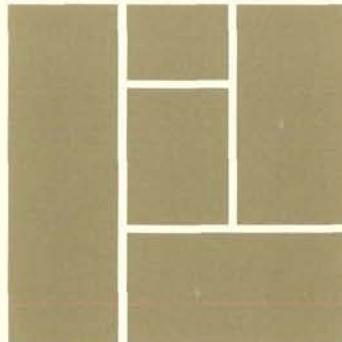
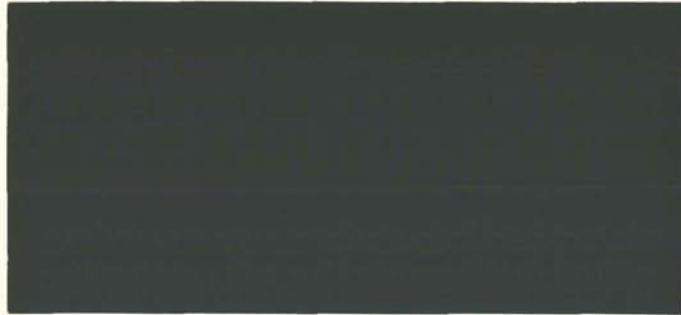


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Project Report

ECONOMIC ANALYSIS OF EFFECTS OF
BUSINESS CYCLES ON THE ECONOMY OF CITIES

CYCLICAL EFFECTS AT THE LOCAL LEVEL:
A MICROECONOMIC VIEW

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INTRODUCTION

The severity of the current recession in conjunction with the long and short run problems of cities has increased concern about the response of city economies to national cycles. Does the relative economic position of cities worsen during recessions because central city economies are more cyclically sensitive than suburban economies or does the relative position of cities improve as recessions dampen the decentralization of employment and population? The purpose of this study is to explore these questions specifically as well as to address the broader issue of the effects of national economic cycles on city economies.

This paper examines these questions using establishment level employment data. The approach of this study differs from that of other studies of subnational cycles in three ways. First, it focuses on the cyclical activity of establishments at the three-digit Standard Industrial Code level of detail. It is well known that spatial variations in business cycles are due, in part, to spatial differences in industry composition. Local economies comprised of cyclically sensitive industries experience relatively volatile cycles, whereas economies comprised of cyclically stable industries are stable relative to the nation. This study takes the industry mix hypothesis as the starting point and addresses the question of whether firms in the same industry behave differently depending on location.

Secondly, this study explores subnational cycles at a relatively small level of geographical detail. The cyclical sensitivity of establishments located in central cities will be compared with that of

establishments located in suburban areas, and employment changes in metropolitan areas will be compared with changes in non-metropolitan areas.

Thirdly, the study will explore spatial differences in employment change by type of change. Net employment changes are disaggregated by change to expansions and contractions in existing establishments, to establishment closings or openings, and to migration of jobs in or out of an area.

To carry out this study, a data base comprised of employment and location information on individual establishments has been assembled for approximately 52,000 establishments, for the peak year of 1973, the trough year of 1975, the peak year of 1979, and the recession year of 1982. This data base, which was assembled from four Dun and Bradstreet Market Indicators Files, was merged with the Bureau of the Census's City Reference File (CRF) to determine whether each firm is located in a central business district or a central city.

This report will now turn to an outline of the questions to be addressed by this study. The following and second section of the report will provide an explanation of the data set, and the manner in which it was created. The third section of this report presents the results produced thus far.

STUDY PURPOSES

This study is divided into three broad areas of inquiry: geographical comparisons of employment cycles, a study of the geographical differences in firm failures and plant closings during the cycle, and a study of the effects of the cycle on the decentralization of employment. The portion of the study that compares geographical sensitivity of business cycles will compare the cyclical behavior of central business districts, central cities, suburbs, metropolitan and non-metropolitan areas. It is the city/suburb and metropolitan/non-metropolitan analysis which is complete to date and reported here. This portion of the study will also examine which components of firm employment change are most cyclically sensitive.

There are a number of reasons to expect geographical differences in business cycles. These reasons will be briefly described here. It is well known that a region or city's industry composition is an important determinant of the amplitude and timing of its local business cycles. Local economies comprised of cyclically sensitive industries experience recessions that are severe relative to the nation, whereas local economies made up of cyclically stable activities exhibit mild cycles relative to the nation.

The effects of industry mix on local cycles are clearly stated by Walter Isard (1957):

Differences in the intensity and timing of regional cycles are explained in terms of differences in the sensitivity and responsiveness of particular industries. Cycles of a regional economy are simple composites of the cyclical movement of the economy's industries appropriately weighted (Isard, 1957:31).

Borts (1960), Browne (1978), Engerman (1965), and Howland (1981) conducted empirical tests of the industry-mix hypotheses and found industry mix to be an important explanatory factor in regional recessions. For example, Howland (1981) controlled for states' industrial composition at the two-digit (Standard Industrial Code) code level and found that industry composition explained an average of 36 percent of the variation in state business cycles for the five recessions between 1950 and 1975. Controlling for industry mix at the three-digit level for machinery manufacturing (SIC 35), Howland found that for the 1973-75 recession 38 percent of the variation in two-digit machinery manufacturing could be explained by industry composition at the three-digit level. For textile manufacturing (SIC 22), none of the cross-state variation in the 1973-75 recession could be explained by industry composition at the three-digit level. These findings as well as those of the above authors indicate that the strength of the relationship between an expected cycle based on industry mix and the actual cycle varies across regions as well as recessions and industries, and that there must be factors other than industry mix that explain the severity of local recessions.

The purpose of this study is to go beyond the industry mix hypotheses to explore economic and institutional factors particular to local economies that influence local cycles. Holding industry composition constant, such factors as the size and age distribution of an area's firms, the age of an area's capital stock, the labor or capital intensity of the aggregate production function, the extent to which the workforce is unionized, the skill level of its workers, the level of unemployment insurance benefits, and a shortage or surplus of workers are all expected to influence

the amplitude of local short run fluctuations in employment. Each of these factors will be described briefly in turn.

AGE AND SIZE DISTRIBUTION OF FIRMS

The first hypothesis is that areas with a large proportion of new firms will be more cyclically sensitive than areas with older established firms.

Small firms have been found to be more susceptible to failure during recessions than large firms. Using the Dun and Bradstreet data, Birch (Appendix D, 1979) found that during recessions job loss in small firms was greater than in large firms and that the primary reason for job loss in small firms was bankruptcy. Among firms sized 1 to 20 employees, 9.7 percent of employment was lost due to firm failures.

The percent of total jobs lost due to bankruptcy for firms with 21 to 100 employees was 5.1. The comparable figures for firm's with 101 to 500 employees and 501+ employees were 4.6 percent and 2.1 percent respectively. In larger firms, Birch found employment contraction to be a more important explanation of job loss during recessions. While the results are derived from data that do not correspond well with peaks and troughs of the national economy, they do suggest that spatial differences in the firms could lead to differences in intensity of the business cycle. Birch's results are derived from the 1972, 1974, and 1976 Dun and Bradstreet data.

New firms are also expected to be more susceptible to bankruptcy than well established firms. New firms have less in the way of retained earnings and less well established lines of credit to see them through periods of economic stringency than mature firms.

The incubator hypothesis suggests that new, small firms concentrate in cities and in particular in central cities. This leads to one reason to expect cities to be more cyclically sensitive than less central economies.

There is some disagreement in the literature over whether small, new firms prefer central city sites. Leone and Struyck (1976) found that births of new manufacturing enterprises were not disproportionately concentrated in the core of five metropolitan areas in the United States. However, using Dun and Bradstreet data, Leone and Struyck failed to separate births of branch plants from births of new firms. New firms are more likely to need the proximity to suppliers, subcontractors, and markets than are branch plants. Frequently supply lines and markets are well established long before a firm decides to open a branch plant. Therefore the low rents, cheap transport, and access to subcontractors and markets of the central city are less likely to be of importance to branch plants than to new firms.

Moreover, with strong financial backing, a branch plant can locate with a view to long run profits. Any short term losses incurred by locating a branch on a less than optimal site can, in the short run, be absorbed by the parent. On the other hand, a new firm must give more attention to short run profit and survival. Thus the failure to separate branch plants from new firms does not provide an accurate test to the incubator hypothesis.

Another study by Nicholson, Brinkley, and Evans (1981) also concluded that the inner city does not play an incubator role for new firms. Again, this study does not distinguish between the location of branch plants and new firms. Moreover, the Nicholson et al. study does not include, for

lack of data, firms that never grew beyond 20 employees in the study period. Thus the location decision of many new and very small firms is missed.

A careful study by Fagg (1980) separated branch plants from new plants for all sizes of firms. Using data from England, Fagg found that "new firms show a greater affinity for the inner area of the city than for the cities' suburbs, although smaller zones of older buildings in outside central city locations also performed a 'seed bed' function" (1980). Fagg also found a low new firm birth rate in redevelopment areas which leads him to conclude that it is low rents and older buildings that attract fledgling firms to the central city.

Unfortunately Fagg's methodology, to my knowledge, has not been duplicated in the U.S., but if his results are transferable they suggest that new, small firms are disproportionately located in central cities, which leads to the hypothesis that central city economies will be more cyclically sensitive than suburban or non-metropolitan economies--all other factors held constant.

Age of capital, the labor intensity of the production process, unionization of the labor force, the level of unemployment insurance benefits, and worker skill levels are also expected to influence the intensity of local cycles. The hypotheses are only briefly presented here. (For a more detailed description, see Howland, 1981.)

AGE OF CAPITAL

A second hypothesis is that geographical differences in the age of capital also influence local cycles. New capital is, on the average, more appropriate for current relative prices of land, labor, and other inputs

than old plant and equipment. For this reason establishments with a high average age of capital should have a higher average cost curve and lower profits than plants producing the same product with a new capital stock.

In multiplant firms, the oldest capital plants should absorb a disproportionate share of the firms' recessionary cutbacks in output. Losses in profits are minimized when cutbacks are concentrated in the least efficient, highest average cost plants. During the expansionary phase of the cycle output should again resume in the relatively old plants. For this reason employment is expected to be more variable in firms with old capital; in the aggregate employment cycles should be more variable in regions and locations where old capital is concentrated (Jackson et al., 1981).

A second reason for more severe cycles in old-capital areas is that single and multiplant firms are more likely to shut down, during the recession, when their capital is old. Economic theory suggests that a firm will continue to produce as long as price is greater than average variable costs (AVC). When price falls below AVC the firm or plant will be closed. This shut-down will take place earlier in the old capital, high-average-cost plants than in new, efficient operations. Thus we would expect plant closings to be greater in areas where old capital is concentrated. Whether this would also lead to more severe cycles in areas with a high average age of capital would depend upon the rate of new investment during the recovery.

Varaiya and Wiseman (1977) have suggested that old capital stock may lead to more severe regional recessions because the retirement of obsolete capital is concentrated in regions where the average age of capital is high. During the expansionary phase of the cycle, scheduled retirements

may be postponed because either the revenues from running the old capital are temporarily higher than the salvage value of the land, labor and capital, or orders from regular or new customers must be met. With the end of the expansion, the delayed retirements combined with the regularly scheduled retirements are bunched together, creating the appearance of a more volatile cycle. This phenomenon is expected to explain a concentration of plant closings during economic downturns.

Old capital in this argument is a sign of long run disinvestment. Due to high relative wages, declining markets, etc., firms may disinvest in a region with a view to eventually closing the plant. It is these permanent plant closings that are described by Varaiya and Wiseman. Since branch plants with old capital are spatially concentrated in the Northeast and Midwest and in cities rather than suburbs, it is expected that, all other factors constant, the Northeast and Midwest will experience more severe recessions than the South and West. It is also expected that employment in cities will be more variable than in suburbs.

LABOR INTENSITY OF THE PRODUCTION PROCESS

A third hypothesis is that labor-intensive branches of multi-establishment firms absorb a disproportionate share of the firm's output adjustments during the business cycle. Because labor-intensive operations are concentrated in low wage regions and/or regions with relatively old capital, local business cycles in these areas may be more severe than the national average, holding all other factors constant.

During periods of cyclical downturn, managers of profit-maximizing multi-plant firms should allocate, ceteris paribus, production cutbacks disproportionately with high-variable-cost plants bearing a larger burden

of economic slowdown than the high-fixed-cost plants. The reason is that the cost of idle fixed inputs is borne entirely by the firm, whereas the cost of idle variable inputs is not or is only partially assumed by the firm. Labor is a major variable cost, whereas capital is a major fixed cost. Thus, losses to the firm are minimized when labor-intensive plants are idled, workers laid off, and production shifted to capital-intensive plants. As a consequence it is predicted that, during economic downturns, firms and, in the aggregate, regions and cities with low capital-labor ratios will experience more severe reductions in aggregate output and therefore greater cyclical unemployment than their high capital-labor ratio counterparts.

This hypothesis depends upon the evidence of Feldstein (1976), McLure (1977), and Vickery (1979). All three researchers found that with the current unemployment insurance system, firms do not bear the full cost of layoffs. To illustrate the cross-regional variations in production functions, within two-digit SIC level industries the capital-labor ratios for the South, North Central, and Northeast were 12.0, 8.8, and 9.0, respectively, for textile manufacturing in 1972. The values for machinery manufacturing were 7.9, 7.6, 10.4, and 12.0 for the West, South, North Central, and Northeast regions, respectively, in 1972.

Because capital and skilled labor are complements in the production process, the owner of capital-intensive plants may be reluctant to reduce output through layoffs in that plant due to the high cost of replacing skilled workers during the recovery. This effect would reinforce a positive relationship between layoffs and labor intensity of branch plants. It is worth mentioning that capital-intensive operations are energy using. Thus in the post-1973 period, capital-intensive plants may have

had relatively high average costs. This effect would counteract the negative relationship between layoffs and capital intensity hypothesized here.

UNIONIZATION

The fourth hypothesis of spatial differences in business cycles is that cross-area differences in layoff practices occur due to cross-area differences in union strength. Feldstein (1978) and Medoff (1979) found evidence to support the hypothesis that workers in unionized firms have significantly higher probabilities of being laid off than workers in similar nonunionized firms. When demand for labor falls, management has several options for reducing their workforce: to leave positions vacated by quits unfilled, to reduce or slow the growth in real wages, to reduce hours, or to increase layoffs.

Adjustments through unreplaced quits are less of an option for the unionized firm than the nonunionized firm. The reason is that the quit rate in union firms is relatively low (see Freeman [1978] and Johnson [1976]).

A second option for labor adjustments is a reduction in wages. Empirical evidence by Hamermesh (1970) and Lewis (1978) suggests that real wages in the union sector are less sensitive to changes in the unemployment rate than are wages in the nonunion sector, a finding that suggests that unionized establishments are unlikely to respond to falling labor demand by reducing wages. With lower quit rates and less ability to reduce wages, union firms must make use of either layoffs or work sharing.

Work sharing is likely to be the preferred strategy of the younger, more recently hired workers. With work sharing the marginal worker bears

only part of the cost of the cutback whereas with layoffs, the recently hired or marginal worker bears the total cost. The older workers, on the other hand, prefer cutbacks to take the form of layoffs. Under a policy favoring layoffs, senior workers are likely to retain their jobs, and therefore incur no or little cost.

Because in nonunionized firms the marginal workers' preferences are transmitted to management, it is likely that cutbacks in such firms will take the form of work sharing and cuts in wages. In unionized firms where the demands of the average and more senior workers predominate, layoffs will be more likely to prevail (see Medoff [1979]).

An additional hypothesized reason for the positive relationship between unionization and layoffs is that managers of unionized firms may find a policy favoring layoffs acceptable because they anticipate low rehiring costs during the recovery. Laid off union workers are not likely to abandon a union job. Rather, they will collect unemployment benefits and wait to be recalled. This ensures the firm a ready pool of workers to draw from during the upswing, making firms less reluctant to lay off workers during the downturn. Additional evidence by Freeman (1978) has shown that years of tenure with an employer are positively correlated with unionization, a result consistent with the argument that workers are reluctant to relinquish a union job.

Union workers tend to be skilled. Since employers are reluctant to lay off skilled employees, the impact of unionization on the severity of regional recession will be muted.

LABOR SURPLUS

Another hypothesis of cross-area differences in layoffs, the fifth, is that employers in labor-surplus markets may expect low labor search costs during the recovery and therefore readily lay off workers during the downturn. Comparable plants in labor-short areas may anticipate difficulties in rehiring and, therefore, find it cheaper in the long run to hoard workers. Using the annual peak-level unemployment rate as a proxy and data from Great Britain, Thirwell (1966) found that regions experiencing the greatest cyclical sensitivity were those with unemployment rates persistently above the national average.

UNEMPLOYMENT INSURANCE

A sixth hypothesis is that plants located in states with greater unemployment insurance (UI) benefits relative to wages are expected to experience more severe layoffs. The greater the state's UI in relation to wages, the more likely workers are to wait out the recession without looking for and taking another job. Employers, therefore, may be inclined to lay off workers expecting them to be available for rehiring at a later date. Also, employees with some bargaining power are more likely to accept layoffs in high UI states than in low UI states. In low UI states workers may prefer wage or hour reductions to layoffs. The level of unemployment insurance benefits should only affect regional cycles, not metropolitan/non-metropolitan or central city/suburban differences in employment cycle.

HEADQUARTERS VS. BRANCH PLANTS

A final hypothesis holds that headquarters locations of firms will be less vulnerable to economic cycles than branch plant locations. In one interpretation, cities can be divided into "command and control" centers and "production" centers (Noyelle and Stanback, 1983). The former have a high concentration of service and management activities, which insulates them from cyclical fluctuations. There is also held to be a managerial or social inclination to mitigate cyclical fluctuations in the headquarters location, while concentrating recessionary cutbacks in production principally in branch plants at other locations. (See also Bluestone and Harrison, 1982.)

To determine whether the share of manufacturing employment in administrative position varies by area, the following percentages were calculated. In the New York SMSA, .15 of all manufacturing employment is in administrative positions. The equivalent values for Boston, Baltimore, and Houston are .10, .03, and .07, respectively. The proportion of manufacturing employment in administrative positions also varies by state. For example, the value for Florida is .02 and for Michigan is .09 (Census of Manufacturers, 1972). Area differences in employment in central administrative employment may explain, in part, why regional business cycles within the same industry vary.

SUMMARY

To summarize, it has been hypothesized that the severity of actual recessions deviates from the pattern based on industry mix alone for seven reasons: the age and size of firms, age of capital, capital-labor ratios, the extent to which labor forces are unionized, the existence of a labor

shortage or surplus in peak years, the level of unemployment insurance benefits, and the concentration of headquarters versus branch plants.

Aside from studying geographical differences in the business cycle, this study also addresses the effects of business cycles on intra- and inter-urban migration patterns. The questions to be addressed under this portion of the study are what happens to central city-suburban and metropolitan-non-metropolitan employment shifts during the expansionary and recessionary phases of the business cycle.

THE DUN AND BRADSTREET DATA

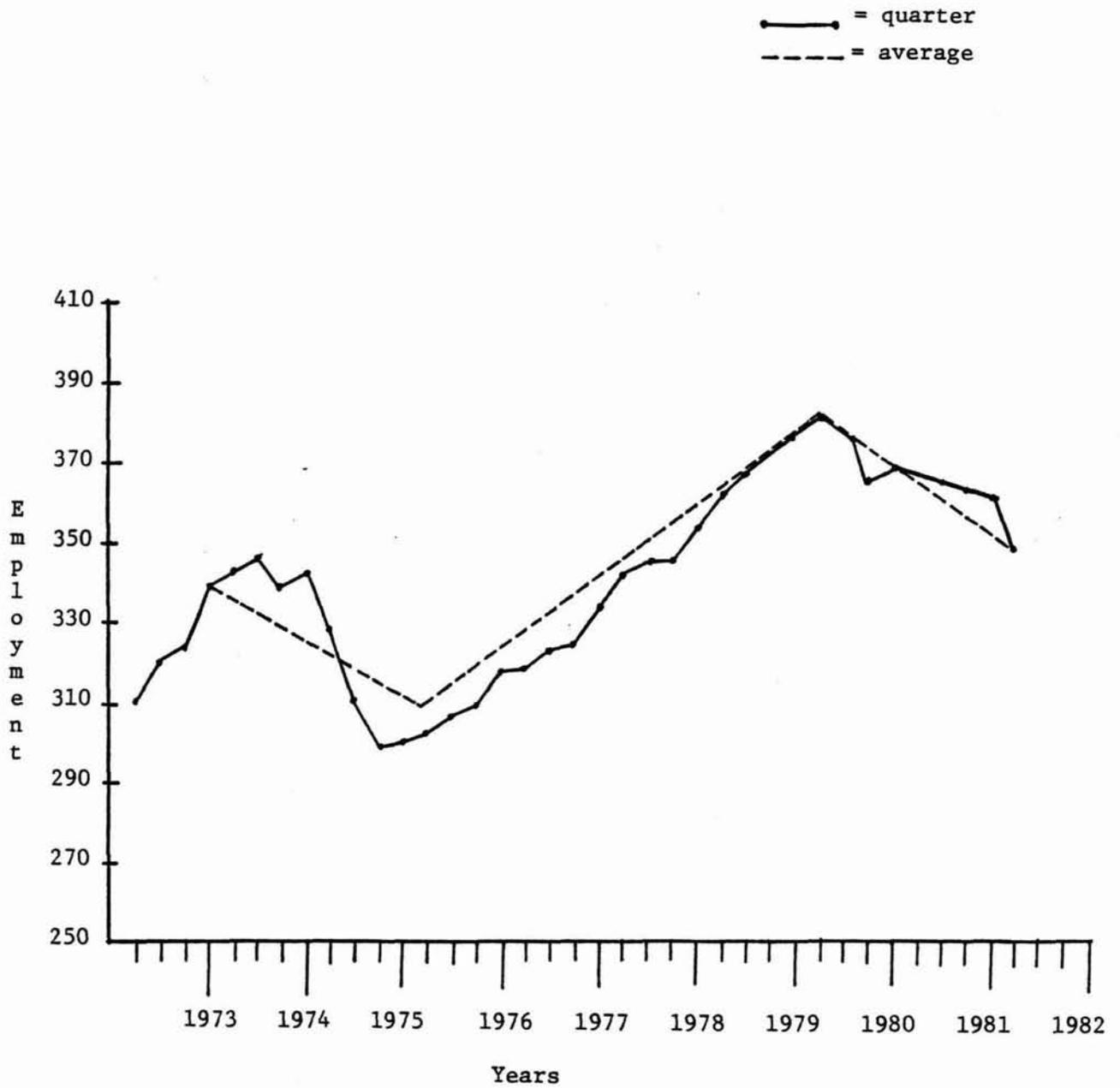
In its role as a credit rating company, Dun and Bradstreet (D&B) collects and maintains information on approximately 4.5 million establishments. This computerized data base, called the Dun's Market Indicators (DMI) file, includes: a Dun's number, a unique number assigned to each business establishment; the establishment's business address; the number of employees; the operation's major standard industrial classification(s) (SIC) at the four-digit level; and the establishment's status as a single establishment operation, a headquarters, a branch location, or a subsidiary.

We have obtained a sample of the Dun and Bradstreet file that includes all firms that listed either SIC 354 (machine tools), SIC 367 (electronic components) or SIC 371 (motor vehicles) as primary, secondary or tertiary activities. To permit an analysis of firm employment changes over the business cycle, the above data were obtained for the peak year of 1973, the trough year of 1975, the peak year of 1979 and the recession year 1982. The sample includes data on 27,014 firms in SIC category 354, 14,067 firms in SIC category 367, and 11,909 firms in SIC category 371.

These three industries were selected for the following reasons. First, firms in SIC code categories 354, 367 and 371 are cyclically sensitive (see Figures 1 through 3). Therefore, we were assured that a geographic comparison of employment fluctuations was possible. Secondly, the selected industries are comprised of a substantial number of multiunit firms. Since a comparison of the behavior of branch plants with single

Figure 1

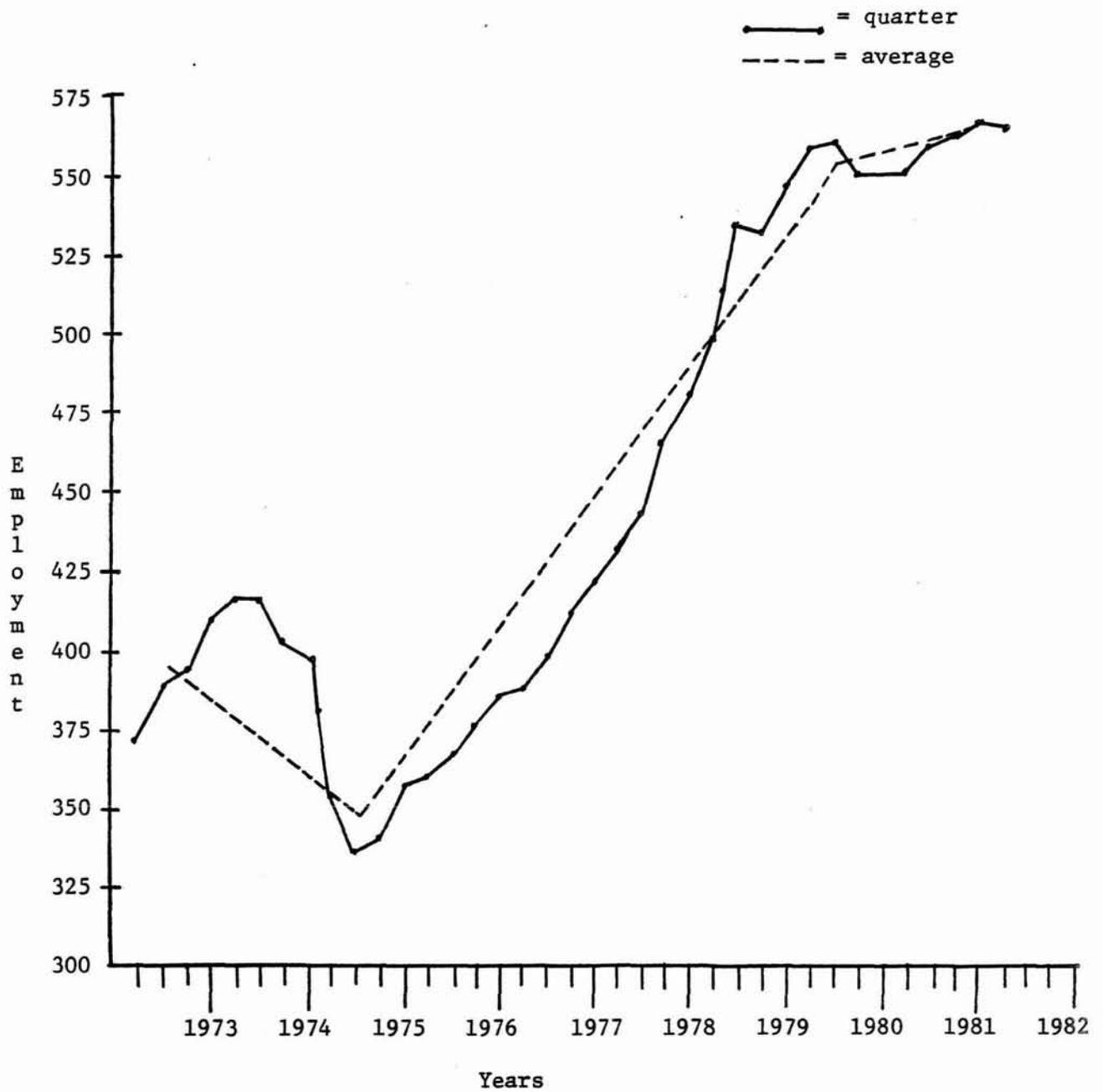
Annual and Quarterly Employment
for SIC 354 for Years 1973-1982
(1,000s)



Source: Employment and Earnings 1973-1982.

Figure 2

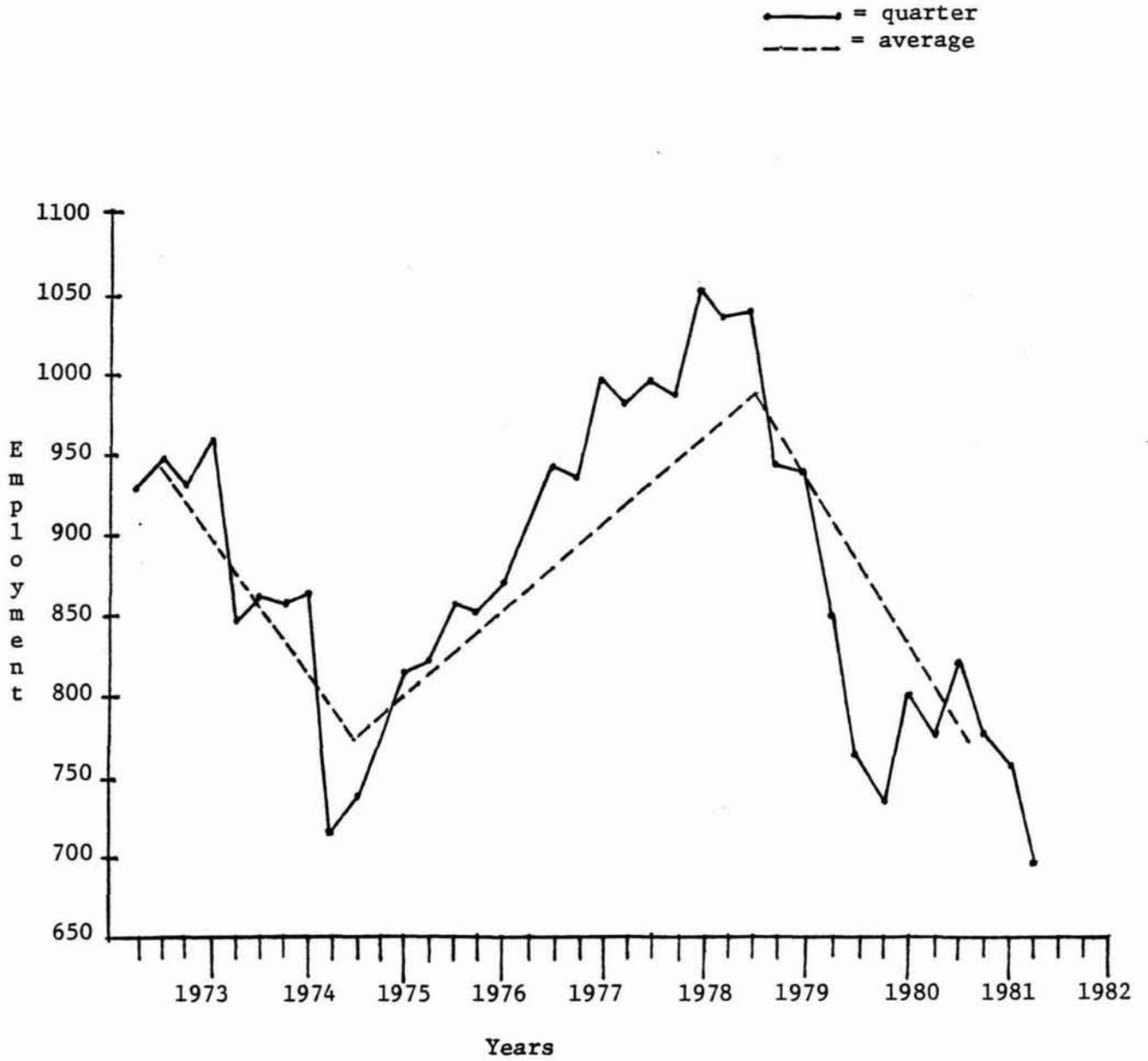
Annual and Quarterly Employment
for SIC 367 for Years 1973-1982
(1,000s)



Source: Employment and Earnings 1973-1982.

Figure 3

Annual and Quarterly Employment
for SIC 371 for Years 1973-1982
(1,000s)



Source: Employment and Earnings 1973-1982.

establishment plants is one question to be addressed, it was important that the industries to be analyzed contain a sufficiently large sample of both types of operations. The percent of all establishments that were multiunit organizations in 1977 was 11 percent for SIC 354, 21 percent for SIC 367, and 28 percent for SIC 371 (Census of Manufacturers, 1977, pp. 7-64 to 7-78).

A third reason for selecting machine tools, electronic components and motor vehicles is that there has been a substantial number of permanent plant and firm closings in these industries. This allows comparisons of closings in branch plants with closings in single plant establishments during the cycle, as well as comparisons of establishment closing in downswings with rates of closing during expansions. Fourthly, the growth rates of the three industries vary. Motor Vehicles is declining in terms of employment. Machine tools is relatively stable, while electronic components is a growing industry. Finally, Motor Vehicles is an industry that frequently responds to economic slowdowns with temporary plant closings. The inclusion of motor vehicles will permit a study of the regional distribution and determinants of temporary shutdowns.

While it is not ideal to use annual values to measure employment changes over the business cycle, Figures 1 through 3 demonstrate that at least for the 1973-75 and 1979-82 recessions the approach is acceptable. Figure 1 compares quarterly employment changes for machine tools from the period 1973 to 1982 with annual average values for 1973, 1975, 1979, and 1982. The employment changes calculated using data from the four years fairly closely approximated the business cycle using quarterly data. Figures 2 and 3 present similar data for electronic components and motor vehicles.

CREATING THE FILE

In order to analyze employment contractions and expansions over the business cycle, the four Dun and Bradstreet files were merged to create histories for each firm.

The files were merged using the Dun's numbers, a number unique to an establishment. When an establishment closes the Duns number is permanently retired. Every new establishment is assigned an original Dun's number.

Each establishment was then flagged as to whether it closed, opened or moved within the nine year period. A firm was flagged as a mover if the firm had matching Dun's numbers in two consecutive years, but had moved from one zip code area to another in the interim. For example, if Jones Electronics Company was located in zip code area 02140 in 1975 and in 02267 in 1979, this company is noted as a 1975-79 mover. A firm for which there was a Dun's number in an early year but none in the following years was flagged as an establishment closing, and a firm that appeared for the first time in the data set in any year after 1973 was flagged as an establishment opening. The opening or birth records are less reliable than the plant closing data, however. Since Dun and Bradstreet are constantly expanding their coverage of firms, it is not clear whether a firm new to the file is actually new to the economy or a recent addition to the DMI file. There also is considerable delay--often several years--before a new firm enters the Dun and Bradstreet file.

There were 155 firms that showed up in the 1973 file but were absent in the 1975 file and reappeared in the 1979 file. There were 259 firms that appeared in the 1975 file, disappeared in 1979 and reappeared in 1982. This disappearance and reappearance of firms may have been due to

changes in firms' major lines of business. For example, if a firm listed 3671 as one of its top three lines of business in 1973 but not in a primary, secondary or tertiary line of business in 1975, then the firm would not appear in the 1975 file. If 3671 was again among the firm's three most important lines of business in 1979, the firm would reappear in the file. Since this problem of disappearing and reappearing establishments occurs in only .5 percent of the cases it is not a major concern here and is overlooked for purposes of this study. However, any firm that reappeared in the data base was treated as if it had a continuous history.

The merged Dun's files were then merged with the Bureau of the Census's City Reference File (CRF). The CRF assigns place descriptions to zip code areas. For example, the CRF file notes that zip code area 20003 is a central city. The place descriptions used for this study are central business districts and central cities, and suburbs (rest of SMSA).

Each firm located in a central business district or a central city was flagged as such by matching the firm's zip code with the place descriptions on the CRF. The CRF noted whether a zip code is "unique to," "primarily in," "primarily outside," or "outside of a" central business district. Any firm whose zip code area is "unique to or primarily in" a central business district (CBD) was flagged as a CBD.

According to the Census, the Central Business District is defined as "an area in a city which has high land value; a high concentration of retail businesses, offices, theaters, hotels, and service businesses; and high traffic flow. The CBD is defined in terms of existing census tract boundaries and may comprise one or more whole tracts" (Census Geography, 1979, p. 28).

A second central city flag was attached to any firm whose zip code identified it as being inside a central city of an SMSA. The Census definition of a central city is the largest city in an SMSA. One or two additional cities may be identified as central cities on the basis of the following criteria:

"1. The additional city or cities must have a population of one-third or more of that of the largest city and a minimum population of 25,000, or

2. The additional city or cities must have at least 250,000 inhabitants" (Census Geography, 1979, p. 25).

Incorporated place is defined as "political units incorporated as cities, boroughs (excluding Alaska and New York), villages and towns (excluding the New England States, New York, and Wisconsin). Most incorporated places are subdivisions of the MCD (minor civil divisions) or CCD (census county divisions) in which they are located; for example, a village located within and legally part of a township. However, almost 4,000 incorporated places cross MCD and/or county lines, but no incorporated places cross state lines since they are chartered under the laws of a state." (Census Geography, 1979, p. 22.)

The Dun's file records a standard metropolitan statistical area (SMSA) code for each firm. Thus the Dun's file allows us to determine whether a firm is located in or outside an SMSA. Suburbs, for this study, are defined as the area within an SMSA as noted by the Dun's file but outside of the central city as noted by the CRF.

The 1977 boundaries of central business districts and central cities are used throughout this study, in order to maintain consistency in geographical comparisons. This created one problem.

The post office is constantly dividing zip code areas and creating new zip codes. For the zip codes created after 1977 there were no matches in the 1977 CRF. Since the majority of these new zip codes were outside SMSAs the problem was not as serious as it might have been. Out of 32,253 records in 1982, there were 204 firms located within SMSAs whose zip codes did not have matches on the City Reference File. The firms were eliminated from the central city/suburban analysis. The number of cases in this category is sufficiently small (.6 percent) that the elimination of these cases should not distort the results.

The report submitted earlier, entitled "Using the Dun and Bradstreet Data to Analyze the Effects of Business Fluctuations on Firm Employment," describes a number of problems with the D&B data. These shortcomings are not to be repeated here except to report on how several problems were resolved in creating the merged file.

One problem with the DMI data is that many addresses were illegitimate, such as Esplanade Mall in place of a street name and number. Birch found that about 20 percent of all addresses were not legitimate street addresses (Birch 1979, p. 15). They were names of office buildings, industrial parks, shopping plazas, or street intersections. In other cases addresses were abbreviated in one year and not in another; for example, Skyline Rd was reported as the address for one firm in 1975 and Skyline Road was reported in 1979. Due to both of these problems, in combination with misspellings, the matching of street addresses to determine movers was problematic. For this reason we decided to match zip codes rather than addresses to identify movers.

Two complications arose. One is that occasionally firms use the zip code of the nearest post office rather than the code of the location of

their facility. This creates a city bias in identifying the location of firms. The extent of this problem is not yet known but will be explored.

The second problem was that some zip code boundaries change over time. Thus it was difficult to determine whether a firm was an actual mover or whether its zip code was redefined. This problem was resolved through a hand editing process. This process was carried out as follows.

According to the post office, when changes are made in a geographical area's zip code, only the last two numbers of the zip code are affected, with one exception which will be mentioned below. For example, in 1979, 8611 8 Mile Drive in Detroit had a zip code of 48074. In 1982, the same address had a zip code of 48091.

In order to distinguish between an actual move and a redefinition of zip codes, each firm in which the last two digits changed during interim years and the addresses were not equal were printed out. Many non-movers were included in this file, due either to misspelled or to inconsistently reported addresses. For example, Jephco Manufacturing fell into this category. In 1975 Jephco's zip code was 74135. In 1979 the code was 74112. The address for Jephco Manufacturing was recorded as 3704 E 56th St. in 1975 and as 3704 E 56 St. in 1979. Jephco Manufacturing is clearly operating in the same location, however the addresses were reported slightly differently by Dun and Bradstreet in the two years. Firms such as Jephco were remerged with the file and flagged as non-movers.

The exception to zip code changes affecting only the final two digits occurred in 1980. During that year the post office revised the last three or four digits of a number of zip codes. Firms that were affected by these changes are accurately recorded as non-movers.

It is clear that the use of zip codes arbitrarily includes some short moves in the mover file and excludes others. For example, if a move across the street put the firm in a new zip code district it is included as a mover. The same distance move is overlooked when it was an intra-zip code district move. This should not have a substantial effect on our results. The study will analyze central city to suburb moves, SMSA to metropolitan moves, and inter-regional moves. The number of firms moving within a zip code district and yet changing type of geographical place should be very small.

A second shortcoming of the DMI file is that not all firms are interviewed every year. The data sets acquired from D&B are as they existed on December 31, 1973, December 31, 1975, December 31, 1979 and July 28, 1982. However, not all firms are interviewed during the year of the tape's date. So, for example, on the 1979 tape, information on a record may date from June 1978.

Fortunately, the D&B file records the date of firm interview so that a distribution of interview dates could be calculated. This information is presented for machine tools in Tables 1 and 2 below. The tables were calculated by region, in order to detect any regional biases in the final results that could occur due to regional differences in updating.

Tables 1 and 2 indicate that there is little regional difference in the updating of the DMI files and that about 80 percent of all firms are interviewed each year. In the 1975 tape, 79 percent of all firms in New England were updated in that year. Eight percent of the firms on the 1975 tape in New England were last interviewed in 1974, and 12 percent of the firms on the 1975 tape were last interviewed in the years 1967 to 1973.

Table 1

Percent of Interviews taken in
and Prior to 1975 as Recorded
on the 1975 Dun and Bradstreet
Tape, by Region For Machine Tools
(SIC 354)

	1967-69	1970-72	1973	1974	1975
New England	1	5	6	8	79
Mid-Atlantic	2	5	5	8	80
South Atlantic	1	4	5	10	79
East South Central	0	3	2	10	85
East North Central	1	4	4	8	83
West South Central	1	5	4	8	82
West North Central	1	5	4	8	82
Mountain	1	4	4	9	83
Pacific	1	5	7	10	78

Table 2

Percent of Interviews taken in
and Prior to 1982 as Recorded
on the 1982 Dun and Bradstreet
Tape, by Region For Machine Tools
(SIC 354)

	1973-76	1977-79	1980	1981	1982
New England	5	6	7	38	44
Mid-Atlantic	4	5	6	39	46
South Atlantic	3	6	7	42	42
East South Central	2	4	6	42	47
East North Central	3	5	6	39	47
West North Central	3	6	5	39	46
West South Central	3	6	5	39	46
Mountain	6	8	6	35	46
Pacific	5	6	8	37	44

The distribution of interview dates in New England is similar to that of all other regions in 1975. The regional distributions of interview dates in 1982 are also similar across regions. In all regions, between 42 percent and 47 percent of all firms on the 1982 tape were interviewed in 1982. (Note that the 1982 tape includes the information as it stood on July 28 rather than December 31. For this reason only about 42 percent of all firms were interviewed in 1982.) The frequency of updating is similar for electronic components and motor vehicles. These tables as well as the 1979 machine tool tables are presented in Appendix A.

A third problem with the data were coding errors in the employment numbers. In the original D&B tape the number of employees was coded as YXXX, where Y is the number of zeros to be attached to XXX. Any error in coding Y could easily distort employment values by thousands of employees.

To check for such errors, employment for all firms that experienced employment changes of 1500 employees or greater between any two years was printed out. There were 304 firms or records that fell into this category for machine tools, 708 firms for electronic components, and 767 firms for motor vehicles. These large changes were reviewed for coding errors. In many cases the changes looked plausible and were left as coded by Dun and Bradstreet. For example one firm had 7,500 employees in 1973, 7,500 employees in 1975, 6,000 employees in 1979, and 6,400 employees in 1982. The 1975 to 1979 change in employees of 1,500 seemed plausible. In other cases only two years of employment were available so it was more difficult to determine if the employment values were reasonable. These cases were also left unchanged.

However, there were cases where coding errors were obvious. For example, one firm was recorded as having 260 employees in 1973, 300,000

employees in 1975, and 151 employees in 1979. Clearly the 1975 value was incorrectly reported. This number was changed to 300. Errors such as these could seriously distort the analysis. The number of cases where similiar errors were detected and records revised was five cases for SIC 354, 17 cases for SIC 367, and 16 cases for SIC 371.

Coding errors were also discovered for a small number of SMSAs. This fourth problem surfaced during the central city/suburban and metropolitan/non-metropolitan comparisons, when establishments appeared as residents of central cities but not as residents of an SMSA. Further analysis of this inconsistency¹ indicated that a number of establishments located within SMSAs, as noted by their addresses, were recorded by Dun and Bradstreet as being outside of any SMSA.

This problem was easily circumvented when an establishment was located within a central city, because the central city code can be checked against the SMSA code. However, errors in SMSA codes for establishments outside of central cities could only be detected with a laborious process of matching city names with SMSA codes. For this reason no adjustments were made for firms that are recorded, incorrectly, as non-metropolitan but are located in suburban areas, and for firms that are recorded, incorrectly, as suburban firms but located in non-metropolitan areas.

To indicate the extent to which SMSA codes are misreported, out of 2023 electronic components establishments in central cities in 1973, 105 or 5 percent are misrecorded as being outside of SMSAs by the Dun and

1. As explained on page 22 above, a central city was defined by the Bureau of the Census and used in the City Reference File as the largest city in an SMSA.

Bradstreet SMSA codes. In the 1982 data, only one out of 2,489 or .04 percent of central city electronic component establishments are miscoded. Clearly, there are fewer reporting errors at least for SMSA codes in later years than in earlier years.

COVERAGE OF DATA BASE

Table 3 compares the coverage of employment and number of firms for the Dun and Bradstreet file with that of the County Business Patterns. The tables show the ratio of the D&B data to that of the County Business Patterns for machine tools by state. Table 3 indicates that the D&B data capture a large proportion of each state's employment in machine tools. Similar tables are presented for electronic components and motor vehicles in Appendix B. The results for all industries indicate the D&B data has good cross-state coverage for all industries.

Coverage appears to be substantially higher for the D&B data primarily because the D&B data base includes firms that listed the three-digit SIC code as a primary, secondary, or tertiary line of business. The County Business Patterns records only those firms that list a particular SIC code as a primary line of business. Since the 1982 County Business Patterns is not yet out, the 1982 ratios could not be calculated.

Table 3 also allows us to check for any major problems in the Dun and Bradstreet file. For example, unusually large or small ratios or large fluctuations in ratios across years would signal possible coding errors. As demonstrated in Table 3, as well as the tables in Appendix B, the majority of the ratios are reasonable.

Table 3
 Ratio of Number of Employees
 and Number of Firms Reported
 in the DMI File to that
 Reported by CBP for SIC 354,
 by State

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Alabama	2.36	1.52	1.82	2.03	2011/G	1.80
Alaska	--	--	--	--	1/NA	1/NA
Arizona	.85	1.69	3.62	1.97	1.06	1.54
Arkansas	2.48	1.73	1.40	1.69	1.19	1.83
California	1.49	1.33	1.83	1.52	N/A	N/A
Colorado	3.14	2.06	1.72	1.59	1.17	1.61
Connecticut	1.95	1.56	2.61	1.58	2.30	1.60
Delaware	2.26	1.28	1.79	1.83	1.25	1.83
DC	15/NA	3/NA	--	--	4/NA	2/NA
Florida	1.04	1.39	1.59	1.59	1.30	1.47
Georgia	1.96	1.80	2.08	2.29		2.27
Hawaii	--	--	--	--	--	2.00
Idaho	72/NA	5/NA	60/NA	4/NA	71/B	1.60
Illinois	1.48	1.45	1.87	1.56	1.64	1.62
Indiana	1.60	1.42	1.75	1.53	1.31	1.40
Iowa	1.04	1.92	1.05	1.69	1.17	1.48
Kansas	2.20	1.83	2.07	1.73	3.27	1.92
Kentucky	1.71	1.37	2.26	1.44	2.45	1.30
Louisiana	6.05	1.60	189/C	1.42	.36	1.71

Table 3 (continued)

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Maine	2.46	1.08	1.29	1.25	.89	.93
Maryland	1.63	2.00	—	—	1.44	2.29
Massachusetts	1.94	1.58	1.77	1.67	1.52	1.61
Michigan	1.29	1.41	1.44	1.50	1.33	1.50
Minnesota	1.20	1.31	1.32	1.49	1.31	1.43
Mississippi	1.95	2.00	1031/E	1.54	1859/F	1.34
Missouri	1.63	1.52	1.50	1.42	2.16	1.49
Montana	9/NA	2/NA	20/NA	2/NA	66/NA	5/NA
Nebraska	1.23	1.63	5.22	1.83	3.23	2.50
Nevada	29/NA	6/NA	30/B	3.00	.14	1.3
New Hampshire	1.60	1.56	NA	NA	1.13	1.49
New Jersey	1.78	1.46	2.09	1.52	1.95	1.39
New Mexico	119/NA	9/NA	1.46	3.50	1.18	2.29
North Carolina	1.26	1.53	1.30	1.58	1.06	1.48
New York	1.42	1.43	NA	NA	1.48	1.56
North Dakota	211/NA	6/NA	57/NA	2.00	90/B	1.75
Ohio	1.47	1.48	1.57	1.58	1.38	1.54
Oklahoma	2.44	1.90	2.92	1.91	4.17	2.34
Oregon	2.65	2.19	2.10	2.83	2.68	2.89
Pennsylvania	2.3	1.37	2.62	1.43	1.54	1.31
Rhode Island	1.90	1.91	1.76	1.78	1.44	1.75

Table 3 (continued)

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
South Carolina	1.05	1.66	2.30	1.54	1.27	1.44
South Dakota	168/D	2.00	1.07	1.60	.92	1.80
Tennessee	2.05	1.49	1.56	1.48	1.49	1.31
Texas	.96	1.51	1.17	1.66	1.54	1.80
Utah	131/NA	14/NA	2.4	3.37	5.13	2.61
Vermont	1.02	1.37	NA	NA	NA	NA
Virginia	6.26	2.2	1.13	1.93	2.04	1.42
Washington	2.49	2.64	1.42	2.85	2.44	2.68
West Virginia	1.98	.92	1.7	1.00	6.45	1.31
Wisconsin	1.25	1.44	1.59	1.56	1.63	1.43
Wyoming	4/NA	1/NA	4/NA	1/NA		2.00

* A:0-19; B:20-99; C:100-249; E:250-499; F:500-999; G:1,000-2,499; H:2,500-4,999; I:5,000-9,999; J:10,000-24,999; K:25,000-49,999; L:50,000-99,999; M:100,000 or more.

* Figures reported as NA or D are unavailable due to negligability or avoidance of disclosure, respectively.

Several ratios do, however, stand out as potential problems. For example, for SIC 354, the employment ratio for West Virginia for 1979 is high at 6.45. This as well as several large ratios that appear in Appendix B will be analyzed for errors.

To conclude, The Urban Institute has created a unique data set to study spatial differences in business cycles. This data set includes employment histories for machine tools, electronic components, and motor vehicle industries. These establishment employment histories include data for 1973, 1975, 1979 and 1982. This data set has been merged with the Bureau of the Census' City Reference File to note whether firms are located in central business districts or central cities. We now turn to the metropolitan/non-metropolitan and city/suburban results.

RESULTS

This section presents the results of the metropolitan/non-metropolitan and central city/suburban business cycles analysis. The cross-regional and central business district results will be presented at a later date. This presentation of the results is divided into five parts. First the geographical differences in employment fluctuations during the 1973-75 recession, the 1975-79 expansion and the 1979-82 recession are analyzed for each industry. The remaining four parts consider the four components that underlie or explain employment changes at the subnational level. These four factors include employment expansions or contractions in existing establishments, variations in establishment closing rates, fluctuations in firm birth rates, and changes in establishment migration rates. Each of these four components of the cycle will be discussed in turn, with an emphasis on metropolitan/non-metropolitan and central city/suburban differences over the business cycle.

Before turning to a detailed discussion of the results, an overview of the major conclusions will be presented.

The major findings are:

(1) Employment cycles vary geographically, even when industry mix is held constant at the three-digit Standard Industrial Code (SIC) level. In general, the areas where employment growth is greatest experience the greatest fluctuation in employment.

(2) Employment loss during recessions is primarily due to large increases in plant closings and small reductions in establishment

births. Employment at existing establishments continues to expand, on the average, during recessions, rather than contracts. Motor vehicles is in several cases an exception.

(3) During expansions in the national economy, employment at continuing firms grows, firm birth rates increase slightly and death rates fall dramatically.

(4) Establishment relocation patterns vary geographically, as expected. Migration from all central cities to any suburban area and from all metropolitan to any non-metropolitan area is greater than from all suburbs to any central cities and from all metropolitan to any non-metropolitan areas. The business cycle has little effect on the movement of employment between central cities and suburbs and between metropolitan and non-metropolitan areas.

(5) Areas where employment is growing most rapidly experience the greatest employment variability. The reason appears to be that these areas have high firm birth rates and a disproportionate share of new firms that experience high rates of failure during recessions.

We now turn to consider these findings in more detail. First the geographical comparison of employment fluctuations between metropolitan and non-metropolitan areas and central cities and suburbs is presented. Table 4 compares annual employment growth rates across geographical areas for machine tools, electronic components, and motor vehicles for three periods: the 1973-75 recession, the 1975-79 expansion and the 1979-82 recession. Machine tool employment is shown to have declined by 3 percent during the 1973-75 recession, expanded by 2.8 percent during the 1975-79 recovery and declined by 2.3 percent during the current

Table 4

Annual Growth Rates of Employment over the Business Cycle,
for Metropolitan and Non-Metropolitan Areas, Central
Cities and Suburbs, for Machine Tools,
Electronic Components, and Motor Vehicles

(Percent)

	Metropolitan	Non-Metropolitan	Central City	Suburbs	Annual Growth Rate for the Nation derived from <u>Employment</u> and <u>Earnings</u>
Machine Tools					
1973-75 Recession	-2.972	-.937	-5.537	.247	-2.304
1975-79 Expansion	2.841	2.746	-.40	5.893	4.371
1979-82 Recession	-2.283	3.013	-4.183	.021	-2.218
Electronic Components					
1973-75 Recession	-3.651	-5.820	-3.949	-3.332	-6.028
1975-79 Expansion	3.689	-1.003	5.752	2.163	10.110
1979-82 Recession	-1.434	3.010	-.438	2.549	2.890
Motor Vehicles					
1973-75 Recession	-4.553	-6.081	-.169	-11.022	-9.735
1975-79 Expansion	-5.213	1.456	-8.166	.152	6.129
1979-82 Recession	-8.922	-11.880	-9.771	-8.329	-15.429

Source: Urban Institute Analysis of the Dun and Bradstreet Data and U.S. Department of Labor,
Bureau of Labor Statistics, Employment and Earnings.

recession, in metropolitan areas. The comparable figures for non-metropolitan areas are $-.94$, $+2.8$ and $+3.0$.

The figures in Table 4 were constructed from the four components of employment change mentioned above. Employment changes due to expansions or contractions in continuing firms were added to total employment at the beginning of the period. New employment due to firm births and net migration were added to this total and employment loss due to establishment closings was subtracted from this total. The figures reported in Table 4 are equivalent to the net change in employment divided by employment at the midpoint of the period. This process was carried out for metropolitan, non-metropolitan, central city and suburban areas. The underlying figures are presented, along with a brief description of the process in Appendix C.

Annual employment growth rates over the cycle could not be derived directly from employment totals in the Dun and Bradstreet file. The reason is that every year Dun and Bradstreet adds new establishments to their file, many of which are not new births to the economy. Thus, employment totals in the files have increased steadily over time. For example, total employment increased from 471,545 in 1973 to 524,999 in 1975, to 533,064 in 1979, to 548,960 in 1982, for machine tools.

Because data on the year of birth is not collected for branch plants, old firms that are new additions to the file cannot be distinguished from branch plant births. Therefore, these old firms' new additions cannot be subtracted from total employment to obtain a consistent sample of establishments.

The annual growth rates constructed from the Dun and Bradstreet file are roughly consistent with other sources of industry level employment

data. For example, Table 4 reports growth rates for the nation as reported in Employment and Earnings. The national figures show, for example, a 9.7 percent decline in annual employment in motor vehicles for 1973 to 1975. The comparable figures for motor vehicles as calculated from the Dun and Bradstreet data are -4.6 for metropolitan areas and -6.1 for non-metropolitan areas. In general the growth rates as derived from Dun and Bradstreet do not vary as much as those of Employment and Earnings. In other words, Employment and Earnings tends to show more severe recessions and healthier expansions than the Dun and Bradstreet data.

The data in Table 4 are consistent with expectations. Employment, in most cases, contracts during the recessions and expands during the periods of national economic growth. However, it is important to keep in mind that these growth rates are not detrended. That is, the percentage changes combine not only the cyclical but secular trends in employment. This explains the consistently negative numbers in central cities for machine tools and motor vehicles. Machine tool employment declined in central cities by 5.5 percent in 1973-75, by .6 percent in 1975-79, and by 4 percent in 1979-82. Motor Vehicles employment declined by .2 percent in 1973-75, by 8 percent in 1975-79, and by 9.7 percent in 1979-82 in central cities. These figures represent a combination of the long run decline in industry employment in central cities with the swings of the business cycle.

In order to adjust for the long run trend and to facilitate cross area comparisons of cyclical variability, "swing" measures were calculated for all industries for each period. The swing measure is equivalent to the absolute value of the difference between two consecutive annual growth

Table 5

Comparisons of Swings in the Business Cycle, between
Metropolitan and Non-Metropolitan Areas and
Central Cities and Suburbs, for Machine Tools,
Electronic Components, and Motor Vehicles

	Metropolitan	Non-Metropolitan	Central City	Suburbs
<u>Machine Tools</u>				
1973-79	813 5.768*	3.683	4.897	5.646
1975-82	124 5.434**	.267 1.476	3.343	5.872
<u>Electronic Components</u>				
1973-79	7.340	4.817	9.701	5.495
1975-82	5.123	4.013	6.190	.386
<u>Motor Vehicles</u>				
1973-79	3.660	7.537	8.335	10.870
1975-82	3.709	13.336	1.605	8.481

* Equal to the absolute value of the difference between the annual growth rate of employment during the 1973-75 recession and the annual growth rate of employment during the 1975-79 expansion.

** Equal to the absolute value of the difference between the annual growth rate of employment in the 1975-79 expansion and the annual growth rate of employment during the 1979-82 recession.

rates. A larger swing value indicates a greater employment fluctuation over the cycle. For example, a large swing value occurs when employment fell dramatically during the recession and then expanded strongly during the recovery.

The results of Table 5 indicate that there are substantial geographical variations in employment cycles. Machine tool employment is more cyclically sensitive in metropolitan areas than in non-metropolitan areas, and more sensitive in central cities than in suburbs. Electronic component employment is also more cyclically sensitive in metropolitan areas than in non-metropolitan areas. However, in this industry central city employment is more cyclical than suburban employment. Motor vehicles firms, on the other hand, are more cyclically sensitive in non-metropolitan areas than in metropolitan areas and in suburbs than in central cities. Thus it is clear from Tables 4 and 5 that there are substantial geographical variations in employment cycles when industry mix is held constant, but that the cyclically sensitive area varies by industry.

The remaining part of this section will analyze underlying components of employment change. First we turn to a comparison of annual employment growth rates in establishments that continued in operation at the same location throughout each period. This subset of all firms includes PTO firms that were operating in both 1973 and 1975 for the first period, firms that operated both in 1975 and 1979 in the second period and firms that operated in both 1979 and 1982 in the second period. This subset of all firms was further narrowed to include only those firms whose data was updated in the current year. So, for example, if the employment figure for a firm had not been updated in 1975, the observation was eliminated

from the growth rates in Table 6. Again the analysis focuses on metropolitan and non-metropolitan and city and suburban differences.

Tables 6 and 7 present annual employment growth rates in these stayput firms over the business cycle. Approximately 75 percent of total machine tool and electronic components employment is in stayput firms and approximately 90 percent of all motor vehicle employment falls into this category. Approximately 85 percent of these firms had up-to-date information on the Dun and Bradstreet tapes.

An interesting finding from Table 6 is that employment growth is positive in stayput firms during both recessions and expansions. During the 1973-75 and 1979-82 recessions firms in machine tools and electronic components expanded rather than reduced their labor force. In fact, in most cases the annual employment growth rate is higher in the 1973-75 recession than in the 1975-79 recovery. For example, during the 1975-75 recession, machine tool employment in metropolitan establishments expanded by 1.9 percent. During the recession employment in this category expanded by only 1.5 percent. In non-metropolitan areas machine tool employment in stayput establishments expanded by 5.9 percent during the 1973-75 recession and by only 3.3 percent during the 1975-79 expansion. Motor vehicle employment in 1973-75 in non-metropolitan areas is an exception. Employment expanded by 3.2 percent in the first period increasing to 4.1 percent in the second period.

The pattern for central cities and suburban areas is similar, as shown in Table 7. Annual employment growth rates for firms that stayed put over the period are positive during both recessions and expansions for central city and suburban machine tools and electronic components. In

Table 6

Annual Employment Growth Rates in
Stay Put Establishments over the
Business Cycle in Metropolitan
and Non-Metropolitan Areas, for
Machine Tools, Electronic
Components, and Motor Vehicles

		Metropolitan Areas (Percent)	Non-Metropolitan Areas (Percent)
Machine Tools			
1973-75	Recession	1.881	5.886
1975-79	Expansion	1.509	3.293
1979-82	Recession	.703	2.982
Electronic Components			
1973-75	Recession	6.444	3.810
1975-79	Expansion	4.537	3.048
1979-82	Recession	4.467	1.902
Motor Vehicles			
1973-75	Recession	3.771	-3.219
1975-79	Expansion	-2.890	4.173
1979-82	Recession	-3.556	1.309

Table 7

Annual Employment Growth Rates in
 Stayput Establishments over
 the Business Cycle in Central City
 and Suburban Areas for Machine Tools,
 Electronic Components, and
 Motor Vehicles

		Central City Areas (Percent)	Suburban Areas (Percent)
Machine Tools			
1973-75	Recession	.000	4.128
1975-79	Expansion	.827	2.208
1979-82	Recession	1.075	.339
Electronic Components			
1973-75	Recession	5.284	7.141
1975-79	Expansion	5.679	3.569
1979-82	Recession	2.120	6.206
Motor Vehicles			
1973-75	Recession	11.008	-9.550
1975-79	Expansion	-8.820	7.201
1979-82	Recession	-2.581	-4.721

fact, expansions for these industries are as great or greater in recessions than in the period of national economic growth, 1975 to 1979. One possible explanation is that these stayput firms are established, mature firms that pick up business from firms forced into bankruptcy by the recession or from branch plant shutdowns.

As in the metropolitan/non-metropolitan comparison, employment contracted in stayput motor vehicle establishments fell in several periods. Motor vehicle employment contracted in central city firms in the 1975-79 expansion and in the early part of the current 1979-82 recession. Employment in stayput suburban motor vehicle establishments contracted in both recessions and expanded during the 1975-79 upswing in the national economy. The contraction in motor vehicle employment for stayput firms in central cities in 1975-79 may be explained by the long run decline of the auto industry during this period in conjunction with the decentralization of motor vehicle employment.

The metropolitan area statistics for motor vehicles mask major differences in the behavior of stayput central city and suburban firms. The annual employment growth rate for stayput motor vehicles firms was 3.771 percent in metropolitan areas in 1973-75. Breaking this figure down into central city and suburban areas, the growth rate was a positive 11.008 percent for central cities and a negative 9.550 for suburbs. In 1975-79 metropolitan area motor vehicle employment declined by 2.89 percent. This figure also covers tremendous variation in the behavior of central city firms (-8.82 percent) and suburban firms (7.201 percent).

In order to control for long run employment trends, swing measures for the annual growth rates in Tables 6 and 7 were calculated. As described above, the swing measure as used in this study is the absolute

value of the difference between annual growth rates in two consecutive periods. These measures are displayed in Table 8. Table 8 indicates the employment fluctuations in stayput firms did not vary much across metropolitan and non-metropolitan areas. However, as demonstrated by the relatively large swing measure in suburbs, fluctuations in suburbs were substantially greater than in central cities. In other words, changes in employment in stayput firms varied more over the business cycle in suburbs than in cities. For machine tools and electronic components the pattern was that suburban areas experienced an increase in employment growth in stayput firms, during recessions and a decrease in the positive rate of employment growth during the expansion. Motor vehicles experienced declines in employment in stayput firms during the 1973-75 and 1979-82 recessions and then rapid employment growth during the 1975-79 expansion.

In summary, the major findings from Tables 6 through 8 indicate that contrary to expectations employment in stayput firms not only increases during recessions, but increases at a greater rate during recessions than expansions of the national economy. Motor vehicles is an exception. In several geographical areas employment growth was negative in continuing firms during at least one recession. A second finding is that employment growth rates in stayput firms fluctuate more in suburban areas than in central cities. This pattern holds for all three industries.

Tables 9 through 14 present the geographical data on establishment closings and employment loss due to establishment closings. These closing rates are equivalent to establishment deaths divided by the total number of establishments in the Dun and Bradstreet file at the beginning of the period. Employment loss due to plant closings is equal to employment loss divided by total employment in the Dun and Bradstreet file at the

Table 8
 Swing Measures for Employment
 in Stayput Firms for Machine
 Tools, Electronic Components,
 and Motor Vehicles

	Metropolitan	Non-Metropolitan	Central City	Suburb
Machine Tools				
1973-79	.372	2.593	.827	1.917
1975-82	.806	.311	.248	1.869
Electronic Components				
1973-79	1.907	.762	.395	3.572
1975-82	.07	1.146	3.559	2.637
Motor Vehicles				
1973-79	6.661	7.392	19.828	16.751
1975-82	.666	2.864	6.239	11.922

Table 9

Establishment Closings and Employment
Loss Due to Establishment
Closings over the Business
Cycle, in Metropolitan and
Non-Metropolitan Areas,
Machine Tools

		Metropolitan Areas (Percent)	Non-Metropolitan Areas (Percent)
Establishment Closings*			
1973-75	Recession	10.02	10.05
1975-79	Expansion	6.48	6.19
1979-82	Recession	8.53	7.71
Employment Loss**			
1973-75	Recession	7.87	9.35
1975-79	Expansion	5.12	3.71
1979-82	Recession	7.84	6.01

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

Table 10

Establishment Closings and Employment Loss
Due to Establishment Closings, over the
Business Cycle, in Metropolitan and
Non-Metropolitan Areas,
Electronic Components

		Metropolitan Areas (Percent)	Non-Metropolitan Areas (Percent)
Establishment Closings*			
1973-75	Recession	14.64	14.93
1975-79	Expansion	8.61	7.74
1979-82	Recession	11.84	9.88
Employment Loss**			
1973-75	Recession	10.04	9.85
1975-79	Expansion	6.83	5.83
1979-82	Recession	6.94	6.46

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

Table 11

Establishment Closings and Employment Loss
Due to Establishment Closings over the
Business Cycle in Metropolitan
and Non-Metropolitan Areas,
Motor Vehicles

		Metropolitan Areas (Percent)	Non-Metropolitan Areas (Percent)
Establishment Closings*			
1973-75	Recession	13.28	13.14
1975-79	Expansion	8.62	7.80
1979-82	Recession	10.91	9.61
Employment Loss**			
1973-75	Recession	3.85	5.09
1975-79	Expansion	4.93	3.21
1979-82	Recession	6.30	6.21

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

Table 12

Establishments Closings and Employment
Loss due to Establishment Closings over
the Business Cycle, in Central
City and Suburban Areas,
Machine Tools

		Central City (Percent)	Suburban Areas (Percent)
Establishment Closings*			
1973-75	Recession	9.88	10.11
1975-79	Expansion	6.76	6.27
1979-82	Recession	8.48	8.57
Employment Loss**			
1973-75	Recession	7.54	8.29
1975-79	Expansion	5.53	4.68
1979-82	Recession	8.69	7.05

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

Table 13

Establishments Closings and Employment
Loss due to Establishment Closings
over the Business Cycle, in Central
City and Suburban Areas,
Electronic Components

		Central City (Percent)	Suburban Areas (Percent)
Establishment Closings*			
1973-75	Recession	15.50	14.02
1975-79	Expansion	9.09	8.26
1979-82	Recession	12.37	11.54
Employment Loss**			
1973-75	Recession	9.37	10.50
1975-79	Expansion	6.96	6.74
1979-82	Recession	7.05	6.87

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

Table 14

Establishments Closings and Employment
Loss due to Establishment Closings
over the Business Cycle, in Central
City and Suburban Areas,
Motor Vehicles

		Central City (Percent)	Suburban Areas (Percent)
Establishment Closings*			
1973-75	Recession	12.90	13.75
1975-79	Expansion	8.29	8.98
1979-82	Recession	10.60	11.22
Employment Loss**			
1973-75	Recession	3.67	4.15
1975-79	Expansion	4.65	5.49
1979-82	Recession	4.90	8.10

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

beginning of the period. Both figures are on an annual basis. An establishment is considered closed if it appears in the file one year but in none of the following years.

A number of findings can be generalized from Tables 9 through 14. First, there are major differences in establishment closing and employment loss rates over the business cycle. Closing rates are approximately fifty percent higher during recessions than expansions. For example, in 1973-75 closing rates were 10.02 percent for machine tool employment in metropolitan areas. The rate fell to 6.48 percent during the 1975-79 expansion and then rose to 8.53 percent in the current 1979-82 recession.

The pattern for employment loss is similar. For example, in non-metropolitan areas, 9.35 percent of total employment was lost in the machine tools industry due to plant closings in the 1973-75 recession. During the 1975-79 expansion only 3.71 percent of total employment was lost annually and in the current recession, 6.01 percent of employment has been lost annually. The pattern for all industries and all geographical areas is similar. David Birch (1979, pp. 23-24) also found that death rates varied over the cycle. However his results show only small cyclical changes in death rates. The difference between the Birch result and those presented here can be explained by the fact that his time periods do not correspond closely to the business cycle. His time periods range from 1972 to 1974, which captures the last year-end of the expansion and the first year of the recession, and 1974 to 1976, which captures the last year of the recession and the first year of the recovery. Thus his death rates are averages of recessionary and expansionary years.

A second finding from Tables 9 through 14 is that plant closing rates are highest for electronic components. For example, the closure rates for

electronic components range from 7.74 percent in 1975-79 to 14.93 percent in 1973-75 in non-metropolitan areas. Motor vehicles has the second highest rate of closures, ranging from 7.80 to 13.14 for the same periods. Machine tool rates are the lowest, ranging from 6.19 percent to 10.05 percent for the same periods. This pattern holds for the central city and suburban rates as well.

A third finding is that establishment closing rates are, in most cases, higher in all phases of the cycle in metropolitan than in non-metropolitan areas. This pattern also holds for employment loss due to plant closings and can probably be explained by the concentration of new firms in metropolitan areas. New firms are more likely than mature firms to go bankrupt.

A fourth result to be drawn from Tables 12 through 14 is that closing rates tend to be higher for machine tools in suburban areas, for electronic components in central cities and for motor vehicles in suburban areas. Again, the areas where industry employment is growing most rapidly are experiencing the greatest employment loss due to plant closings. Over the period 1973 to 1979 machine tool employment declined at an annual rate of -2.36 percent in central cities and grew at an annual rate of 1.52 percent in suburbs. Employment in electronic components grew faster in central cities than in suburbs. The annual employment growth rate for this industry was 2.98 percent in central cities and .49 percent in suburbs. Motor vehicle employment declined in metropolitan areas, with an approximately 11.54 percent decline in central cities and a 3.56 percent decline in suburbs. Thus establishment closing rates and employment loss

due to plant closings are greatest in the geographical areas where employment growth is greatest or decline is slowest.

Establishment death rates in the most rapidly growing areas are probably due to the high birth rates in these areas. Areas with high birth rates have a large proportion of new firms, which are relatively susceptible to bankruptcy during all phases of the business cycle.

In order to determine which geographical areas experienced the largest fluctuations in closing rates over the cycle, swing measures were calculated for plant closing rates and employment loss rates. The swing measures are displayed in Table 15. Table 15 indicates that there is little difference in the fluctuations of death rates between metropolitan and non-metropolitan areas. However, there are differences between central cities and suburbs.

The central city and suburban swing measures indicate that plant closing rates for machine tools and motor vehicles are especially sensitive to the business cycle in suburban areas and that plant closings in electronic components are more sensitive to the business cycle in central cities. In other words, plant closings are more sensitive to the business cycle in areas where the industry is the healthiest. This pattern can be explained by the existence of a disproportionate share of new firms in economically healthy areas. These firms are particularly sensitive to bankruptcy during recessions. The argument is consistent with the spatial pattern of firm births, to be discussed presently.

Table 15
 Swing Measures for Establishment
 Closings and Employment Loss Due
 to Establishment Closing

	Metropolitan	Non-Metropolitan	Central City	Suburbs
Machine Tools Establishment				
1973-79	3.54	3.86	3.12	3.84
1975-82	2.05	1.52	1.72	2.30
Employment				
1973-79	2.75	5.64	2.01	3.61
1975-82	2.72	2.30	3.13	2.37
Electronic Components Establishment				
1973-79	6.03	7.19	6.41	5.76
1975-82	3.23	2.14	3.28	3.28
Employment				
1973-79	3.21	4.02	2.41	3.75
1975-82	.11	.63	.09	.13
Motor Vehicles Establishment				
1973-79	4.66	5.34	4.61	4.77
1975-82	2.29	1.81	2.29	2.24
Employment				
1973-79	1.08	1.88	.98	1.34
1975-82	1.37	3.00	.25	2.61

Tables 16 through 21 display firm birth rates and employment gains due to firm births for the 1973-75 recession, the 1975-79 expansion and the 1979-82 recession. These rates are presented for metropolitan and non-metropolitan areas, as well as for central cities and suburbs. The firm birth rates are equivalent to the number of new firms divided by the total number of firms in the Dun and Bradstreet file at the end of the period. The employment gains due to firm births are equal to employment resulting from the birth of new firms divided by total employment at the end of the period. Again, the rates are on an annual basis. In both cases firm births include only those firms that are recorded as having started in the interim year. For example, the 1973-75 birth rate includes only firms that listed 1974 or 1975 as the year started.

As discussed in some detail in the report "Using the Dun and Bradstreet Data to Analyze the Effects of Business Fluctuation on Firm Employment," births are substantially under-counted in the Dun and Bradstreet file. One reason is that it may take several years after the birth of a firm for Dun and Bradstreet to collect credit information on it. Secondly, there is no means of determining the year of birth of a branch plant. Therefore, it is impossible to determine whether a recently added branch plant is new to the economy or just a recent addition to the Dun and Bradstreet file. For this reason, the birth rates reported here exclude branch plant births. While the birth rates in Tables 16 through 21 clearly under-report total births, there is no evidence of any bias in this under-reporting by geographical area.

Table 16

Firm Births over the Business
Cycle in Metropolitan and
Non-Metropolitan Areas,
Machine Tools

		Metropolitan (Percent)	Non-Metropolitan (Percent)
Firm Births*			
1973-75	Recession	2.95	3.98
1975-79	Expansion	3.53	4.38
1979-82	Recession	2.52	2.50
Employment Gains**			
1973-75	Recession	.429	.555
1975-79	Expansion	.877	.658
1979-82	Recession	.648	.862

* As an annual percent of all establishments at the end of the period.

** As an annual percent of all employees at the end of the period.

Table 17

Firm Births over the Business
Cycle in Metropolitan and
Non-Metropolitan Areas,
Electronic Components

		Metropolitan (Percent)	Non-Metropolitan (Percent)
Firm Births Rates*			
1973-75	Recession	4.45	3.77
1975-79	Expansion	4.86	3.58
1979-82	Recession	4.44	4.12
Employment Gains**			
1973-75	Recession	.432	.324
1975-79	Expansion	.981	.709
1979-82	Recession	.776	.900

* As an annual percent of all establishments at the end of the period.

** As an annual percent of all employees at the end of the period.

Table 18
 Firm Births over the Business
 Cycle, in Metropolitan and
 Non-Metropolitan Areas,
 Motor Vehicles

		Metropolitan	Non-Metropolitan
Firm Births*			
1973-75	Recession	3.64	3.94
1975-79	Expansion	4.18	3.80
1979-82	Recession	2.99	2.45
Employment Gains**			
1973-75	Recession	.156	.585
1975-79	Expansion	.412	.485
1979-82	Recession	.476	.619

* As an annual percent of all establishments at the end of the period.

** As an annual percent of all employees at the end of the period.

Table 19

Firm Births Over the Business Cycle,
in Central City and Suburban Areas,
Machine Tools

	Central City (Percent)	Suburban Areas (Percent)
Firm Births*		
1973-79 Recession	2.55	3.27
1975-79 Expansion	3.14	3.76
1979-82 Recession	2.32	2.64
Employment Gain**		
1973-75 Recession	.283	.601
1975-79 Expansion	.665	1.054
1979-82 Recession	.645	.659

* As an annual percent of all establishments at the end of the period.

** As an annual percent of all employees at the end of the period.

Table 20

Firm Birth Rates over the
Business Cycle, in Central
City and Suburban Areas,
Electronic Components

		Central City (Percent)	Suburban Areas (Percent)
Firm Births Rates*			
1973-75	Recession	4.33	4.54
1975-79	Expansion	4.91	4.79
1979-82	Recession	4.77	4.22
Employment Gains**			
1973-75	Recession	.371	.472
1975-79	Expansion	1.203	.833
1979-82	Recession	.584	.936

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

Table 21

Firm Birth Rates over the
Business Cycle in Central
City and Suburban Areas,
Motor Vehicles

		Central City (Percent)	Suburban Areas (Percent)
Firm Births Rates*			
1973-75	Recession	3.34	4.96
1975-79	Expansion	3.84	5.86
1979-82	Recession	3.02	3.43
Employment Gains**			
1973-75	Recession	.097	.249
1975-79	Expansion	.370	.657
1979-82	Recession	.265	.688

* As an annual percent of all establishments at the beginning of the period.

** As an annual percent of all employees at the beginning of the period.

As expected, firm birth rates are greater during expansions than recessions. This pattern holds, in most cases, for employment gains as well. Birth rates, as expected, are higher for the electronics components industry than the machine tools and motor vehicles. However, it is surprising, at first glance, to see that the birth rate for machine tools is lower than that of the declining motor vehicles industry. One possible explanation for this pattern is that births in motor vehicles firms are more likely to be included in the Dun and Bradstreet file. The accounting of total employment presented in Appendix C indicates that this may be the case.

There is no major difference in birth patterns between metropolitan and non-metropolitan areas. The data indicate a slight tendency for metropolitan area birth rates to be greater for electronic components, and for non-metropolitan rates to be greater for machine tools and motor vehicles. Major differences do, however, appear between central city and suburban areas. Tables 19 through 21 indicate that firm birth rates for machine tools are greater in suburban areas than in central cities; that birth rates for electronic components are greater in central cities than suburbs; and that birth rates for motor vehicles firms are greater in suburbs than central cities. This pattern is particularly strong during expansions. Birth rates and employment gains due to firm births are, as expected, greater in areas where growth in industry employment is strongest. For example, birth rates for motor vehicle employment in suburban areas was equal to 4.96 per annum in the 1973-75 recession, rising to 5.86 percent in the 1975-79 expansion and falling again to 3.43 percent during the current recession. The pattern for employment gains due to firm births is similar. As mentioned above, motor vehicle

employment growth is stronger in suburban than central cities. The comparable figures for central cities are 3.34 percent, 3.84 percent, and 3.02 percent.

The results of Tables 19 through 21 are consistent within the plant closing rates presented earlier. Areas with high birth rates also experienced relatively high rates of plant closings. Again, this suggests that new firms were susceptible to failure.

The swing measures for birth rates and employment gains are shown in Table 22. Several conclusions can be drawn from these measures. First, firm births and employment gains due to firm births are not as sensitive to the business cycle as firm closings. For example, the swing measures for establishment closings in Table 15 range from 2.03 to 3.54 for machine tools in metropolitan areas. The comparable figures for births range from .58 to 1.01. Once again, these swing measures denote changes in annual rates between expansions and recessions.

As in the case of firm closing rates, there is little difference in variability of firm birth rates between metropolitan and non-metropolitan areas. However, distinctions can be made between the swing measures of central cities and suburbs. While fluctuations in employment gains are small for machine tools and motor vehicles, they are greater in suburbs than in central cities. For electronic components, fluctuations are greater in central cities than in suburbs. This finding indicates that in more rapidly growing areas, or in the case of motor vehicles the more slowly declining area, employment gains due to firm births are relatively sensitive to the business cycle. Employment gains decline with recessions and then pick up more strongly during expansion in areas where employment growth is strong.

Table 22
 Swing Rates for Firm Births
 and Employment Gains Due
 to Firm Births

	Metropolitan	Non-Metropolitan	Central City	Suburb
Machine Tools Firm Births				
1973-79	.58	.40	.59	.49
1975-82	1.01	1.88	.82	1.12
Employment Gains				
1973-79	.488	.103	.382	.453
1975-82	.229	.204	.02	.395
Electronic Components Birth Rates				
1973-79	.41	.19	.58	.25
1975-82	.42	.54	.14	.57
Employment Gains				
1973-79	.549	.385	.832	.361
1975-82	.205	.191	.619	.103
Motor Vehicles Birth Rates				
1973-79	.54	.14	.50	.90
1975-82	1.19	1.35	.82	2.43
Employment Gains				
1973-79	.256	.10	.273	.408
1975-82	.064	.135	.105	.031

Finally, the evidence on migration patterns over the cycle will be presented. Tables 23 through 28 present inter-area migration rates. The rates of establishment shifts represent the number of establishments that migrated divided by the total number of establishments in the area of origin. Employment shifts are equivalent to the number of jobs that were relocated due to the migration of firms divided by total employment in the area of origin. Once again, the rates are on an annual basis.

A review of Tables 23 through 28 indicates that, as expected, migration of establishments and employment is greater from central cities to suburbs than vice versa and from non-metropolitan to metropolitan areas than from metropolitan to non-metropolitan areas. For example, .33 percent of all non-metropolitan machine tool establishments moved to metropolitan areas in 1973-75. During the same period only .15 percent of establishments moved in the opposite direction. Tables 23 through 28 also indicate that migration rates are independent of fluctuations in the national economy. In other words, the business cycle appears to have little effect on the movement of firms and jobs between metropolitan and non-metropolitan areas and central cities and suburbs. For example, the rate of non-metropolitan to metropolitan migration during the 1973-75 recession to the 1975-79 expansion increased from .330 to .608 for machine tools, increased from .764 to .999 for electronic components, and decreased for motor vehicles from .201 to .148. For suburban to central city moves the rates increased from .314 to .350 for motor vehicles but declined from .369 to .358 for machine tools and from .714 to .438 for electronic components.

Table 23

Annual Establishment and
Employment Migration Patterns between
Metropolitan and Non-Metropolitan
Areas over the Business Cycle,
Machine Tools

		Non-Metropolitan to Metropolitan Areas (Percent)	Metropolitan to Non- Metropolitan Areas (Percent)
Establishment Moves*			
1973-75	Recession	.330	.150
1975-79	Expansion	.608	.069
1979-82	Recession	.528	.064
Employment Shifts**			
1973-75	Recession	.145	.052
1975-79	Expansion	.481	.028
1979-82	Recession	.415	.063

* As an annual percent of all establishments in the area of origin.

** As an annual percent of all employees in the area of origin.

Table 24

Annual Establishment and Employment
Migration Patterns between
Metropolitan and Non-Metropolitan
Areas over the Business Cycle,
Electronic Components

		Non-metropolitan to Metropolitan Areas (Percent)	Metropolitan to Non- Metropolitan Areas (Percent)
Establishment Moves*			
1973-75	Recession	.764	.173
1975-79	Expansion	.999	.137
1979-82	Recession	.578	.067
Employment Shifts**			
1973-75	Recession	.817	.067
1975-79	Expansion	1.092	.033
1979-82	Recession	.327	.049

* As an annual percent of all establishments in the area of origin.

** As an annual percent of all employees in the area of origin.

Table 25

Annual Establishment and Employment
Migration Patterns between
Metropolitan and Non-Metropolitan
Areas over the Business Cycle,
Motor Vehicles

		Non-Metropolitan to Metropolitan Areas (Percent)	Metropolitan to Non- Metropolitan Areas (Percent)
Establishment Moves*			
1973-75	Recession	.201	.137
1975-79	Expansion	.148	.070
1979-82	Recession	.306	.081
Employment Shifts**			
1973-75	Recession	.106	.014
1975-79	Expansion	.045	.015
1979-82	Recession	.722	.012

* As an annual percent of all establishments in the area of origin.

** As an annual percent of all employees in the area of origin.

Table 26

Annual Establishment and Employment
Migration Patterns between
Central Cities and Suburban
Areas, over the Business Cycle,
Machine Tools

		Suburbs to Central Cities (Percent)	Central Cities to Suburbs (Percent)
Establishment Moves*			
1973-75	Recession	.369	1.048
1975-79	Expansion	.358	.798
1979-82	Recession	.280	.799
Employment Shifts**			
1973-75	Recession	.435	.669
1975-79	Expansion	.306	.429
1979-82	Recession	.180	.457

* As an annual percent of all establishments in the area of origin.

** As an annual percent of all employees in the area of origin.

Table 27

Annual Establishment and Employment
Migration Patterns between
Central Cities and Suburban
Areas over the Business Cycle,
Electronic Components

		Suburbs to Central Cities (Percent)	Central Cities to Suburbs (Percent)
Establishment Moves*			
1973-75	Recession	.714	1.211
1975-79	Expansion	.438	.971
1979-82	Recession	.673	1.109
Employment Shifts**			
1973-75	Recession	.232	.744
1975-79	Expansion	.191	.916
1979-82	Recession	.859	1.076

* As an annual percent of all establishments in the area of origin.

** As an annual percent of all employees in the area of origin.

Table 28

Annual Establishment and Employment
Migration Patterns between
Central Cities and Suburban
Areas, over the Business Cycle,
Motor Vehicles

		Suburbs to Central Cities (Percent)	Central Cities to Suburbs (Percent)
Establishment Moves*			
1973-75	Recession	.314	.632
1975-79	Expansion	.350	.568
1979-82	Recession	.246	.597
Employment Shifts**			
1973-75	Recession	.043	.258
1975-79	Expansion	.084	.156
1979-82	Recession	.196	.129

* As an annual percent of all establishments in the area of origin.

** As an annual percent of all employees in the area of origin.

The failure of the business cycle to influence migration patterns may be due to the fact that a relocation requires long range planning and thus is difficult to delay. Moreover, the evidence presented above suggests that it is bankruptcies or plant closings that explain most of the recession. Healthy, mature firms not only continue to operate throughout the recession but actually expand employment. Since it is most likely to be these healthy and growing firms that are undertaking a relocation, it is plausible that the recession has little effect on their profits, employment, and relocation plans. The swing measures of Table 29 are small, indicating little variability in migration rates over the business cycle.

What support do these findings give the hypotheses stated above and in the literature review, "The Sensitivity of Local Economic Activity to National Cycles" by Peterson and Manson? The findings support the hypothesis that the age and size distribution of firms varies by geographical area and that these variations influence local cycles. Fast growing areas experience high firm birth rates, and thus a disproportionate share of new firms. These new firms are vulnerable to swings in the business cycle. Thus fast growing areas, holding other factors constant, appear to experience relatively volatile cycles.

The findings do not, however, support the central city incubator hypothesis. The high birth rate of electronic components firms in central cities supports the hypothesis that central cities act as incubators for new firms. However, high birth rates for motor vehicles firms and machine tools firms are greater in suburbs than in central cities, contradicting the hypothesis.

Table 29
 Swing Measures for Migration Rates
 and Employment Shifts due to
 Migration

	Non-Metropolitan to Metropolitan	Metropolitan to Non-Metropolitan	Suburbs to Central City	Central City to Suburb
Machine Tools				
Establishment Moves				
1973-79	.278	.081	.011	.25
1975-82	.08	.005	.078	.001
Employment Shifts				
1973-79	.336	.024	.129	.24
1975-82	.066	.035	.126	.028
Electronic Components				
Establishment Moves				
1973-79	.235	.036	.276	.24
1975-82	.421	.07	.235	.138
Employment Shifts				
1973-79	.275	.034	.041	.172
1975-82	.765	.016	.668	.160
Motor Vehicles				
Establishment Moves				
1973-79	.053	.067	.036	.064
1975-82	.158	.011	.104	.029
Employment Shifts				
1973-79	.061	.001	.041	.102
1975-82	.677	.003	.112	.027

The remaining six hypotheses have not been tested. These tests can be carried out using the same data set to study cross-state variations in cyclical activity and then by running simple regressions explaining cross-state differences in births, deaths, etc.

Another hypothesis not supported by the findings of this study is that the business cycle influences the decentralization of employment by affecting migration patterns. The business cycle appears to have little effect on the migration of firms between central city and suburban locations or between metropolitan and non-metropolitan areas.

CONCLUSIONS

A unique and rich data base has been assembled to trace geographical differences in employment changes over the business cycle. This data base, comprised of four years of Dun and Bradstreet data merged with the Bureau of the Census's City Reference File, permits comparisons of central business district, central city, metropolitan and non-metropolitan employment changes during the business cycle. These data also allow employment changes over the cycle in each geographical area to be disaggregated by employment change due to in- or out-migration of establishments, to establishment closings, to contractions or expansion of existing firms, or to establishment openings.

To date, this data base has been used to compare metropolitan and non-metropolitan business cycles, as well as central cities and suburbs cycles. The findings indicate that large fluctuations in plant closing rates over the cycle and small fluctuations in establishment birth rates explain the major share of employment variability for all industries in all geographical areas. Plant closing rates are about 50 percent greater per annum during downswings in the business cycle than they are during upswings in the cycle. Birth rates are approximately 20 percent per annum higher during expansions than recessions. In all industries these two phenomena explain the major share of employment variability over the business cycle.

In machine tools and electronic components, employment in stayput establishments expands rather than contracts during downswings in the national economy. Employment in stayput motor vehicle firms contracts in several periods, but employment loss in this sector of the industry is small relative to employment loss due to plant closings. In metropolitan areas, only 4

percent of total employment loss during the 1973-75 recession was due to contractions in stayput establishments. The remaining proportion was due to employment loss due to plant closings. Thus it is primarily an increasing firm death rate and secondarily a falling firm birth rate that explains employment loss during recessions. Large decreases in the establishment death rates and increases in establishment birth rates explain the major share of employment growth during expansions.

The variability of establishment birth and death rates does, however, vary across geographical areas. In areas where the industry is growing fastest, death and birth rates are more variable than in areas where the industry is growing relatively slowly. The high birth rates in these areas suggests that this large fluctuation in establishment death rates may be explained by the high proportion of new and thus cyclically sensitive firms. Thus the results of this study indicate that, holding industry mix constant, at the three-digit SIC level of industrial detail, fast growth areas are more cyclically sensitive than slow growth areas. The reason appears to be that the industry, in fast growth areas, is comprised of a high proportion of new and thus cyclically sensitive firms. High failure rates among these firms lead to large employment downswings in the local economy. Rising birth rates and falling death rates lead to healthy recoveries during the expansion. This argument is more convincing given the result that fluctuations in establishment birth and death rates explain the major share of employment fluctuations during the business cycle.

The implication of their findings for long run growth is that long run growth in suburban areas, where most manufacturing employment is growing relatively rapidly, is dampened by recessions. Long run growth should be slower when recessions occur because many potentially viable firms fail during

the recession, leaving suburban areas with a net loss in employment in the long run. There is no evidence to support the hypothesis that establishment migration patterns are influenced by swings in the business cycle. Thus business cycles appear to leave no lasting effects on central city or suburban growth by dampening the trend of decentralization in metropolitan areas.

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Appendix A

Table A-1

SIC 354
 Percent of Interviews Taken in
 and Prior to 1979 as Recorded
 on the 1979 Tape,
 by Region

	1972 or earlier	1973-1976	1977	1978	1979
New England	.2	7.4	3.0	9.5	79.9
Mid Atlantic		7.3	3.4	8.3	80.8
South Atlantic	.4	6.9	2.8	10.4	79.5
E. South Central		6.9	3.1	8.9	81.1
E. North Central	.1	5.9	2.8	8.7	82.4
W. South Central		6.2	2.8	9.8	81.2
W. North Central					
Mountain		8.6	5.9	9.1	76.5
Pacific	.1	9.2	4.7	9.0	77.0

Table A-2

SIC 367
 Percent of Interviews Taken in
 and Prior to 1975 as Recorded
 on the 1975 Tape,
 by Region

	1966 or earlier	1967-69	1970-72	1973	1974	1975
New England		.1	4.3	3.1	7.4	84.5
Mid Atlantic	.3	1.3	5.3	2.6	7.2	83.5
South Atlantic	.2	1.8	3.2	3.4	13.4	78.0
E. South Central			5.5	3.3	9.9	81.3
E. North Central		1.3	6.0	5.2	8.6	78.8
W. South Central		.6	9.4	3.8	9.4	76.7
W. North Central		.8	4.9	2.6	9.3	82.5
Mountain		2.7	3.3	3.3	8.6	82.1
Pacific	.1	1.1	2.5	3.54	8.9	83.9

Table A-3

SIC 367
 Percent of Interviews Taken in
 and Prior to 1979 as Recorded
 on the 1979 Tape,
 by Region

	1972 or earlier	1973-1976	1977	1978	1979
New England	.12	5.9	2.8	7.5	83.7
Mid Atlantic	.2	6.4	2.2	7.0	84.2
South Atlantic		7.3	3.5	10.8	78.5
E. South Central		9.0	4.9	7.9	78.7
E. North Central	.7	8.0	4.2	7.8	79.2
W. South Central		6.8	5.9	9.8	77.6
W. North Central	.3	8.0	4.7	9.4	77.6
Mountain	.5	5.8	4.9	3.0	85.4
Pacific		6.3	2.9	7.2	83.7

Table A-4

SIC 367
 Percent of Interviews Taken in
 and Prior to 1982 as Recorded
 on the 1982 Tape,
 by Region

	1972 or earlier	1973-76	1977-79	1980	1981	1982
New England		2.8	2.8	4.1	40.9	49.5
Mid Atlantic	.2	3.04	3.7	5.3	38.6	49.1
South Atlantic		2.9	3.8	5.0	39.5	48.9
E. South Central		1.5	4.5	6.8	46.2	40.9
E. North Central	.2	4.1	4.7	4.1	38.8	51.1
W. South Central		2.1	4.9	5.5	39.8	47.8
W. North Central		2.8	4.8	4.2	40.1	48.2
Mountain	.4	2.4	7.5	3.9	38.6	47.2
Pacific		2.3	3.9	5.7	36.8	51.2

Table A-5

SIC 371
 Percent of Interviews Taken in
 and Prior to 1975 as Recorded
 on the 1975 Tape,
 by Region

	1966 or earlier	1967-69	1970-72	1973	1974	1975
New England		1.1	2.1	5.3	5.9	85.6
Mid Atlantic	.2	2.4	6.2	3.8	7.1	80.3
South Atlantic		1.0	4.2	4.8	12.8	77.0
E. South Central			5.4	5.0	15.3	73.6
E. North Central		2.0	6.4	5.0	11.0	74.9
W. South Central		1.4	6.0	4.6	9.6	78.5
W. North Central	.4	1.4	5.0	3.7	9.7	80.2
Mountain		1.5	4.0	5.2	6.7	82.1
Pacific		1.8	4.0	4.7	10.6	78.6

Table A-6

SIC 371
 Percent of Interviews Taken in
 and Prior to 1979 as Recorded
 on the 1979 Tape,
 by Region

	1972 or earlier	1973-1976	1977	1978	1979
New England		7.62	3.3	8.1	80.9
Mid Atlantic	.3	5.5	3.9	7.9	82.4
South Atlantic	.2	7.6	4.8	10.2	77.2
E. South Central		10.1	4.04	9.4	76.4
E. North Central	.6	7.8	3.8	9.3	78.5
W. South Central	.3	10.7	2.7	12.2	74.2
W. North Central		7.3	4.9	8.7	79.1
Mountain		11.9	6.5	4.2	77.4
Pacific	.1	9.6	4.8	11.3	74.2

Table A-7

SIC 371
 Percent of Interviews Taken in
 and Prior to 1982 as Recorded
 on the 1982 Tape,
 by Region

	1972 or earlier	1973-76	1977-79	1980	1981	1982
New England		5.5	7.8	6.4	34.3	46.1
Mid Atlantic		3.2	5.6	6.7	37.8	46.6
South Atlantic	.3	4.7	6.1	6.8	41.9	40.2
E. South Central		5.9	4.4	8.1	43.0	38.6
E. North Central	.68	3.9	4.3	5.2	41.5	44.4
W. South Central	.27	6.2	5.9	5.7	36.1	45.8
W. North Central		4.8	8.7	4.2	35.2	47.1
Mountain		6.1	7.5	8.4	36.0	42.1
Pacific		5.4	7.8	8.1	38.2	40.5

Appendix B

Table B-1

Ratio of Number of Employees and
Number of Firms Reported in the
DMI File to that Reported
by CBP for SIC 367,
by State

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Alabama	3.81	3.66	2.98	1.81	2.47	2.5
Alaska	0	0	3/NA	1/NA	3/NA	1/NA
Arizona	.37	1.19	.56	1.79	.93	1.58
Arkansas	1.04	2.2	1.17	2.16	1.48	1.87
California	1.44	1.82	2.36	2.22	--	--
Colorado	2.18	2.78	4.14	2.42	3.09	1.51
Connecticut	1.75	1.73	2.73	2.09	1.7	1.71
Delaware	161/NA	3.00	199/C	3.5	41/NA	5.00
DC	98/NA	11/NA	98/NA	9/NA	57/A	8.00
Florida	1.86	1.93	1.70	1.90	1.26	1.81
Georgia	1329/NA	30/NA	12.15	4.00	3.98	3.25
Hawaii	0	0	0	0	NA	1.00
Idaho	287/NA	2.5	569/E	7/F	1319/F	2.66
Illinois	2.02	2.08	2.21	2.10	1.48	1.89
Indiana	2.45	1.72	2.75	1.83	2.40	1.59
Iowa	.48	1.6	.53	1.58	.85	1.43
Kansas	.82	1.41	2.07	1.65	3.1	1.81
Kentucky	1.14	3.8	3979/H	2.75	5002/G	2.31
Louisiana	305/NA	14/NA	350/NA	10/NA	8.98	2.66

Table B-1 (continued)

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Maine	.87	1.00	1.07	1.11	.94	1.06
Maryland	2.04	2.56	--	--	4305/G	2.35
Massachusetts	1.79	1.83	2.71	2.19	1.95	1.71
Michigan	1.93	2.03	3.90	2.60	2.58	1.94
Minnesota	3.88	1.86	2.67	1.71	1.56	1.49
Mississippi	.58	1.25	1.50	.88	3.16	2.16
Missouri	11413/D	2.04	12700/G	2.6	1.59	1.9
Montana	78/NA	3/NA	0/C	1.00	19/NA	2/NA
Nebraska	.32	.86	.44	1.00	1212/H	1.06
Nevada	108/NA	9/NA	113/NA	11/NA	1.22	2.12
New Hampshire	2.01	1.71	--	--	1.43	1.69
New Jersey	2.42	2.11	2.8	2.21	1.98	1.71
New York	2.73	2.36	--	--	1.55	1.85
New Mexico	2761/D	2.5	7.76	2.1	10.59	2.06
North Carolina	.75	1.39	1.38	2.00	.76	1.8
North Dakota	0/NA	1/NA	255/E	1.00	359/B	7.00
Ohio	3.43	2.49	5.62	2.39	3.54	2.08
Oklahoma	1.04	2.26	2.30	1.92	2.02	1.44
Oregon	6.52	2.33	.47	1.94	.97	1.64
Pennsylvania	1.37	1.69	1.38	1.78	1.23	1.54
Rhode Island	4.7	2.5	5601/G	2.36	2.42	1.92
South Carolina	.78	1.73	1.17	2.11	.80	1.57
South Dakota	490/D	.75	695/C	3.5	490/F	1.43

Table B-1 (continued)

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Tennessee	2.56	1.47	7.15	1.77	3.01	1.83
Texas	2.06	2.51	2.98	2.85	1.77	1.94
Utah	1.18	2.40	1949/F	2.54	2.04	2.40
Vermont	1145/D	1.40	--	--	--	--
Virginia	.88	1.63	1.58	1.93	1.43	1.46
Washington	15.13	2.55	26.63	2.71	4.64	2.11
West Virginia	886/D	1.16	730/E	3.25	456/B	4.33
Wisconsin	3.46	1.76	7.68	2.37	6.15	1.81
Wyoming	0	0	0	0	5/NA	1/NA

* A:0-19; B:20-99; C:100-249; E:250-499; F:500-999; G:1,000-2,499; H:2,500-4,999; I:5,000-9,999; J:10,000-24,999; K:25,000-49,999; L:50,000-99,999; M:100,000 or more.

* Figures reported as NA or D are unavailable due to negligability or avoidance of disclosure, respectively.

Table B-2

Ratio of Number of Employees and
Number of Firms Reported in the
DMI File to that Reported
by CBP for SIC 371,
by State

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Alabama	1.38	.45	1.88	1.53	1.29	1.44
Alaska	0	0	4/NA	1/NA	0	0
Arizona	.60	1.11	.38	.86	1.24	1.58
Arkansas	1.71	1.59	1.49	1.70	1.82	1.84
California	1.17	.49	1.52	1.78	—	—
Colorado	1.29	2.11	2082/G	1.81	1.22	1.69
Connecticut	2.31	.29	2.75	2.45	5331/I	2.80
Delaware	9752/NA	1.20	5253/H	1.00	5605/O	2.66
DC	1537/NA	4/NA	18/NA	2/NA	62/NA	4/NA
Florida	1.58	1.27	1.97	1.37	1.42	1.81
Georgia	1.09	1.51	1.73	1.89	1.13	2.01
Hawaii	104/NA	5/NA	128/NA	8/NA	96/A	2.5
Idaho	105/NA	11/NA	.71	1.54	196/C	1.66
Illinois	1.34	2.26	2.02	2.25	1.52	2.22
Indiana	1.42	1.37	1.79	1.52	1.12	1.46
Iowa	.74	1.89	1.31	1.83	1.42	2.20
Kansas	1.01	1.93	.46	2.34	.62	2.15
Kentucky	.90	1.44	11770/J	1.12	16749/J	1.33

Table B-2 (continued)

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
Louisiana	1.21	1.66	927/F	1.50	4038/G	1.96
Maine	7.83	1.75	1674/B	2.8	33.94	4.50
Maryland	.97	1.04	—	—	10901/I	1.88
Massachusetts	1.06	1.61	1.93	1.52	1.32	1.98
Michigan	1.25	1.38	11694/M	1.81	30086/M	1.67
Minnesota	1.58	1.79	2.31	1.79	1.40	1.71
Mississippi		1.88	1.43	2.05	1.24	1.64
Missouri	.73	1.32	1.04	1.52	1.15	1.82
Montana	5/NA	2/NA	17/NA	7/NA	.96	1.87
Nebraska	1.34	2.06	1.3	2.47	1.24	2.72
Nevada	123/NA	12/NA	1.6	2.00	.99	2.125
New Hampshire	43/D	.29	—	—	43/G	1.25
New Jersey	1.47	1.80	.99	1.52	1.57	1.58
New York	1.39	1.73	—	—	1.79	1.76
New Mexico	304/NA	10/NA	.94	1.5	456/F	2.8
North Carolina	.79	1.15	4561/I	1.4	.56	1.33
North Dakota	38/D	2.66	330/E	2.8	365/E	1.55
Ohio	1.06	1.55	1.26	1.75	1.2	1.81
Oklahoma	3.06	1.77	6805/H	1.96	1.61	1.80
Oregon	1.61	1.62	1.90	1.46	1.005	1.87
Pennsylvania	1.20	1.55	1.99	1.78	1.16	1.78
Rhode Island	.80	.94	.48	1.89	.35	1.13

Table B-2 (continued)

	<u>1973</u>		<u>1975</u>		<u>1979</u>	
	Employment	Firms	Employment	Firms	Employment	Firms
South Carolina	1.22	2.66	2.16	2.13	.66	2.14
South Dakota	1.10	1.55	.91	1.31	1.26	1.54
Tennessee	.96	1.16	1.19	1.36	.92	1.34
Texas	1.13	1.85	1.52	1.70	21576/D	1.85
Utah	610/D	1.37	1.24	1.44	792/G	1.12
Vermont	34/NA	2/NA	--	--	--	--
Virginia	1.28	1.77	6107/H	1.66	.91	1.775
Washington	5.03	1.87	6.48	2.12	1.39	2.02
West Virginia	1813/D	1.27	1.25	1.00	1.11	1.30
Wisconsin	1.34	2.08	1.66	1.99	1.16	1.82
Wyoming	5/NA	2/NA	22/NA	5/NA	82/A	8/0

* A:0-19; B:20-99; C:100-249; E:250-499; F:500-999; G:1,000-2,499; H:2,500-4,999; I:5,000-9,999; J:10,000-24,999; K:25,000-49,999; L:50,000-99,999; M:100,000 or more.

* Figures reported as NA or D are unavailable due to negligability or avoidance of disclosure, respectively.

Appendix C

Appendix C

The employment growth rates for metropolitan and non-metropolitan areas and central cities and suburbs are displayed in Tables 4 and 5. The method by which these figures were estimated is described here. Tables C-1 and C-2 present the underlying figures.

Columns 1 and 2 of Tables C-1 and C-2 present total employment at the beginning of the period and the end of the period as recorded in the Dun and Bradstreet files. For example 391,687 is the sum of all employment in all machine tool establishments in the metropolitan areas in 1973 as captured on the Dun and Bradstreet file. The figure 430,306 is the comparable number for 1975.

The figures in Columns 3 and 4 are total employment in stayput firms at the beginning and end of the period, respectively. So that, for example, firms that operated throughout the period 1973-75 hired 290,448 employees in 1973 and 302,686 employees in 1975. Column 5 reports the net employment expansion or contraction, and is equivalent to Column 4 minus Column 3. Column 6 is equivalent to all employment created during the period due to firm births. Column 7 is the birth adjustment. As discussed earlier, the Dun and Bradstreet file underestimates the number of establishments that opened for business during a period. To compensate for this problem, new employment due to firm births was adjusted upwards for machine tools and electronic components. The adjustment was carried out by determining the level of firm births that would make employment growth rates in the Dun and Bradstreet file similar to those reported for the nation in Employment and Earnings. The resulting estimate was that Dun and Bradstreet captured approximately 13.7

percent of all firm births in the machine tools industry on the 1973, 1975, and 1979 tapes . For electronic components it was estimated that Dun and Bradstreet captures approximately 13.7 percent of all firm births for all years. Dividing actual births by .137 gave too large an employment change estimate for the 1979 to 1982 period for machine tools, therefore it was assumed that during 1979 and 1984, Dun and Bradstreet captured 17 percent of all machine tool industry firm births. It is reasonable to assume that Dun and Bradstreet's coverage improved with time.

No adjustments were made in the births of motor vehicles firms. The totals reported by Dun and Bradstreet yielded results compatible with the national employment figures reported in Employment and Earnings.

Column 8 displays total employment lost due to establishment closings. Column 9 is the total number of jobs that an area lost due to outmigration, and Column 10 reports employment gained due to the immigration of establishments. Column 11 is the net change in employment. It is equivalent to total changes due to expansions or contractions (Column 5), plus employment additions due to establishment births (Column 6 or 7), minus employment lost due to establishment closings (Column 8), plus net migration (Column 9-10).

The percentage change in employment is equivalent to $[(11/1 + (1+11))/2]$ year. The figures in Column 12 are equal to the annual percent in employment over the period using the midpoint between the two years as a base.

Table C-1

Annual Growth Rates Over the Business Cycle, Subdivided into Employment Expansions or Contractions in Stayput Firms, Closings, Births and Migration, for Machine Tools, Electronic Components, and Motor Vehicles, for Metropolitan and Non Metropolitan Comparisons

Total		Continuing Firms		Employment Expansion*	Firm Births	Birth Adjustment**	Closings	Out Migration	In Migration	Net Change in Employment***	Annual Growth Rate in Employment**** (Percent)	13
Beginning of Period 1	End of Period 2	Beginning of Period 3	End of Period 4									
Machine Tools												
Metropolitan Areas												
391687	430306	290448	302686	12238	3696	26978	61658	411	231	-22622	-2.972	1973-75 Recession
430306	442748	293389	310788	17399	15529	113350	80062	475	1821	52033	2.841	1975-79 Expansion
442748	460492	337656	352333	14677	7491	54677	86747	697	937	-24337	-2.283	1979-82 Recession
Non Metropolitan Areas												
79858	94693	54193	59795	5602	1051	7672	14937	231	411	-1483	-0.937	1973-75 Recession
94693	90316	65890	74954	9064	2377	17350	14063	1821	475	11005	2.746	1975-79 Expansion
90316	88468	65074	70584	5510	1906	11212	13570	937	697	5612	3.013	1979-82 Recession
Electronic Components												
Metropolitan Areas												
601886	628061	449900	488026	38126	5420	39562	120881	826	1619	-42400	-3.651	1973-75 Recession
628061	699239	406628	474006	67378	27437	200270	171596	817	4838	100073	3.589	1975-79 Expansion
699239	774973	545422	582630	37208	15030	109708	121251	849	708	25524	1.434	1979-82 Recession
Non Metropolitan Areas												
99068	110731	74042	78220	4178	718	5240	19524	1619	826	-10898	-5.820	1973-75 Recession
110731	86684	75824	83382	7558	2457	17934	25824	4838	817	-4353	-1.003	1975-79 Expansion
86684	92018	69472	74996	5524	2070	15110	13996	708	849	6779	3.010	1979-82 Recession
Motor Vehicles												
Metropolitan Areas												
945590	995027	852410	847270	-5140	3170	---	72869	265	345	-74759	-4.553	1973-75 Recession
995027	964920	718480	714176	-4304	15905	---	196274	587	317	-184943	-5.213	1975-79 Expansion
964920	918143	778595	723193	-55402	10933	---	151884	288	3007	-193634	-8.922	1979-82 Recession
Non Metropolitan Areas												
163526	174736	143393	139323	-4070	2043	---	16642	345	265	-18749	-6.081	1973-75 Recession
174736	166551	143333	172732	29399	3233	---	22423	317	587	10479	1.456	1975-79 Expansion
166551	152192	137520	154355	-16835	2357	---	25874	3007	288	-43071	-11.880	1979-82 Recession

* (Col. 4 - Col. 3)

** (divided by .137)

*** (Col. 5 + Col. 7 - Col. 8 - Col. 9 + Col. 10). In the case of motor vehicles Col. 6 is used in place of Col. 7.

**** (Col. 11 ÷ by ((Col. 1 + (Col. 11 + Col. 1))/2)/year)

Table C-2

Annual Growth Rates Over the Business Cycle, Subdivided into Employment Expansions or Contractions in Stayput Firms, Closings, Births and Migration, for Machine Tools, Electronic Components, and Motor Vehicles, City and Suburban Comparisons

Total		Continuing Firms		Employment Expansion*	Firm Births	Birth Adjustment**	Closings	Out Migration	In Migration	Net Change in Employment***	Annual Growth Rate in Employment****	13
Beginning of Period 1	End of Period 2	Beginning of Period 3	End of Period 4									
Machine Tools												
Central Cities												
211649	229042	151182	152731	1549	1296	9460	31931	2833	1547	-22208	-5.537	1973-75 Recession
229042	214172	146150	150933	4783	5695	41569	50652	3931	2446	-5785	-.640	1975-79 Expansion
214172	2-5847	155101	162930	7829	3317	19512	46518	3132	1022	-21287	-4.183	1979-82 Recession
Suburbs												
177634	199622	137159	148445	11286	2400	17518	29440	1547	3064	881	.247	1973-75 Recession
199622	227585	145613	158107	12494	9596	70044	37394	2446	5752	53343	5.893	1975-79 Expansion
227585	252909	181694	188469	6775	4164	30394	40099	1022	4069	117	.021	1979-82 Recession
Electronic Components												
Central Cities												
243840	255457	181159	196473	15314	1896	13839	45694	3630	1660	-18511	-3.949	1973-75 Recession
255457	277067	165406	206061	40655	13333	97321	71157	3242	2842	66419	5.752	1975-79 Expansion
277061	317515	219422	230790	11368	4638	33854	48836	3435	4034	-3015	-.438	1979-82 Recession
Suburbs												
358038	372559	268737	291545	22808	3520	25693	75183	1660	5249	-23093	-3.332	1973-75 Recession
372559	420561	241192	267831	26639	14009	102255	100431	2842	8080	33701	2.163	1975-79 Expansion
420561	423410	324583	349974	25391	10192	74394	72217	4034	4143	27677	2.549	1979-82 Recession
Motor Vehicles												
Central Cities												
580066	663774	522638	564606	41968	1285	NA	42544	2988	316	-1963	-.169	1973-75 Recession
663774	485175	489535	422443	-67092	7179	NA	123450	4129	1111	-186382	-8.166	1975-79 Expansion
485175	461933	421717	371835	-49882	3061	NA	59477	1561	2239	-105620	-9.771	1979-82 Recession
Suburbs												
365466	331162	329733	282637	-47096	1817	NA	30306	316	3333	-72568	-11.022	1973-75 Recession
331162	455910	228907	291663	62756	8707	NA	72777	1111	4446	2021	.152	1975-79 Expansion
455910	431191	333135	329304	-3831	7839	NA	92315	2239	4563	-85979	-8.329	1979-82 Recession

* (Col. 4 - Col. 3)

** (divided by .137)

*** (Col. 5 + Col. 7 - Col. 8 - Col. 9 + Col. 10). In the case of motor vehicles Col. 6 is used in place of Col. 7.

**** (Col. 11 ÷ by ((Col. 1 + (Col. 11 + Col. 1))/2)/year)

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