurs) exist for a given site, and thus, how random the successes of economic development programs are likely to be, as long as they rely on non-targeted, general-promotion-oriented firm attraction strategies.

6.4.2. Procurement and Preparation of Updated Data.

Following completion of the first round of filters and the selection of an initial list of firms, raw 1982 D.M.I. records were acquired from Dun and Bradstreet, and prepared for use in the second, and final, round of filters. As Figure 20 indicates, several tasks are involved in this process, most of which are of a technical nature and of little interest or consequence to those who are not completely familiar with the Dun and Bradstreet data (in both its raw and edited forms). On the other hand, the preparation of new data entails, as a matter of course, quality control issues and actions which, due to their ultimate effect upon the outputs which they produce, are significant enough to warrant discussion here.

In order to perform a time series analysis of the type implied by the algorithm, the data must be available in a longitudinal form. For the initial analyses and filters, such data already existed, in the form of the Dun and Bradstreet U.S. file, and extracts of it such as the Headquarter/Branch Squashed Hierarchy file. For the secondary analyses and updated filters they did not exist, and therefore had to be created anew. The age of the Dun and Bradstreet data, in combination with the short time span within which location decisions are made, thus necessitated not only the procurement of more recent data, but also the preparation of this data into a form which enabled cross-temporal comparisons to be made. This, the second task of the filtering processes, was therefore comprised of two flows of operations: 1) that which involved preparation of the 1982 updated data; and 2) that which involved preparation of 1976 data for comparative uses.

Upon receipt of 1982 data for the filtered firms and their families (about 2000 records, in all), a series of quality control procedures was performed. The data were first checked (manually and computationally) for "bad" records -- i.e., those which contained data items which, for one reason or another, appeared to be incorrect or illogical. Problems of this sort which were encountered in the Indianapolis case included one firm whose Canadian affiliate records were mixed in with those of its American branches, and branches whose headquarter Duns Numbers were incorrect or not recorded. Any records which were flagged as containing inconsistent or illogical data items were manually corrected (when possible), or deleted from the file altogether.

To prepare the 1982 data for cross-temporal comparison, its

consistency with the 1976 data had to be ascertained. Most particularly, it was necessary to identify firms (especially headquarters) which existed in only one of the two years, in order to later be able to tabulate: 1) headquarter deaths; and 2) branch births. The former task was thus the next to be performed, through a tabulation which identified any headquarter establishments which disappeared* from the file during the period in question. All in all, these operations resulted in ten headquarter records (8 disappearances and two status changes) and a number of branches being dropped from the file. The final filters were therefore performed on 74 headquarters and their families (although the two families of indeterminant status were included as addendums).

In a simultaneous string of tasks, 1976 data for the filtered firms and their families were extracted from the Headquarter/Branch file and prepared for analysis. Specifically, these records were used to create the basis for a two-period, six-variable longitudinal extract file. Branch records underwent particular scrutiny during this process. Records for both years (1976 and 1982) were first screened for non-reported employment variables (an omission of fairly common, although decreasing, occurence). Secondly, since the year started is not reported

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*A firm whose legal status changes due to acquisition sometimes receives a new Duns Number. Under such circumstances, it is virtually impossible to distinguish between an acquisition and a "death" (let alone between a bankruptcy and a simple closure). While the records received for the Indianapolis analysis proved that there are, fortunately, exceptions to this rule, it is often true that the sources of a firm's disappearance from the file cannot be easily identified.

However, even if we assume that all of the firms which disappeared from this subset during the period (1976-82) were, indeed, deaths, they still represent only 10% of the population (8 of 84 headquarters) -- a result which can be taken as an indicator of the success of the filter in identifying particularly healthy firms.

for these firms, an algorithm had to be developed to protect against the inference of spurious births.

The final output of these preparations were edited 1976 and 1982 files for the filtered headquarters and their families, which could then be merged, through the final filtering program, into a form supportive of time series analysis.

6.4.3. Design and Implementation of Final Filtering Algorithm.

The second round of filters provided a final screen on firm performance and location potential. Its basic objective was to test for the consistency of the filtered firms' growth, i.e., to eliminate any firms which proved, in the long run, to have been merely one-period (1974-76) "flashes in the pan".

Non-time-sensitive criteria (such as multi-unit status) having already been met by these firms in the first round of filters, could be eliminated from the second. The following criteria were thus incorporated into the second filtering algorithm:

1. Headquarter or branch S.I.C. code in proper range;
2. Total family employment >100;
3. Total number of family members increased, 1976-82;
4. Total family employment change >25% in period;
5. Midwest branch employment change >25% in period.

Sensitivity tests were again utilized to gauge the relative potential of the filtered firms. The three growth variables (criteria 3, 4, and 5) were set in four combinations and used to categorize the remaining 76 firms into six "filter tiers" of increasing stringency. As Figure 23 indicates, only twenty of the firms passed the above (i.e., most stringent)

Figure 23

Distributions of 'Filter Tiers'

Tier Number	Absolute # of Firms	Cumulative # Firms	Cumulative % Total
1	23	23	30.2
2	3	26	34.2
3	7	33	43.4
4	5	38	50.0
5	36	74	97.4
6	2	76	100.0

Definitions of Tier Groups

Tier Number	# Branches Increased?	Total Emp. Change	Midwest Branch Emp. Change
1	Yes	Positive(>0)	>25%
2	Yes	"	Positive
3	No	"	>25%
4	No	"	Positive

5 - - Failed to meet all of above criteria.

6 - - Reported status change (although still consisted of Headquarter and Branches); performance unmeasurable.

set of criteria and therefore fell into the first tier; 32 passed the least demanding combination of parameters, while the remaining 44 failed altogether.

6.4.4. Preparation and Delivery of Final Firm Lists.

The final task of the filtering process was purely mechanical in nature. Here, the tiered lists of firms and families were sorted (alphabetically, by headquarter S.I.C. code, and by tier number); their records edited (adding, for example, computations of employment change rates, deleting confidential, redundant, or non-useful data); formatted; and printed out for delivery to the user. The final product was thus a rigorously selected group of presumably high-potential firms and their branches -- complete with detailed data on their characteristics and performance -- ready for incorporation into an economic development strategy.

In this case, the final list consisted of 76 firms and their families. As prior discussions have indicated, however, this number can be adjusted (through the selection and design of the criteria) to suit the user's needs. The format and content of the final printouts (particularly with respect to thechoice of sorting variables, and content of data included) can be similarly adjusted to meet the user's data and analytical needs.

6.5. Some Issues with Respect to Implementation.

As the Indianapolis experience made only too clear, the importance of the role which is played by the user during the process of design and implementation of the algorithm cannot be underestimated. The firm-

identification process is a relatively technical and structured mode of problem-solving. Yet it is one which must be made sensitive to the issues and characteristics which do, and will continue, to affect development on or in the project site. In short, it must be able to incorporate into its design an awareness of the unique array of conditions surrounding the process of development within a particular economic, social, political, and physical environment. In order to achieve this, a high degree and quality of client participation in the implementation process is required.

As a result, not insubstantial demands are placed upon both the user and the provider of the technology. On the one hand, those involved in the technical aspects of the procedure must be able to understand and to incorporate into its form and substance a number of often-intangible factors which are more or less critical to the development of the site. On the other hand, the user must develop an understanding of the theoretical and empirical bases of the procedure which is sufficient to enable him to foresee and to furnish the types of information and guidance which can only be provided through first-hand knowledge of the local situation.

The algorithm is an inherently iterative, adjustive process; one which thereby requires an almost pre-emptive understanding of its own demands and products for its maximum powers to be exploited to their fullest. Sensitivity to this circumstance, combined with the expertise which can only be gained through practical experience, are necessary before this goal can possibly be achieved.

CHAPTER SEVEN:

CONCLUSION

The ultimate measure of the "success" of a planning technique, such as the firm-identification procedure which has been described in the preceding chapters, lies in its ameliorative abilities. From the practitioner's persepctive, academic concerns, such as the theoretical purity or philosophical integrity of its premises, or the grace of its computer code are quite secondary to the practical concerns attendant upon the tool's problem-solving potential. The standard against which the promise of the finding -firms methodology can be weighed is thus tripartite: defined by way of its usefulness, its appropriateness, and its effectivenss as a development tool. The schooling of development planning thus lends itself to a redefinition of the proverbial "3Rs"; for it is against its relevance, its realisticness, and its results that the feasibility of policies within this field will, for practical purposes, be gauged.

As previous discussions have indicated, current approaches to location planning have, on the whole, failed to fulfill these necessarily rigorous criteria. Partial responsibility for this failure is attributable to the incompleteness of our theoretical and empirical understandings of the economic forces underpinning the urban fabric. For, only with a complete and accurate perspective on these forces, can policy and planning officials and agencies begin to focus their attention on real, as opposed to perceived, aspects of the urban development process. This aside, however, it remains true that a significant portion of the responsibility for the failure of economic policy lies not in the practitioners'

inability to comprehend the relevant problems, but rather in their failure to devise policies which can be used to solve these problems in an appropriate and effective manner.

The firm identification procedure is designed to serve as a useful, appropriate, and effective means for improving upon this unfortunate situation, by providing a technique which can supplant or augment current approaches to development planning. Such lofty objectives are, to be sure, commendable; the critical question which therefore remains to be answered pertains to the procedure's ability to achieve them. At this point, the method's success in doing so can be evaluated in two respects: 1) in terms of its apparent ability, through the prior (Southwest Corridor) and present (Indianapolis) applications, to identify high-potential locators; and 2) in terms of its adaptability to a wider range of uses, specifically with respect to the problem of occupant identification in joint development planning. And examination of the procedure's performance in these two respects, and in terms of the three criteria mentioned above, will enable conclusions regarding its overall potential as a development-enhancing tool to be drawn.

7.1. Prior and Present Indications of the Procedure's Performance.

The results of the two applications of the process to date are sufficiently preliminary and/or limited in scope that it would be unreasonable to base an assignment of the method's "success" or "failure" upon them. The Southwest Corridor application did foresee the location of one of the identified firms upon the project site. But it is impossible, at this juncture, to ascertain whether or not the branch might have been located there anyway, regardless of the procedure's results. The impact

of the Indianapolis application is similarly inconclusive, because this project has only recently begun to enter the final (i.e., marketing) stages of implementation.

While these rather sketchy and preliminary findings do not provide any very good indication of the process's ability to identify the "right" firms, they do provide the basis upon which a first major conclusion regarding the methodology's performance can be drawn; that is, that the usefulness of the finding-firms approach is as much a function of the user's ability to utilize the data in an appropriate and effective manner, as it is of the characteristics of the procedure and its product. The firm-identification methodology is quite specific in terms of its premises and its promises: failure, on the part of the user, to understand the implications thereof with respect to the output and its best uses thus bodes poorly for the ultimate usefulness of the filtering process in a particular situation. In short, the method provides the development planning with a tool, but one which cannot help but be impotent, if ineffectively used.

Of particular importance is the user's grasp of the rationality and specificity underlying the procedure's output; i.e., the analytical and computational processes and structure which are implicit in the selection of a miniscule proportion of existing firms as potential occupants of a particular location. That is to say, users must understand how and why it is that certain firms emerge as being more likely candidates than others. Even more importantly, they must be able to use that understanding as the basis for incorporating the filtered lists into a marketing and development strategy. The strength of the firm-identification approach derives from its explicit rationality, and its

translation of this rationality into a highly-specific, data-rich prospecting tool. The list of filtered firms is therefore not simply a glorified mailing list, and the user's strategy must reflect this condition if the process's true potential (as limited or expansive as it may be) is to be realized.

There are, of course, ways of getting around this problem -- of separating analytical from implementational effect. For example, follow-up surveys or interviews could (if carefully designed, so as to avoid "leading" problems of the type mentioned earlier) be used to determine: a) if the identified firms were considering the establishment of a new branch, in the near future; and b) whether they would, indeed, consider location a facility in the project area. The findings related to these questions could provide a good basis from which to evaluate the effectiveness and accuracy of the firm- and site-related analyses, respectively.

Unfortunately, neither the time nor the resources were available to enable the performance of an (obviously costly) evaluation of this sort in the previous applications of the procedure. From an analytical viewpoint, however, the incorporation of a follow-up procedure of this type into the finding-firms process would appear to be a useful and appropriate step to take, in order that the credibility of the process's results may be better ascertained.

7.2. The Procedure's Potential as a Joint Development Tool.

The prospects for more generalized use of the firm-identification procedure would appear to be quite good. To begin with, there is nothing inherent in the process's structure or approach that would preclude its application to a potentially vast array of scenarios. The flexibility of

the location-specific component of the analysis allows for incorporation of a relatively wide range of factors into the identification of promising industries, and thus lends itself to a kaleidescopic range of focuses. For example, a third application of the method, which is presently being undertaken to identify potential tenants for a real estate developer, will base its locational analysis on a profile of existing tenants (rather than upon the local labor force), thus implying greater reliance upon a market-area (rather than labor-based) model to locational behavior.

Again the purpose of the location analysis segment of the process is to capture the essence of an area's unique locational resources, through the selection of industries which can best exploit this set of attributes. In the case of transit joint development, it is difficult to define, in abstract terms, the extent to which the relevant resource (that is, the transit system) impacts the locational potential of a particular development site; this will depend upon a number of factors, including distance from the facility, improvements, transit technology, etc. This notwithstanding, it is from its ability to identify and analyze the relative importances of a wide range of location-influencing factors -- transit access, among them -- on a location-by-location basis, and then to include these factors in the identification of site-appropriate locators, that the true potential of the firm-finding process, as a joint (or general) development tool derives.

The fact that generalized use of the firm-identification procedure is possible does not, in itself, indicate that its widespread use is either desirable or forthcoming, however. To speculate upon the procedure's more general potential, we therefore turn again to the three critical evaluative variables -- i.e., usefulness, appropriateness, and

effectivenss -- in order to gauge the process' performance in their respect.

Turning first to the issue of usefulness, it is clear that the problems associated with attracting and maintaining health local economies are of paramount concern to planners and politicians, alike. It is thus apparent that any technique which can aid in their development efforts is apt to be of substantial use. Beyond that, it would appear to be the case that existing approaches to private sector investment attraction planning and policy are, at best, misguided and, at worst, outright misuses of scarce physical and fiscal resources. The firm-identification procedure offers an alternative approach to the far-flung strategies typical of current development practices, through its ability to target the area's resources in a precise and rational manner. The ultimate usefulness of the procedure derives from its structured and explicit incorporation of empirically-supported observations into a list of target firms. In doing so, it therefore provides the user not only with a very specific-purpose marketing tool, but also with a unique source of informational power, in the form of the tabulations and analyses which underlie the final output of the process.

The appropriateness of the procedure can be evaluated in two respects: 1) in terms of local capabilities; and b) in terms of local need. As prior discussions have indicated, the accuracy of the procedure's final output depends, in large measure, upon the user's ability to provide support and guidance for the locational analysis. This quality of the procedure places a not-insubstantial demand upon the capability of the user to caputre, and to communicate to the analyst, the essential qualities of the place's location potential. On the other hand, these are not

unreasonable demands to place upon local development officials. In addition, fulfillment ofthem is facilitated by the presumed competence (or at least, coopeartion) of local officials, and the inherently iterative, give-and-take nature of the procedure's implementation process.

In terms of need, the opportunities available through improved public management of private and public investment patterns have already been ascertained, with respect to joint development planning in particular. The firm-identification methodology -- or any similar procedure -- is thus of equal relevance to young, growing areas as it is to those facing the consequences of age and decline. The only economy for which it would be inappropriate is that characterized by total stability -- a possibility which the inherent disequilibrium of market systems, such as ours, would appear to effectively preclude. Need is therefore a function of change: determination of the appropriateness of the firm-identification process thus hinges upon its ability to ease the pain of transition, through its highly targeted approach to development planning.

Finally, we encounter the issue of effectiveness. In theory, the firm-identification procedure offers an unprecedented level of detail and information to the development planner; in reality, it is, at this point, difficult to determine how well it succeeds in fulfilling its own, admittedly lofty objectives. As the discussion of the previous section indicated, a larger sample of applications combined with more extensive follow-up analysis, is necessary before the approach's effectiveness as a predictor of locational behavior can be ascertained.

The issue of effectivenss is not singularly one of accuracy,

either. Preceding sections have also demonstrated the critical role which the user's method of implementation plays in the procedure's ability to achieve the anticipated results. Implementation is, of course, a problem by which virtually all planning efforts are plagued; the firm-finding process is hardly unique in this respect. Nor is it unique in the magnitude of unfulfilled potential which is the inescapable (though unquantifiable) product of poor or ineffective utilization of a well-designed tool.

The rationality underlying its analytical process, the demand for and sensitivity to user concern embedded in its iterative nature, and the specificity of its results may, in combination, serve to mitigate the opportunities for mis-implementation of the firm-identification procedure. In general, however, the long-term solution of the "implementation problem" lies in continued development of planning skills, per se, and thus,far beyond the scope of this analysis. Suffice it to say, at thispoint, that the greater degree of immunity to implementational irregularity which can be incorporated into planning techniques and policies, the greater is their promise for general purpose use and success.

In sum, while it would be premature to draw conclusions here with respect to the overall effectivenss of the finding-firms methodology, its usefulness in, and appropriateness for the problems confronting efforts at development coordination would appear to be substantial. The continuousness and complexity of the process by which an economy evolves has tended to leave planners in abeyance to the dynamics of the systems whose destinies they would endeavor to portend. Planning is,

at its absolute minimum, a field in which everything seems possible but nothing appears probable. The real value of the firm-identification procedure, or any other planning tool, lies in its ability to turn probability into result. It is against this standard that the merit of the finding-firms process stands, through continued application and improvement, to be assessed.

APPENDIX A

EMPLOYMENT CHANGE TABLES

Table A-1

TABLE - 8 NET EMPLOYMENT CHANGE IN INDIANAPOLIS 74-76

COUNT BY - AEMPL74

	EMP SIZE				
SIC #	0-20	21-100	101-500	>500	TOTALS
AG.7	4.2	14 7	0	0	19 2
MIN8-14	-8 9	-9 4	0	0	-7 2
CONST15	-5 5	-28 3	-37 8	0	-17.2
16	16.9	-12 4	-2.4	0.	-2 1
17	-5.1	-15.6	-27 6	0.	-11 6
MFG 20	-14 2	-6.1	-9.2	-4.4	-8.1
21	0.	0.	0	0	0.
22	-16.1	-17.5	0.	0.	-17.0
23	6.2	-1 6	-5.7	0.	-2.1
24	13 9	-10 6	7.1	-42.9	-13 4
25	-4.7	0.8	28.0	-100 0	-31 1
26	3 0	5.3	-19.3	0.	-11 1
27	-9.4	-8 3	-9.3	-21.8	-13 6
28	-5.6	-9 0	37 9	0	0.6
29-32	72.5	-4.0	7.9	-13.1	4.2
33	5.1	-13.2	-11.5	0	-9 5
34	18.7	-7.4	-12 5	150 9	32.7
35	8.6	-8.9	-16 3	-3.5	-6.2
36	58.2	3.4	19.3	-19 0	-13 5
37	14 7	-3.5	4.7	-14 1	-12 0
38	38.2	10.5	-56 8	0.	-11.5
39	8.9	-4.5	0.3	0.	0.1
TR&U 40	4.0	-50 0	60.6	0.	4.5
41	3.2	-35 5	7.0	0.	0.0
42	39.8	-5.1	-13 6	-3.4	1.8
43	0.	0.	0.	0.	0.
44	-20.0	0.	0.	0.	-20 0
45	-18.4	0.	146 3	0.	44.2
46	0.	175.0	0.	0.	175.0
47-49	44.2	8.2	-35.0	2.2	0.4
TRADE50	11.6	-1 4	-2.2	0.	3.5
51	21 5	0.2	-17.2	0.	4.7
52	5.2	2.8	-50 0	0.	-0.4
53	-18.8	55.8	27.2	18.5	23 0
54	-2 1	-2.6	0.	-30.6	-19 1
55	-4.3	-2.8	-30 0	0.	-4.9
56	-3.2	-52.6	36.7	0.	-5 1
57	-0.5	-0.7	-19 7	0.	-2.7
58	-2.5	-4.1	60.7	0.	0.3
59	3.4	6.4	-3.5	0.	2.9
FI&RE60	30 0	0.	0.	0.	30.0
61	27.3	12 7	-100.0	-50 8	-22 2
62	120 0	9.2	87.0	0.	65.0
63-64	86.7	25.6	7.2	78.1	41.6
65-66	18.5	24.4	0.	0	18.0
67	-3.2	-24 5	-26 3	46.8	26.8
SRVC 70	26 9	68.5	-19 5	0.	16.3
72	0.3	-3.0	-25 6	0.	-7.4
73	26.8	5.1	24.0	10.3	15.4
75	1.7	35.1	0.	0.	7.7
76	14.3	10.2	0.	0.	13.6
78	47 9	-8.3	0.	0.	13.4
80	43.8	37.7	23.2	-2.6	7.9
81	43.5	-2.5	0.	0.	16.4
82	30 3	64.2	-10 7	631.3	124.9
83	86.2	63.5	134 4	0	101.0
84	250.0	0.	-100 0	0.	-80.5
86	85 6	2 2	0.	0	36.4
88	0.	0.	0.	0.	0.
89	28.2	-1 0	190 0	0.	23 1
TOTALS	8 4	-0.8	-2.1	2.1	2 2

Table A-2

TABLE - ABS. NET EMP. CHANGE IN INDIANAPOLIS, 74-76

COUNT BY - AEMPL74

	EMP.SIZE				
SIC #	0-20	21-100	101-500	>500	TOTALS
AG 7	36.0	55.0	145.0	0.	236.0
MIN8-14	-29.0	-15.0	0.	0.	-44.0
CONST15	-205.0	-643.0	-350.0	0.	-1198.0
16	106.0	-144.0	-4.0	0.	-42.0
17	-335.0	-785.0	-394.0	0.	-1514.0
MFG 20	-44.0	-58.0	-349.0	-50.0	-501.0
21	0.	0.	0.	0.	0.
22	-5.0	-10.0	0.	0.	-15.0
23	15.0	-6.0	-35.0	0.	-26.0
24	53.0	-55.0	30.0	-300.0	-272.0
25	-13.0	3.0	142.0	-712.0	-580.0
26	4.0	50.0	-410.0	0.	-356.0
27	-141.0	-185.0	-177.0	-710.0	-1213.0
28	-25.0	-61.0	146.0	0.	60.0
29-32	640.0	-56.0	90.0	-400.0	274.0
33	9.0	-57.0	-60.0	0.	-108.0
34	228.0	-200.0	-473.0	3772.0	3327.0
35	155.0	-337.0	-535.0	-210.0	-927.0
36	206.0	29.0	243.0	-2800.0	-2322.0
37	36.0	-24.0	110.0	-3391.0	-3269.0
38	78.0	39.0	-230.0	0.	-113.0
39	36.0	-34.0	1.0	0.	3.0
TR&U 40	1.0	-50.0	303.0	0.	254.0
41	5.0	-75.0	69.0	0.	-1.0
42	607.0	-180.0	-190.0	-80.0	157.0
43	0.	0.	0.	0.	0.
44	-3.0	0.	0.	0.	-3.0
45	-29.0	0.	234.0	0.	205.0
46	0.	105.0	0.	0.	105.0
47-49	280.0	68.0	-445.0	135.0	38.0
TRADE50	899.0	-97.0	-67.0	0.	735.0
51	667.0	7.0	-288.0	0.	386.0
52	85.0	15.0	-110.0	0.	-10.0
53	-98.0	412.0	630.0	500.0	1444.0
54	-46.0	-43.0	0.	-1700.0	-1789.0
55	-188.0	-106.0	-129.0	0.	-423.0
56	-56.0	-174.0	110.0	0.	-120.0
57	-11.0	-4.0	-75.0	0.	-90.0
58	-154.0	-269.0	475.0	0.	52.0
59	189.0	76.0	-40.0	0.	225.0
FI&RE60	6.0	0.	0.	0.	6.0
61	107.0	64.0	-250.0	-310.0	-389.0
62	120.0	19.0	240.0	0.	379.0
63-64	403.0	519.0	218.0	2460.0	3600.0
65-66	265.0	281.0	0.	0.	546.0
67	-8.0	-81.0	-126.0	1170.0	955.0
SRVC 70	90.0	717.0	-219.0	0.	588.0
72	5.0	-21.0	-220.0	0.	-236.0
73	589.0	113.0	245.0	220.0	1167.0
75	30.0	132.0	0.	0.	162.0
76	133.0	18.0	0.	0.	151.0
78	263.0	-55.0	0.	0.	208.0
80	167.0	372.0	627.0	-210.0	956.0
81	37.0	-3.0	0.	0.	34.0
82	44.0	122.0	-299.0	5050.0	4917.0
83	81.0	47.0	168.0	0.	296.0
84	5.0	0.	-125.0	0.	-120.0
86	387.0	10.0	0.	0.	397.0
88	0.	0.	0.	0.	0.
89	228.0	-11.0	247.0	0.	464.0
TOTALS	5905.0	-566.0	-1127.0	2434.0	6646.0

Table A-3

TABLE - 8 NET EMPLOYMENT CHANGE IN CITIES LIKE INDY 74-76

COUNT BY - AEMPL74

	EMP SIZE				
SIC #	0-20	21-100	101-500	>500	TOTALS
AG 7	9.7	0 3	27 9	0	8 7
MIN8-14	10 8	2 1	-44 5	70.8	3 5
CONST15	4.0	-14.0	-5.6	-12.8	-3.4
16	5.5	-6.6	-5.0	37.5	-0.9
17	-2.7	-12.4	-11.2	-8.8	-7.0
MFG 20	5.0	-4.1	-5.2	1.6	-2.4
21	-39.4	-22.6	-100 0	28.0	22 9
22	4.3	-7.6	-11 2	-6.9	-8.5
23	12.8	-8.3	-10 4	-6.4	-7.8
24	9.0	-15.8	-17 3	-41 1	-14 5
25	8.8	-8.1	-14 0	6.7	-5.6
26	34.6	-3.6	-6.7	3.9	-1.3
27	2.2	-2 2	-4.4	-16.0	-6.7
28	9.3	4.5	-0.3	-2.1	-0.4
29-32	14.0	-6.5	-4.4	-11 4	-5.8
33	12.8	-1.9	-6.9	-1.0	-2.2
34	5.2	-3.8	-6 5	-3.1	-3.7
35	3.9	-3.4	-6.0	0.9	-1.2
36	22.5	0.5	0.6	0.4	1.0
37	16.2	4.1	-3.2	-2.6	-2.2
38	13.0	7.8	-9.3	-18.7	-11 5
39	6.5	-5.0	-12 1	-14 1	-7.6
TR&U 40	27.1	-3.2	25.0	35.0	32.2
41	14.3	-0.5	-4.5	-36.3	-4.6
42	9.3	-0.4	0.0	-3.0	2.1
43	960.0	0.	0.	0.	24.6
44	16.8	-3.9	0.	0.	2.9
45	30.8	5.1	2.5	4.0	8.3
46	19.8	26.9	-1.4	0.	17.3
47-49	21.7	5.6	23.2	-0 3	10.4
TRADE50	10.4	0.0	0.6	21.5	6.3
51	13.5	3.9	0.5	35.4	8.1
52	4 1	1.5	-17.4	0.	2.2
53	-3.4	14.0	19.7	10.0	13.6
54	-1.8	9.7	5.5	24.9	5.6
55	-8.7	-3.6	-2.4	-0.6	-6.2
56	-0.2	-9.8	-12 0	5.3	-3.0
57	0.5	-3 7	-35 7	0.	-2.4
58	2.1	8 9	8.6	19.6	5.9
59	4.2	1.9	16.3	27.8	5.4
FI&RE60	229.6	54.3	47.7	0.	33.0
61	24.5	-6 0	-22 1	-19.3	-0.9
62	34.3	18.7	3 4	0.	17.7
63-64	63.9	16.4	9.9	24.4	20.0
65-66	49.2	7.9	3.9	0.	32.2
67	65.6	-5.5	-0.9	16.2	14.7
SRVC 70	21.9	20.4	16.9	-11 9	17.8
72	-0.6	-14.0	-6.7	0.	-5.2
73	33.3	19.0	8.3	43.8	23.0
75	0.9	4.8	-100.0	0.	1.0
76	8.2	17.8	60.2	0.	12.1
78	38.2	6 8	48.5	0.	24.0
80	60.8	72.2	35.7	24.6	32.6
81	105.6	10.0	0.	0.	52.9
82	72.7	59.5	15.1	13.5	16.6
83	160.8	96.2	26.5	0.	77.6
84	39.3	37.9	-100 0	0.	5.6
86	52.9	9.6	7.0	-11.0	15.7
88	225.0	0.	0.	0.	225.0
89	21.4	15.8	59.6	119 1	37.8
TOTALS	7.2	1.6	0.3	3.0	3.2

Table A-5

TABLE - 8 NET EMPLOYMENT CHANGE IN INDIANAPOLIS 72-76

COUNT BY - AEMPL72

	EMP SIZE				
SIC #	0-20	21-100	101-500	>500	TOTALS
AG 7	21 9	48 3	0	0.	49 3
MIN8-14	16 8	3 6	-56 1	0	-18 6
CONST15	15.7	-34 0	-44 2	0.	-12.1
16	22.3	-7.9	-36 3	0.	-3.6
17	9.9	-9.3	-48 1	0	-5.3
MFG 20	-26.6	-10 1	-10.3	-40.3	-18.9
21	0.	0.	0.	0.	0.
22	-72.2	-39 0	0.	0.	-45.3
23	-2.3	-6.5	-7.3	0.	-6.2
24	31.4	50.0	-31 7	-25 5	-2.8
25	3.1	17.5	83.1	0.	36.6
26	55.4	12.1	-34 3	0.	-18.3
27	-5.5	-2.7	7.0	-21.8	-9.5
28	7.4	-2.0	52.1	27.8	19.9
29-32	36.3	16.7	2.6	-11.7	2.6
33	34.0	-3.8	6.4	0.	8.2
34	12.5	-5.9	-7.0	150 9	35.0
35	17.9	7.1	-14.9	-19.6	-9.8
36	107 4	39.0	34.4	-20 4	-12 3
37	18.6	7.3	5.0	-12.6	-9.9
38	86.2	44.4	-45 7	0.	0.2
39	20.5	3.4	3.7	46.7	22.4
TR&U 40	44.4	0.	60.6	0.	1034 9
41	40.0	-22 8	-33.6	0.	-28.9
42	86.8	4.4	0.2	-3.4	13.5
43	0.	0.	0.	0.	0.
44	350.0	0.	0.	0.	350.0
45	19.8	26.0	0.	0.	127.4
46	0.	175.0	0.	0.	175.0
47-49	77.7	3.2	-27.8	2.2	1.2
TRADE50	28.1	10.5	8.1	0.	15.0
51	26.4	2.6	-22.9	0.	3.8
52	6.1	15.2	-50 0	0.	2.3
53	-18.0	212.3	138.1	45.5	76.6
54	-5.3	3.5	-22.0	-19.8	-12.1
55	-12.5	1.5	-41.6	0.	-8.9
56	8.6	-38.5	120.0	-57 1	-7.9
57	20.4	-0.2	0.	0.	15.9
58	10.8	23.0	174 9	0.	61.1
59	18.5	-5.4	38.4	0.	16.2
FI&RE60	0.	0.	0	0.	0.
61	112.0	50.8	-74 3	-70 6	-41 7
62	97.8	83.0	0.	0.	360.2
63-64	361.0	85.4	29.1	71.5	66.3
65-66	142.5	90.5	-47 1	0.	84.8
67	39.3	-85.0	16 7	0.	243.8
SRVC 70	50.7	253 8	-18.2	0.	53.6
72	0.4	-8.5	-56 8	-41.2	-22.1
73	65.0	18.3	-32 5	116 7	44.1
75	23.5	7.8	0.	0.	20.0
76	32.0	73.2	0.	0.	36.3
78	144.6	90.7	0.	0.	87.1
80	160.9	246 8	63.4	-32 8	-7.8
81	0	0.	0.	0.	0.
82	890.0	170 9	0.	0.	4397 5
83	0.	324.0	0.	0.	1180 0
84	133.3	-100 0	0.	0.	-93.2
86	621.9	0	0.	0.	778.1
88	0.	0.	0.	0.	0.
89	77 0	0.9	238.9	0.	53.9
TOTALS	21.9	11.2	-0.3	12.2	12.0

Table A-6

TABLE - ABS NET EMP CHANGE IN INDIANAPOLIS, 72-76

COUNT BY - AEMPL72

	EMP.SIZE				
SIC #	0-20	21-100	101-500	>500	TOTALS
AG 7	114.0	114 0	145 0	0.	373 0
MIN8-14	36.0	5.0	-160.0	0.	-119 0
CONST15	475 0	-611 0	-615 0	0.	-751 0
16	141.0	-80.0	-134 0	0.	-73.0
17	531.0	-430 0	-707 0	0.	-606 0
MFG 20	-95.0	-127 0	-362.0	-725 0	-1309 0
21	0.	0	0.	0.	0.
22	-13.0	-30 0	0.	0.	-43.0
23	-5.0	-29 0	-45 0	0.	-79.0
24	96.0	129 0	-130 0	-137.0	-42.0
25	10.0	53.0	295 0	0.	358 0
26	87.0	108 0	-829 0	0.	-634 0
27	-69.0	-68.0	74.0	-710 0	-773.0
28	29.0	-16.0	137.0	500 0	650 0
29-32	281.0	194.0	43.0	-350 0	168.0
33	68.0	-14 0	28.0	0.	82.0
34	152.0	-147 0	-269.0	3772 0	3508.0
35	310.0	227.0	-435 0	-1760 0	-1658 0
36	392.0	267 0	309 0	-3050 0	-2082 0
37	44.0	72.0	110 0	-2675.0	-2449 0
38	131.0	111 0	-240 0	0.	2.0
39	71.0	19.0	14.0	350 0	454 0
TR&U 40	8 0	50.0	303 0	5000 0	5361.0
41	42.0	-26 0	-562 0	0.	-546 0
42	968.0	121.0	3.0	-80.0	1012 0
43	5.0	0.	0.	0.	5.0
44	7.0	0.	0.	0.	7.0
45	23.0	25.0	222.0	0.	270.0
46	0.	105.0	0.	0.	105.0
47-49	313.0	28.0	-372.0	135.0	104 0
TRADE50	1937 0	621 0	213 0	0.	2771.0
51	649.0	78.0	-449 0	0.	278.0
52	109.0	56.0	-110 0	0.	55.0
53	-109.0	775.0	1710 0	1000 0	3376 0
54	-110 0	55.0	-33 0	-950 0	-1038 0
55	-514 0	54.0	-286 0	0.	-746 0
56	129.0	-119 0	180 0	-400 0	-210.0
57	425.0	-1.0	0.	0.	42[illegible].0
58	551.0	1096 0	600 0	4000 0	6247 0
59	850.0	-70.0	305.0	0.	1085 0
FI&RE60	26 0	0.	0.	0.	26.0
61	187.0	94.0	-303.0	-720 0	-742.0
62	89.0	83.0	516 0	0.	688.0
63-64	592.0	919 0	671 0	2298.0	4480.0
65-66	805.0	343.0	-124.0	0.	1024 0
67	57.0	-153.0	50.0	1570 0	1524 0
SRVC 70	113 0	1155 0	-229.0	0.	1039 0
72	6.0	-51.0	-486.0	-245 0	-776.0
73	906.0	199.0	-190.0	700 0	1615 0
75	309.0	29.0	0.	0.	338.0
76	227.0	60.0	0.	0.	287.0
78	415.0	224.0	0.	0.	639.0
80	185.0	506 0	545.0	-1740.0	-504 0
81	83 0	0.	0.	0.	83.0
82	89.0	188 0	0.	5000 0	5277.0
83	46.0	81.0	168 0	0.	295.0
84	4 0	-100 0	0.	0.	-96.0
86	199.0	50.0	0.	0.	249.0
88	0.	0.	0.	0.	0.
89	251.0	5.0	301.0	0.	557.0
TOTALS	12658 0	6227 0	-128 0	10783.0	29540 0

Table A-7

TABLE -
ROW PER CENTS

P TYPE

SIC #	24<HS	24 HS	24COLL	24COLL	34<HS	34 HS	34COLL	34COLL	64<H
1-2	3.1	2.6	1.8	0.6	6.0	7.5	1.3	0.9	46.8
7	7.7	5.2	6.8	3.1	10 5	7.7	2.5	3.7	30.2
8	6.6	4.9	4.9	0.	6.6	6.6	0.	9.8	37 7
9	0.	0	0.	0.	0.	14.3	0.	14.3	42 9
10	5.9	2.9	8.8	0.	5 9	8.8	2.9	2.9	35.3
11-12	2 9	2.9	0 8	0.4	9.8	5.8	1.0	0.4	59.5
13	2.3	6 4	3.4	0.8	6 4	10 2	1.9	3.4	36.8
14	3.3	3.3	1.4	1.4	11.2	7.4	1.4	0.9	47 0
15	2 7	5.4	3.5	1.0	8.6	11 3	2.5	1.7	34.6
16	2.8	3.8	3.5	1 2	8.2	7.7	2.3	2 1	41 3
17	2.7	5.6	2.4	0.8	9.4	11 0	2.4	0.9	34 9
20	3.9	5.9	2.6	1.5	8 8	11.0	2.6	1.1	36 8
21	3.7	5.3	1.6	0.	8.6	8.0	2.1	2 1	51.9
22	7.3	8.0	2.0	0.5	11 8	12 4	1.9	1.2	37 3
23	6.6	9.6	1.1	0.3	14.6	11 0	1.1	0.6	38 0
24	6.4	5.9	1.0	0.4	14 8	6.4	0.8	0.8	44 5
25	6.0	10 1	1.5	0.8	12 5	10 3	2.0	0.8	37 1
26	4.5	7.4	3.1	0.7	8.8	11 5	3.4	1.8	33 5
27	1.7	7.9	4.0	1.6	5.1	14 5	4.4	3 8	19 8
28	1.6	6.7	3.7	1.5	4.6	12 0	4.5	7.1	20 7
29	1.9	7.8	4.3	1.6	2.2	14.1	3.5	3.5	18 4
30	4.0	8.4	2.8	1.2	9.4	12.0	3.1	2.3	28 7
31	5.5	10 1	1.1	0.2	12 5	12 5	1 7	0.4	38 5
32	2.7	5.9	2.4	0.8	9.2	11.8	2.5	1.6	34 9
33	2.2	6.3	3.0	0.9	6.5	11 1	2.4	1 6	36 9
34	3.8	6.3	3.0	0.9	8.3	10.9	3.0	1.4	34 0
35	2.4	7 7	3.1	1.0	6.6	13.6	3.8	2.4	27 1
36	2.7	9.8	2.7	0.6	8.1	14.6	3.5	2.4	26 4
37	2.8	6.3	2.4	0.7	7.2	13 0	3.9	2.4	32 0
38	3.2	7.9	4.0	0.5	6.5	15.3	3.2	3.1	22 6
39	4.6	7.4	3.4	1.5	9.9	11 4	3.4	2.1	29 7
40	1.6	5.6	2.3	0.6	3.1	9.8	2.1	0.6	39 4
41	2.0	3.9	2.6	2.0	6.9	9.2	3.3	0.8	38.3
42	3.1	5.0	2.8	1.0	10 7	11 7	2.7	0 7	38 2
44	2.7	4.0	3.4	2.7	5.4	4 7	2.0	0.7	45.0
45	0.9	9.9	11 8	2.6	2.2	20 6	9.2	4.1	7.6
46	0.	14.3	14 3	0.	0.	23.8	0.	0.	19.0
47	1.3	6.7	4.7	1.3	2.7	13 4	8.7	4.7	15 4
48	0.9	15 1	6.6	1.9	1.8	18 1	6.1	2.4	9.1
49	1.4	5.8	3.1	1.5	3.9	13 5	3.7	2.0	25 5
50	2.2	7.6	3.9	1.4	5.0	12 9	5.1	3.9	18.9
51	2.2	5.3	3.6	1.2	6.5	12 7	4.1	2.3	26 0
52	1.8	6.3	3.9	1.4	5.0	10.8	2.7	1.9	27 8
53	2.6	10 2	5.6	2.0	4.8	13 5	3.1	1.8	22 0
54	3.0	8.8	5.5	1.6	6.4	13.4	2.0	0.6	29.0
55	3.5	9.0	4.6	1.1	7.7	12.9	3.6	0.9	25.3
56	1.7	8.4	7.3	2.0	3.1	10 1	3.6	1.7	21 0
57	2.2	5.9	4.3	1.8	6.0	12 8	3 7	1.8	23 4
58	6.3	7.5	4.4	1.7	11.1	9.9	1.4	0.7	35.6
59	3.4	8.1	5.8	2.5	5.7	11.3	2.9	2.8	23 3
60	0.6	13 5	8.8	1.6	0.8	19 5	6.6	4.1	7.9
61	0.1	16 1	8.1	1.5	1.3	21 2	9.1	2.7	4.7
62	0.3	8.6	9.2	1.8	0.3	11.6	5.2	12 5	7.0
63-64	0 7	14 1	5.4	2.3	1.0	17.2	7.8	4 8	5.5
65-67	1 4	3.0	3.3	1.4	3.3	8.0	3.4	2.5	24.9
70	3.8	5.3	3.8	3.0	8.9	7.4	1.8	1.5	40.1
72	3.3	11 7	2.3	0.4	7.2	13 3	2.7	0.6	30 3
73	1.9	7.3	5.7	2.8	3.9	11 7	6.8	6.1	16 1
75	5.4	8.0	3.6	0.8	10 8	10 3	1.9	0.6	36 2
76	2.2	6.2	2.8	0.3	7.8	14 1	2.4	1.4	30 0
78	4.5	10 7	11.5	6.1	4.9	5.7	4.5	3.3	16 0
79	2.9	5.4	8.9	6.7	7.1	8.4	3.2	2.3	27 4
80	1.7	8.0	6.0	2.5	3.7	11.0	6.3	5.6	19 6
81	0.3	7.4	4.7	1.8	0.4	11 0	6.0	13 7	2.0
82	0.3	1.7	5.3	11 7	1.2	3.1	2.4	21 4	8.9
84	1.7	1.7	13 8	6.9	3.4	5.2	6.9	10 3	12 1
86	1.0	3.9	3.6	4.8	2.1	6.5	4.3	10.1	15 8
88	3.4	3.1	1.4	0.6	6 0	4.3	0.5	0.4	62 6

APPENDIX B

INDUSTRY GROUP NUMBER	CENSUS INDUSTRIAL CLASSIFICATION CODE	SIC#	DESCRIPTION
1	17	1, 2	Agricultural Production
2	18,19	7	Agricultural Services
3	27	8	Forestry
4	28	9	Fishing, hunting & trapping
5	47	10	Metal mining
6	48	11,12	Coal Mining
7	49	13	Oil & gas extraction
8	57	14	Non-metals mining (except fuels)
9	67	15	Building construction
10	68	16	Other construction
11	69	17	Special trade contractors
12	268, 269, 278, 279, 287-89, 297, 298	20	Food manufacturing
13	299	21	Tobacco mfg.
14	307-309, 317, 318	22	Textiles mfg.
15	319, 327	23	Apparel mfg.
16	107 -109	24	Lumber & wood products mfg.
17	118	25	Furniture & fixtures mfg.
18	328, 329, 337	26	Paper products mfg.
19	338, 339	27	Printing & publishing
20	347-49, 357-59, 367-69	28	Chemicals
21	377, 378	29	Oil refining
22	379, 387	30	Rubber & misc. plastics mfg
23	388-89, 397	31	Leather products mfg.
24	119, 127, 128, 137, 138	32	Stone, clay, glass & concrete products
25	139, 147-49	33	Primary metals industries
26	157-59, 167-69	34	Fabricated metal products
27	177-79, 187-89, 197, 198	35	Machinery (except electrica
28	199, 207-209	36	Electronics
29	219, 227-29, 237, 238	37	Transportation Equipment
30	239, 347-49, 257	38	Specialty equipment

INDUSTRY GROUP NUMBER	CENSUS INDUSTRIAL CLASSIFICATION CODE	SIC#	DESCRIPTION
31	258, 259, 398	39	Misc. mfg.
32	407	40	Railroad transportation
33	408-9	41	Transit operators
34	417-18	42	Trucking & warehousing
35	419	44	Shipping
36	427	45	Air transportation
37	428	46	Pipelines (exceptnaturalgas)
38	429	47	Transportation services
39	447-49	48	Communication
40	467-69, 477-79	49	Electric, gas & sanitary services
41	507, 529, 537-39, 557-59, 569, 587	50	Wholesale trade-durables
42	508, 509, 527, 528, 567, 568	51	Wholesale trade-nondurables
43	607-8	52	House & garden supplies dealers
44	609, 617-19,627	53	General merchandise stores
45	628, 629, 637, 638	54	Food stores
46	639, 647-49	55	Car dealers & gas stations
47	657-58	56	Clothes stores
48	667-68	57	Home furnishing stores
49	669	58	Eating & drinking places
50	677-79, 687-89,697-99	59	Misc. retail
51	707	60	Banking
52	708	61	Credit agencies other than banks
53	709	62	Securities & commodities
54	717	63-64	Insurance
55	718	65-67	Real estate, law & misc. financial
56	777-78	70	Hotels & other lodging
57	779, 787-89, 797-98	72	Personal services
58	727-29, 737-39, 747-48	73	Business services
59	749, 757	75	Auto repair services
60	758-59	76	Misc. repair services

INDUSTRY GROUP NUMBER	CENSUS INDUSTRIAL CLASSIFICATION CODE	SIC#	DESCRIPTION
61	807	78	Movies
62	808-9	79	Amusement & recreation services
63	828-29, 837-39, 847-48	80	Health services
64	849	81	Legal services
65	857-59, 867-68	82	Educational services
66	869	84	Museums, zoos, galleries
67	877-79, 887	86	Membership organizations
68	769	88	Private households
69	888-89, 897	89	Misc. services

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[15]A typology developed by the Urban Land Institute, in their previously cited publication.

[16]Urban Land Institute, p. 5.

[17]Webber, op. cit., p. 24.

[18]Witherspoon, op. cit., p. 74.

[19]Ibid, p. 69.

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Chapter Five

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[2]The term 'migration area', and definitions of them, were developed as part of a project to identify household and firm migration patterns. The areas consists of groups of counties, and subdivide the Bureau of Economic Analysis' employment areas into urban and rural components. For practical purposes, metropolitan migration areas can be thought of synonymously with SMSAs. (See Peter Allaman and David Birch, Definition of Migration Areas Used in the Inter-Area Migration Project [Cambridge, Mass.: M.I.T.-Harvard Joint Center for Urban Studies, 1975]).

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[6]Birch, Using..., op. cit., p. 5.

[7]Ibid, pp. 5-7.

[8]Ibid, p. 16.

Chapter Six

[1]For a detailed description of the Southwest Corridor highway controversy, and the subsequent decision to replace the road with a relocated transit facility, see Lupo, et al., op, cit.

[2]Birch, Choosing ..., op. cit., p. 26, 33.

[3]In The Job Generation Process (op. cit.), Birch found that 66% of the new jobs created over the 1969-76 period (or 6.8 million jobs) were produced by firms with twenty or fewer employees.

[4]Birch and MacCracken, op. cit., pp. 15-35.

[5]Ibid, pp. 42-3.

[6]For a more detailed discussion of the grouping procedure and choice of criteria, see Birch, Choosing a Place to Grow (op. cit.).

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[9]Ibid, p. 26.

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[12]Ibid, p. 33.

[13]For more information about this standardization procedure, see David Birch, Reilly Atkinson, Sven Sandstrom and Linda Stack, The New Haven Laboratory: A Test-Bed for Planning (Lexington, Mass.: Lexington Books, 1974), pp. 45-49.