This is to certify that the

dissertation entitled

HUMAN CAPITAL AS A REGIONAL FACTOR
IN THE GROWTH OF SMALL FIRMS

presented by

Joan Margaret Kendall

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Geography

Major professor

Date March 20, 1995

HUMAN CAPITAL AS A REGIONAL FACTOR IN THE GROWTH OF SMALL FIRMS

By

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Geography

1995

ABSTRACT

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Small firms are accounting for an increasing share of new employment, but growth in the number of small firms is not occurring equally over space. Since small firms are less likely to make explicit location decisions, regional variation in the number of such firms is less likely to be explained by cost-related factors traditionally thought to be most important in attracting firms to a region. Regional factors which influence new firm formation and survival rates, such as a region's human capital, are expected to be more important to growth in small firms. Regional variation in the distributions of small firms and of several human capital variables are examined using MSA-level data, and regression analysis is used to measure the impact of human capital on small firm growth. This relationship is examined for two different firm-size categories and for four industrial sectors. In all but one of the sectors examined, human capital variables are found to be significant predictors of growth in the smallest category of firms.

ACKNOWLEDGEMENTS

I would like to thank the Department of Geography for the financial support I received, the faculty and staff for their guidance and support, and my fellow students for their friendship and moral support. In particular I would like to express my appreciation to the members of my committee: Bruce Pigozzi, Gary Manson, and Assefa Mehretu from the Department of Geography, and Karen Roberts from Labor and Industrial Relations; and also to Judy Olsen, for encouraging me to pursue this degree. And last, but definitely not least, I thank my entire family, whose support and faith in me contributed significantly to my success in completing this degree.

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CHAPTER I

INTRODUCTION

The decade of the 1980's saw small-business dominated industries' share of total employment steadily increasing (U.S. Small Business Administration, 1989), and currently small firms are responsible for an increasing share of net new employment (Erdevig 1986; Loveman, Piore, and Sengenberger 1990; U.S. Small Business Administration 1989; White and Osterman 1991). Some of this increase in small firm employment can be accounted for by the shift to services (since service firms tend to be smaller than manufacturing firms), but evidence also indicates that small firm growth *not* related to inter-industry shifts is occurring in all major sectors of the economy (Mardsen 1990, Piore 1990). Much of this growth in small firms is attributed to the rise of flexible specialization and assciated downsizing, vertical disintegration, and increased outsourcing (Loveman et.al. 1990), all responses to changing global competitiveness. According to Spindler and Forrester (1993), such economic changes are related to the increased premium placed on the skills and education of the labor force; and Reich (1991) emphasizes that in an increasingly global economy, where most factors of production are more mobile than labor, it is the skills and abilities embodied in a nation's laborforce that are the key to its *future* productivity and competitiveness. These ideas suggest that

the success of any business, but particularly the small firm, will increasingly be dependent upon its human capital. Does this also translate into a more immediate and direct link, at the *regional* level, between human capital and the above noted growth in small firms? This question is the focus of this dissertation.

Research related to regional variation in the growth of entrepreneurship and small firms suggests that *regional* factors do play an important role in the growth of such firms (Beyers, Christopherson, Erickson, Gibson, Hewings, Malecki, McConnell, Rees 1990; Erdevig 1986), but regional factors which explain variation specifically in *small* firm growth have not been identified. Although factors which impact regional growth in general would certainly also explain some of the differential growth in *small* firms, Watts (1987) suggests that because small firms do not usually make explicit location decisions, *cost* factors such as local tax and utility rates, which are usually emphasized when the focus is upon *attracting* industry, are likely to be relatively less important to the location of small firms. This is not to imply that location is not important to the success of small firms, only that locational *adoption* is more likely to be associated with small firms, while locational *adaption*, the "... rational selection of an optimal location for a firm," is more characteristic of larger firms (Berry, Conkling, and Ray (1993, p. 296). This suggests that regional characteristics which foster the

creation and success of small firms, factors such as the region's industrial structure and its *human* capital, are likely to be more important determinants of small firm location.

The Growing Importance of Human Capital

Although according to Kiker (1966) a few 19th century economists such as Fisher and von Thunen did argue for treating people as capital, it is primarily since the middle of this century that leading economists, including Theodore Schultz (1971, 1990) and Lester Thurow (1970), began to acknowledge the *quality* of human input as a significant factor in economic growth. And even recently, says Schultz (1990, p.3), "Growth models either omit or underrate the increases in income from investments in human capital." For the most part, because the quality of labor was generally less important in primary and secondary industries, the importance of human capital to economic growth and development has focused on the quantity, rather than the quality, of the laborforce (Salamon, 1991). As post-industrial economies evolve, the emphasis shifts to labor force quality, the key to productivity and the focus of human capital theory. As Thurow (1970) has stated,

> Economists cannot determine the sources of economic growth if they measure labor as a homogenous commodity...Increases in the productive capacities of labor play an important role. Increases in human skills, talents, and knowledge are of primary importance. Measuring labor in terms of human capital focuses attention on this source of economic growth. Labor is no longer regarded as a homogeneous, fixed commodity, but as a commodity that may be expanded and improved (p. 11).

Packer (1991), acknowledging the relationship between productivity and economic growth, focuses on the relationship between education and productivity. He sees the need for increasing productivity as a response to both demographic and economic change. The primary demographic issue centers on the need for greater laborforce productivity resulting from the increased dependency ratio which will occur as the baby-boomers began to retire. At the same time, he points out (p. 45) that economic changes, the shift away from manufacturing, the technological revolution, and changing competitive environment, "...have outpaced the change in our education and training institutions and methods."

There is no question that in advanced industrial economies industrial restructuring and changing global competitiveness are increasing the demand for skilled labor and for more responsive production systems (Beyers, et.al. 1990; Howell and Wolff 1991; Lever 1985; Spenner 1988; Spindler and Forrester 1993; Storper and Walker 1983). Although traditional location theory emphasized transport costs (Webber 1984), as the economic base shifts away from manufacturing, transport costs decline in relative

importance, and productivity is increasingly related to human resources (Beyers, et.al. 1990; Leven 1985; Lever 1985; Storper and Walker 1983). According to Leven, as the economy shifts from goods to services, and as the information content of output increases, regional variations in levels of technological knowledge become a factor in regional development. As Berry, Conkling, and Ray (1991, p. 298) explain:

> Location theory can no longer confine itself to identifying the specific location that optimizes some requirement of an economic maximizer. Instead, it must seek to understand the processes that enable an entrepreneur to start up a small business, to survive and to grow, as well as the processes that cause firms, large or small, to fail and to exit.

Schultz (1990) focuses on the role of the entrepreneur; he views productivity as increasingly related to education, not only because education increases skills, but because it enhances entrepreneurship, which he sees as essential to restoring the *disequilibria* which results from a modernizing economy. It is the relationship between education and entrepreneurship, he says, which explains why the proportion of farmers with college degrees is increasing. The importance of entrepreneurship is also stressed by Salamon (1991), citing documentation of a strong relationship between education and the adoption of innovations, a characteristic associated with entrepreneurship (Clark 1985). Also associated with entrepreneurship is new firm formation. Firm formation is receiving increasing attention because it is thought to explain much of the regional

variation in the growth of small firms, whose share of new employment, as noted above, has been increasing.

The purpose of this dissertation is to examine spatial variations in the role of human capital in small firm growth. Human capital will be measured by education and occupational background, and their relationship to small firm growth will be examined both for different size small firms and for different industrial sectors, over both Metropolitan Statistical Areas and census regions. This dissertation will differ from much of the traditional research on the role of human capital in economic development in the following ways: 1) its focus on human capital at the regional, rather than national, level; 2) its inclusion of entrepreneurship as a regional factor, as opposed to examining characteristics of individual firm founders; 3) its specific focus on small firms, and 4) the use of establishment data.

The dissertation will begin with an examination of small firm growth, with emphasis on the components of growth and the location of small firms. This will be followed by a discussion of human capital as a factor in economic development, particularly as such growth relates to small firms, consideration of how best to measure human capital within the context of regional development, and an examination of geographic patterns in the distribution of human capital.

CHAPTER II

SMALL FIRMS AND REGIONAL GROWTH

There is a considerable literature related to the increased contribution of small firms to employment growth, and there are reasons to expect that regional variations in this phenomenon may be related to geographic differences in human capital. The first step in examining the possibility of such a relationship is to settle upon a precise definition of *small firms*, examine actual patterns of small firm growth over space, and then take a closer look at the components of small firm growth and the factors involved in their increasing contribution to job growth.

Definition

Exactly what is meant by a *small* business is not clear, and according to Bannock (1981, p.25), "It troubles many people that there should be doubt about exactly what a small firm is." Most literature relating to small firms deals with the problem by simply avoiding any specific definition. The Small Business Administration (1989) indicates that small firms are sometimes defined as those with fewer than 500 employees, and sometimes defined as only those with under 100 employees. The SBA then offers a breakdown used by all federal agencies in publishing business data, and one which is consistent with that developed by the Office of Management and Budget: under 20 employees, *very small*; 20-99 employees, *small*; 100-499 employees, *medium*; and over 500

employees, *large*. Size, however, is not the only criteria to be considered. Bannock suggests that small firms are defined less by their absolute size and more by other factors, the essential characteristic being that a small firm is managed personally by the person who owns it. He also points out that "small" is relative to market share and to industry, and that even when industry is taken into consideration, definitions vary widely and tend to be somewhat arbitrary.

Contribution to Job Growth

Small firms' increased share of employment was noted in the introduction, but no evidence was offered to indicate how much impact such firms have on employment. The impact of change in the number of small firms in each sector on employment in that sector is examined for each sector by a simple regression of employment growth on small firm change as follows:

{1} $EMP_i = a + b_i SF_i + e_i$

where: EMP_i = percent change in total employment in sector i

SF_i = percent change in number of small firms, sector i from 1983-1988

Data used correspond with the breakdown (discussed earlier in this chapter) which the Small Business Administration indicates is used by federal agencies publishing business data for *very small* and *small* establishments (1-19 employees and 20-100 employees, respectively).

The results of this analysis are seen in Table 1. All coefficients are positive and significant at P=.01, and while R^2's are not large, they clearly indicate that small firm change has a positive impact on employment in all sectors. This impact appears to be greater in the Finance, Insurance, and Real Estate and the Service sectors than in the Manufacturing or Business Services sectors. However, it appears that for the Finance, Insurance, and Real Estate and the Business Service sectors, *very* small firms have a greater impact, while in the Manufacturing sector *small* firms have the greatest impact; in the Service sector, the

TABLE 1. Regression Coefficients: Equation 1
(Impact of Change in Small Firms on Employment Growth)

Sector	a	B	t-value	R2
Manufacturing				
Very Small	0.052	0.301	5.538	0.087
Small	0.044	0.380	7.268	0.142
F.I.R.E.				
Very Small	0.108	0.582	12.676	0.336
Small	0.154	0.352	6.670	0.121
Services				
Very Small	0.129	0.587	12.843	0.342
Small	0.155	0.588	12.895	0.344
Business Services				
Very Small	0.349	0.426	8.339	0.179
Small	0.383	0.359	6.787	0.126

impact of both size firms appears to be equal. For Business Services, also, *very* small firms appear to have a greater impact than those size 20-99.

Increased small firm share of employment is explained by a variety of factors relating to restructuring, changing technology, and increasing competitiveness. The shift to services, because they are generally smaller establishments, accounts for some increase in the relative number of small firms; however evidence indicates that more of this increase can be accounted for by within-sector change than by inter-industry shifts (Mardsen 1990, Piore 1990). And, in fact, the Small Business Administration (1989) indicates that current growth in small firms represents a change from historical trends. The SBA states,

> Small businesses are generating relatively more of the job growth in traditionally large-business-dominated manufacturing, but relatively less of the growth in retail trade and services, industries generally dominated by small firms. (p.15)

Much of the trend toward smaller firms is thought to result from vertical disintegration, as rapidly changing technologies increase the need to contract out more specialized functions if firms are to remain competitive (Loveman, et.al. 1990). Also in the interests of competitiveness, firms are increasingly relying on smaller cores of full-time, permanent employees and depending more upon contingent labor, both to minimize costs and to foster flexibility (Abraham 1990). According to Bannock (1981) and White, et.al. (1988), it is this increased flexibility which

allows small firms to be able to respond to change more quickly, providing them with a key advantage over large firms. Thus, it is not difficult to see why, in the context of today's economy, small firms might be growing faster than larger firms. *Where* they are growing faster is a more difficult question to answer, although it seems reasonable to expect that areas with greater access to information which would be likely to increase awareness of the need for greater flexibility and also in the ability to achieve it would be more likely to show strong small firm growth. The search for an answer to why small firms are growing faster in some places than in other will begin in the following section with an examination of regional patterns in the growth of small firms.

Regional Patterns in Small Firm Growth

Small firm data are the same as used in the previous section (equation 1). Growth in the number of small firms is measured as the percent change in the number of small firms from 1983-1988. "All sectors" in Table 2 refers not just to the sum of the four sectors shown here, but represents total establishments. Starting with MSA data which has been aggregated to the census region level, Table 2 shows the percent change in the number of firms for selected sectors. It appears that for *very* small firms (Table 2a), over *all* sectors and for each of the individual sectors except Manufacturing, the strongest growth is found

in the Southeast. Even in Manufacturing, growth in the Southeast is considerably higher than in all but the Mountain region. The Midwest and Southwest regions, particularly the Southwest, had the worst rates of small firms growth; in these regions, only the Service sector displayed "reasonable" growth rates.

In the 20-99 employee category, (Table 2b), the Southeast region again displays the highest overall growth in firms; however, much of this aggregate growth must have occurred in sectors not included in the analysis, since this region not only does *not* have the highest rates of growth in any of the individual sectors, but has a very low growth rate in the Business Service sector (SIC 73). The Mountain

TABLE 2. Percent Change in Number of Establishments by Census Region

	Region					
Firm Size/Sector	NE	SE	MW	SW	MT	WEST
a) 1-19 Employees						
All sectors	14.39	19.61	10.41	2.79	17.08	15.82
Manufacturing	-3.01	11.43	-0.15	0.59	15.54	3.21
F.I.R.E.	12.58	18.57	2.10	4.71	11.24	12.87
Services	18.46	26.81	17.83	15.63	26.64	20.25
Business Serv	3.43	22.85	6.40	-4.59	7.67	2.05
b) 20-99 employees						
All sectors	23.94	39.03	23.82	6.18	25.13	30.75
Manufacturing	-3.23	13.12	12.05	-1.41	20.59	14.56
F.I.R.E.	15.58	15.28	11.18	11.19	16.60	14.91
Services	39.13	48.42	35.99	23.41	43.12	48.89
Business Serv	13.26	5.95	18.42	-1.82	19.25	23.95

and Western regions both show greater increases in small firms in most sectors, while the Southwest has the smallest rates of change (even negative in two sectors). The Midwest and Northeast regions fare better than the Southwest, although the Northeast does poorly in Manufacturing.

In general, the figures in Table 2 indicate that there is considerable spatial variation in the growth of both *very* small and small Manufacturing firms. The same is true for very small Finance, Insurance, and Real Estate firms, although small firms in this sector vary less than those in other sectors. The sector which reflects the most consistency in growth rates, for both firm-size categories, is the Service sector; however, Business Service firms, a subset of Services, displays the most variation over space. Table 2 indicates that in the "all sectors" category, small firms with 20-99 employees grew much faster in the Midwest, Mountain and Western regions than did the *very* small firms. This was not the case in other regions. In both the Northeast and Southwest regions, *negative* growth in Manufacturing was greater in the larger firms, and in the Southeast, growth in the larger firms was slower in both Finance, Insurance, and Real Estate and Business Service firms. These aggregate census region data, while helpful in determining general patterns, are likely to hide considerable within-region variation, as reflected in maps of MSA level data.

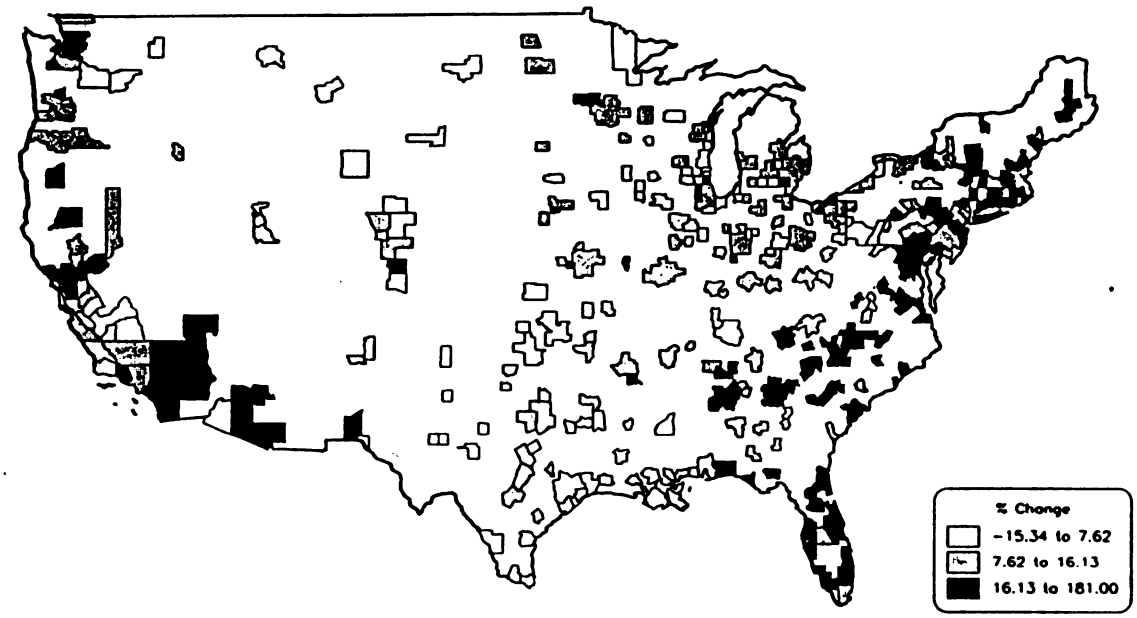
Sectoral changes in the number of firms over Metropolitan Statistical Areas are mapped in Figures 1 through 5. An examination of Figure 1 shows that over *all* sectors (for both small and *very* small establishments), most areas of the Southeast do exhibit strong growth, with the strongest growth concentrated in Florida, Atlanta, and parts of North Carolina. In fact there is a fairly strong bicoastal pattern. The midwest and south central/southwest show the least growth, while actual decline in small firms seems concentrated in a vertical belt beginning south of Minneapolis and running all the way to the Gulf. Even the traditional "rust belt" exhibits small firm growth in many MSA's.

For all sectors, the major differences between *very* small firms (Figure 1a) and small firms (Figure 1b) are in the Northeast and the Great Lakes areas. In the Northeast, *very* small firms appear to be more successful than small firms, at least in relative terms. In contrast, in the Great Lakes area, specifically in MSA's around the Detroit area, small firms are growing at a faster rate than *very* small firms. (Note: the classes are not the same on both maps; the range of change for small firms is considerably higher than for *very* small firms).[1]

---

[1]Because the range of change, both between *very* small and small firms and among sectors, was so great, it was not possible to use an absolute scale for all maps and have a meaningful result; thus it was decided to use categories which produced equal numbers of cases, i.e. divided MSA's into lower, middle, and upper thirds.

a) CHANGE IN VERY SMALL ESTABLISHMENTS



b) CHANGE IN SMALL ESTABLISHMENTS

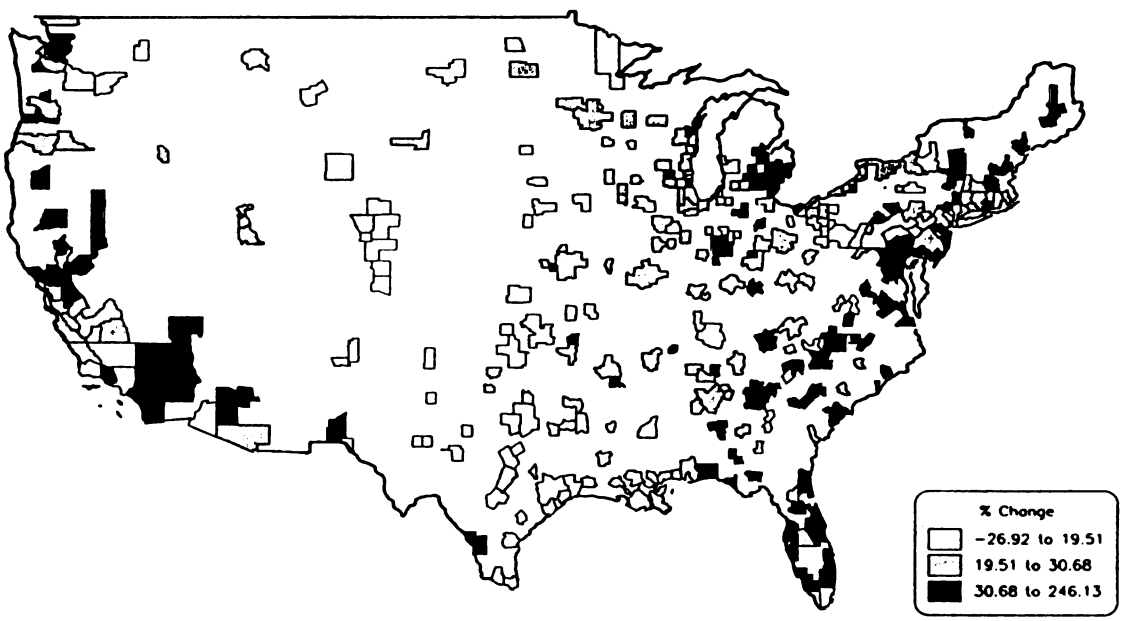


Figure 1. Percent Change in Total Establishments

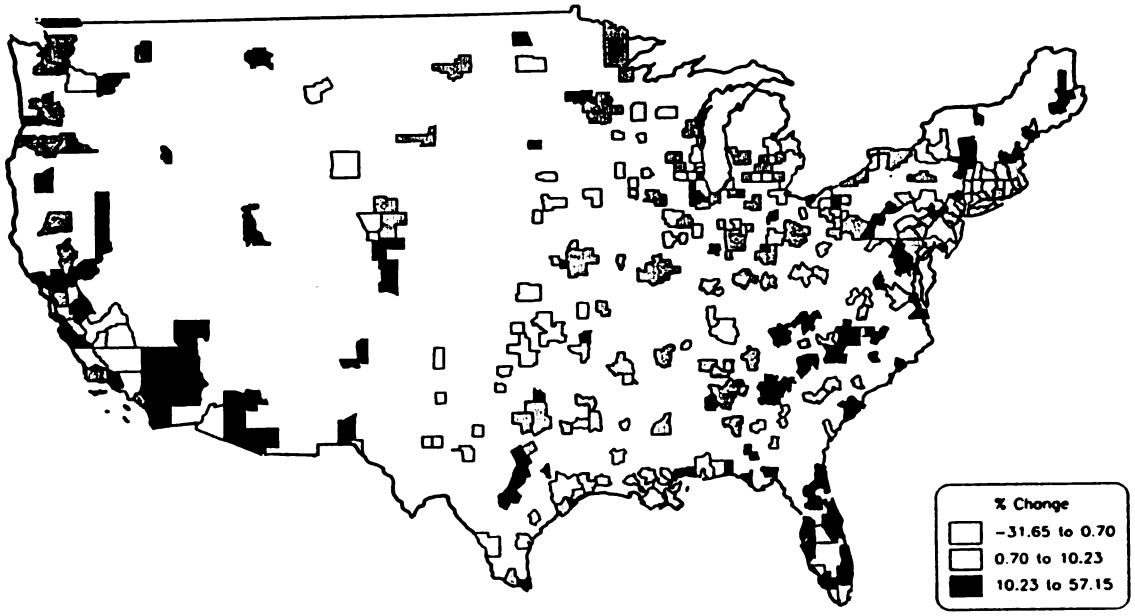
For individual sectors, the maps of changes over MSA's revealed the considerable variation within census regions that did not appear in Table 2. For example, when MSA changes in the number of *very* small Manufacturing firms over MSA's are examined, while Table 2a indicated negative growth in very small Manufacturing firms in both the Midwest and Northeast, Figure 2a shows many MSA's in both of these regions to have high levels of growth in very small manufacturing firms, along with areas of negative growth.

For *very* small Manufacturing firms, the southeast, and particularly Florida, along with MSA's in Colorado, southern Arizona and New Mexico, experienced the greatest growth. Many areas of strong growth also occurred along the west coast as well as in New England. While there does not appear as strong a bicoastal pattern among Manufacturing firms (compared to all firms), the areas of greatest decline *are* concentrated in the middle of the country.

Small Manufacturing firms along the East coast (both north and south) appear to be growing much more slowly than *very* small firms (Figure 2b). On the other hand, small Manufacturing firms fared better in the Great Lakes area, the upper Midwest, and on the West coast than did *very* small firms. For example, Detroit and Saginaw, Michigan; Duluth, Minnesota; and Wausau, Wisconsin all show strong growth in small Manufacturing firms but only weak or negative growth in *very* small Manufacturing firms.

In contrast to Manufacturing firms, growth in *very*

a) CHANGE IN VERY SMALL MANUFACTURING FIRMS



b) CHANGE IN SMALL MANUFACTURING FIRMS

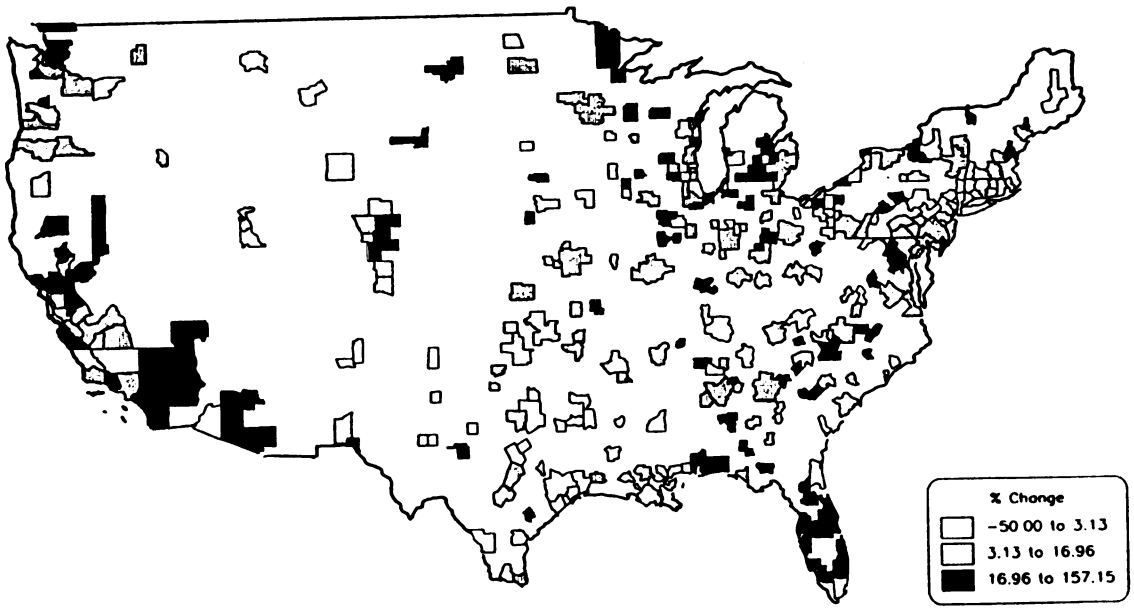


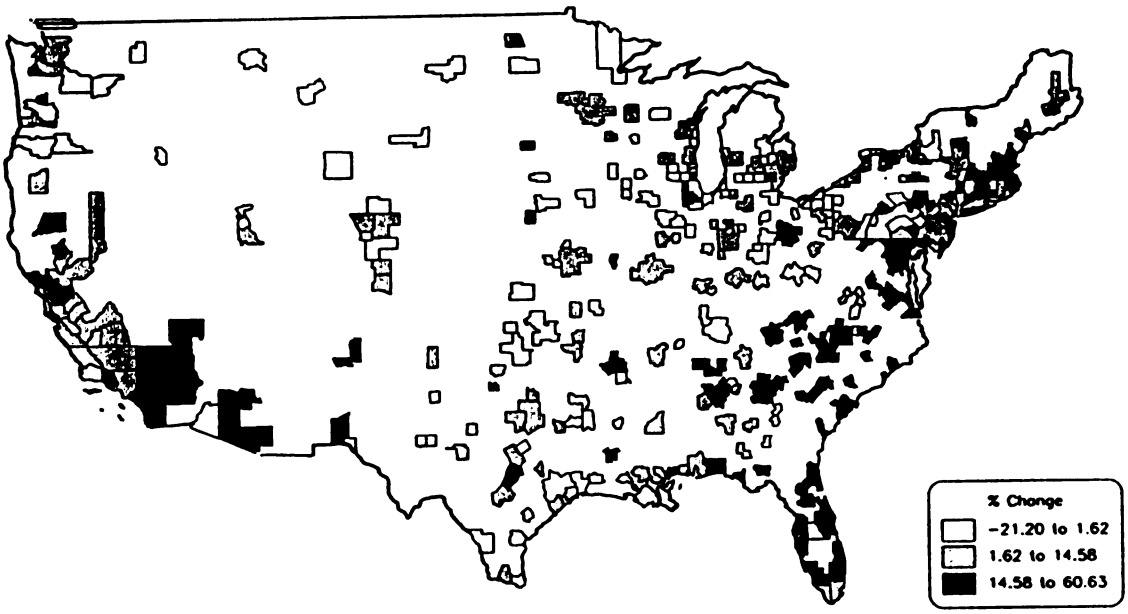
Figure 2. Percent Change in Manufacturing Firms

small Finance, Insurance, and Real Estate establishments, which appeared positive across all regions in Table 2a, exhibits a strong bicoastal pattern (see Figure 3a), with the exception of the Northwest. In the Midwest, where *very* small firm growth is the weakest in this sector, the Ann Arbor MSA, along with Kenosha, Wisconsin, two MSA's in the Chicago area, Columbus, Ohio, and Columbia, Missouri, stand out. Much of the remainder of the Midwest shows actual decline in Finance, Insurance, and Real Estate. In the Southwest, there is also considerable decline, although two isolated areas of strong growth are Little Rock, Arkansas and Austin, TX.

The greatest difference in growth between *very* small and small Finance, Insurance, and Real Estate firms is the lack of the bicoastal pattern for the small firms (Figure 3b). Growth in these firms shows the least amount of geographic concentration of any of the sectors of either size category.

Figure 4a maps the growth in *very* small Service firms, which, next to small Finance, Insurance, and Real Estate firms, appear to be the least concentrated, with the exception of the Southeast. In general, the Service sector shows strong growth in the Southeast and in the Washington D.C. area, and parts of the Mountain and Western regions; and although the Northeast region did not experience the strong growth (compared to other regions), this was the Northeast's strongest sector. In contrast, small Service

a) CHANGE IN VERY SMALL F.I.R.E. FIRMS



b) CHANGE IN SMALL F.I.R.E.FIRMS

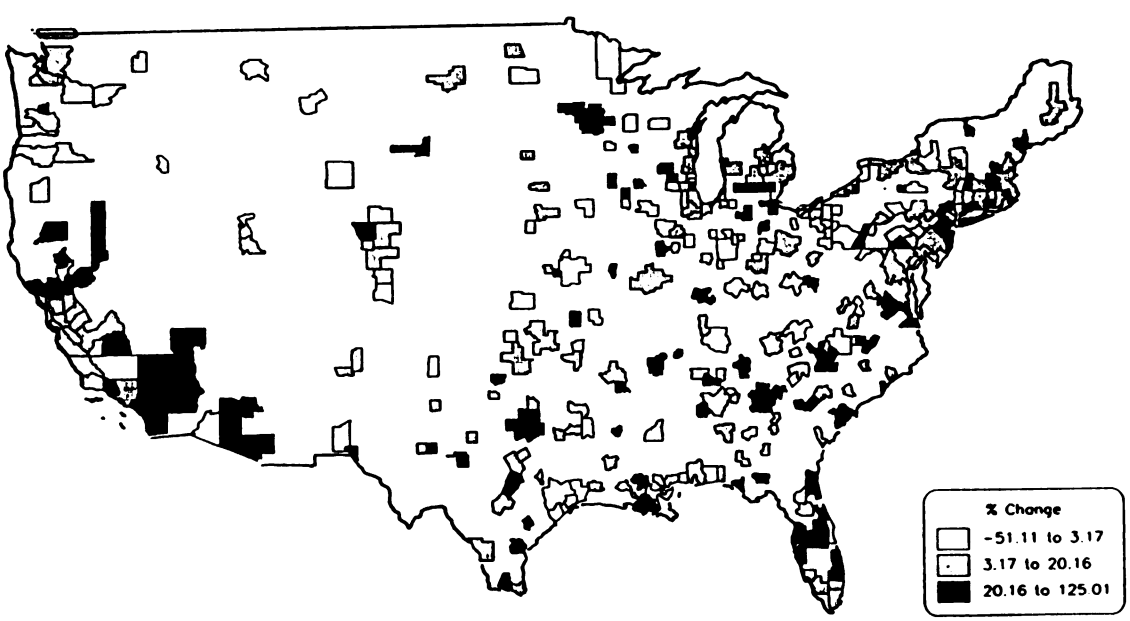
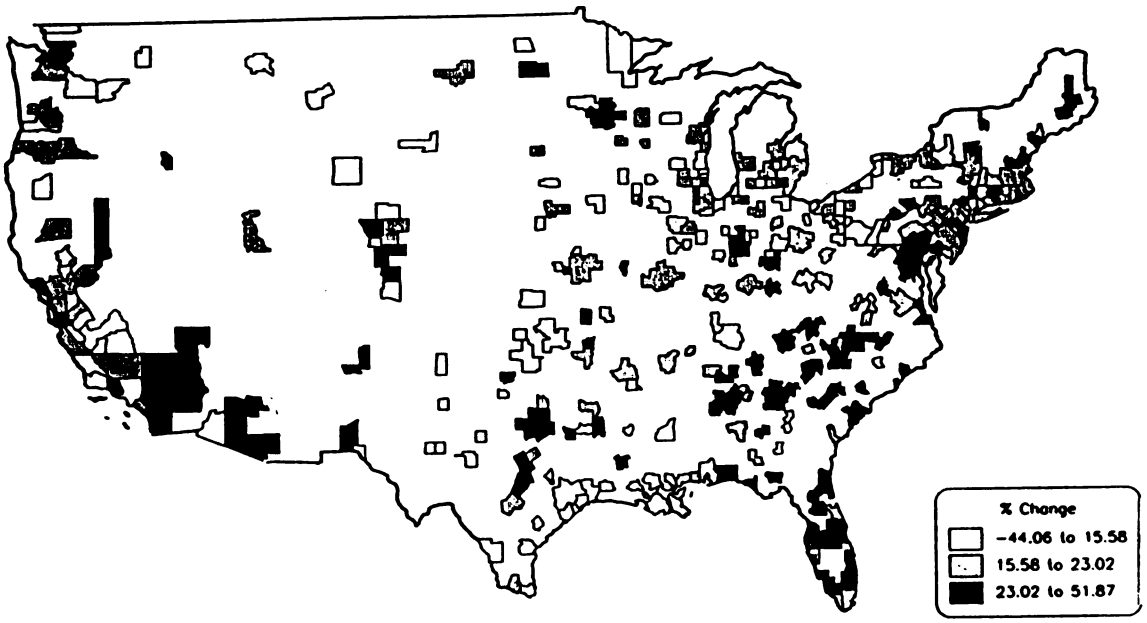


Figure 3. Percent Change in Finance, Insurance, and Real Estate Firms

a) CHANGE IN VERY SMALL SERVICE FIRMS



b) CHANGE IN SMALL SERVICE FIRMS

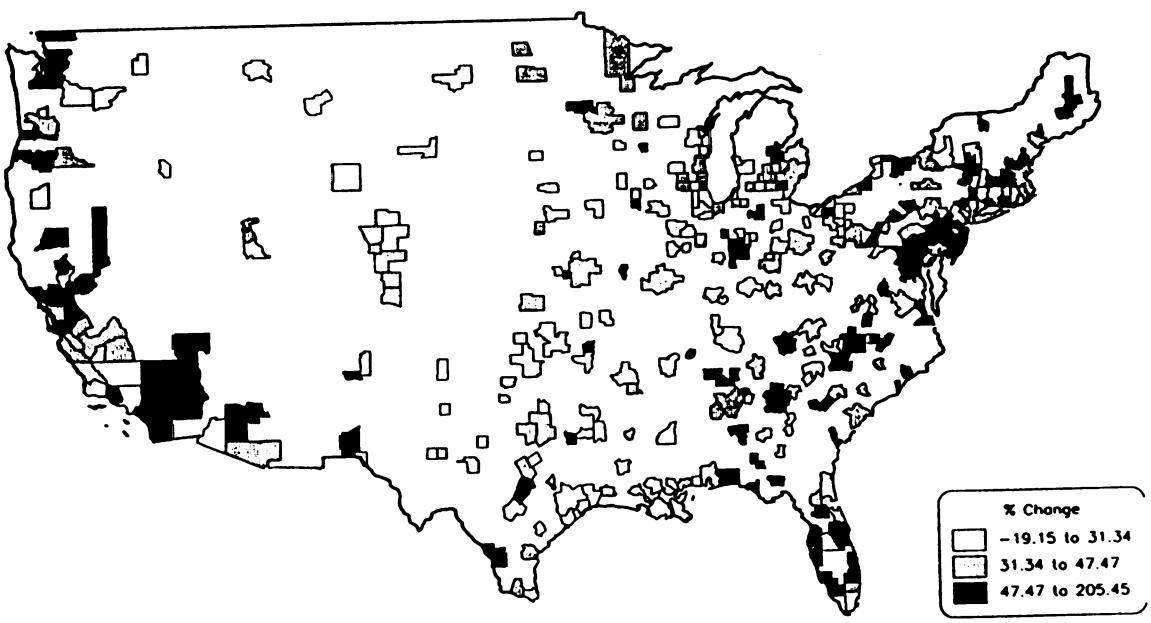
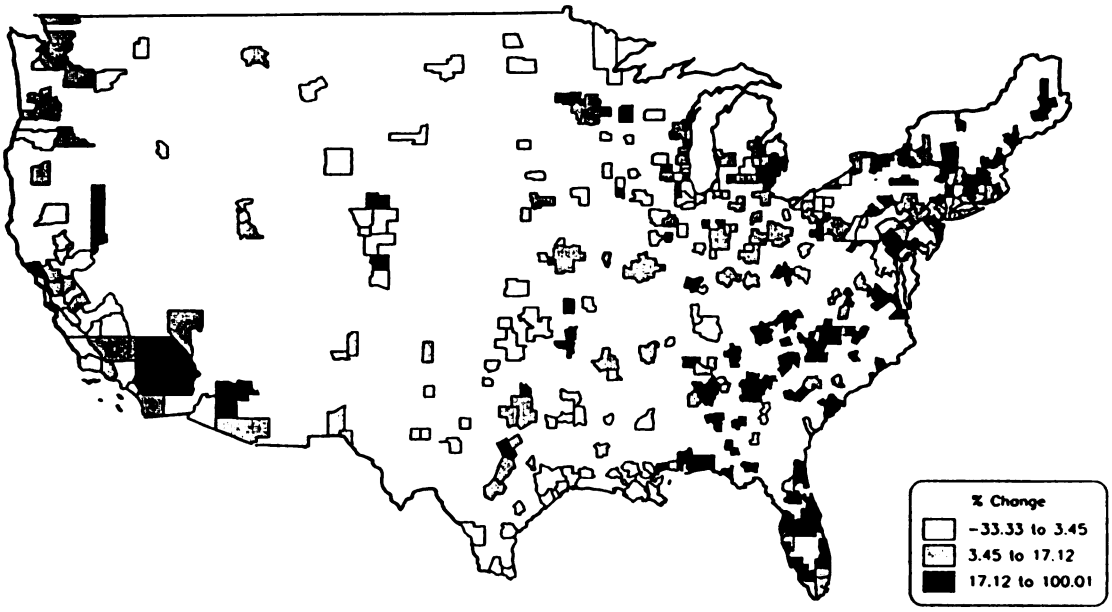


Figure 4. Percent Change in Service Firms

firms (Figure 4b) exhibited a stronger bicoastal pattern than did *very* small firms.

Growth in Business Service firms, a subsector of Services, was quite different for the two size categories. According to Table 2, in the Northeast, growth in *very* small Business Services firms was much weaker than in Services. However, comparing Figures 4a and 5a, this does not appear to be the case for *very* small firms. These firms, particularly in the New England area, appeared much stronger in Business Services growth than in Services. It is likely that the strong growth in Services in the Washington D.C. area is responsible for the aggregate strength reflected in the Table 2 figures. In general, in contrast to Service firms, growth in the number of *very* small Business Service firms is much greater in the Southeast and in Florida (Figure 5a) than in any other region. There was much negative growth in this sector in the Southwest and even in the Northwest, with the exception of the Seattle area, This is somewhat surprising, given the research of Beyers (1990) and Beyers and Alvine (1985) on the growth of producer services in this area. However, since this research focused on firms exporting services (which are generally larger than those providing services for local consumption), perhaps a decline in the number of *very* small firms in this sector is the reciprocal of an increase in small Busines Service firms, which both Table 2 and in Figure 5b show to be much higher in the Western region. In general, the maps of small

a) CHANGE IN VERY SMALL BUSINESS SERVICE FIRMS



b) CHANGE IN SMALL BUSINESS SERVICE FIRMS

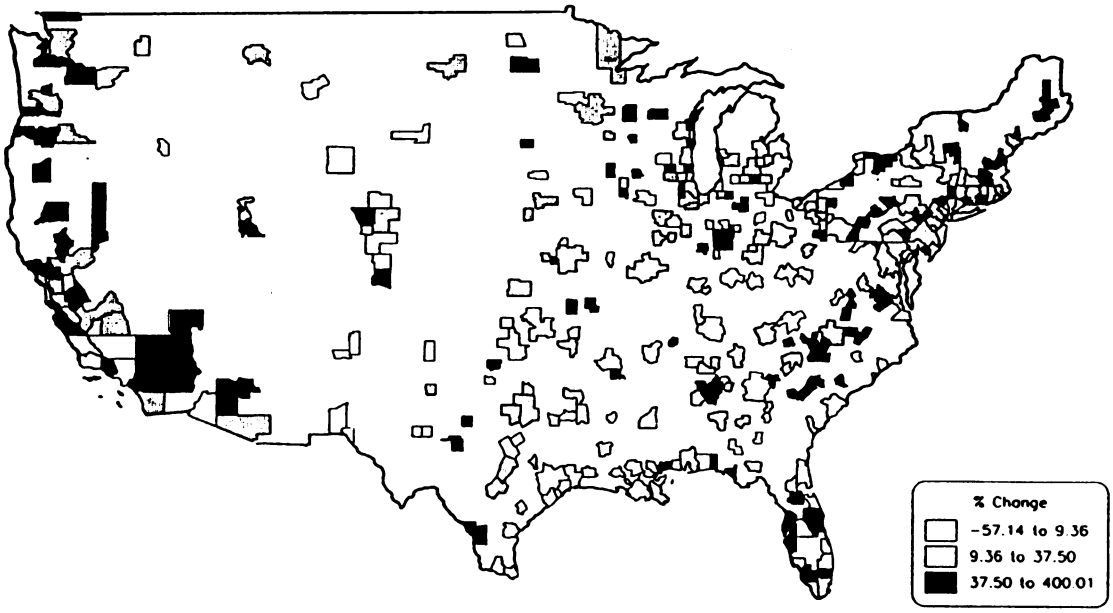


Figure 5. Percent Change in Business Service Firms

firm growth show considerable variation within regions which is not evident in the figures in Table 2.

An interesting phenomena that is seen when firm growth in all sectors is examined is the apparent spatial polarization by sector. Although many MSA's, such as Atlanta, exhibit strong growth in all sectors, there are numerous MSA's which fall into the highest growth categories in some sectors and the lowest in others. For example, Pueblo, CO shows stronger growth in very small Manufacturing firms than does adjacent Colorado Spring, yet Colorado Springs is experiencing very strong growth in Services while Pueblo shows negative growth in this sector. The same is true for adjacent Minneapolis and St. Cloud, MN.

To understand why small businesses are growing faster in some regions than in others, it is necessary to examine more closely the components of small firm growth.

Components of Small Firm Growth

Change in the number of firms, like population change, results from birth, deaths, and net migration, i.e. firm formations, minus business failures, plus net relocations (including branch plants). It also occurs as a result of both inter-industry shifts and downsizing within industries. Since both downsizing and the shift to services are fairly universal phenomena resulting from restructuring and competitive pressures, change attributed to these factors might be expected to vary more by industry than by region. If this is true, it would be reasonable to assume that,

within each industry, most of the *regional* change in the number of small firms will result from births, failures, and net relocations.

Of these three major factors, relocations are expected to account for less of the variation in *small* firm growth than are births and survival rates since, according to Watts (1987), small firms do not usually make explicit location decisions. Relocation is more likely to be a factor in regional small firm growth as a result of branch plant location. While not dismissing relocation as accounting for some of the change in small firms, more regional variation will be accounted for by differences in firm formation rates and failure rates. Thus the role of human capital in these two processes will be considered more closely.

New Firm Formation

A considerable amount of literature examines variation in new firm formation rates at the regional level (Ashcroft, Love, and Malloy 1991; Bartik 1989; Carlton 1979, 1983; Gould and Keeble 1984; Lloyd and Mason 1984; Moyes and Westhead 1990; Schmenner, Huber, and Cook 1987; Watts 1987). Watts'1987 review of this literature summarized regional characteristics affecting new firm formation into three categories: 1) industrial mix, 2) occupational and social characteristics, and 3) plant size structure. It is the second category which includes human capital; variables examined by studies in this category are educational attainment, occupational mix, age structure, unemployment

rates, income, savings, and homeownership. In the analyses cited above not all of these variables are related to new firm formation, and some, such as age structure, show inconsistent results. Others are problematic for a variety of reasons. For example, as Horiba and Kirkpatrick (1979) point out, income cannot be used as a surrogate for skill since male earnings exceed female earnings significantly when female levels of education are equal or ever greater than males. Further, although income might be associated with human capital insofar as it may enhance natural ability and education, it is more commonly thought of as *resulting from* education and abilty. The two measures most commonly associated with new firm formation are educational attainment and occupational background, particularly managerial experience. Of these two variables, education appears to be most universal.

Although occupational mix is expected to vary more at the regional scale than at the national scale, in the above mentioned regional level analyses, educational attainment is more consistently related to new firm formation than is occupational background. In fact Bartik (1989), in a state level analysis which used the variable *percent scientists and engineers* as a measure of occupational background (and using data which allowed him to distinguish between firm starts and branch plants), found this variable not to be significantly related to firm starts, although both percent

high school graduates and levels of public school spending were related.

When the location process, as opposed to the creation process, is considered, higher levels of education appear to be less significant than other laborforce skills. For example, in the case of a branch plant location, the location decision is made by someone *outside* of the region, and thus the entrpreneurial aspect of this location decision would not be a characteristic of the region *receiving* the firm; in this case, the region's laborforce skills would be more important than factors related to entrepreneurship. Schmenner, Huber and Cook (1987), in a study relating to the location decisions of new *manufacturing* plants, found that in general lower educational levels were more important; the percent high school graduates was positively related only to the location of manufacturing plants characterized by new product engineering.

These analyses may indicate that occupational skills, while important to growth in general, and often significant factors in a location decision (depending upon the type of industry involved), are less important in firm formation, i.e. occupational structure may be more important to *attracting* than to *creating* firms. Much of the creation process, as part of what is considered the *entrepreneurial* factor, is probably not industry-specific, except insofar as a founder's industry background oftens determines what type of firm is started. Education, as opposed to technical

training, is both more general and more transferrable. Insofar as firm formation is dependent upon general vs. specific knowledge, it will be more strongly related to education than to occupational background.

Numerous variables related to education are found in the literature, some measuring educational attainment (years of schooling, percent high school grads, percent college grads, etc.). Others are more qualitative, such as pupil/teacher ratios, dollars spent on education, and standardized scores, all measures of local school systems. Generally, all of these education-related variables tend to be associated with firm formation to some degree, although not consistently over space, due to the mobility of human capital.

A study by McNamara, Kriesel, and Deaton (1988) suggests that variables which measure the quality of *education* (pupil-teacher ratios, dollars spent), are less likely to impact local economic development than are education attainment variables which measure the quality of the *laborforce* (percent with college degree). They categorize the former as *flow* variables, and the latter as *stock* variables and argue that since the output of a local areas's education system does not necessarily remain in the region (and often does not in rural or depressed areas where employment is not available), an educational flow variable is not the best measurement if the focus is on regional characteristics, such as those which might encourage firm

formation. On the other hand, if the focus is on a region's potential, e.g. a corporation is considering locating a branch plant in an area and needs to consider if the school system can meet its labor needs, then a flow measurement might be more appropriate. Warner's (1989) comparison of the impact of education and other human capital variables on economic growth to cost-minimizing factors, used one measure of each: percentage of the population with more than 16 years of schooling (*stock*), and pupil/teacher ratios (*flow*). In a regression analysis using data from the 44 Metropolitan Statistical Areas in the southeast, both variables were significant predictors of growth (at alpha = .05).

Small Firm Survival

Since a high percentage of small firms fail within a short period of time, regional factors which encourage firm *survival* are also quite important. Many of the factors associated with new firm *formation* will also be related to firm *survival*, but not all. For example, research has documented instances where firm formation rates increase with unemployment, the explanation being that the firm founder had no other opportunity for employment. However, such a person is not necessarily going to have the education and skills required to successfully manage a small firm. Also, as Bruderl (1992) mentions, if it is unemployment which has motivated someone to start a business, there has probably not been time to adequately plan, look for and evaluate the best opportunities, or get the best advice.

Income also might be less important to the operation of a firm than during the start-up phase, although Lloyd and Mason (1984) found that lack of personal capital did tend to result in chronic undercapitalization of new firms, resulting in low rates of growth. Which characteristics *are* more important to firm survival?

According to Bruderl (1992), contrasting human capital theory with organizational ecology theory, research relating to organizational failure indicates that characteristics of the founder are the key to success; he describes successful individuals as coordinators, risk-takers, and innovators, pointing to managerial incompetence and lack of relevant experience as factors in failure. Human capital not only increases chances of success *after* a firm is set up, as it affects productivity, efficiency, and results in higher profits, but has an impact *before*. Banks more likely to loan money to individuals with more education and experience, and such individuals are better able to get relevant information, and make good decisions. Other factors which he indicates are also relevant to firm survival include prior self-employment, parental self-employment, and "leadership experience." Although a regional scale analysis cannot assess characteristics of individuals, to some extent such characteristics can be taken into consideration through surrogates. For example, a variables such as "percent in management" might reflect leadership experience.

In summary, considerable spatial variation in the growth of small firms is evident. Most of this variation is expected to be related to differences in small firm *formation* and *survival*, and only to a lesser extent to differences in those regional factors which might be related to the attraction of new firms. Because firm formation and survival have been shown to be associated with human capital, it is expected that regional variation in small firm growth is related to regional variations in human capital. The following chapter will take up the questions related to human capital: how it can/should be measured, how it relates to economic development at the regional level, and how it is distributed over space.

CHAPTER III

HUMAN CAPITAL AND DEVELOPMENT

Before developing hypotheses relating "human capital" to small firm growth, it is first necessary to determine exactly how human capital is to be defined, i.e. which variables might be used to measure human capital, and to consider which of these variables will best operationalize the model to be proposed. This will also require a more in depth discussion of how human capital functions at the regional level and an examination of how how human capital varies from region to region.

Definition

Although the term *human capital* may seem somewhat vague, there is general agreement as to its meaning, and it has changed little over time. Two-hundred years ago, in *The Wealth of Nations*, Adam Smith (1961) defined human capital as "... the acquired and useful abilities of all the inhabitants of the society..." and asserted that a nation's human capital was an important part of its wealth. In 1962, Weisbrod identified health, learning, and location (migration) the principal types of human capital investment; Thurow (1970, p.1) defined human capital as "...an individual's productive skills, talents, and knowledge," and Salamon (1991, p. 9) describes human capital as "...the size, productive capabilities, or useful life of the work force..." These characteristics go beyond simply labor

quantity; they reflect labor productivity and entrepreneurship (organization and management skills), often considered a separate factor of production (O'Farrell 1986). As an input to production, human capital has implications for both the attraction and the creation of industry. To the extent that labor productivity and entrepreneurship both vary over space, human capital is a factor in the location of economic activity and can provide a regional comparative advantage. Although a return to investment in human capital is not disputed, quantifying human capital in order to estimate this return is more problematic.

Measuring Human Capital

According to Spindler and Forrester (1993, p. 34), "...the link between education and increased productivity is generally accepted." Three measures of human capital stock commonly used in either growth or new firm location studies are identified by McNamara, Kriesel, and Deaton (1988) as: 1) number of persons 25 years of age or more having a college degree, 2) median years of schooling, and 3) percentage of adults with a high school education. Most studies tend to ignore health investment, and rely on formal education as the measure human capital (Denison 1962, Glomm and Ravikuman 1992). At the theoretical level, there is the problem that some of the expenditure associated with improving the well-being and abilities of human beings also represents consumption, not just investment (Salamon 1991). And, as Salamon points out, although this may be somewhat

true of investment in education and training, it is far more true of other forms of human capital investment, such as investment in health care. Another reason for the focus on education, as Becker (1962) pointed out, is that in developed economies, earnings are far more strongly related to education than to physical ability and strength; thus investment in education is seen as more directly related to development than investment in health. Not only is the return on investment in healthcare more difficult to quantify, but it may take longer to be realized.

According to Parnes (1984), this concentration on education further tends to be limited specifically to skills and abilities that have required some investment to acquire and that are in demand in the labor market. This specific focus on *formal* education is due in part to the fact that differences in natural ability and experience are more difficult to quantify. Also, as Schultz (1991) points out, at least within large populations the distribution of inherent, as opposed to acquired, abilities probably does not vary significantly.

McNamara, Kriesel, and Deaton (1988) suggest that one of the problems with demonstrating the relationship between education and economic development may be a result of the failure of much of this research to distinguish between human capital *stocks* and *flows*. Most of these studies have used various measurements of educational attainment, which, according to McNamara, Kriesel, and Deaton, would be

considered human capital stock, since they measure the existing level of education, the levels necessary to support the existing economic structure. In contrast, the authors argue, per pupil expenditures, the percent of teenagers in high school, and standardized test scores measure human capital *flows*, since they reflect marginal *change* in educational attainment. They appear to suggest that perhaps flow measures would be more important to *attracting* industry, since a relocating firm's concern is with laborforce potential, skills which will not outmigrate if appropriate jobs become available. A study which appears to support McNamara, Kriesel, and Deaton's position is that of Killian and Parker (1991). Results of this study, which compared education variables in both metro and nonmetro areas, indicated that although educational attainment was a significant factor in employment change at the metro level, it was not at the nonmetro level. In the rural areas, the initial job mix was a better predictor of employment change than educational attainment, a result which they attributed to the problem of the outmigration of human capital from areas of low job opportunity.

The fact that labor is mobile, that *human* capital, unlike fixed capital, does not have to remain at the location of the investment, raises another issue related to assessing the impact of investment in education, particularly in rural areas. If appropriate job opportunities do not exist in a region, a condition more

likely in rural areas, increasing the education or skills of the laborforce may only result in the outmigration of this capital, as reflected in Killian and Parker's (1991) results.

With respect to the determining the economic impacts at the regional scale, the human capital argument depends to some extent on the assumed immobility of the laborforce. And, although it is true that labor is more mobile at the regional level than at the national or international scale, according to the Committee for Economic Development (1987), both economic and demographic factors are contributing to declining workforce mobility. Watts (1987) also questions the mobility of labor, suggesting that the assumption that labor follows jobs needs to be examined more closely. To the extent that labor is not as mobile as it once was (or was assumed), the possibility of human capital as a factor in local economic growth increases.

Human Capital as a Regional Factor

At the national scale, the role of human capital in development is well documented (Psacharopoulos and Woodhall 1985, Schultz 1971, Thurow 1970, Weisbrod 1962). At the individual level, the return to investment in education, in the form of future earnings, has also been verified (Schultz 1971). Its importance at the *regional* level, however, at least until recently, has not been emphasized (Beyers, Christopherson, Erickson, Gibson, Hewings, Malecki,

McConnell, and Rees 1990; Haider 1992). Spindler and Forrester (1993) indicate that human capital development policies focus on *national* economic growth, and according to McNamara, Kriesel, and Deaton (1988, p.61), "...limited progress has been made in isolating the spatial impacts of specific local investment in human capital on economic development."

Although evidence linking human capital to development at the regional scale may be less than conclusive, there has recently been increased interest in human capital as a factor which might provide a local competitive advantage. Haider (1992. p.127), discussing what he calls *place advantage*, suggests that with the globalization of markets, local competitive advantages change more frequently, and "...people and their know-how and knowledge have become more important than places and things." In other words, in a scenario where, increasingly, comparative advantages associated with relative location and resources are changing, it is the human capital which can provide stability to a region.

Clarke and Gaile (1992) indicate that, in addition to global economic trends, cutbacks in federal economic development programs are resulting in what they refer to as the "new centrality of locality," which emphasizes place-specific attributes as competitive advantages. Although in the past such place-specific advantages might have centered on a region's natural resources or its industrial base,

today it is often the type of labor force skills availabale in a region that determines what type of economic activity exists in the region. As O'hUallachain (1991, p.73) says, "Differences between places are based less on specialization by sector and more on intrasectoral specialization by type of labor process."

One manifestation of human capital that has received little consideration as a regional attribute is entrepreneurship. Although economists have recently stressed the importance of this factor in responding to the changing economic conditions (Schultz 1990, Salamon 1991), Leven (1985, p.576) states that at the regional level, "...there are really no definitive studies of payoffs of improved human capital to the investing region or of policies to promote entrepreneurialism per se." Haider (1992, p.128) also mentions the lack of study relating to this factor, indicating that "...we have not yet discovered why some places are more entrepreneurial than others." And Erdivig (1986) suggests that accounting for the spatial variation in high-tech industries will require deemphasizing global and corporate factors and focusing on regional factors likely to foster entrepreneurship.

Thompson (1965) suggested that the lack of knowledge relating to the role of entrepreneurship may be related to the difficulty in defining and quantifying this factor. According to Gillis, Perkins, Roemer, and Snodgrass (1987),

the concept of the entrepreneur, as developed by Schumpeter, was

> ... someone who had the imagination to see the potential for profit from the innovation, the initiative to carry out the task of introducing the innovation, and a willingness to take a calculated risk that the effort might fail and lead to a loss rather than a profit (p. 26).

This definition sounds very much like that of a firm founder, which is generally what the term is associated with. Recent studies relating human capital to regional economic growth (Beyers, Johnsen, and Stranahan 1987; Lloyd and Mason 1984; O'Farrell and Hitchens 1989) have tended to examine characteristics of the individual entrepreneur, as opposed to regional characteristics. Many of the studies which *have* taken a regional approach have focused on human capital investment as a *rural* economic development strategy and much of this research, as discussed earlier, has not found strong evidence for a return to investment in education (Killian and Parker 1991, McNamara, Kriesel, and Deaton 1988). However, regional approaches which have considered the impact of human capital at the metropolitan level suggest that it *is* a factor in growth.

One such study (Warner 1989), an examination of growth in per capita income, compared the impact of a human capital strategy to a more traditional cost-minimizing strategy. The human capital strategy focused on quality of the labor force, quality of public goods, and quality of life as determinants of growth. Variables used in the human capital analysis were pupil-teacher ratios, percentage of the

population with a college degree, and a quality-of-life variable; the sample consisted of forty-four Metropolitan Statistical Areas. Warner's results indicate that these human capital variables provide a better explanation for economic growth than do measures relating to cost-minimization. His findings suggest that more economic growth occurs as a result of local area firm formation and growth than from business relocations or branch plant openings, the targets of cost-minimization strategies. (He also suggests that this was not necessarily always the case, that in the past ten years, changes in technology and in the world economy have lessened the importance of cost factors and increased the importance of the education and skill of the laborforce.) Further support for the idea that human capital is a significant factor at the regional level is provided by Rauch (1993), whose MSA-level study concluded that increases in factor productivity were related to the average level of formal schooling.

As discussed in the introduction, treating human capital as a regional factor assumes that significant differences in the distribution of human capital across regions do exist (and that regional differences in rates of small firm growth also exist and are related to differences in human capital). Thus, before turning to the discussion of small firms, the spatial distributions of human capital will now be examined.

Regional Patterns of Human Capital

As suggested in the above section on measuring human capitall, formal education is the most widely accepted measure of human capital. Thus, the following examination of the distribution of human capital by Metropolitan Statistical Areas will use three variables related to education: the percent of the population age 25 and older with a college degree (COLLGRD), the percent of the same population with *only* a high school education (HSGRD), and the level of local spending on education (EDEXP). In addition, a measure of occupational background, the percent of the labor force in management occupations (PCMGT) is included. (A thorough rationale for the selection of all variables to be used in this study, along with more precise definitions, is presented in the chapter V.)

In Table 3, MSA-level data are aggregated by census region. These figures suggest that the MSA's in the Mountain and Western regions (followed by the Northeast region) are the more human capital rich, having both the highest levels of college graduates and the highest levels

TABLE 3. Human Capital by Census Region

Region	COLLGRD(%)	HSGRD(%)	PCMGT(%)	EDEXP(%)
Northeast	18.68	35.49	11.36	46.70
Southeast	15.62	32.68	10.70	44.60
Midwest	16.53	37.51	10.39	46.20
Southwest	18.10	30.94	10.92	49.70
Mountain	21.03	35.11	12.15	45.10
Western	19.81	32.32	11.97	43.60

in management occupations. The Southeast region appears most deficient in human capital, while the Southwest and Midwest regions fall somewhere in between, but with very different human capital profiles. While both have approximately the same proportions of the laborforce in management occupations, the Midwest has fewer college graduates but more high school graduates than the Southwest. Interestingly, the level of local per capita education spending does not appear to be related to other measures of human capital; i.e. it is highest in the Southwest, not one of the stronger human capital regions, and lowest in the West, which has relatively high levels of human capital. This may indicate that MSA variations in local per capita expenditures on education vary considerably as a result of *state* level differences in methods and levels of funding.

MSA patterns in human capital are mapped in Figures 6-9, and all of the four variables exhibit distinct variations across MSA's, but not all reflect broad regional differences. Figure 6, mapping percent college graduates, shows only a few MSA's in the highest category; they were widely scattered, geographically, and are, generally, college towns (the Washington DC area; Ann Arbor, MI; Madison, WI; Bloomington, IN; Columbia, MO; Iowa City, IA; Bryan/College Station, TX; Santa Fe, NM; Lawrence, KS; and Boulder, CO). The most noticeable absence of college graduates is in MSAs in the southeast.

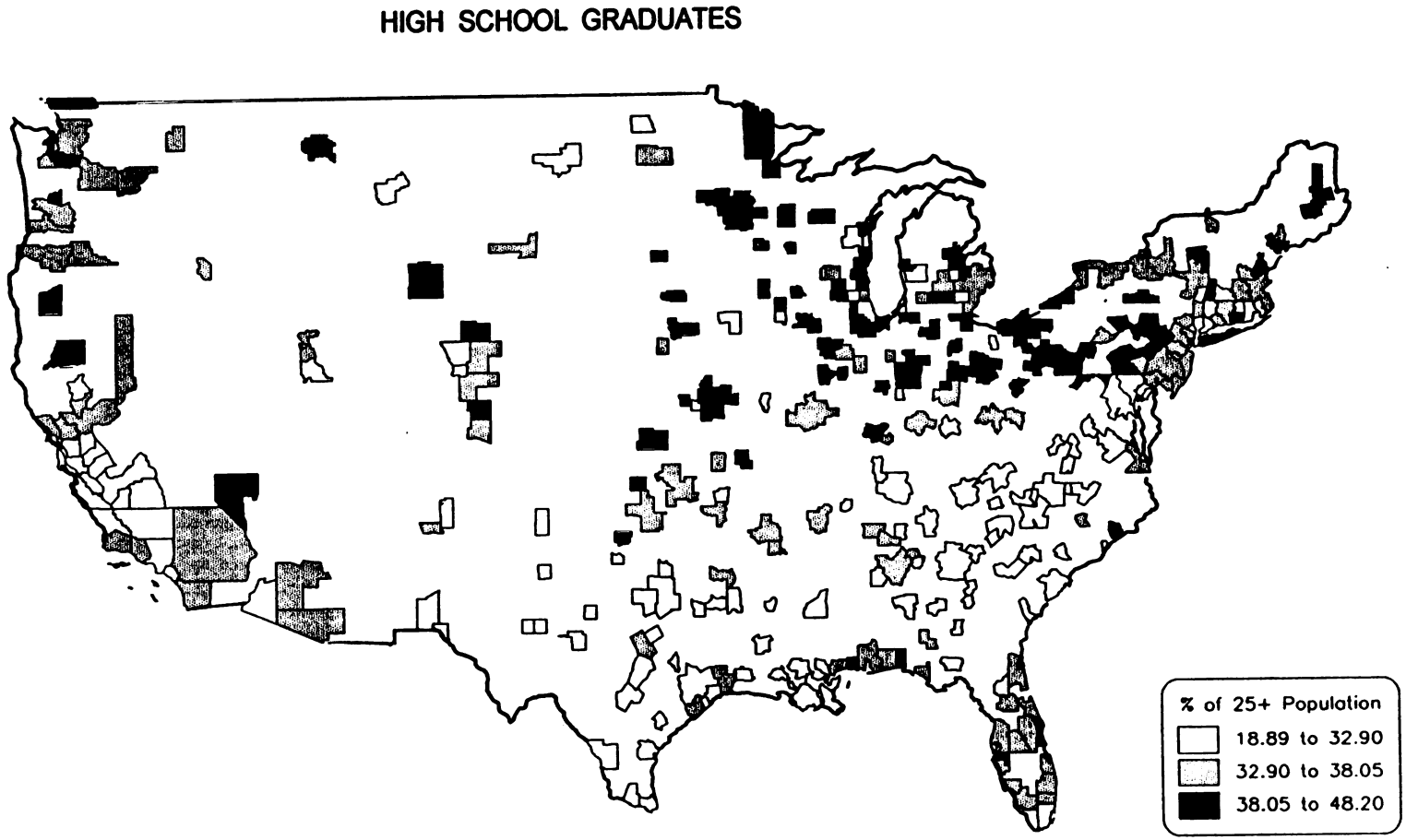


Figure 6. Percent of the 25+ Population with a College Degree

In contrast, a more definite regional pattern emerges in Figure 7, with the high proportion of high school graduates in Midwest region MSA's quite evident. Higher percentages of high school graduates in the parts of the northeast are also reflected in this map, although the almost equally high percent in the Mountain region (indicated by Table 3) does not appear as pervasive in Figure 7. Since this variable measures those with *only* a high school diploma (It doesn't include college graduates), it was expected that the pattern would to some extent be the inverse of the college graduate pattern (R = -.359); i.e. an area might scoring low on HSGRD precisely because it has a high percentage of college graduates. This appears to be true for most areas. On the other hand, an area with low scores on both HSGRD and COLLGRD would be an area of very low human capital. It is in many areas of the south that this pattern is most noticeable.

As mentioned above, the deficiency in formal education in the south does not appear to be related to the percent of local budgets spent on education. No discernable spatial pattern appears to exist with respect to this variable (Figure 8). This might reinforce the idea that perhaps most of the variation in local dollars spend on education is a result of state-level differences in the amount of state funding is available to local schools. On the other hand, the range displayed by this variable is not that great; MSA's in the lowest region averaged 43.6% while those in the

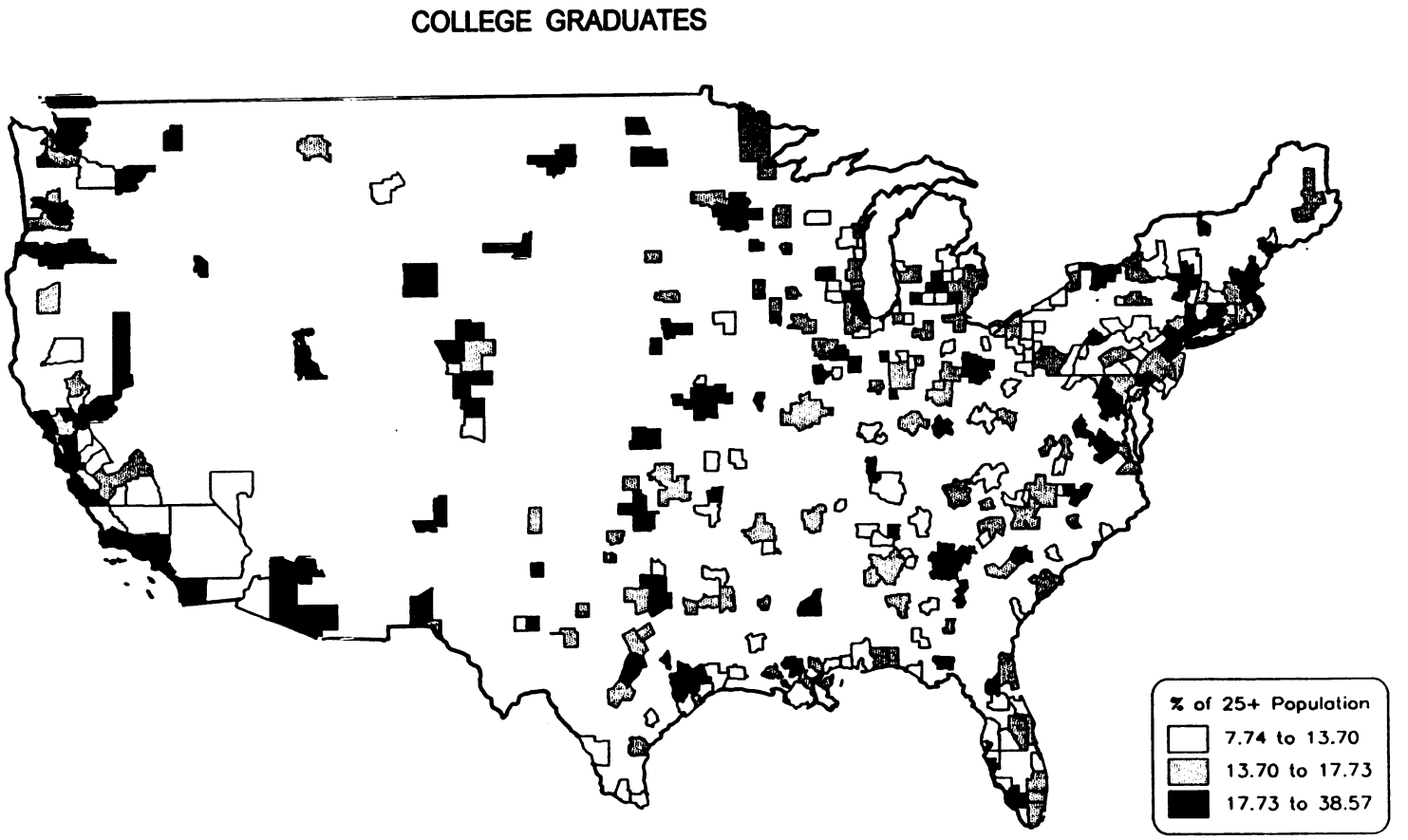


Figure 7. Percent of the 25+ Population with a High School Diploma

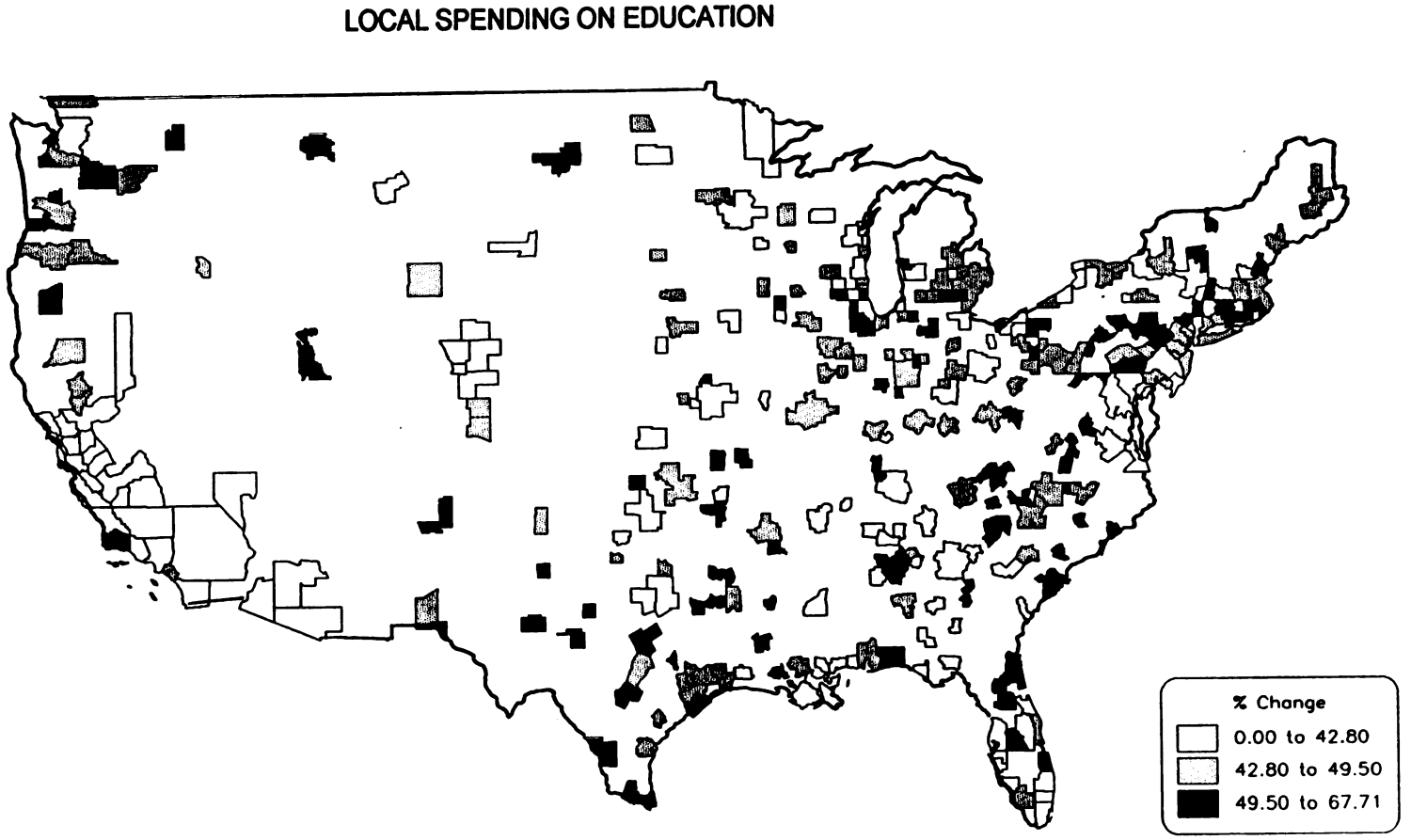


Figure 8. Local Per Pupil Education Expenditures (% of Local Budget)

highest averaged 49.7%. Figure 8 does reveal intraregional differences which do not show up as clearly in Table 3. For example, there is a distinct difference in the percent of local budgets spent on education in MSA's in the northern part of the Western region (Oregon and Washington) compared to those in most of California.

The percent of the laborforce in management occupations, seen in Table 3 to be highest in the Northeast, Mountain, and Western regions, does not appear in Figure 9 as a strong regional pattern. This map looks a lot like that of college graduates, but with somewhat more of a bicoastal pattern, and not as many southern MSA's in the lowest categories. One area where the percent in management is much greater than percent college graduates is Florida.

To summarize, generally the east and west coasts and the Mountain region appear most human capital rich, and the deep south, especially the south central area, appears to be human capital poor, with low levels of human capital in all categories. Although this descriptive analysis does not address the issue of whether there is a relationship between human capital and small firm growth, it does serve to verify that there are great differences in levels of human capital over space and, thus the possibility that human capital may account for some of the spatial variation of small firm growth is reasonable to consider.

The next chapter will consider the theoretical links between human capital and small firm growth, along with what

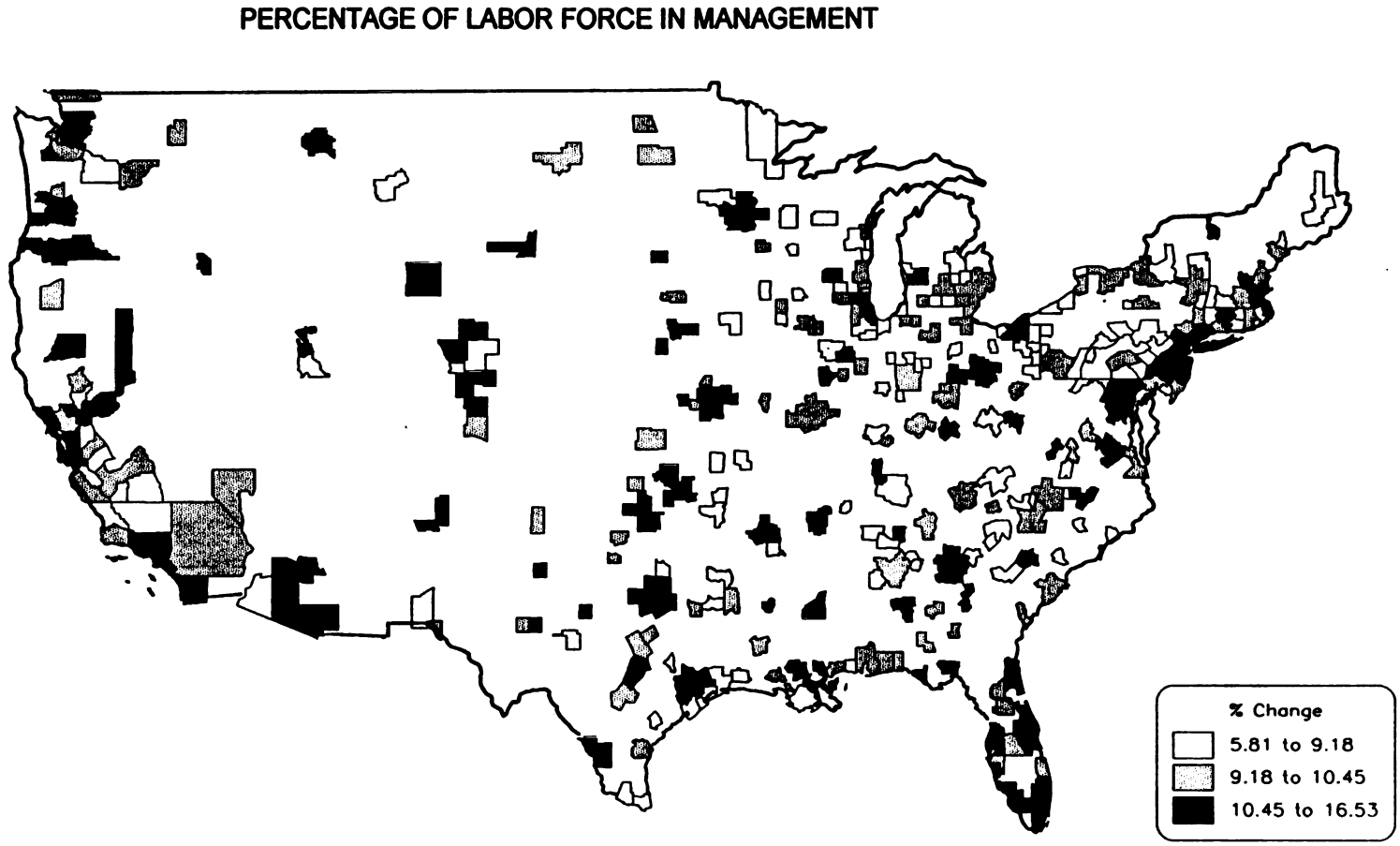


Figure 9. Percent of the Labor Force in Management Occupations

has been seen of the spatial distribution of these phenomena. Based upon both of these considerations, specific hypotheses concerning the relationship between human capital and the formation and survival of small firms will be developed.

CHAPTER IV

RESEARCH PROBLEM AND HYPOTHESES

Although the literature reviewed in the previous two chapters suggests a relationship between human capital and the growth of small firms, much of this discussion has focused on separately examining human capital and small firms as factors in economic growth. Where these two factors come together is in the context of the changing global economic environment, an environment which is increasingly dependent upon innovation, entrepreneurial skill, flexible production processes, and responsiveness to change. These are characteristics which are associated with both higher levels of human capital and with smaller firms which, because of their smaller size, are often at an advantage in being able to quickly respond to market changes and changes in technology (Bannock 1981, White et.al. 1988). To compete successfully in today's increasingly global, increasingly high tech economy requires both better access to information and greater ability to use such information, and it seems likely that individual entrepreneurs with higher educational attainment are more likely to satisfy such requirements.

The role of human capital in small firm growth has spatial implications both because the quality of human capital varies over space and as a result of what Pred (1977) refers to as *spatial bias* in the availability of

specialized information. According to Pred,

> ...all economic and locational actors - whether individual entrepreneurs, business firms and corporations, or government organizations - can choose only from alternatives of which they have become aware... The specialized information pertaining to costs, prices, supply, demand, and technological and other matters which influences the decisions underlying city-system growth and development is virtually never universally available.(p.20)

Thus it can be argued that the education and experience, human capital, which help to transcend spatial bias in information availability become even more critical for the small firm, since small firms are generally more constrained in their locational choices than larger firms.

The central questions that this dissertation will attempt to answer are: 1) does human capital play a significant role in the growth of small firms at the local level, 2) are there industry-specific differences in the impact of of human capital, and 3) are there regional differences in the impact of human capital? Hypotheses designed to examine these questions will now be discussed.

Which Human Capital Measures?

Both human capital theory and research suggest formal education as the best measure of human capital. Thus the first five hypotheses relate to various measures of *education* and its impact on small firms in general. They are not industry-specific.

The first education-related variable to be examined is *percent of the workforce, age 25 and over, with a college*

degree (COLLGRD). Even though, for many industries, the skill requirements of the laborforce do not dictate a college degree, the basis of the argument relating to higher education is that both the formation and the successful management of a small business requires a certain level of entrepreneurial skill, regardless of the *type* of business; this skill is expected to be strongly related to higher education. Thus it is hypothesized that:

> H1: *At the regional level, small firm growth is positively related to educational stock, as measured by the percent of the laborforce with a college degree.*

Although it has been shown that the existence of a large proportion the labor force with a high school education is often a regional factor considered by firms relocating or opening branch plants, small firms seldom relocate or open branch plants. Relocation, therefore, is expected to account for less of the change in small firms than are firm formation and survival. Thus, *percent of a local laborforce with a high school education* (HSGRD) is *not* expected to be a significant factor in small firm growth. The following hypothesis will be tested:

> H2: *The percent of the laborforce with a high school diploma will not be a predictor of small firm growth.*

Both of the preceding hypotheses are related to educational attainment, rather than educational quality, i.e. *stock* vs. *flow* measures, according to McNamara, Kriesel, and Deaton (1988). According to McNamara, et.al., *flow* measures are also relevant to economic growth insofar

as the quality of local education is an indication of the potential skill of the local labor force and therefore likely to account for some small firm growth resulting from relocations. Local educational quality is also, according to Warner (1989), a reflection of the general quality of life in a metropolitan area, a characteristic considered conducive to economic growth. Since research has indicated that per pupil expenditure on education is strongly related to standardized scores and thus a valid surrogate for output quality (McNamara, et.al. 1988), *local per pupil expenditure* (EDEXP) is the variable used as a qualitative measure. The hypothesis is:

> H3: *Regional variation in small firm growth is positively related to regional variation in local per pupil expenditures.*

Educational attainment variables are expected to be of greater importance to small firm formation and survival than *qualitative* measures. Since qualitative (flow) measures do not reflect how much of the local school system's output *remains* in the area, they are considered to be more important to firm attraction than firm creation. According to the argument put forth by McNamara, Kriesel, and Deaton, qualititive, flow measures of education represent the incremental additions to human capital that a location-seeking firm might expect from the local workforce, after an initial lag period, if employment opportunities were available. In contrast, *stock* measures such as the educational attainment of the region's laborforce would be

better indicators of the actual, as opposed to potential, level of entrepreneurial skill. Since the creation/management component of small firm growth is expected to be more important than the attraction component, educational attainment is expected to be a better predictor of growth than a qualitative measure. Thus, the following hypothesis is added:

> H4: *The percent of the laborforce with a college degree will be a greater predictor of small firm growth than will local per pupil education expenditures.*

The percent of the laborforce with a high school diploma is, like the percent with a college degree, considered a measure of educational attainment, rather than of quality; however, like the educational quality measure, it is expected to be more important to attracting industry than to creating industry. It must also be acknowledged that the labor needs of some industries can best be satisfied by high school graduates, and thus the percent of the population with a high school diploma might be a better predictor of growth for such industries. For a large, labor-intensive firm, seeking to locate a branch plant this might be an important consideration. However, for *small* firms, which are not being managed from outside the area, percent of college graduates, the variable thought to be most strongly associated with firm formation and survival, is expected to be a stronger factor than the variable measuring general laborforce skills. Thus, the following

hypothesis is suggested:

H5: *The percent of the laborforce with a college degree will be a greater predictor of small firm growth than will the percent of the laborforce with a high school education.*

To briefly summarize these hypotheses relating to education, in the aggregate analysis, the impact of a college education is expected to be a greater factor in small firm growth than the other educational measures. The primary reason for this expectation is that for small firms, the creation and management components of growth are thought to outweigh other laborforce considerations.

Watts' 1987 review of relevant literature suggests that occupational characteristics are a significant factor in firm births, and this literature suggests that occupational background is probably a greater factor in small firm *survival* than in small firm births. Although growth in any size firms depends not only upon firm births but also upon survival, because the failure rate of *small* firms is much greater than that of larger enterprises, factors influencing survival are expected to be particularly important to small firms. According to Bruderl (1992), small businesses are more likely to succeed when their founders/managers have prior management experience. This leads to a sixth hypothesis:

H6: *The growth of small firms is positively related to the percent of the laborforce in management occupations.*

As discussed previously, empirical evidence suggests that occupational background, while important to firm

survival, is not as strong a factor in new formation as educational attainment. This could indicate either that firm formation is a more important component of small firm growth than is survival, or that a formal education is more important to successful management than is actual experience in management. Regardless of the explanation, since education seems to be the more transcendant factor, the following hypothesis will be tested:

> H7: *The percent of the laborforce with a college degree will be a greater predictor of small firm growth than will the percent of the laborforce in management occupations.*

Which Size Small Firms

Beyers, et.al. (1987) found that among producer service firms, founders of export-oriented firms were even more likely to have a least a bachelor's degree. This makes sense insofar as managing an export-oriented industry requires increased knowlege concerning distant markets and more understanding of nonlocal economic conditions. Location theory would tend to reinforce this as it indicates that since basic industries are less constrained by the need to locate near their markets, the role of other locational factors, such as the need for skilled labor, may be relatively more important. Unfortunately, it would be difficult, within the framework of the present research, to test the hypothesis that the impact of a college education is greater for basic than for nonbasic firms. However, such an hypothesis does suggest something with respect to which

size category of small firms might be most impacted by education. If one assumes that larger firms are more likely to be export-oriented, for such firms, education is probably more important than for very small firms. Also supporting this hypothesis is the observation made by Acs and Audretsch (1989) that

> ...small firms are more inhibited than their larger counterparts from entering industries which have a high technological environment and where human capital plays an important role (p. 468).

Based upon these considerations, it is hypothesized that:

> H8: *The impact of education (specifically a college degree) will be greater for the 20-99 size category than for the <20 category.*

Which Industries?

For small firms, for the reasons discussed at the beginning of this chapter, it is not expected that industry-specific differences in human capital based upon the labor needs of such firms will be as important as for large firms. The impact of both a college education and management background are expected to transcend industry differences to a great extent, since the success of small firms in any industry is expected to be primarily related to their founders' and managers' entrepreneurial abilities. Thus for *all* industries, small firm growth is expected to be more strongly associated with a college education than with any of the other human capital variables.

Considering industrial structure as a factor in the impact of human capital is somewhat problematic insofar as

industrial structure may not be as important a dimension of variation as it once was. As discussed earlier, and supported by O'hUallachain (1991), there is likely to be more variations among places based upon labor processes than upon industrial sectors. However, having emphasized this, it is conceded that some arguments for industry-specific variations based upon differential labor needs are possible.

Even among small firms the laborforce requirements of industries vary, and thus the *relative* importance of certain human capital variables will differ from industry to industry. For industries which are more information intensive, or more dependent upon advanced technology, the relative importance of a college degree, compared to the other human capital variables will probably be greater. Thus, although a college education is hypothesized to be the most important human capital variable, the relative importance of human capital variables is expected to show some variation by industry.

One indication of industry-specific distinctions in human capital needs is provided by the Bureau of Labor Statistics' occupational employment projections summarized by Silvestri and Lukasiewicz (1989). For the three occupational categories most dependent upon higher education and technical skills (executive, administrative, and managerial; professional specialty; and technical and related support occupations), Silvestri and Lukasiewicz show, for the United States, both the share of employment by

sector for 1988 and the anticipated share in the year 2000. These data are summarized in Table 4. According to their figures, service industries have a higher demand for professional and technical skills than for executive, administrative, and management skills. Since it is the former category that has the greatest higher education needs (Silvestri and Lukasiewicz), for service industries educational attainment would be expected to be more important than management background. Assuming, therefore, that the laborforce-related educational needs of small firms in a given sector are similar to those of that sector as a whole, these findings would suggest that

H9: *The relative impact of a college education on small firm growth will be greater for service industries than for manufacturing.*

The survey results of Beyers, Johnsen, and Stranahan (1987) provide another indication of human capital needs. When they compared the employment composition of producer service firms to that of manufacturing firms, they found that manufacturing firms had only 11% of their workforce in professional and technical occupations (those requiring the highest level of education), compared to 43% for producer service firms. They also found that the majority of the producer service firms indicated that most new employees were recruited from the local area, implying that local educational "stock" is important. The findings of Howell and Wolff (1991) also support the implications of the research of Beyers, Johnsen, and Stranahan. Howell and

TABLE 4. Percent Distribution of Wage and Salary Workers by Selected Occupation and Industry, 1988 and Projected to 2000

	Occupation					
	EX/AD/MGR		PROF/SP		TECH	
Industry	1988	2000	1988	2000	1088	2000
Goods Producing	8.8	9.5	5.1	5.8	2.6	2.8
Mining	11.9	12.0	7.8	8.2	3.1	3.1
Manufacturing	8.6	9.5	6.3	7.4	3.2	3.7
Services Producing	10.1	10.4	14.7	15.3	3.8	4.3
Transportation and Communication	7.9	8.4	4.4	5.1	4.3	4.7
Retail	8.3	8.6	1.2	1.3	2.0	2.0
Wholesale	11.6	11.5	1.5	1.8	2.0	2.4
F.I.R.E	22.5	23.8	2.8	3.4	1.9	2.2
Services	8.2	8.6	28.1	28.0	6.2	6.9

Source: Silvestri, George and John Lukasiewicz, 1991. Projections of Occupational Employment, 1988-2000. Bureau of Labor Statistics Monthly Labor Review, November 1989

Wolff show that educational attainment is highly correlated with both cognitive and interactive skills, and employment growth in jobs requiring these skills is greater for service industries, particularly advanced services, than for good-producing industries. These findings would support the hypothesis that:

H10: *For small business service firms, the percent of the workforce with a college degree would be of greater relative importance than for other small service firms.*

The correlative of hypotheses 9 and 10 might be as follows:

H11: *For small manufacturing and service firms, the percent of the workforce with a high school diploma will be of greater relative importance than for other sectors.*

The data in Table 4 also suggest that for the Finance, Insurance, and Real Estate sectors, management background might be more important than education. Based upon this information, it might be hypothesized that

H12: *The relative importance of management background, compared to education, will be greater for finance, insurance, and real estate industries than for other industries.*

Industrial Structure

Although a region's industrial structure is not a measure of human capital, the literature indicates that the growth in firms in a given sector is, to a considerable extent, related to that sector's existing share of the region's activity (Watts 1985). This is due to the fact that new firm founders are more likely to start and succeed

in a business in the same sector in which they have experience. It may also be a reflection of agglomeration economies. Since some of the growth in firms in a particular sector is expected to be explained by that sector's share of all firms, sector-specific analyses will control for this factor by including a variable measuring the sector's share of total employment. The associated hypothesis is:

> H13: *Growth of small firms in sector "j" will be positively related to sector j's share of the region's establishments.*

Regional Implications

The descriptive analyses relating to the spatial distribution of human capital and of small firm change, discussed in Chapters 2 and 3, were presented, in part, to verify that both do vary considerably over space. If this analysis revealed a strong coincidence between the geographic distributions of human capital and small firm growth, regional hypotheses relating to the impact of human capital would be suggested. However, what was most obvious in Figures 6-9, the maps of human capital variables, is that only high school graduates (Figure 7), the one variable hypothesized *not* to impact small firm growth, shows any strong geographic concentration (at the regional scale). The other three variables, percent college graduates, percent of labor force in management occupations, and local per pupil expenditures on education, are fairly evenly distributed over space (particularly the first two, which

are expected to be most significant). In contrast, Figures 1-5 (maps of small firm growth) indicate that areas of relatively strong small firm growth *do* exist, particularly in the Southeast, an area of low human capital. The absence of human capital in regions of strong small firm growth may suggest that the link between human capital and small firms is weak (or overshadowed by other factors) in these areas. On the other hand, it could also be argued that stronger small firm growth in the face of minimal levels of human capital (such as in the Southeast) points to the increased *impact* of human capital in such areas (more bang for the buck). Since the first interpretation would be inconsistent with the overall thesis that human capital is a significant factor in small firm growth, it is the second explanation that will be pursued. Since the Southeast region is the most human capital poor, yet the region displaying the most consistent growth in small firms, the following hypothesis is proposed:

H14: *The impact of human capital will be greater in the Southeast than in other areas of the country.*

The lack of other obvious hypotheses suggested by the descriptive analysis is actually wholly consistent with the general thesis of this research, i.e. that the impact of human capital is relatively universal. For the same reasons that human capital's impact is expected to transcend industry differences (as discussed in the previous section) it is also expected to be fairly consistent over space.

Thus, while not abjuring the hypothesis just proposed, a more general hypothesis will also be offered:

H15: *The impact of human capital will vary little among census regions.*

Although the descriptive data offer scant reason for further speculation, theoretical considerations may provide the basis for further geographic hypotheses. Product cycle theory suggests that stages in the development of products influence their location insofar as the labor needs of these stages vary. In earlier stages, when skilled labor and urbanization economies are more important, location in metropolitan/core areas is favored; in the more mature stages, when production is more routine and less dependent upon innovation and skilled labor, firms tend to locate in peripheral and nonmetropolitan areas. Since *small* firm growth is expected to be significantly related to new firm formation, the greatest geographic variation in the importance of human capital will be along the urban-rural continuum, a dimension of variation that cannot be examined in this analysis since only metropolitan areas are included. There may, however, be reasons to expect differences in the impact of human capital based upon MSA size.

It is expected that human capital, i.e. education and management skills, becomes more important as economies shift to advanced services and become increasingly global, as industries depend more upon advanced technologies and as production becomes more information intensive. This would imply that areas characterized by advanced service

industries and technologies, areas which function as hubs in information networks, etc. would be more human capital dependent. The direction of this relationship, however, may be two-way, i.e. human capital might also be dependent upon such areas, or at least its impact might be enhanced by the urbanization economies associated with larger metropolitan areas. Further, it might be argued that large MSA's and small MSA's are different, even if not extreme, points along the rural-urban continuum. The theoretical principles discussed above might then suggest that the impact of human capital would be greater in larger metropolitan areas than in smaller MSA's. Thus the following hypothesis is proposed:

H16: *The impact of human capital will be greater in large MSA's than in small MSA's*

As already discussed, a firm's labor needs are also related to the type of industry, although perhaps not as much as in the past (O'hUallachain 1991). Nevertheless, in the aggregate (vs. industry-specific) analysis, some regional patterns in the *importance* of human capital may result from variation in regional industrial structure. For example, a college education might be expected to be more important in areas of the country associated with high tech and advanced service industries. However, because certain regions of the country rely more on human capital because of the demands of their industrial structure does not necessarily mean that the *impact* of this human capital is greater, only that there is likely to be more of it. In

other words, an area whose economy is based upon agriculture will undoubtedly have a smaller proportion of its population with a college degree than one whose economy centers on advanced services; but assuming both areas are experiencing growth in some types of small firms, is there any *a priori* reason why the impact of college education on the growth of these firms would be less in the agricultural region?

Other theoretical considerations have not suggested further explanations related to regional differences in the impact of human capital on small firm growth. Although the importance of amenities has been emphasized as a locational factor (Stafford 1974), particularly for corporate headquarters and industries dependent upon attracting a highly educated laborforce, since small firms do not usually attract labor from outside the local area, the amenity factor is not likely to be a significant in their growth.

More recently, the locational implications of laborforce requirements have been related to not just laborforce skills, but to social aspects of production such as capital/labor relations (Clark 1988). Thus much of the growth in the South has been attributed to industry's need for cheap labor and its desire to minimize capital/labor conflict, neither of which are usually associated with areas of high human capital.

In summary, it seems that there are not many reasons for expecting regional differences in the impact of human capital, at least not within the purview of this study. The

focus of this analysis is on the type of human capital and firms for which variation is expected to be greater along the urban-rural continuum than at the interregional level. Thus, as hypothesized above, with the exception of the Southeast region, little interregional variation in the impact of human capital is expected. Further speculation concerning regional patterns will follow evaluation of the results of the analysis.

CHAPTER V

ANALYSIS

This study will employ regression analysis to measure the impact of human capital on the growth of small firms, across both industry sectors and census regions, and regional patterns will be further analysed by examining residuals from the regression analysis. This chapter will identify the data and explain the methodology for testing the hypotheses developed in the previous chapter.

Data

The unit of measurement will be the Metropolitan Statistical Area (MSA). The study will include all MSA's and Primary Metropolitan Statistical Areas (PMSA's) in the coterminous United States, with the exception of the 26 New England MSA's. MSA's in New England, unlike those in the other census regions, are not defined in terms of counties. Since the data being used for the dependent variable (change in small establishments) is only available by county, the 16 New England County Metropolitan Areas (NECMA's), which *are* defined by county boundaries, will be used in place of the MSA's in this region. Altogether, the study will include 317 metropolitan areas (see Appendix B for complete listing of MSA/county equivalents). Although many studies of regional growth use counties to measure variables, MSA's are thought to better represent functional economic areas.

Counties are simply political units, whereas, according to the Statistical Abstract (1989, p.908), the concept of an MSA "...is one of a large population nucleus, together with adjacent communities which have a high degree of economic and social integration with that nucleus."

One problem with the use of MSA's that does not occur when counties are used is that MSA definitions change over time. Since the dependent variables will be calculated as a rate of change over time, the spatial units of measurement must be the same at both ends of the time period used. Therefore, the most current MSA definitions (1988) will be used for both the beginning and ending time periods. The reason for this is that, assuming growth in small firms reflects a growing MSA, such growth might be underestimated if the earlier MSA definition were used. Of course it is also true that if the number of small firms is declining, use of the more recent MSA definition might bias the results in the opposite direction, but it is assumed that this is the more unlikely error, since the MSA is less likely to have grown if the number of establishments are declining.

For all variables, county-level data will be aggregated to the MSA-level before transformations are calculated. For example, to determine the percent change in small Service firms for the Lansing, Michigan MSA, the number of small Service firms in Ingham, Eaton, and Clinton counties (the three counties making up the Lansing MSA) in 1983, will be totaled; the number of small Service firms in these counties

in 1989 will also be totaled. These aggregate figures will then be used to calculate the percent change in these firms for the Lansing MSA.

The **dependent variable** will be the percent *change* (from 1983-1988) in the number of small establishments by sector and by size category. (This time period is dictated by data availability.) The source of these data is the U.S. Census' County Business Patterns. It is the expectation that this net growth figure will reflect both the creation and the *survival* of small firms. Firm birth data, such as the Dun and Bradstreet data used by many studies focusing only on firm formation, give no indication as to the success of these firms. As pointed out by Acs and Audretsch (1989), such data do not account for business failures. Since a large percent of new small firms fail within a short time (Bruderl 1992), the percent change in the number in small firms over time is a *net* figure, which reflects both firm creation and survival rates, is a better indicator of the contribution small firms make to the economy.

The use of establishment-level data as a measure of small-firm based economic growth is dictated by the unavailability of employment data by firm size classifications. However, although it is more common to use employment data to measure economic growth, the use of *establishments* is not without some advantage. As White and Osterman (1991, p.242) point out, "The number of jobs in a particular location is more important than an aggregated

number of jobs that a firm may have at multiple locations." Whether or not an establishment is part of a larger enterprise, it is counted as a separate entity because it has an independent location and thus is important for local development.

Two establishments size categories (based upon number of employees), as defined by the Small Business Administration, will be examined. They are: *very small* (1-19 employees) and *small* (20-99 employees). The four **industry sectors** included are: Manufacturing; Finance, Insurance, and Real Estate; Services; and Business Services (SIC 73), a subdivision of services.

Data for the **independent variables**, will come from the U.S. Census. Since the hypothesized relationship between these variables and the dependent variable is causal, and some lag time is generally assumed between cause and effect, 1980 data will be used for the independent variables. The rationale for the use of these variables has been discussed in previous chapters and so will not be repeated. As mentioned earlier in this chapter, all data are measured by county and then aggregated into MSA's, with the exception of local per pupil expenditures, which was available only by MSA. The variables are:

* Percent of the population 25 years and older with a college degree (COLLGRD)

* Percent of the population 25 years and older with *only* a high school education[2] (HSGRD)

* Percent of the local expenditures for education (EDEXP)

* Percent of the laborforce in management occupations (PCMGT)

* Percent of the laborforce employed in each of the four industries listed above (INDSHR)

In relation to the "local expenditures for education" variable, it should be noted here that the map of this variable (Figure 3), while reflecting considerable within-state variation (see, for example, Florida), also shows entire states with much lower level of local spending, e.g. California. This suggests that some of the state-to-state variation in local spending on education may be related to differences in state funding for education, and thus it may not be a very good indicator of total spending on education. Nevertheless, because considerable within-state variation was also exhibited, it was decided to include this variable in the analysis.

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[2]The reason for using a figure which does not include high school graduates who also have a college degree is explained later in the chapter, in a discussion of colinearity.

Methodology

Regression analysis will be used to test all hypotheses. The generic model, used to test the first six hypotheses, is as follows:

{2} $CSF = a + b_1COLLGRD + b_2HSGRAD + b_3PPEXP + b_4MGT + e$

where:

CSF = percent change in the number of small firms

COLLGRD = percent of 25+ age group with a college degree

HSGRAD = percent of 25+ age group with a high school diploma (only)

PPEXP = percent of local expenditures for education

MGT = percent of laborforce employed in management occupations

e = error term; a, b_1, b_2, b_3, and b_4 are parameters to be estimated

When the equation is run for specific sectors, another independent variable, the industry share of total employment, will be included, producing the following:

{3} $CSF_i = a + b_1COLLGRD + b_2HSGRAD + b_3PPEXP + b_4MGT + b_5INDSH_i + e$

where: INDSH = industry i's share of total employment

This equation will be modified by the addition of a dummy variable to reflect growing vs. declining areas. It will be recalled that an underlying assumption of this research is that areas where the number of small firms are

increasing are areas whose economies are growing, i.e. that there is a positive relationship between overall growth and growth in small firms. However, it must be considered that some relative increase in the number of small-firm might be accounted for by general economic decline in a region, i.e. as employment in larger firms decreases, these firms shift into smaller size categories. If the relative number of small firms is increasing in both growing and declining regions, it is possible that, statistically, there will be either no relationship or a negative relationship between overall growth and the growth of small firms, a situation likely to confound the analysis since these two types of regions would be unlikely to have similar human capital profiles. Two approaches to dealing with this problem are considered.

The first approach would be to test for a relationship between growth in total employment in a given sector and growth in the number of small firms in that sector. This has been done (regression analysis in Chapter 2), and the results are shown in Table 1. Although the relationships are positive for all sectors, indicating that small firm growth is occurring in growing region (not as a result of decline), because coefficients are not strong, a further test is proposed.

To determine if increases in small firms are occurring in declining regions, some means of distinguishing between growing and declining regions might be useful. This could

be accomplished using a dummy variable. A dummy variable will allow the impact of human capital in regions which are experiencing growth to be distinguished from the impact in regions experiencing decline. Values of the dummy variable will be based upon a region's employment growth relative to the nation's employment growth. This measure can be made industry-specific for testing hypotheses relating to specific sectors. Growing regions will be those in which the regional rate of change in total *employment* for industry "j" is equal to or greater than the national rate of change for this industry; declining regions will be those where this rate is less than the national. In other words, a location quotient will be calculated as follows:

$$LQ = E_{ij}/E_{Nj}$$

where: E_{ij} = percent change in employment in region i, sector j

E_{Nj} = percent change in employment in the nation in sector j

The sector-specific model would then be as follows:

$$\{4\} \quad CSF_i = a + b_1COLLGRD + b_2HSGRAD + b_3PPEXP + b_4MGT + b_5INDSH + b_6D + b_7(COLLGRD*D) + B_8(HSGRAD*D) + b_9(PPEXP*D) + B_{10}(MGT*D) + b_{11}(INDSH*D) + e_i$$

where:

CSF_i = percent change in the number of small firms in industry i

COLLGRD = percent of 25+ age group with a college degree

HSGRAD = percent of 25+ age group with a high school diploma

PPEXP = per capita expenditures on education

MGT = percent of laborforce employed in management occupations

INDSH = industry i's share of total employment

D = dummy variable to distinguish growing regions from declining regions
0 = growing
1 = declining

e_i = error term

If analysis indicates that the relationship between growth in total employment and growth in small firms *is* positive, and thus there is no need to use dummy variables to distinguish growing from declining regions, equation (5) will incorporate five regional dummy variables (plus an intercept dummy) to distinguish the six census regions; the default will be the Northeast region. The resulting equation is:

$$\{5\} \quad CSF_i = a + b_1SE + b_2MW + b_3SW + b_4MT + b_5WST + b_6HC_j + b_7(SE*HC_j) + b_8(MW*HC_j) + b_9(SW*HC_j) + b_{10}(MT*HC_j) + b_{11}(WS*HC_j) + e_i$$

where:

CSF_i = percent change in the number of small firms in industry i

SE = intercept dummy = 1 if Southeast Region

MW = intercept dummy = 1 if Midwest Region

SW = intercept dummy = 1 if Southwest Region

MT = intercept dummy = 1 if Mountain Region

WST = intercept dummy = 1 if Western Region

HC_j = human capital variable j

$SEHC_j$ = slope dummy = $SE*HC_j$

$MWHC_j$ = slope dummy = $MW*HC_j$

$SWHC_j$ = slope dummy = $SE*HC_j$

$MTHC_j$ = slope dummy = $MT*HC_j$

$WSHC_j$ = slope dummy = $WS*HC_j$

Equations incorporating regional dummy variables will be run separately for each independent variable (*since to do all four human capital variables would have required 48 independent variaables)* and, for each sector, will be run only for those variables which were significant in the equations {2} or {3}.

Finally, differences in MSA size will be tested by incorporating dummy variables into the equation {3} to distinguish large MSA's (defined as MSA's with a labor force greater than 150,000) from small MSA's. This equation will be:

$$\{6\} \quad CSF_i = a + b_1COLLGRD + b_2HSGRAD + b_3PPEXP + b_4MGT + b_5INDSH_i + b_6D + b_7(D*COLLGRD) + b_8(D*HSGRD) + b_9(D*EDEXP) + b_{10}(D*MGT) + b_{11}(D*INDSH_i) + e$$

where: D = dummy variable to distinguish MSA size
0 = labor force < 150,000
1 - labor force ≥ 150,000

The possibility of colinearity among the independent variables was considered. In a preliminary investigation using the 84 MSA's of the North Central census region, multiple regression output showed tolerances between COLLGRD and PCMGT to be .9010183, clearly not an indication of colinearity. In the current analysis (n = 317), correlation between COLLGRD and PPEXP was examined using both Pearson and Spearman tests; the results indicated correlation coefficients of -.401 and -.418, respectively, indicating some degree of colinearity, but not enough to seriously compromise the analysis. Correlation between HSGRAD and PPEXP was much lower (.044). A serious colinearity problem did exist, however, between COLLGRD and HSGRAD, Pearson's and Spearman's being .765 and .707, respectively. Since these two variables are already percentages, the problem cannot be solved with a transformation. Likewise, putting the four human capital variables through a principal components analysis to produce two or three orthogonal variables would defeat the purpose of including both educational variables to begin with (the purpose being to discrimate between the impact of different levels of education). One of the reasons why these two variables are collinear is that the HSGRAD figure *includes* COLLGRD (assuming all college graduates are also high school graduates); when COLLGRD is subtracted out of HSGRAD,

leaving a figure that represents the number of persons with *only* a high school education, this figure should not (and does not) exhibit the same amount of colinearity with COLLGRD.

Hypotheses Testing

All hypotheses, along with the criteria for their acceptance, are shown in Table 5. The first eight hypotheses will be tested using equation {2}, since these hypotheses are not industry-specific. Acceptance or rejection of hypotheses {4}, {5} and {7} will depend upon comparing coefficients within equations; thus, if more than one of the coefficients in the equation is significant, it will be necessary to determine if the coefficients are *significantly* different from each other (as opposed to significantly different from zero). Since each coefficient is theoretically the mean of a normal distribution with standard deviation equal to the standard error of the b-value, a difference of means t-test can be conducted. However, since the samples from which the estimates are derived are not independent, the standard error of the difference between means for correlated groups is used for the denominator (Kendall and Pigozzi 1994, Runyan and Haber 1980):

{7} $S_{x1-x2} = S^2_{x1} + S^2_{x2} - 2rS_{x1}S_{x2}$

where "r" is the correlation between the two samples.

TABLE 5. Hypotheses Testing

HYPOTHESIS	EQUATION #	TEST
1 Regional variation in small firm growth is positively related lto regional variation in educational stock, as measured by the percent of the laborforce with a college degree	2	accept if b1 is positive and significant
2 The percent of the laborforce with a high school diploma will not be a predictor of small firm growth	2	reject if b2 is positive and significant
3 Regional variation in small firm grow is positively related to regional variation in local per pupil expenditures	2	accept if b3 is positive and significant
4 the percent of the laborforce with a college degree will be a greater predictor of small firm growth than will local per pupil expenditures	2	accept if b1 > b3 and significant
5 The percent of the laborforce with a college degree will be a greater predictor of small firm growth than will the percent of the laborforce with a high school education	2	accept if b1 > b2 and significant
6 The growth of small firms is positively related to the percent of the laborforce in management occupations	2	accept if b4 is positive and significant
7 The percent of the laborforce with a college degree will be a greater predictor of small firm growth than will the percent of the laborforce in management occupations	2	accept if b1 > b4 and is significant
8 The impact of human capital will be greater for the 20-99 size category than for the 1-19 category	2	B1 (small firms) > B1 (very small firms)
9 The relative impact of a college education on small firm growth will be greater for service industries than for manufacturing	3	B1 (service firms) > B1 (manufacturing firms)
10 For small business service firms, the percent of the labor-force with a college degree will be of greater relative importance than for other small service firms	3	B1 (business service firms) > B1 (services)

TABLE 5 (cont'd)

HYPOTHESIS	EQUATION #	TEST
11 The percent of the laborforce with a high school diploma will be of greater relative importance for small manufacturing and service firms than for other sectors	3	B2 (manufacturing firms) > B2 (other sectors)
12 The relative importance of management background, compared to education, will be greater for finance, insurance, and real estate firms than for other firms	3	B4 (F.I.R.E. firms) > B4 (other sectors)
13 Growth of small firms in sector "j" will be positively related to sector j's share of the regions establishments	3	accept if b5 is positive and significant
14 The impact of human capital will be greater in the Southeast region than in other regions	5	accept if b7 is positive and significant
15 The impact of human capital will vary little among census regions other than the Southeast	5	reject if b8-b11 are positive and significant
16 The impact of human capital will be greater for large MSA's than for smaller MSA's	6	accept if b7-b11 are positive and significant

b = coefficient

B = beta value

Hypotheses 9-13 are industry-specific and thus require separate equations. These hypotheses will be tested by comparing *beta* coefficients within and across equations. Since all variables are expressed in comparable units (percentages), such comparisons will be reliable. These hypotheses do not take the form of asserting, for example, that b_1 in one equation is greater than b_1 in a different equation; rather, they state that the importance of b_1 relative to other coefficients in the *same* equation is greater than the importance of b_1 in a *different* equation (relative to other coefficients in that equation). For example, such an hypothesis might be that when the dependent variable is the *change in manufacturing firms*, b_1 is more important relative to other b's than when the dependent variable is the *change in service firms*. Firm size comparisons will be made in the same manner.

CHAPTER VI

RESULTS

The first issue to be resolved in this analysis has to do with the need for equation {4}, in which dummy variables were incorporated to distinquish growing regions from declining regions. It will be recalled that a potential problem with the basic model was that the model assumes growth in the number of small firms is occurring in *growing* regions, not simply resulting from downsizing in declining regions. In reality, however, some growth in the number of *small* establishments might result from shrinking employment of *larger* firms in declining regions. To clarify which scenario better explains the growth of small firms, two approaches were suggested. First, it is assumed that if most of the increase in small firms were the result of downsizing there would be either no relationship or a negative relationship between employment growth and the growth of small firms in a given sector. The relationship between growth in employment and growth in the number of small firms was tested and the results (Table 1) indicated that in all four sectors employment growth and small firm growth were *positively* correlated. Thus it is assumed that growth in the number of small firms is not primarily the resulting of downsizing occurring in declining regions. Equation {4} was also run, and the results (not reported here, since none of the dummy variables were significant) confirmed that there were no significant differences in the

impact of human capital between growing and declining regions. This analysis has, therefore, proceeded on the assumption that most growth in the number of small establishments is related to growth, not decline.

General Hypotheses Testing

The first eight hypotheses are tested with respect to both the aggregate and sector-specific growth in establishments. In this section, only the results of the aggregate analysis will be presented.

Hypotheses 1-7 are tested using equation {2}. These hypotheses all examine the impact of the four human capital variables on the change in the number of small and *very* small establishments *in all sectors*. In general, it was hypothesized that all variables except HSGRD will be significant, but that the percent of the population with a college degree will have the greatest impact. The results indicate that while PCMGT was significant for *very* small firms, none of the education variables were significant in the growth of aggregate small firms of either size category (Table 6). Thus, for *all sectors*, hypotheses 1, 3, and 4 must be rejected. Hypothesis two, which stated that HSGRD would *not* impact the growth of small firms, can be accepted since this variable was not significant. Hypothesis six, that the growth of small firms is positively related to the percent of the laborforce in management occupations, can

TABLE 6. Regression Results: Equations 2 and 3

Sector	a	COLLGR	HSGRD	EDEXP	PCMGT	INDSHR	ADJ R2
All Sectors							
1-19 employees	-15.409	0.186	0.143	0.064	1.733		0.050
		(1.014)	(.900)	(.603)	(3.136)*		
20-99 employees	-10.288	.175	.293	.039	.912		0.052
		(.559)	(1.081)	(.215)	(.965)		
Manufacturing							
1-19 employees	-7.264	0.162	0.006	0.139	-0.027	-0.058	0.023
		(2.218)**	(.091)	(2.389)**	(-.360)	(-.911)	
20-99 employees	15.737	-0.001	0.05	-0.081	-0.002	-0.009	0.000
		(-0.013)	(.803)	(-1.376)	(-.029)	(-.144)	
F.I.R.E.							
1-19 employees	3.838	0.022	-0.153	0.011	0.287	-0.11	0.090
		(.312)	(-2.617)**	(.186)	(3.897)**	(-1.706)	
20-99 employees	14.532	-0.038	-0.042	-0.109	0.21	-0.077	0.033
		(-.525)	(-.693)	(-1.862)**	(2.763)**	(-1.165)	
Services							
1-19 employees	9.961	0.127	-0.043	0.028	0.214	-0.098	0.073
		(1.755)*	(-.712)	(.488)	(3.025)**	(-1.591)	
20-99 employees	24.933	0.191	-0.014	-0.011	0.075	-0.033	0.042
		(2.600)**	(-.223)	(-.182)	(1.041)	(-.532)	
Business Services							
1-19 employees	22.389	-0.014	0.038	-0.028	-0.0482	-0.154	0.025
		(-.186)	(.634)	(-.469)	(-.603)	(-2.077)**	
20-99 employees	2.371	0.084	0.081	0.077	-0.058	-0.214	0.062
		(.244)	(1.353)	(1.319)	(-.750)	(-2.945)**	

NOTE: For individual sectors, coefficients are beta-value

*significant at .05

**significant at .01

(t-values)

also be accepted for the *very* small size category, since PCMGT was positive and significant.

Hypothesis seven, which stated that the percent of the laborforce with a college degree would be a greater predictor of growth than the percent of the laborforce in management must be rejected, since COLLGRD is not significant. The last hypothesis tested at the aggregate level (hypothesis 8), that education would be a greater factor in *small* firms than in *very small* firms must also be rejected since neither of the education variables was significant for either size firms.

Although this analysis is perhaps not very helpful for determining the relative importance of various educational measures of human capital to small firm growth at the aggregate level, it does suggest that occupational background may be more important than suggested by much of the literature reviewed. It also serves to confirm that colinearity among the independent variables is not a serious problem. Regression output shows the following tolerances for the four independent variables: COLLGRD - .59432; HSGRD - .86046; EDEXP - .93283; PCMGT - .63697.

Sector-specific Analysis

Results of sector specific analysis, tested with equation {3}, are also shown in Table 6. The first hypothesis relates to the importance of college education and can be accepted for both the Manufacturing and Services

sectors. College education is significant for *very* small Manufacturing firms and for both size categories of Service firms. It is not, however, significant for either the Business Services or for Finance, Insurance, and Real Estate sectors.

The second hypothesis, that high school education would *not* be important to small firm growth, is also accepted. It is not significant for the Manufacturing, Services, and Business Services sectors, and is *negatively* related to the growth of *very* small in the Finance, Insurance, and Real Estate sector. Hypothesis three, that local per pupil expenditures would be positively related to growth, can be accepted for *very* small Manufacturing firms. This variable (EDEXP) was also significant but negatively related to growth in small Finance, Insurance, and Real Estate firms.

Hypothesis four, which stated that college education would be a greater predictor of growth in small firms than local per pupil education expenditures, can be accepted for both size Service firms (since EDEXP was not significant). It can also be accepted for *very* small Manufacturing firms since the *beta* associated with COLLGRD is greater than the *beta* associated with EDEXP, and the t-test conducted (using equation {7}) indicates that this difference is statistically significant (at .05). Generally, COLLGRD was significant in three sector/size categories, whereas EDEXP was only in one. Hypothesis five, that the percent of the labor force with a college degree would have a greater

impact on firm growth than the percent with a high school diploma is accepted since HSGRD was not positive and/or significant for any of the sectors.

Hypothesis six stated that growth in small firms would be positively related to the percent of the laborforce in management occupations. This was accepted at the aggregate level and can also be accepted for two of the four sectors examined: *very* small Service firms and Finance, Insurance, and Real Estate firms (both size categories). In addition, the seventh hypothesis, that COLLGRD would have a greater impact than PCMGT, can be accepted for *very* small Manufacturing establishments and for small Service firms. For *very* small Manufacturing firms, this hypothesis can be accepted since PCMGT is not significant. For both *very* small Service establishments and both categories of Finance, Insurance, and Real Estate firms, PCMGT has a greater impact than COLLGRD. For the *very* small Service firms, this difference is significant (at .99).

The hypothesis relating to firm size, which stated that human capital would have a greater impact in the 20-99 employee category than in the 1-19 size category, can be accepted for Services. This is the only sector in which COLLGRD was significant for both size categories, and the *beta* value is not only greater for small firms than for *very* small firms, but for small firms it is the only variable that is significant (while for *very* small Service firms, PCMGT is also significant). However, in general, it should

be noted that this variable is significant for *very small* size firms in two sectors, while for *small* size firms it is significant only in one sector. Also, while no hypothesis relating to firm size was suggested for the PCMGT, it is perhaps worth noting that in the Finance, Insurance, and Real Estate sector, where this variable was significant for both size categories, its impact was greater in the smaller of the two size categories *(based upon a comparison of beta values)*, and for the Service sector, it was significant only for *very* small firms.

Hypotheses nine, that the relative impact of a college education on small firm growth will be greater for Service firms than for Manufacturing firms can be accepted since COLLGRD is significant for both size categories of Service firms but only for *very* small Manufacturing firms. For small firms, COLLGRD is significant *only* for Services, not for Manufacturing. However, for the 1-19 category, the beta value associated with COLLGRD for Manufacturing firms is higher than the corresponding beta value for Services firms.

Hypothesis ten states that college education would be more important in the growth of small Business Service firms than for other Service firms; this must be rejected. Although COLLGRAD is positive and significant for both size categories of Service firms, for Business Service firms it is significant for neither. This is probably the most surprising result, since Business Service firms employ a greater percentage of people with college degrees than do

Service firms as a whole. Hypothesis eleven, that the percent of the population with a high school degree might be more important to the growth of small Manufacturing and Service firms than to firms in other sectors, must be rejected. HSGRD is not positively related to the growth of small firms in any of the sectors examined.

The importance of management background to the growth in Finance, Insurance, and Real Estate firms is strongly suggested by the coefficients associated with PCMGT for both size categories. Therefore, hypothesis twelve, which states that for this sector, management background will not only be more important than college education for but will be more important for the Finance, Insurance, and Real Estate sector than for other industries can definitely be accepted. PCMGT coefficients for both size categories are positive and significant, whereas those associated with COLLGRD are neither. Furthermore, the only other sector in which PCMGT is significant is Services, and only for the 1-19 size category.

A variable measuring each sector's share of total employment (INDSHR) was included in the sector-specific model primarily as a control, but the associated hypothesis (13) was that growth in small firms in a sector would be positively related to that sector's share of employment. For Manufacturing, Services, and larger Finance, Insurance, and Real Estate establishments, INDSHR is not significant. For Business Services (both size categories) this variable

is significant but *negative*. Thus hypothesis thirteen is rejected.

To summarize these results, it can be said that human capital variables are generally more important for the growth of *very small* firms than for *small* firms. The importance of college education and management background are generally substantiated, while high school education in itself does not appear to positively impact the growth of small firms, not even in Manufacturing, a sector which employs a greater proportion of people with only high school level education than the other sectors. In general, for the sector-specific analysis, ten of the first twelve hypotheses can be either accepted universally or at least for some sectors. Only hypotheses ten and eleven must be rejected completely. The following section will present results of the regional analysis.

Regional Patterns

The last three hypotheses relate to regional patterns. Three techniques were employed to determine if regional patterns in the impact of human capital exist: 1) the use of regional dummy variables in the basic regression analysis, and 2) the incorporation of a dummy variable to test for differences in MSA size, and 3) examination of residuals from regression. (Residuals were saved from equations which included *only* the coefficients which were significant in the

original analysis). These residuals were standardized and mapped (see Figures 10-14).

The equation incorporating regional dummy variables (equation 5) was run separately for each independent variable (*since to do all four human capital variables would have required resulted in 48 independent variables).* Results of these equations are shown in Table 7, which indicates only significant coefficients for this entire set of regressions (see appendix, Table 1, for complete results of these regressions). In the aggregate model (all sectors), for *very* small firms, PCMGT (the only significant human capital variable in the original analysis) was significant in *none* of the six regions. On the other hand, for these same firms, COLLGRD, which was *not* significant in the basic analysis, was positive and significant for all regions.

When the impact on *very* small Manufacturing firms was examined with regional dummy variables included, COLLGRD, which was positive and significant overall (in original analysis), is positive and significant only in the Southeast. For these firms, however, EDEXP is positive and significant for all regions.

For the Finance, Insurance, and Real Estate firms sector, with the dummy variables included, a positive relationship between PCMGT and growth in very small firms is seen in the all but the Southwest and Mountain regions. In both the Southwest and Mountain regions the impact of PCMGT

TABLE 7. Regression Results: Equation 5 (Regional Differences)

Note: only significant coefficients shown

	Very Small Firms				Small Firms			
Sector	COLLGRD	HSGRD	EDEXP	PCMGT	COLLGRD	HSGRD	EDEXP	PCMGT
All Sectors:								
Northeast	0.879 **							
Southeast	0.879 **							
Midwest	0.879 **							
Southwest	0.879 **							
Mountain	0.879 **							
Western	0.879 **							
Manufacturing:								
Northeast			0.527 **					
Southeast	0.841 *		0.527 **					
Midwest			0.527 **					
Southwest			0.527 **					
Mountain			0.527 **					
Western			0.527 **					
F.I.R.E.:								
Northeast				2.918 **				
Southeast				2.918 **				
Midwest				2.918 **				
Southwest				-0.181 *				
Mountain				-2.347 **				
Western				2.918 **				
Services:								
Northeast	0.779 **			1.041 *				
Southeast	0.779 **			1.041 *				
Midwest	0.779 **			1.041 *				
Southwest	0.779 **			1.041 *				
Mountain	0.779 **			1.041 *				
Western	0.779 **			1.041 *	1.691 *			
Business Services:								
Northeast			0.692 *				4.461 **	
Southeast			0.692 *			-4 851 *	1.736 *	
Midwest			-0.153 *				0.579 **	
Southwest			0.692 *				-0.285 **	
Mountain			0.692 *				-1.627 **	
Western			0.692 *				4.461 **	

*significant at .05

**significant at .01

is negative and significant, particularly in the Mountain region.

When regional dummies variables are added to the equation testing the impact of COLLGRD and PCMGT on *very* small Service firms, no regional differences appear (both variables are significant in all regions). In contrast, for small Service firms, the impact of COLLGRD (which, in the original analysis was a stronger predictor of growth than for *very small* firms), is positive and significant only in the Western region.

Neither size category of Business Service firms was positively related to any of the human capital variables in the original analysis, but when dummy variables are added EDEXP appear significant in some regions for both size categories. For the *very small* firms, PCMGT is postive in all regions but the Midwest region, where it is significant but negative. For small Business Service firms, EDEXP is positive and significant in the Northeast, Southeast, Midwest, and Western regions; and it is negative and significant in the Southwest and Mountain regions (the same two regions where PCMGT is negative for Finance, Insurance, and Real Estate). In addition to the positive impact of EDEXP, one other difference occurs for the larger Business Service firms; HSGRD, not significant otherwise, is negative and significant in the Southeast region.

Based upon the above results, hypothesis fourteen, which states that the impact of human capital will be

greater in the Southeast than in other regions, can be accepted, for *very* small firms in the Manufacturing sector. Likewise, hypothesis fifteen, that the impact of human capital will vary little among regions other than the Southeast, can also be accepted, particularly with respect to the impact of college graduates.

City-Size Comparison

This section will examine the impact of human capital variables on the growth of small firms for two different size MSA's. It was hypothesized, based upon both product cycle theory and upon the general shift to a more advanced service economy, that larger MSA's would be likely to have a greater proportion of industries requiring higher levels of human capital than smaller MSA's, and in addition these larger MSA's would be more likely to embody urbanization economies which would increase the effectiveness of human capital. Equation {6}, incorporating dummy variables (both slope and intercept) to distinguish MSA's with a laborforce greater than 150,000 from smaller MSA's, was employed to determine if city size was a factor in the impact of human capital on small firm growth.

Almost no differences were found between large and small MSA's (see Table 8). The dummy variables were not significant for equations which examined all sectors, Manufacturing firms, or Service firms. In the Finance, Insurance, and Real Estate sector, HSGRD, which is

TABLE 8. Regression Coefficients: Equation 6 (MSA Size Differences)

Sector	a	COLLGRD	HSGRD	EDEXP	PCMGT	R2	F-RATIO
All Sectors:							
1-19 Employees						0.054	2.947
- small MSA's	-24.358*	-	-	-	2.289 **		
- large MSA's	-	-	-	-	2.289 **		
20-99 Employees						0	0.477
- small MSA's	-	-	-	-	-		
- large MSA's	-	-	-	-	-		
Manufacturing:							
1-19 Employees						0.018	1.633
- small MSA's	-	0.428 **	-	0.218 *	-		
- large MSA's	-	0.428 **	-	0.218 *	-		
20-99 Employees						0	0.524
- small MSA's	-	-	-	-	-		
- large MSA's	-	-	-	-	-		
F.I.R.E.:							
1-19 Employees						0.087	4.29
- small MSA's	-	-	-0.279 *	-	1.745 **		
- large MSA's	-	-	-0.997 *	-	1.745 **		
20-99 Employees						0.02	1.709
- small MSA's	-	-	-	-0.378 *	2.285 *		
- large MSA's	-	-	-	-0.378 *	2.285 *		
Services:							
1-19 Employees						0.068	3.487
- small MSA's	-	0.254 *	-	-	0.944 *		
- large MSA's	-	0.254 *	-	-	0.944 *		
20-99 Employees						0.039	2.389
- small MSA's	-	0.679 *	-	-	-		
- large MSA's	-	0.679 *	-	-	-		
Business Services:							
1-19 Employees						0.015	1.515
- small MSA's	-	-	-	-	-		
- large MSA's	-	-	-1.089 *	-	-		
20-99 Employees						0.03	2.04
- small MSA's	-	-	1.217 *	0.829 *	-6.881 **		
- large MSA's	-	-	1.217 *	0.829 *	-6.881 **		

*significant at .05

**significant at .01

negatively related to growth in very small firms, appears even more negative in the larger MSA's. In the Business Service sector, one change related to city size was noted; for *very small* firms, in the larger MSA's, HSGRD is negative and significant. However, it is interesting to note that although for this sector, *none* of the human capital variables were significant without the dummies (equation {3}), and while the larger size-category of Business Service firms displays no differences by MSA size, when these dummy variables are incorporated both HSGRD and EDEXP are positive and significant (at .05); PCMGT is *negative* and significant (at .00).

In general, it appears that the impact of human capital is not related to MSA size; thus the final hypothesis must be rejected. The only variable to vary in impact by MSA size was HSGRD (not significant in earlier analyses) and in both cases the impact was negative.

Residuals Analysis

As noted above, residuals were saved from equations which included *only* the variables which were found to be significant in the original analysis. Thus, for the aggregate analysis (all sectors), the equation would be:

{8} $CSF_{vs} = a + b_1 PCMGT + e$

where CSF_{vs} = the change in *very* small firms

Residuals from this equation are shown in Figure 10. The geographic pattern of these residuals is definitely

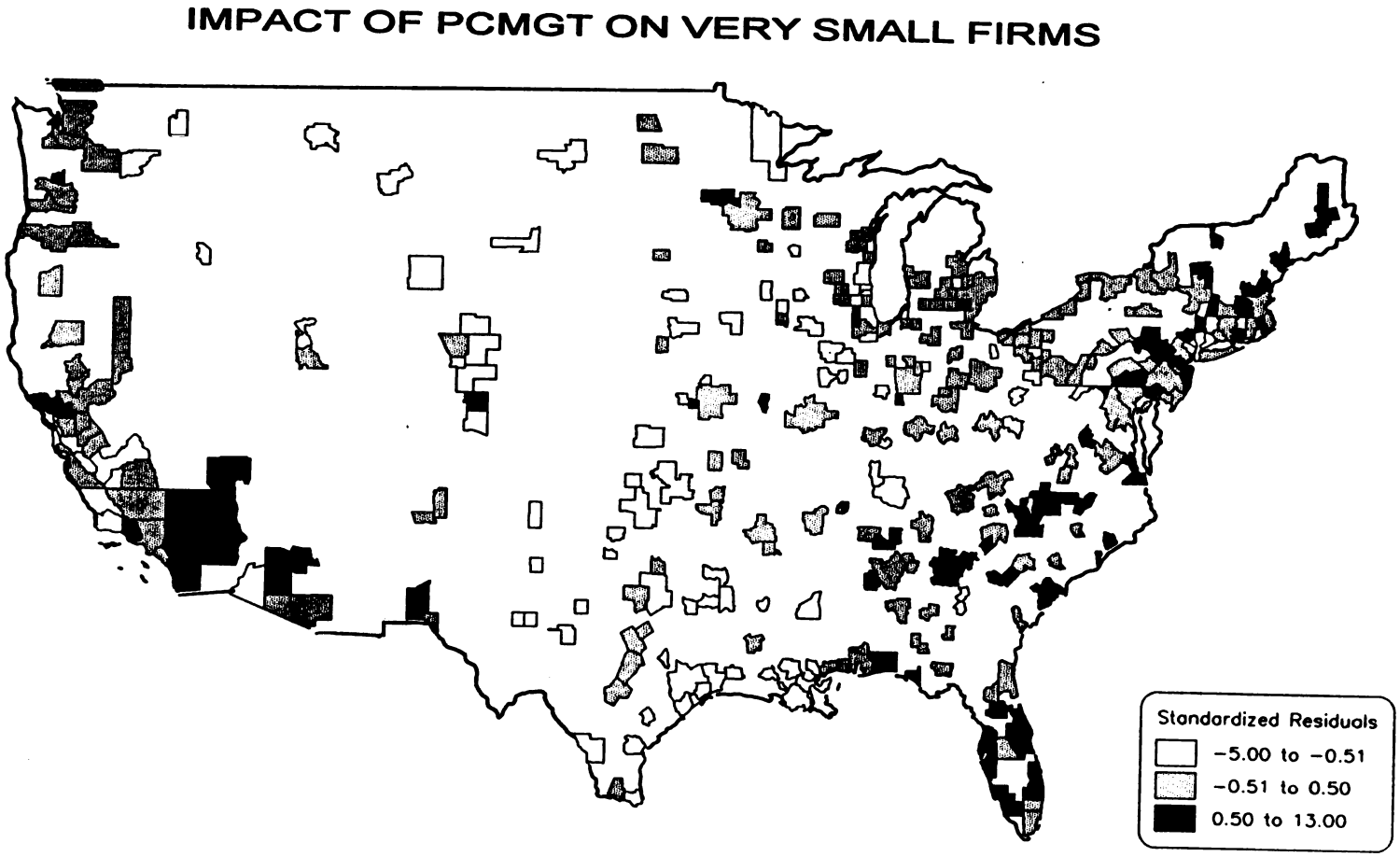


Figure 10. Residuals from Equation {8}

different from the distribution of those in management occupations seen in Figure 9. For example, in several MSA's which were among those with the highest percentage of managers, residuals were either negative or less than +.5 (e.g. Orange County; Washington DC; Denver; Springfield, Illinois; Boise, Idaho), indicating that in these MSA's a wealth of managers did not translate into increases in small firms. On the other hand, there were also MSA's with few managers, but in which a strong relationship between management and small firm growth was evident (Las Cruces, NM; St. Cloud, MN). In general, the relationship between management and the increase in small firms seems stronger in the Northeast and the Southeast.

For very small Manufacturing firms, residuals were saved from an equation regressing the change in very small Manufacturing firms on both COLLGRD and EDEXP. This equation is:

{9} $CSF_{vs} = a + b_1 COLLGRD + b_2 EDEXP + e$

where: CSF_{vs} = percent change in *very* small Manufacturing firms

The residuals from this equation (Figure 11) do not exhibit the strong east coast concentration seen in Figure 10. The impact of these two human capital variables on *very* small Manufacturing firms is weaker in the Northeast but somewhat stronger on the West coast (Figure 11). The impact of these variables in the Southeast and in some Texas and Mountain regions also appears somewhat stronger.

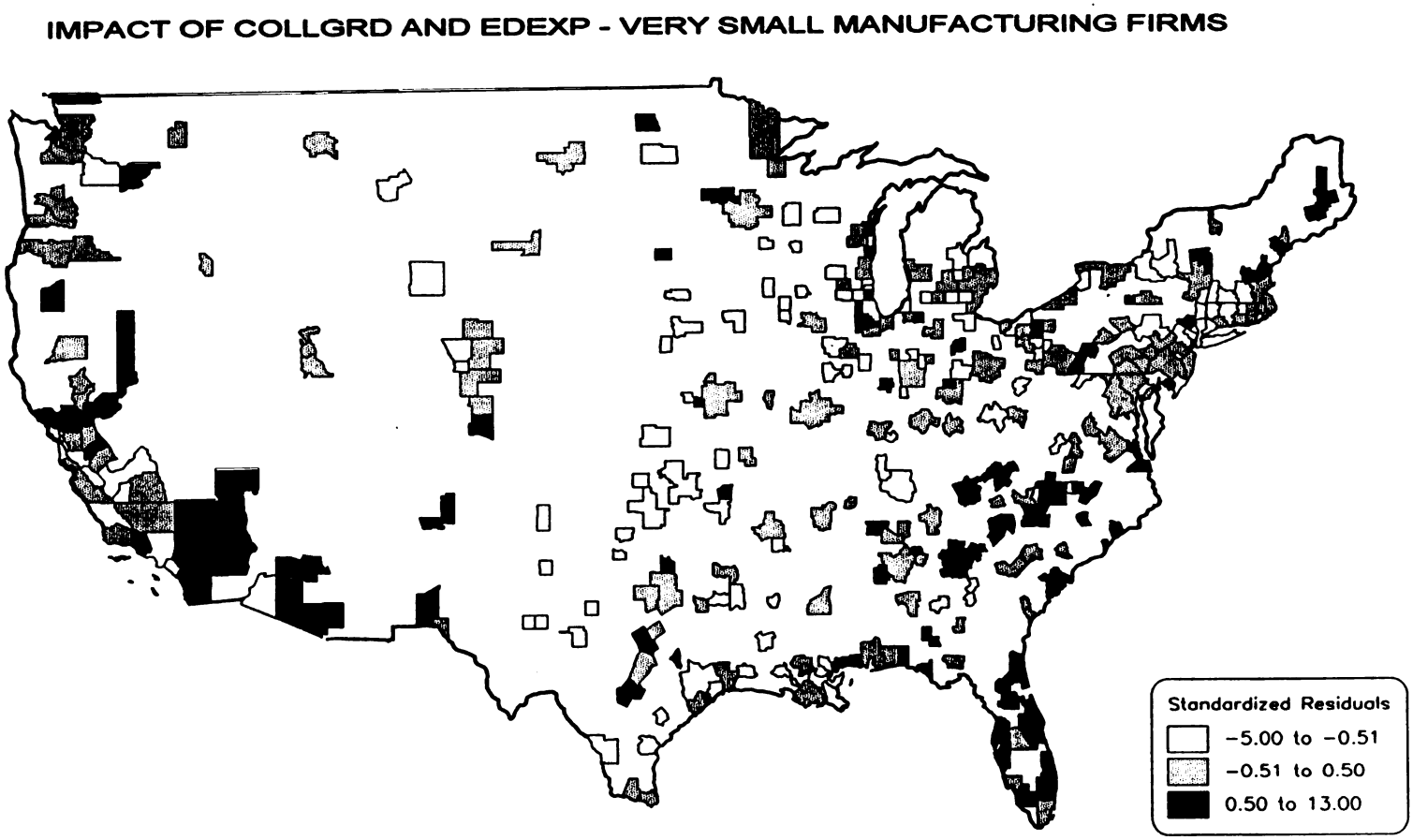


Figure 11. Residuals from Equation {9}

The equation used to examine residuals for *very* small Finance, Insurance, and Real Estate firms is:

{10} $CSF_{vs} = a + b_1HSGRD + b_2PCMGT + e$

where CSF_{vs} = change in very small Finance, Insurance, and Real Estate Firms

For these *very* small firms, the impact of PCMGT appears greater in the Northeast than in the Northwest (Figure 12a), and is also strong in the Southeast and somewhat stronger in more Midwest MSA's than for either of the previous patterns of residuals. In most of the North Central part of the country PCMGT appears to have a negative impact on growth in this sector, despite the fact that most of the MSA's in this area fall into the "middle" category with respect to their percent in Management occupations.

Residuals were also saved for small Finance, Insurance, and Real Estate firms, from the equation below.

{11} $CSF_s = a + b_1EDEXP + b_2PCMGT + e$

where: CSF_s = percent change in small Finance, Insurance, and Real Estate firms

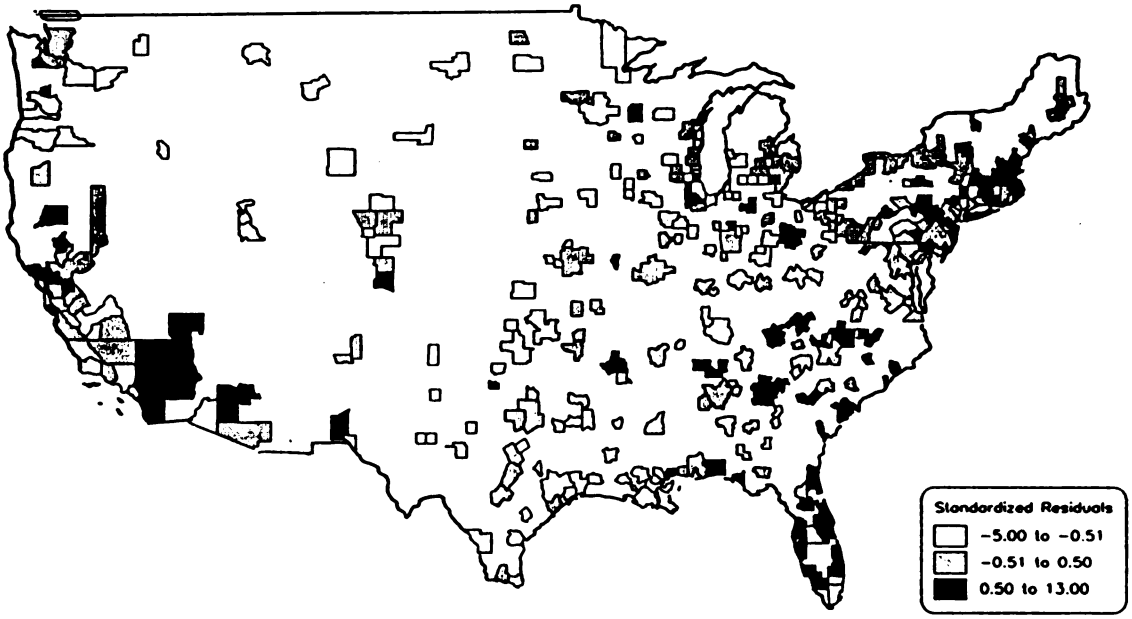
Results are shown in Figure 12b. Residuals for these firms are definitely weaker in all areas than those associated with *very* small Finance, Insurance, and Real Estate firms.

Both PCMGT and COLLGRD impacted the growth in *very* small Service establishments. Thus equation used was:

{12} $CSF_{vs} = a + b_1COLLGRD + b_2PCMGT + e$

where: CSF_{vs} = percent change in very small Service firms

a) IMPACT OF HSGRD AND PCMGT ON VERY SMALL F.I.R.E FIRMS



b) IMPACT OF EDEXP AND PCMGT ON SMALL F.I.R.E FIRMS

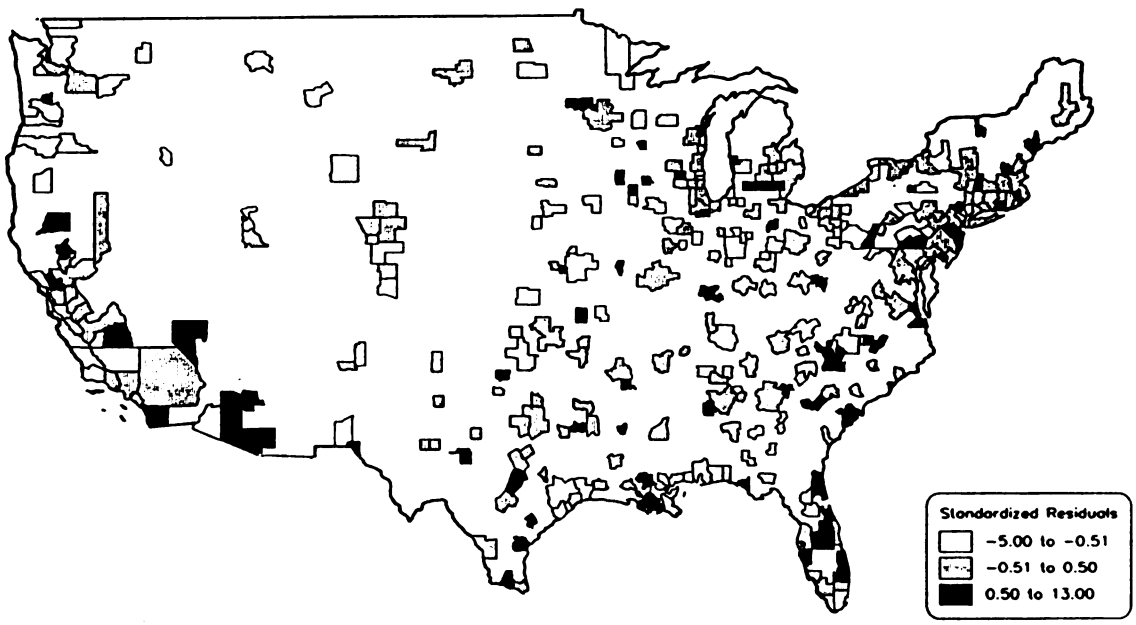


Figure 12. Residuals from Equation {10} and {11}

The impact of these variables in the Northeast does not appear as strong as the impact of human capital variables on growth in Finance, Insurance, and Real Estate firms (Figure 13a), but seems greater than for Manufacturing firms (Figure 11). In the West, impacts appear somewhat weaker than in the East, and were also weaker than the impacts of human capital variables on both Manufacturing and Finance, Insurance, and Real Estate in this region. In the Southcentral area *very* small Service firms showed a slightly stronger response to these variables other sectors.

For small service firms, PCMTG was not significant, but COLLGRD was, thus residuals were saved from the following equation:

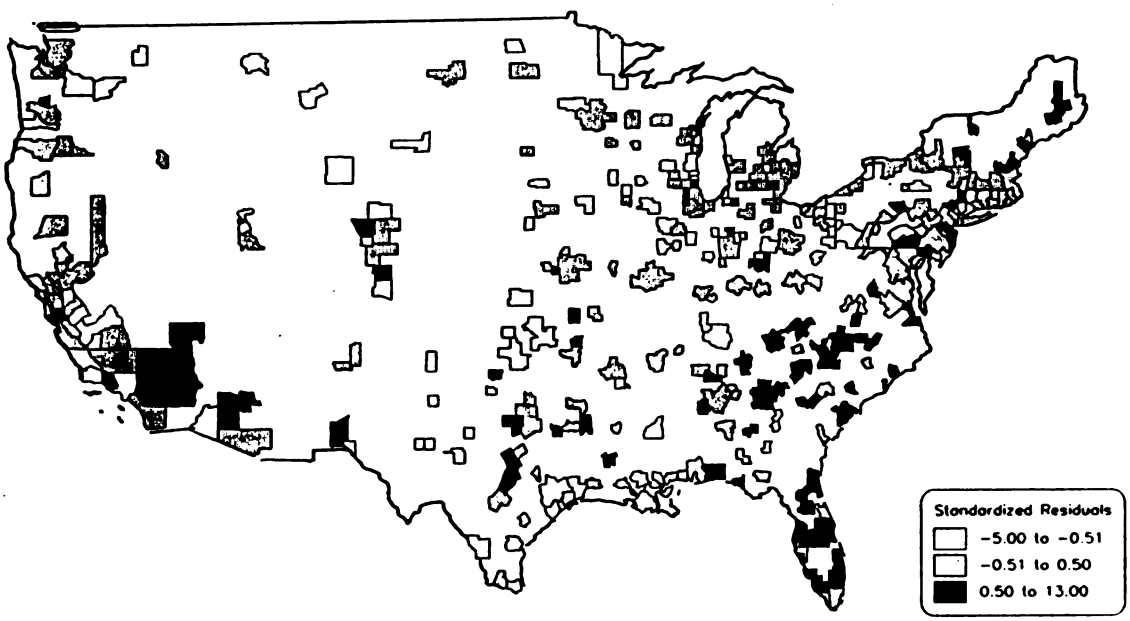
{13} $CSF_s = a + b_1 COLLGRD + e$

where: CSF_s = percent change in small Service firms

Compared to the *very* small Service firms, the impact of human capital on small Service firms was much stronger on the West coast, but somewhat weaker in the Southeast and the Midwest (Figure 13b).

In summary, although statistically there were few regional differences in the impact of human capital, these maps do show some broad regional patterns and also indicate some interesting patterns for individual MSA's. For example, Ann Arbor, Michigan, scores high in the impact of human capital variables in the aggregate analysis, as well as for Service and Finance, Insurance, and Real Estate firms; yet for Manufacturing firms, the impact is negative.

a) IMPACT OF COLLGRD AND PCMGT ON VERY SMALL SERVICE FIRMS



b) IMPACT OF COLLGRD ON SMALL SERVICE FIRMS

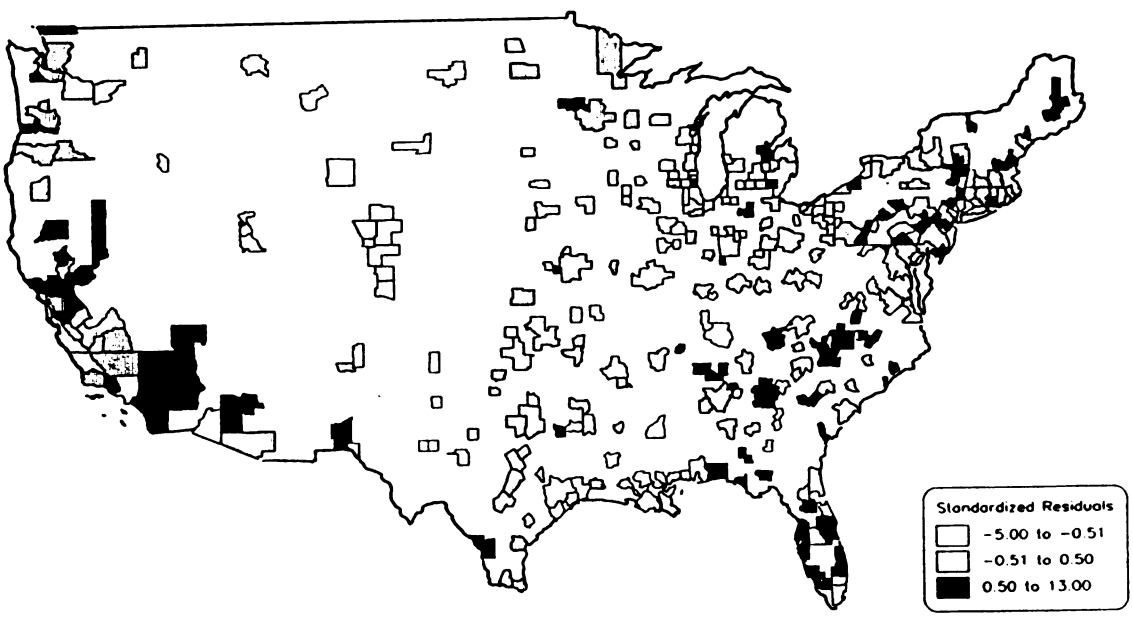


Figure 13. Residuals from Equation {12} and {13}

Colorado Springs likewise has high residuals for both Manufacturing the and Finance, Insurance, and Real Estate sectors, but negative residuals for Service firms. Residuals in other MSA's, Jacksonville, North Carolina, Charlotte, South Carolina, and many in Florida, are strong in all sectors. The implications of these results, as well as the other findings reported in this chapter, will be discussed in the next chapter.

CHAPTER VII

CONCLUSION

The questions this dissertation set out to answer are 1) is human capital a factor in the growth of small firms at the regional level, 2) assuming that it is, which human capital variables are most important, 3) are there sectoral differences in the impact of human capital, and 4) are there regional differences in the impact of human capital. The findings of this dissertation with respect to each of these questions will be summarized and discussed.

Human Capital as a Regional Factor

The first of these questions can be answered in the affirmative. One or more of these human capital variables is significant in all sectors examined except Business Services, and even in this sector, when regional dummy variables are incorporated, two human capital variables are seen to impact small firm growth in some regions.

Which types of human capital are most important varies, depending both upon the sector and upon the size of firms, although generally human capital appears to play a greater role in the growth of *very small* establishments. *All* human capital variables included were significant for one of the size categories of at least one sector. And the two variables argued to measure human capital *stock* (based upon McNamara, Kriesel, and Deaton), percent of college graduates and percent of the local labor force in management

occupations, were (as hypothesized) more important than local education expenditures and high school education, the two which measured human capital *flow*. It will be recalled that the rationale for this hypothesis was that flow variables would be more important to *relocating* firms (which presumably would be influenced more by indications of an area's potential for supplying labor), whereas measures of human capital stock would play a greater role in firm *formation*, which was expected to account for more of the variation in small firm growth. And, in fact, one of these flow variables, HSGRD, is not positively related to growth in any of the sectors examined; it is even *negatively* related to the growth of very small Finance, Insurance, and Real Estate firms.

The other variable assumed to be a measure of human capital flow was EDEXP; this variable was positive and significant only for *very* small Manufacturing firms (and, in some regions, for Business Service firms). The explanation for this might be related to this variable's greater impact in attracting firms, if it can be argued that in the Manufacturing sector, more branch plant location occurs than in non-manufacturing industries. However, as pointed out earlier, this variable also reflects state-level variation in educational funding, which makes its interpretation difficult. Overall, the stronger showing of the two measures of human capital *stock* reinforce the notion that for small firm growth, the creation and management

components outweigh laborforce considerations. With respect to formal education, the percent of the population with a college degree is definitely the most important factor affecting small firm growth.

Because the literature suggested that occupational background is less important to new firm formation than is formal education, the second measure of human capital stock, the percent of the laborforce in management occupations (PCMGT) was not expected to be as important as formal education. However, this variables had the greatest impact on aggregate growth of *very* small firms, the greatest impact on growth of both size firms in the Finance, Insurance, and Real Estate sector, and the strongest impact on *very small* Service firms. When regional dummy variables were added, PCMGT also appears positive and significant for Business Services in most regions. The rationale underlying the general hypothesis relating management background to small firm growth had less to do with the firm *formation* component and more to do with firm *survival*. The fact that empirical evidence suggested formal education would be a greater predictor of growth in the number of small firms than would occupational background may be related to two factors: the size of the firms studied and the time period covered by such research. With respect to size, since small firms have a much greater failure rate than do large firms, PCMGT, because it is considered a more important factor in firm *survival*, might be a greater factor in the growth of small

firms than large firms. The time period is relevant since much of the literature referred to above predated the 1980's; the stronger than expected showing of occupational background in this study may reflect the increasingly competitive environment during this period, an environment in which firm survival rates are generally lower.

Sectoral Differences in the Impact of Human Capital

The third general question considered by this research relates to sectoral differences in the impact of human capital. It was hypothesized that for Manufacturing firms, the impact of COLLGRD would be less than for Service firms, and this was true overall, since this variable was not significant for both size Manufacturing firms. However, for *very* small firms, the impact of COLLGRD was greater in the Manufacturing sector. The variable measuring educational quality, EDEXP, was also significant for Manufacturing firms. For both of these variables, the impact in this sector was greater for *very* small firms. Although HSGRD was not expected to be significant overall, it was expected to be more important for the Manufacturing sector than for other sectors. However, it was not significant in any of the analyses.

For the Finance, Insurance, and Real Estate sector, the importance of occupational background to firms in both size categories was substantiated. This was expected, based upon the high percentage of the administrators and managers in

this sector, and its lower requirement for professional and technical labor, which more often requires college education. All analyses (basic, regional, MSA size) indicated that impacts of PCMGT in this sector were greater for *very* small size firms.

As discussed above, based upon employment figures which indicate that service industries have a greater demand for skills which are dependent upon college education than for management skills and which assume that the laborforce needs of *small* firms will be the same as those of larger firms, it was hypothesized that for the Service sector, COLLGRD have a greater impact than for Manufacturing. This hypothesis was accepted, for both size Service firms, but for *very* small firms the impact of PCMGT was even greater. In contrast, the impact of COLLGRD was was greater for small firms than for *very* small firms. For Services, there were no significant differences in human capital impacts by region or MSA size.

For Business Service firms, the lack of relationship with any of the human capital variables was very surprising, particularly since the survey of Beyers, Johnsen, and Stranahan (1987) found that producer service firms had 43% of their workforce in occupations that require the highest levels of education. When regional dummy variables were added, EDEXP did appear to positively impact the growth of *very* small firms everywhere except in the Midwest and it also positively impacted small firm growth in all but the

Southwest and Mountain regions. The MSA size analysis also indicated positive relationships between small Business Services firms and both HSGRD and EDEXP. In general, it appears that human capital's impact in the Business Service sector is greater for small than for *very* small firms.

Regional Differences

Finally, this dissertation addressed the question of regional differences in the impact of human capital. With respect to its distribution, human capital appears to be greatest in MSA's in the Mountain and Western regions, followed by the Northeast region; the Southeast region appears most deficient in human capital. In contrast, it is in this most human capital poor region that the strongest growth in very small establishments in *all* sectors is occurring. While this might suggest a lack of relationship between human capital and small firm growth, this does not appear to be the case. In fact, the Southeast provides the *only* instance of a human capital variable having a stronger impact than in other regions (the impact of COLLGRD on the growth of *very small* Manufacturing firms).

Regression results revealed few regional differences in the relationship between human capital and small firm growth. The lack of strong regional differences in the *impact* of human capital, despite the obvious differences in rates of small firm growth, suggests that even when macro-level factors influence growth in a general area, the human

capital factor may influence more specifically *where* this growth occurs. The high levels of growth experienced by the human capital poor Southeast region during the 1980's is a good example. The economic boom occurring in this region in the 1980's has been hypothesized to be related to the opening of branch plants and relocation of firms to this area to take advantage of lower taxes and its low-paid, non-union laborforce, in a sense, its *low* (at least inexpensive) human capital. And certainly much of this growth can be attributed to such relocations. However, within this decision to relocate to the south for cost-related reasons, the more specific location within the south was probably related to human capital in these areas.

Further, it is likely that much of the development of these smaller firms was triggered by the relocation of the larger firms in the area, since it is unlikely that many firms in the 1-19 employee category would have *re*located to the area. While the larger firms' location may have been more related to cost factors than to human capital (except perhaps negatively), the related growth of smaller firms in the region, those that are most likely to have "developed in place" vs. relocating, is more dependent upon having a local comparative advantage in human capital.

The only other strong regional differences noted were in the Southwest and Mountain regions. For both of these regions, PCMGT was negatively associated with *very* small firm growth in Finance, Insurance, and Real Estate and EDEXP

was negatively related to small firm growth in Business Services. This is particularly mystifying since the Mountain region, where the impact of PCMGT is most negative, has the highest percent of its labor force in Management occupations. This suggests that perhaps the relationship between these two variables is not linear beyond a certain point, i.e. there is a point where additional levels of management began to have a negative effect, particularly if this disproportionate number of managers also reflects a dearth of other occupations. For *very* small Business Service firms in the Midwest, PCMGT is also negatively related to growth, but this region also has the lowest percent of its labor force in management occupations.

At the subregional scale, although some variation in the impact of human capital was evident, based upon the residuals analysis, differences based upon MSA size were not evident. The only sector in which the impact of human capital varied by MSA size was the Business Service Sector, in which the impact of HSGRD was more negative for large MSA's. The failure of urbanization economies associated with the larger MSA's to enhance the impact of human capital can probably be explained in the light of recent trends in urban growth, which see the smaller metropolitan areas and exurban areas growing faster than many of the larger MSA's.

The fact that the *impact* of human capital is significant, even in areas where levels of human capital are not strong, reinforces the idea that it is a universal

factor in growth. It will be recalled that in the section where hypotheses were developed, regional differences were expected to be minimal; as stated there, if human capital is truly a universal factor which transcends variations in other factors related to growth, its impact should not vary significantly by region. It is more likely that other growth-related factors will vary, but will be augmented by human capital.

Conclusion

Human capital theory and research have always pointed to human capital, particularly formal education, as a significant factor in development, but generally at the national level. Consideration of the role of human capital in *regional* economic growth has been less common. Today, however, advanced economies are undergoing transformation both in industrial structure and in the type of technologies used in all industries; in addition, the increased globalization of economies means that greater productivity is required to be competitive. At the same time that these changes are occurring, in most developed countries, increased productivity is also necessary due to falling birth rates. As both economic and demographic factors demand increased productivity, the education and skills of the laborforce become increasingly important (Spindler and Forrester 1993). Despite this need for a more educated and skilled labor force, the federal government role in economic

development has diminished; thus, regional development initiatives have focused more on local sources of comparative advantage (Rich 1992) and placed more emphasis on entrepreneurial factors (Clark and Gaile 1992), factors which are associated with firm formation and survival.

The same economic environment that appears to enhance the value of human capital also gives an advantage to *small* firms. According to Bannock (1981),

> The principal economic importance of small firms lies in their responsiveness to change and since change is what is required if economic growth is to be resumed, it is desirable that more rather than fewer resources should be channelled into small business (p.8).

Learning more about the role of human capital in the growth of such firms will help to identify exactly which resources are to be channelled into small business and where they should be directed.

The question of which types of human capital are most important to small firm growth is important at the local level. This research appears to indicate, at least in the relatively short term, that human capital *stock*, i.e. the existing level of human capital, is more important to a region than is its potential human capital, as measured by qualitative (flow) variables. This would suggest that regional strategies should focus more on attracting and retaining educated individuals than on improving local educational quality. However, since this study used as its qualitative measure the percent of the local budget spent on education, an amount which would vary from state to state

because of differences in *state* funding for education, further research would be necessary before such a conclusion could be reached. Even if such a conclusion were found to be justified for the local area, if individual regional strategies focused only on *attracting* human capital, rather than *creating* it, for the nation as a whole, the result would quite possibly be only a redistribution of human capital, not an increase. This speaks to the question of who should pay for upgrading the education and skills of the laborforce. Local areas, like individual firms, often have less incentive to invest in human capital which may not remain in the area, particularly if it can be attracted from elsewhere. Thus a case might be made for federal and/or state government subsidies for education and training.

The increasing importance of an educated, skilled labor force is occurring at a time when local areas are experiencing cutbacks in federal funds for education and training, fewer individuals can afford the cost of higher education, and fewer firms can afford (or are willing, when skills involved are transferrable) to invest in training (Gaspersz and vanVoorden 1987). A case for more federal support in developing human capital resources would seem to be suggested by Warner's (1989) argument (relating to the importance of human capital in promoting local economic

growth):

> The human capital strategy, which focuses on raising labor productivity, has the potential to increase the growth path of the national economy and therefore raise the overall standard of living. However, the cost minimization approach is far more likely to result in relocation of resources within the economy and not stimulate national economic growth. (p. 396)

Future Research

Although this research has indicated a relationship between some types of human capital and small firm growth, results say nothing about *how* this effect occurs. Does the number of small firms increase as a result of increased new firm formation or because of a decrease in firm failures? This question could only be answered by utilizing a dataset which breaks down establishment change by firm starts and firm failures.

A variation on the question of how human capital impacts small firm growth is to consider whether it is primarily the human capital embodied in the firm's founder that is most important, or whether it is also necessary (for the survival of firms) to have a workforce which is characterized by high levels of human capital? As seen in the above results, growth in small firms in a sector whose laborforce had the highest percent of college educated employees (Business Services, according to Beyers et.al., 1987), was not significantly related to human capital. A possible way to resolve this question would be to survey new small firms, to determine both their laborforce needs, with

respect to educational levels, and the educational and occupational background of their founders.

The time period covered by this study was dictated by data availability and the desire to use the most recent data available. However, it was a time period characterized by considerable restructuring and the continued shift to a global economy, a time period during which some regions experienced rapid growth while others stagnated. As a Washington Post series, focusing on the economic outlook for the 1990's, stated (1990, p. 8), "In a way, there is no American economy, but a collection of regional economies that rise and fall to distinctive rhythms." Perhaps a longer time period, which would be more likely to capture long term trends, as opposed to shorter fluctuations in growth, would be more appropriate. It might also indicate, contrary to what the results of this study suggest, that over the long term, investment in human capital *potential*, i.e. educational quality, is more important to a local area than increasing the level of human capital stock. A study which focused on a smaller, more cohesive, region over a longer time period, might also produce more definitive results.

Possibly the most interesting finding of this study was the existence of significant sectoral variation in the impact of human capital. Further investigation of such differences is certainly called for. This might take the approach, as discussed earlier, of considering different

functional forms. Also, incorporating a greater number of less general sectors, would probably be illuminating, particularly if such a study were confined to a more homogeneous region.

Although this study has made only a small contributin to the question of how human capital influences economic development at the *regional* scale, it has shown that human capital *is* a factor at this scale. At a time when, as Reich (1991) points out, the concept of a national economy is losing its validity, the fortunes of regional economies are more closely tied to the education and skills of their labor forces than to the economic success of the state in which they happen to be located.

Schumacher (1973), discussing education, which he considered to be "the greatest resource," pointed out that throughout history, not only have civilizations flourished in all parts of the world, but even when they have declined and perished, new civilizations have developed in the very same spaces, raising the question of how the necessary resources for development have been reconstituted. His explanation is that these resources were not simply material. He says,

> All history - as well as all current experience - points to the fact that it is man, not nature, who provides the primary resource: that the key factor of all economic development comes out of the mind of man (p. 72).

At a time when economies are in the process of significant transformations, are increasingly threatened by

global competition, and when the competitive advantage associated with material, place-specific resources is diminishing, it is the resources embodied in the mind of man that will determine which regions flourish and which decline.

APPENDIX A

APPENDIX A

TABLE 1. Regression Results: Equation 5 - Very Small Firms

Dependent Variable = CHGTOTVS

a	PCMGT	SE	MW	SW	MT	WST	SEMGT	MWMGT	SWMGT	MTMGT	WSMGT	R2
5.330	1.264	-11.763	-9.308	-5.942	-18.699	-5.923	1.227	0.084	-1.073	1.545	0.146	0.208
(.665)	(1.547)	(-.932)	(-.807)	(-.386)	(-.848)	(-.397)	(.971)	(.071)	(-.684)	(.795)	(.103)	
a	COLLGRD	SE	MW	SW	MT	WST	SWCOLL	MWCOLL	SWCOLL	MTCOLL	WSCOLL	R2
3.616	0.897**	3.283	-1.083	-2.433	9.201	5.458	-0.092	-0.503	-0.875	-0.586	-0.574	0.208
(.596)	(2.372)	(.415)	(-.152)	(-.272)	(.732)	(.545)	(-.186)	(-1.184)	(-1.597)	(-.942)	(-1.003)	

Dependent Variable = CHGMFGVS

a	COLLGRD	SE	MW	SW	MT	WST	SECOLL	MWCOLL	SWCOLL	MTCOLL	WSCOLL	R2
6.959	-0.092	-6.292	-8.234	-14.599*	-0.534	2.153	0.841*	0.304	0.572	0.449	0.124	0.142
(1.226)	(-.265)	(-.851)	(-1.247)	(-1.745)	(-.045)	(.230)	(1.816)	(.765)	(1.117)	(.771)	(.232)	
a	EDEXP	SE	MW	SW	MT	WST	SEEDEXP	MWEDEXP	SWEDEXP	MTEDEXP	WSEDECP	R2
-19.114*	0.527**	17.266	7.451	3.334	25.671	19.148	-0.216	-0.229	-0.212	-0.350	-0.307	0.161
(-1.708	(2.223)	(1.328)	(.513)	(.199)	(1.281)	(1.123)	(-.777)	(-.741)	(-.617)	(-.805)	(-.815)	

Dependent Variable = CHGFIRVS

a	PCMGT	SE	MW	SW	MT	WST	SEMGT	MWMGT	SWMGT	MTMGT	WSMGT	R2
-13.195*	2.918**	-0.604	3.522	17.523	48.331**	5.506	0.194	-1.649	-3.098*	-5.265*	-1.136	0.298
(-1.864)	(4.041)	(-.054)	(.345)	(1.288)	(2.480)	(.417)	(.173)	(-1.571)	(-2.234)	(-3.064	(-.904)	

*significant at .05

**significant at .01

(t-value)

TABLE 1 (cont'd)

Dependent Variable = CHGSERVS

a	COLLGRD	SE	MW	SW	MT	WST	SECOLL	MWCOLL	SWCOLL	MTCOLL	WSCOLL	R2
8.364*	0.779**	8.139	0.974	1.899	3.177	1.762	-0.163	-0.362	-0.532	-0.264	-0.273	0.22
(1.973)	(3.012)	(1.473)	(.195)	(.304)	(.362)	(.252)	(-.472)	(-1.218)	(-1.391)	(-.607)	(-.682)	

a	PCMGT	SE	MW	SW	MT	WST	SEMGT	MWMGT	SWMGT	MTMGT	WSMGT	R2
10.652*	1.041*	-2.764	-7.808	1.187	12.348	-10.164	0.728	0.38	-0.805	-1.083	0.701	0.195
(1.873)	(1.795)	(-.308)	(-.954)	(.109)	(.789)	(-.959)	(.811)	(.451)	(-.732)	(-.785)	(.694)	

Dependent Variable = CHGBSVS

a	EDEXP	SE	MW	SW	MT	WST	SEEDEXP	MWEDEXP	SWEDEXP	MTEDEXP	WSEDEXP	R2
-14.130	0.692*	20.498	30.604	-8.082	26.731	18.536	-0.231	-0.845*	-0.310	-0.851	-0.671	0.267
(-.869)	(2.008)	(1.085)	(1.451)	(-.332)	(.918)	(.748)	(-.571)	(-1.882)	(-.620)	(-1.348)	(-1.229)	

*significant at .05

**significant at .01

(t-value)

TABLE 2. Regression Results: Equation 5 - Small Firms

Dependent Variable = CHGSERS

a	COLLGRD	SE	MW	SW	MT	WST	SECOLL	MWCOLL	SWCOLL	MTCOLL	WSCOLL	R2
36.541	0.551	3.609	-26.581	-24.735	-5.495	-25.023	0.194	0.941	0.114	-0.318	1.691	0.245
(3.716)**	(.918)	(.262)	(-2.300)**	(-1.707)*	(-.270)	(-1.541)	(.242)	(1.366)	(.129)	(-.315)	(1.825)*	

Dependent Variable = CHGBSS

a	HSGRD	SE	MW	SW	MT	WST	SEHSGRD	MWHSGRD	SEHSGRD	MTHSGRD	WSHSGRD	R2
-69.488	2.877	170.501	83.411	60.247	48.786	-22.877	-4.851	-2.238	-2.594	-1.73	1.435	0.061
(-.929)	(1.464)	(1.933)*	(.897)	(.637)	(.347)	(-.204)	(-2.007)*	(-.962)	(-.954)	(-.444)	(.458)	

a	EDEXP	SE	MW	SW	MT	WST	SEEDEXP	MWEDEXP	SWEDEXP	MTEDEXP	WSEDEXP	R2
-168.944	4.460	128.063	178.289	182.596	264.459	69.568	-2.724	-3.881	-4.745	-6.087	-0.927	0.127
(-3.229)**	(4.024)**	(2.104)*	(2.627)**	(2.299)*	(2.824)**	(.873)	(-2.090)*	(-2.687)**	(-2.923)**	(-2.999)**	(-.527)	

*significant at .05

**significant at .01

(t-value)

APPENDIX B

APPENDIX B

TABLE B-1. MSA/County Configuration

MSA	County
Abilene, TX	Taylor
Akron, OH	Portage
	Summit
Albany, GA	Dougherty
	Lee
Albany, NY	Albany
	Greene
	Montgomery
	Rensaleer
	Saratoga
	Schnectady
Albuquerque, NM	Bernaillo
Alexandria, LA	Rapides
Allentown, PA	Carbon
	Lehigh
	Northhampton
	Warren
Altoona, PA	Blair
Amarillo, TX	Potter
	Randall
Anaheim, CA	Orange
Anderson, IN	Madison
Anderson, SC	Anderson
Ann Arbor, MI	Washtenaw
Anniston, AL	Calhoun
Appleton, WI	Calumet
	Outagamie
	Winnebago
Ashville, NC	Buncombe
Athens, GA	Clarke
	Jackson
	Madison
	Oconee
Atlanta, GA	Barrow
Atlanta (cont'd)	Butts
	Cherokee
	Clayton
	Cobb
	Coweta
	DeKalb
	Douglas
	Fayette
	Forsyth
	Fulton
	Gwinnett
	Henry
	Newton
	Paulding
	Rockdale
	Spalding
	Walton
Atlantic City, NJ	Atlantic
	Cape May
Augusta, GA	Columbia
	McDuffie
	Richmond
	Aiken
Aurora/Elgin, IL	Kane
	Kendall
Austin, TX	Hays
	Travis
	Williamson
Bakersfield, CA	Kern
Baltimore, MD	Anne Arundel
	Baltimore County
	Carroll
	Hartford
	Howard

TABLE B-1 (cont'd)

MSA	County
Baltimore (cont'd)	Queen Anne
	Baltimore City
Bangor, ME	Penobscot
Boston,MA	Essex
	Middlesex
	Norfolk
	Plymouth
	Suffolk
Baton Rouge, LA	Ascension
	East Baton Rouge
	Livingston
	West Baton Rouge
Battle Creek, MI	Calhoun
Beaumont,TX	Hardin
	Jefferson
	Orange
Beaver County, PA	Beaver
Bellingham, WA	Whatcom
Benton Harbor, MI	Berrien
Bergen-Passaic, NJ	Bergen
	Passaic
Billings, MT	Yellowstone
Biloxi/Gulfport, MS	Hancock
	Harrison
Binghamton, NY	Broome
	Tioga
Birmingham, AL	Blount
	Jefferson
	St. Clair
	Shelby
	Walker
Bismark, ND	Burleigh
	Morton
Bloomington, IN	Monroe
Blooming-Normal, IL	McLean
Boise City, ID	Ada
Boulder, CO	Boulder
Bradenton, FL	Manatee

MSA	County
Brazoria, TX	Brazoria
Bremerton, WA	Kitsap
Bridgeport, CT	Fairfield
Brownsville, TX	Cameron
Bryan/College Sta, TX	Brazos
Buffalo, NY	Erie
Burlington, NC	Almance
Burlington, VT	Chittenden
	Grand Isle
Canton, OH	Carroll
	Stark
Caspar, WY	Natrona
Cedar Rapids, IA	Linn
Champaign/Urbana, IL	Champaign
Charleston, SC	Berkely
	Charleston
	Dorchester
Charleston, WV	Kanawha
	Putnam
Charlotte. NC	Cabarrus
	Gaston
	Lincoln
	Mecklenburg
	Rowan
	Union
	York, SC
Charlottesville, VA	Ablemarle
	Fluvanna
	Greene
	Charlottesville
Chattanooga, TN	Hamilton
	Marion
	Sequatchie
	Catoosa. GA
	Dade, GA
	Walker. GA
Cheyenne, WY	Laramie
Chicago, IL	Cook

Table B-1 (cont'd)

MSA	County
Chicago, IL (cont'd)	DuPage
	McHenry
Chico, CA	Butte
Cincinnati, OH	Clermont
	Hamilton
	Warren
	Boone, KY
	Campbell, KY
	Kenton, KY
	Dearborn, IN
Clarksville, TN	Montgomery
	Christian, KY
Cleveland, OH	Cuyahoga
	Geauga
	Lake
	Medina
Colorado Springs, CO	El Paso
Columbia, MO	Boone
Columbia, SC	Lexington
	Richland
Columbus, GA	Chattahooche
	Muscogee
	Russell, AL
Columbus, OH	Delaware
	Fairfield
	Franklin
	Licking
	Madison
	Pickaway
	Union
Corpus Christi, TX	Nueces
	San Patricio
Cumberland, MD	Allegany
	Mineral, WV
Dallas, TX	Collin
	Dallas
	Denton
	Ellis

MSA	County
Dallas, TX (cont'd)	Kaufman
	Rockwell
Danville, VA	Pittsylvania
	Danville City
Davenport, IA	Scott
	Henry, IL
	Rock Island, IL
Dayton/Springfield OH	Clark
	Greene
	Miami
	Montgomery
Daytona Beach, FL	Volusia
Decatur, AL	Lawrence
	Morgan
Decatur, IL	Macon
Denver, CO	Adams
	Araphoe
	Denver
	Douglas
	Jefferson
Des Moines, IA	Dallas
	Polk
	Warren
Detroit, MI	Lapeer
	Livingston
	Macomb
	Monroe
	Oakland
	St. Clair
	Wayne
Dothan, AL	Dale
	Houston
Dubuque, IA	Dubuque
Duluth, MN	St. Louis
	Douglas, WI
Eau Claire, WI	Chippewa
	Eau Claire
El Paso, TX	El Paso

TABLE B-1 (cont'd)

MSA	County
Elkhart, IN	Elkhart
Elmira, NY	Chemung
Enid, OK	Garfield
Erie, PA	Erie
Eugene, OR	Lane
Evansville, IN	Posey
	Vanderburgh
	Warrick
	Henderson, KY
Fargo, ND	Cass
	Clay, MN
Fayetteville, NC	Cumberland
Fayetteville, AR	Washington
Flint, MI	Genesee
Florence, AL	Colbert
	Lauderdale
Florence, SC	Florence
Fort Collins, CO	Larimer
Fort Lauderdale, FL	Broward
Fort Meyers, FL	Lee
Fort Pierce, FL	Martin
	St. Lucie
Fort Smith, AR	Crawford
	Sebastian
	Sequoyah, OK
Fort Walton Beach FL	Okaloosa
Fort Wayne, IN	Allen
	DeKalb
	Whitley
Fort Worth, TX	Johnson
	Parker
	Tarrant
Fresno, CA	Fresno
Gadsen, AL	Etowah
Gainsville, FL	Alachua
	Bradford
Galveston, TX	Galveston
Gary/Hammond, IN	Lake
Gary, IN (cont'd)	Porter
Glens Falls, NY	Warren
	Washington
Grand Forks, ND	Grand Forks
Grand Rapids, MI	Kent
	Ottawa
Great Falls, MT	Cascade
Greeley, CO	Weld
Green Bay, WI	Brown
Greensboro, NC	Davidson
	Davie
	Forsyth
	Guilford
	Randolph
	Stokes
	Yadlom
Greenville, SC	Greenville
	Pickins
	Spartanburg
Hagerstown, MD	Washington
Hamilton, OH	Butler
Harrisburg, PA	Cumberland
	Dauphin
	Lebanon
	Perry
Hartford, CT	Hartford
	Middlesex
	Tolland
Hickory, NC	Alexander
	Burke
	Catawba
Houma, LA	Lafourche
	Terrebonne
Houston, TX	Fort Bend
	Harris
	Liberty
	Montgomery
	Waller

TABLE B-1 (cont'd)

MSA	County
Huntington, WV	Cabell
	Wayne
	Boyd, KY
	Carter
	Greenup
	Lawrence, OH
Huntsville, AL	Madison
Indianapolis, IN	Boone
	Hamilton
	Hancock
	Hendricks
	Johnson
	Marion
	Morgan
	Shelby
Iowa City, IA	Johnson
Jackson, MI	Jackson
Mackson, MS	Hinds
	Madison
	Rankin
Jackson, TN	Madison
Jacksonville, FL	Clay
	Duval
	Nassau
	St. Johns
Jacksonville, NC	Onslow
Jamestown, NY	Chatauqua
Janesville, WI	Rock
Jersey City, NJ	Hudson
Johnson City, TN	Carter
	Hawkins
	Sullivan
	Unicoi
	Washington
	Scott, VA
	Washington, VA
	Bristol, VA
Johnstown, PA	Cambria
Johnstown (cont'd)	Somerset
Joilet, IL	Grundy
	Will
Joplin, MO	Jasper
	Newton
Kalamazoo, MI	Kalamazoo
Kankakee, IL	Kankakee
Kansas City, MO	Cass
	Clay
	Jackson
	Lafayette
	Platte
	Ray
	Johnson, KS
	Leavenworth, KS
	Miami
	Wyandotte
Kenosha, WI	Kenosha
Killeen, TX	Bell
	Coryell
Knoxville, TN	Anderson
	Blount
	Grainger
	Jefferson
	Knox
	Sevier
	Union
Kokomo, IN	Howard
	Tipton
LaCrosse, WI	LaCrosse
Lafayette, LA	Lafayette
	St. Martin
Lafayette, IN	Tippecanoe
Lake Charles, LA	Calcasieu
Lake County, IL	Lake
Lakeland, FL	Polk
Lancaster, PA	Lancaster
Lansing, MI	Clinton

TABLE B-1 (cont'd)

MSA	County
Lansing (cont'd)	Eaton
	Ingham
Laredo, TX	Webb
Las Cruces, NM	Dona Ana
Las Vegas, NV	Clark
Lawrence, KS	Douglas
Lawton, OK	Comanche
Lewiston,ME	Androscoggin
Lexington, KY	Bourbon
	Clark
	Fayette
	Jessamine
	Scott
	Woodford
Lima, OH	Allen
	Auglaize
Lincoln, NE	Lancaster
Little Rock, AR	Faulkner
	Lonoke
	Pulaski
	Saline
Longview, TX	Gregg
	Harrison
Lorain/Elyria, OH	Lorain
Los Angeles, CA	Los Angeles
Louisville, KY	Bulitt
	Jefferson
	Oldham
	Shelby
	Clark, IN
	Floyd, IN
	Harrison, IN
Lubbock, TX	Lubbock
Lynchburg, VA	Amherst
	Campbell
	Lynchburg
Macon, GA	Bibb
	Houston
Macon (cont'd)	Jones
	Peach
Madison, WI	Dane
Manchester, NH	Hillsborough
Mansfield, OH	Richland
McAllen, TX	Hidalgo
Medford, OR	Jackson
Melbourne, FL	Brevard
Memphis, TN	Shelby
	Tipton
	Crittendon, AR
	DeSoto, MS
Merced, CA	Merced
Miami, FL	Dade
Middlesex, NJ	Hunterdon
	Middlesex
	Somerset
Midland, TX	Midland
Milwaukee, WI	Milwukee
	Ozaukee
	Washington
	Waukesha
Minneapolis, MN	Anoka
	Carver
	Chisago
	Dakota
	Hennepin
	Isanti
	Ramsey
	Scott
	Washington
	Wright
	St. Croix, WI
Mobile, AL	Baldwin
	Mobile
Modesto, CA	Stanislaus
Monmouth, NJ	Monmouth
	Ocean

TABLE B-1 (cont'd)

MSA	County
Monroe, LA	Quachita
Montgomery, AL	Autauga
	Elmore
	Montgomery
Muncie, IN	Delaware
Muskegon, MI	Muskegon
Naplels, FL	Collier
Nashville, TN	Cheatham
	Davidson
	Dickson
	Robertson
	Rutherford
	Sumner
	Williamson
	Wilson
Nassau, NY	Nassau
	Suffolk
New Bedford, MA	Bristol
New Haven, CT	New Haven
New London, CT	New London
New Orleans, LA	Jefferson
	Orleans
	St. Bernard
	St. Charles
	St. John
	St. Tammany
New York, NY	Bronx
	Kings
	New York
	Putnam
	Queens
	Richmond
	Rockland
	Westchester
Newark, NJ	Essex
	Morris
	Sussex
	Union
Niagara Falls, NY	Niagara
Norfolk, VA	Gloucester
	James City
	York
	Chesapeake
	Hampton
	Newport News
	Norfolk
	Poquoson
	Portsmouth
	Suffolk
	Virginia Beach
	Williamsburg
Oakland, CA	Alameda
	Contra Costa
Ocala, FL	Marion
Odessa, TX	Ector
Oklahoma City, OK	Canadian
	Cleveland
	Logan
	McLain
	Oklahoma
	Pottawattami
Olympia, WA	Thurston
Omaha, NE	Douglas
	Sarpy
	Washington
	Pottawattami, IA
Orange County, NY	Orange
Orlando, FL	Orange
	Osceola
	Seminole
Owensboro, KY	Daness
Oxnard/Ventura, CA	Ventura
Panama City, FL	Bay
Parkersburg, WV	Wood
	Washington, OH
Pascagoula, MS	Jackson

TABLE B-1 (cont'd)

MSA	County
Pensacola, FL	Escambia
	Santa Rosa
Peoria, IL	Peoria
	Tazewell
	Woodford
Philadelphia, PA	Bucks
	Chester
	Delaware
	Montgomery
	Philadelphia
	Burlington, NJ
	Camden, NJ
	Gloucester, NJ
Phoenix, AZ	Maricopa
Pine Bluff, AR	Jefferson
Pittsburgh, PA	Allegheny
	Fayette
	Washington
	Westmorland
Pittsfield, MA	Berkshire
Portland, ME	Cumberland
Portland, OR	Clackamas
	Multnomah
	Washington
	Yamhill
Portsmouth, NH	Rockingham
	Strafford
Poughkeepsie, NY	Duchess
Providence, RI	Bristol
	Kent
	Providence
	Washington
Provo-Orem, UT	Utah
Pueblo, CO	Pueblo
Racine, WI	Racine
Raleigh, NC	Durham
	Franklin
	Orange
Raleigh (cont'd)	Wake
Rapid City, SD	Pennington
Reading, PA	Berks
Redding, CA	Shasta
Reno, NV	Washoe
Richland, WA	Benton
	Franklin
Richmond, VA	Charles City
	Chesterfield
	Dinwiddie
	Goochland
	Hanover
	Henrico
	New Kent
	Powhatan
	Prince George
	Colonial Heights
	Hopewell
	Petersburg Ct.
	Richmond City
Riverside, CA	Riverside
	San Bernadino
Roanoke, VA	Botetourt
	Roanoke City
	Roanoke County
	Salem City
Rochester, MN	Olmsted
Orchester, NY	Livingston
	Monroe
	Ontario
	Orleans
	Wayne
Rockford, IL	Boone
	Winnebago
Sacramento, CA	El Dorado
	Placer
	Sacramento
	Yolo

TABLE B-1 (cont'd)

MSA	County
Saginaw, MI	Bay
	Midland
	Saginaw
St. Cloud, MN	Benton
	Sherburne
	Steams
St. Joseph, MO	Buchanan
St. Louis, MO	Franklin
	Jefferson
	St. Charles
	St. Louis County
	St. Louis City
	Clinton, IL
	Jersey, IL
	Madison, IL
	Monroe, Il
	St. Clair, IL
Salem, OR	Marion
	Polk
Salinas, CA	Montery
Salt Lake City, UT	Davis
	Salt Lake
	Weber
San Angelo, TX	Tom Green
San Antonio, TX	Bexar
	Comal
	Guadalupe
San Diego, CA	San Diego
San Francisco, Ca	Marin
	San Francisco
	San Mateo
San Jose, Ca	Santa Clara
Santa Barbara, CA	Santa Barbara
Santa Cruz, CA	Santa Cruz
Santa Fe, NM	Los Alamos
	Santa Fe
Santa Rosa, CA	Sonoma
Sarasota, FL	Sarasota

MSA	County
Savannah, GA	Chatham
	Effingham
Scranton, PA	Columbia
	Lackawanna
	Luzerne
	Monroe
	Wyoming
Seattle, WA	King
	Snohomish
Sharon, PA	Mercer
Sheboygan, WI	Sheboygan
Sherman, TX	Grayson
Shreveport, LA	Bossier
	Caddo
Sioux City, IA	Woodbury
	Dakota, NE
Sioux Falls, SD	Minnehaha
South Bend,IN	St. Joseph
Spokane, WA	Spokane
Springfield, IL	Menard
	Sangamon
Springfield, MA	Hampden
	Hampshire
Springfield, MO	Christian
	Greene
State College, PA	Centre
Steubenville, OH	Jefferson
	Brooke, WV
	Hancock, WV
Stockton, CA	San Joaquin
Syracuse, NY	Madison
	Onondaga
	Oswego
Tacoma, WA	Pierce
Tallahassee, FL	Gadsden
	Leon
Tampa, FL	Hernando
	Hillsborough

TABLE B-1 (cont'd)

MSA	County
Tampa (cont'd)	Pasco
	Pnellas
Terre Haute, IN	Clay
	Vigo
Texarkana, TX	Bowie
	Miller, AR
Toledo, OH	Fulton
	Lucas
	Wood
Topeka, KS	Shawnee
Trenton, NJ	Mercer
Tuscon, AZ	Pima
Tulsa, OK	Creek
	Osage
	Rogers
	Tulsa
	Wagoner
Tuscaloosa, AL	Tuscaloosa
Tyler, TX	Smith
Utica, NY	Herkimer
	Oneida
Vallejo, CA	Napa
	Solano
Vancouver, WA	Clark
Victoria, TX	Victoria
Vineland, NJ	Cumberland
Visalia, CA	Tulare
Waco, TX	McLennan
Washington, DC	Washington
	Calvert, MD
	Charles, MD
	Frederick, MD
	Montgomery, MD
	Prince George, MD
	Arlington, VA
	Fairfax, VA
	Loudoun, VA
	Prince William, VA
	Stafford, VA
	Alexandria, VA
	Fairfax City, VA
	Falls Church, VA
	Manassas City, VA
	Manassas Park, VA
Waterloo, IA	Black Hawk
	Bremer
Wausau, WI	Marathon
West Palm Beach,FL	Palm Beach
Wheeling, WV	Marshall
	Ohil
	Belmont, OH
Wichita, KS	Butler
	Harvey
	Sedgwick
Williamsport, PA	Lycoming
Wilmington, DE	New Castle
	Salem, NJ
	Cecil, MD
Wlimington, NC	New Hanover
Worcester, MA	Worcester
Yakima, WA	Yakima
York, NY	Adams
	York
Youngstown, OH	Mahoning
	Trumbull
Yuba City, CA	Sutter
	Yuba

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