Patterns in the Openings and Closings of Manufacturing Plants in Rural Areas of Iowa

By David L. Barkley and
Arnold Paulsen

NORTH CENTRAL REGIONAL CENTER FOR RURAL DEVELOPMENT

Iowa State University
of Science and Technology
108 Curtiss Hall
Ames, Iowa 50011

PATTERNS IN THE OPENINGS AND CLOSINGS OF MANUFACTURING PLANTS IN RURAL AREAS OF IOWA

by

David L. Barkley
Assistant Professor of Economics
Arizona State University
Tucson, Arizona

and

Arnold Paulsen
Professor of Economics
Iowa State University
Ames, Iowa

North Central Regional Center for Rural Development
Iowa State University
Ames, Iowa 50011

May 1979

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

During the late 1950s and all through the 1960s considerable interest in rural development has been shown by federal, state, and local governments. Many regional, state, and local community development organizations were formed to undertake a wide variety of measures to create jobs, raise total area production, reduce the rural-to-urban migration, and provide more amenities for residents, industry, and business in rural areas. To induce industry to locate in rural communities has been viewed as a major means of achieving rural development. The methods and vigor employed by communities and states to attract outside capital and industry for rural areas has varied widely [23]. For whatever reason, the industrialization of rural areas has been rapid [49]. The 4 percent rate of 1959-1969 manufacturing employment growth for nonmetropolitan counties in the United States exceeded that of all Standard Metropolitan Statistical Areas (SMSA) subareas except the 5.4 percent rate for communities on the urban fringe (Table 1).

Iowa has participated in this increased popularity of rural locations among industries. From 1965 to 1975 more than 500 new manufacturing operations were established outside of metropolitan areas in Iowa. However, many of the rural plants were small and several closed. And, although the magnitude of rural area plant openings was significant, focusing only on openings somewhat exaggerates the progress in rural development Iowa small towns have experienced as a result of industrialization.

Table 1. Manufacturing employment: rural and other metro-nonmetro counties, United States, 1959-1969[a]

Class and Subclass	Annual Percentage Increase, 1959-1969
All manufacturing	2.5
Nonmetro	4.0
Urban complex	3.3
Rural-partly urban	4.6
Small city	4.3
Small town	4.6
Entirely rural	5.8
Metro	2.1
Single county	3.0
Multicounty	1.8
Core	1.3
Ring	3.7
Transition	3.6
Fringe	5.4
Small city	5.2
Small town	8.1

[a]SOURCE: [49, p. 10].

Plant closings is an integral but less attractive part of rural industrialization. The percentage growth in manufacturing employment of 4 to 6 percent per year in nonmetro, small town, and rural areas (Table 1) is impressive, but the 1954 manufacturing employment with which these areas started was very small. Many rural Iowa communities have not gotten a manufacturing plant at all and most rural counties have not created enough new manufacturing jobs by industrialization to permit absolute population growth from 1960-1970. Competition among rural communities for additional manufacturers was intense in the late 1950s and 1960s. Each new manufacturing plant or other business addition to any one rural community was eagerly reported and analyzed by industrial promotion boards in other communities.

Plant closings, however, were less eagerly reported even though each closing nullified some area development anticipated from new acquisitions. Reported or not, the employment loss and depression resulting from plant closures in rural areas was significant. In non-SMSA Iowa alone, an average of more than 4,000 jobs was eliminated during each of the last 11 years because of plant failures and outmigrations. Each year rural areas in Iowa need to acquire 100 plants with 40 employees each to stay even. The magnitude, pattern, and consequences of industrial outmigration has been studied relatively little by rural development organizations or regional economists. Perhaps plant closings have been dismissed because they seem to be a random happening which the community can neither prevent nor insure against. Our analysis indicates, however, these closings are not completely random and they are predictable to some extent.

Thus, communities can anticipate and prepare for closings even if they cannot avoid them.

Manufacturing plants are not homogeneous. They differ in many characteristics, e.g., in type of goods produced, plant size, resources required, and ownership (branch plant versus locally-owned). Different degrees of locational stability can be associated with different types of plants, different communities, and different phases of the business cycle.

In this study industrial migration or rates of openings and closings are first compared among groups of industries for an entire decade and second by phases of the business cycle. Relative migration rates over the entire decade are estimated for groups of plants with different product lines, plant sizes, and ownership. The same plants also are grouped similarly and compared in their relative susceptibility to in- and outmigration during the business cycle.

Empirically, the study finds that: (1) the rate of openings and closings of branch plants exceeds that of locally-owned firms, and (2) branch plants exhibit a greater propensity to open during prosperity and to close during a recession. The western region communities seem to experience a more rapid expansion in "boom" periods and difficulty in maintaining their industrial base during cyclical downturns in the nation's economy.

II. THEORETICAL EXPECTATIONS

Several general principles influence industrial location, corporate management, business cycles, cost composition, and regional economics. When combined, these principles generate hypotheses which can be tested with data from Iowa.

Branch Plants Will Be More Flexible

Theoretically, locally-owned manufacturers should be less susceptible to migration or relocation than the branch plants of multiplant corporations. Opening or closing a branch plant provides volume flexibility over the business cycle. However, only large corporations replicating the same manufacturing process at several branch plants are capable of using openings and closings of branch plants as a device to adjust output level to fluctuating demand. Opening or closing one of several identical manufacturing lines within the same plant provides a similar opportunity.

Some scale economies can be achieved by linking several similar branch plants together in the same form. The most important sources of gain from such horizontal mergers are: (1) centralized research and development, (2) financing economies, (3) improved management services, (4) pooled inventory or raw material reserves, (5) marketing, advertising and image benefits, and (6) savings on transportation. For some manufacturing processes these economies may account for significant product improvement, capacity for growth, or cost savings per unit. As a group, multiplant corporations seem to have been able to attract and develop more capable managers than unit plants. Access to credit and equity capital from the financial markets may be more easily maintained by a firm with six branch plants than by six individual plants. Therefore, we expect multiplant firms to have cost savings, more adjustment potential, better financing, and better management and thus, less difficulty than unit concerns in surviving a period of depressed demand. Over a 10-year period or more we expect firms with branch plants to have a superior survival rate, i.e., less bankruptcy. We expect branch plants as a group to exhibit a greater propensity for closing during a depression, however, than a similar group of indigenous firms.

Branch plant outmigration from rural areas during depression results from two forces in the multiplant firm structure. First, the parent company can consolidate production at fewer branch plants during recessions, thus saving fixed costs. This contraction consolidates all the excess capacity at one outlying branch plant and by closing this plant and running the other at full capacity management can make some fixed costs variable. A branch plant closing does not necessarily mean that the particular abandoned facility was unprofitable, poorly management, or did not cover total local costs. It merely means closing the branch plant reduced corporate total costs and per unit costs relative to keeping it open. Total production is unchanged by the closing. The same production is consolidated into fewer plants, total revenue is the same, and since the multiplant corporation's total overhead is reduced, losses are reduced. The remaining plants are used intensively at full capacity and run at minimum total cost per unit of output. Second, branch plants of multiplant firms are easier to relocate than unit concerns when locational optimality shifts. Owner-managers of unit plants, who usually reside within the community and put down "roots," are reluctant to move. Branch plant managers are less able to consider community attachments. They expect to move if told to do so by corporate management. Close identity with a town and personal ties to a community or region is common by a local firm's owners and may prevent or delay the homegrown plant's relocation when relocation is needed. The multiplant firm is expected to more quickly seek a more profitable location. Changes do occur in comparative advantage among states. Shifts in costs of resources or locations of product markets can make a once good location untenable. Because we theoretically expect branch plants to adjust more quickly, we also expect them to survive but with less stability in any one specific community.

A basic justification for more than one plant in a large firm is to have production available at several locations and thus, minimize total corporation transportation costs. A primary incentive for large centralized production at one location is to obtain scale economies and reduce production cost per unit. Consequently, there must be a balance between two considerations which determine whether branches will be opened or closed. In a depression if branch plants should be closed, production will be concentrated and more transport incurred. If in the particular manufacturing process production costs per unit rise rapidly if the plants are operated at less than full capacity it will be important to close one. In other words, branch plants should be closed during depression, i.e., expected to be unstable if the firm is manufacturing a product for which per unit overhead costs are high relative to per unit transit costs.

Conversely, even branch plants cannot close and will have locational stability if the manufacturing process uses heavy bulky raw products requiring high assembly transport costs relative to manufacturing and delivery costs.

Some of the same characteristics of branch plants that precipitate closings also cause openings during a boom period. The "foot-loose" firms using inexperienced labor and standard multipurpose facilities will open more branch plants than those rooted to one labor force and facility. Any branch plant requiring an experienced labor force and specialized facilities is expected to be stable. As sales increase, "foot-loose" branch plants are quickly opened and all plants avoid delays of delivery and high-cost output. The ability to open branch plants facilitates efficient quality production and minimizes total corporation transportation costs. Some firms are able to open branch plants and maximize sales and minimize cost per unit. A community that can quickly accommodate a branch plant in a boom must have available trainable labor and available general purpose space. Such a rural community or region may develop an industrial population with a pro-cyclical pattern of plant openings and closings. In fact, it is imaginable that an area with high concentration of branch plants could experience manufacturing employment fluctuations much larger than the fluctuation in urban areas over the business cycle. Branch plant closings could take up most of the variation while plants operating at the center could always operate near capacity. Local branch employment in one community could contract more than the national total employment in that industry during periods of slack demand. The inmigration (or openings) of branches during the recovery stage of the cycle could enhance the community's prosperity by more than the national average. The empirical question of fact is whether branch plants seek rural areas for location during cyclical upswings and whether branches in rural areas of Iowa are actually less locationally stable than indigenous manufacturers? Do some rural areas have a migration of branch manufacturing plants that is associated with variation in GNP and employment over time?

Business Cycles Will Affect Regions Differently

Production costs fall and transit costs rise if branches are closed. These costs vary among locations and among plants. These branches are more susceptible to closings during a recession. High cost facilities have either higher production or transport costs than other plants. The least efficient plants in cost per delivered unit will be terminated first. If transport to market is important the high total cost plants may be those located at the geographical periphery of the market. In rural regions for most nonagricultural related manufacturing, transport is relatively important because inputs must be shipped in and products shipped out. If a rural community is remote from both the consuming population and component part production than urban plants, it is a high transport cost location. Rural communities with high transport cost manufacturing plants can expect to lose some branch plants during a recession. But if such communities have available labor and space they can also attract branches to their community during booms in spite of high transport cost. However, during recessions or when labor and space is plentiful everywhere, lower transport cost locations in urban areas may look more attractive because the resource availability advantage of the high transport cost periphery is eliminated.

Because the peripheral regions are the first areas to experience branch plant closings, they become very attractive locations once prosperity returns. Available resources freed by the previous recession (labor, utilities, and factories) and not yet reemployed will attract firms back into the area as soon as these factors of production are fully employed in optimally located regions. A multiplant firm is willing to incur higher transit costs if quick expansion is possible and if total costs in peripheral locations are lower because of relative abundance of other resources.

The previous theory has provided three hypotheses for testing. First, branches of multiplant manufacturers are less locationally stable than unit firms. Secondly, branch plant migrations are more sensitive to cyclical demand fluctuations than the openings and closings of locally-owned concerns. Finally, relatively more cyclical plant migrations will occur in high transit cost regions.

III. DATA SOURCES

The number of openings and closings of manufacturing plants each year in rural areas of Iowa was obtained from examination of listings in various issues of the Iowa Directory of Manufacturing. These bi-annual publications have been issued since the 1950s by the Iowa Development Commission. Each edition lists all manufacturing plants by name and gives its city of location, principal products manufactured, number of employees, name of plant manager or owner, the year production was initiated, and the location of the headquarters. The data in the directory are updated every other year by the Iowa Development Commission through surveys and information submitted by location development commissions, chambers of of commerce, city clerks, and the manufacturing firms, themselves. A two-stage process is used to insure the information in the Directory is complete and accurate. First, preliminary information of possible additions to the directory (at least names and addresses) is acquired from the staff and also newspaper clippings, newsletters from local industrial promotion groups, reports in the files of the Iowa Development Commission, etc. Second, any new plant and all old plants are asked to complete a standard directory information form which verifies the accuracy of preliminary information. Thus, all information included in the directory is actually reported by the plant manager. If a plant is closed no reply is received and no listing is made. The completeness or coverage of the Directory is approximately 98 percent, according to the Iowa Development

Commission. Cooperation from plant managers is good and the only underreporting is probably among small businesses employing very few people.

The number of manufacturing plants opening in each of the years used in this study were obtained by comparing successive issues of the Directory. Any manufacturing plant listed and initiating production in a given year in the Directory was counted as an opening in that year. Total openings in rural areas of Iowa were 651 from 1963 to 1975. Information in the Directory allowed the openings to be classified not only by year but also as a branch plant or a unit plant, as located in eastern or western Iowa and as producing one or another of 19 different groups of products according to the budget standard industry classification system (see Tables 2, 6, and A-1). All firms, even small ones with less than 20 employees were included in the openings. However, only those closings of more than 20 employees were surveyed.

The manufacturing plants closing in each year were obtained in a two-stage process. To identify the closing was much more time-consuming than identifying the openings. First, successive issues of the Directory [14-18] were compared with the 1975-76 edition [19]. Each plant listed in an earlier Directory but not in the 1975-76 edition was a "possible closing." Each "possible closing" was immediately screened to eliminate all those that had peak employment below 20. All the "possible closings" with urban addresses in the SMSA Standard Metropolitan Statistical areas also were eliminated. What remained were "possible closings" of manufacturing plants employing at one time more than 20 employees in rural Iowa areas. Additional information was then gathered by telephone on each "possible closing."

Table 2. Annual branch and local plant openings in rural Iowa, 1963-1975[a]

Year	Openings		
	Branch	Local	Total
1963	22	24	46
1964	30	35	65
1965	24	28	52
1966	30	25	55
1967	25	14	39
1968	19	24	43
1969	25	17	42
1970	23	23	46
1971	24	17	41
1972	33	21	54
1973	33	33	66
1974	26	35	61
1975	16	25	41
Total	330	321	651

[a]SOURCES: calculated from [13-19].

In this second stage, the telephone was used to survey or contact knowledgeable people and gather and verify information about each closing. The first contact was with individuals or persons of leadership in the local industrial development group or chamber of commerce in the community where the manufacturing plant was located. When a development group did not list or answer we either contacted personnel of the Iowa State University Extension Service in the area, the president of a bank, the current city clerk, or a former mayor. If we could identify and locate them we also interviewed by telephone former plant managers or individuals who were parent company executives at the time of the closing. Knowledgeable persons were requested to confirm or deny the closing of each plant in their community or associated with their company. Many plants identified as "possible closings" were, in fact, still in operation under a different name. Plants that continued or reopened with less than six months stoppage were eliminated from the sample. If the operation had, in fact, ceased and not reopened, the following information was solicited:

(1) The year the company ceased production in their community.

(2) The estimated peak employment of the plant.

(3) The principal products produced by the company in the community.

(4) The ownership characteristics of the concern: 1) locally-owned, 2) not locally-owned but a single or unit plant operation, 3) a branch plant or subsidiary of a parent company?

(5) If the plant was a branch or subsidiary, who was the parent company and where was the headquarters?

(6) Had the plant or parent company been acquired by or merged with another plant or company during its life in the community? If so, when did this acquisition (merger) occur and who was the buyer?

(7) The reasons production was halted or moved out of the community.

(8) The names of knowledgeable management or executive personnel associated with the plant at the time of the closing and their current address.

If corporate executives, previous managers, or original owners were available, they were contacted and requested to answer the above questions. The unit of observation was always the plant, but information about it was gathered from several sources.

In total, 197 communities were contacted about 300 potentially outmigrating firms and at least 400 individuals provided information. The number of closings for each year and the ownership characteristics of the 128 outmigrating or closed plants are summarized in Table 3.

Table 3. Branch and local plant closings in rural Iowa, 1965-1975

Year	Closings		
	Branch	Local	Total
1965	5	7	12
1966	2	3	5
1967	1	2	3
1968	8	4	12
1969	5	4	9
1970	12	4	16
1971	7	2	9
1972	4	9	13
1973	10	4	14
1974	10	7	17
1975	11	7	18
Total	75	53	128

Most of the individuals contacted were extremely cooperative and willing to provide the necessary information. Frequently, the community's industrial development secretary (who was contacted first) suggested additional knowledgeable individuals. The excellent cooperation from the communities permitted this survey to gather information about all of the rural Iowa manufacturers which had employed 20 or more workers and outmigrated or ceased production during the last 10 years. It is our judgement that the information concerning each firm is accurate. If there is any inaccuracy it is probably with the smaller plants or those plants which closed early in the decade for which we could not corroborate information from two or more sources.

than large plant closings. Therefore, we eliminated the small plant closings. The reader must be warned, however, that part of the difference in 651 openings and 128 closings of Iowa manufacturing firms over 10 years in rural areas is because small plant closings were not included. A very large increase in rural plants in Iowa has taken place, but many small plants have been eliminated and we do not know how many.

IV. STATISTICS, AND EXPECTED RELATIONSHIPS

From the data on plant openings and closings we generate several other statistics. Each statistic was expected to have a certain relationship.

Decade Instability Rates

To estimate instability rates over 10 years the total plant closings over 10 years were divided by the total plants operating in 1973-74. The total Iowa instability rate is 16.5 percent. Group instability rates were calculated by dividing the number of the total plants closing over 10 years in each classification (SIC, employment size, branch plants, local plants, location, etc.) by the total number of plants in that classification in 1973-74. The total number of plants used for demoninators in calculating instability rates was obtained by counting the total numbers in each class as listed in the 1973-74 Directory of Iowa Manufacturers [18].

As expected theoretically, branch plants were less locationally stable than unit concerns and the rate of closings for the branch plants would be significantly greater. Of course, if several factors simultaneously influence plant closings the high rate of closings for branch plants may not prove this ownership characteristics is the cause of the instability, but it does indicate an association. There is some chance that the effect of ownership on rate of closing is confounded with the effect of type of product produced and average plant size which also may influence rate of closings (see Tables 4 and 5). If rural Iowa branch plants more than unit plants were producing for a "declining" market or were too small or technologically obsolete, then a higher rate of closings by branch plants might be actually caused by these associated factors. To check for the influence of other variables the average composition of all Iowa branch plants was compared to that of all unit plants. Branch plants actually were larger on the average and had a larger proportion in the larger employment size group (see Table 4). Branch plants are somewhat more concentrated in nondurable than durable goods manufacturing (see Table 5). A significant difference in the ratio of branch plants to unit plants in east versus west Iowa did not occur (see Table 6). Therefore, we doubt that regional location can confound with the relatively greater instability rate observed for branch than unit plants.

Annual Numbers of Openings and Closings

There is considerable variation in the number of openings and closings from year to year (see Tables 7 and 8). Branch plants are expected to exhibit a greater propensity than unit firms for opening during prosperity and closing during a recession. To test this hypothesis we intend to associate the number with change in Gross National Product (GNP). We expect branches in rural Iowa to be more responsive to demand fluctuations than unit plants. The expected relationships between openings or closings and change in GNP are illustrated in Figures 1 and 2. When regressing plant openings and plant closings per year on the percentage change in Gross National Product or Gross Iowa State Product (GSP), we will interpret

Table 4. The employment characteristics of rural Iowa manufacturers, branch versus local, 1973-1974[a]

Employment Classes	Local No.	Local %	Branch No.	Branch %	Total No.	Total %
21- 50	263	62	112	32	375	48
51-100	87	21	84	24	171	22
101-250	50	12	93	27	143	18
251-500	16	4	37	11	53	7
501-1000	6	1	13	4	19	2
1000+	2	.5	11	3	13	2
Total	424	100	350	100	774	100

[a]SOURCE: calculated from [18].

Table 5. The industrial composition of rural Iowa manufacturers, branch versus local, 1973-1974[a]

Ownership Characteristics		Industrial Composition[b] Durable	Nondurable	Total
Branch	No.	153	197	350
	%	44	56	100
Local	No.	211	213	424
	%	50	50	50
Total	No.	364	410	774
	%	47	53	100

[a]SOURCE: calculated from [18].

[b]The delineation between durable and nondurable goods is presented in Table A-2.

Table 6. The distribution of rural manufacturers between eastern and western Iowa, branch versus local, 1973-1974[a]

Ownership Characteristics	Region			
	Eastern Iowa		Western Iowa	
	Number	% of branch or local	Number	% of branch or local
Branch	232	66.3	118	33.7
Local	261	61.6	163	38.4
Total	493		281	

[a]SOURCE: calculated from [18].

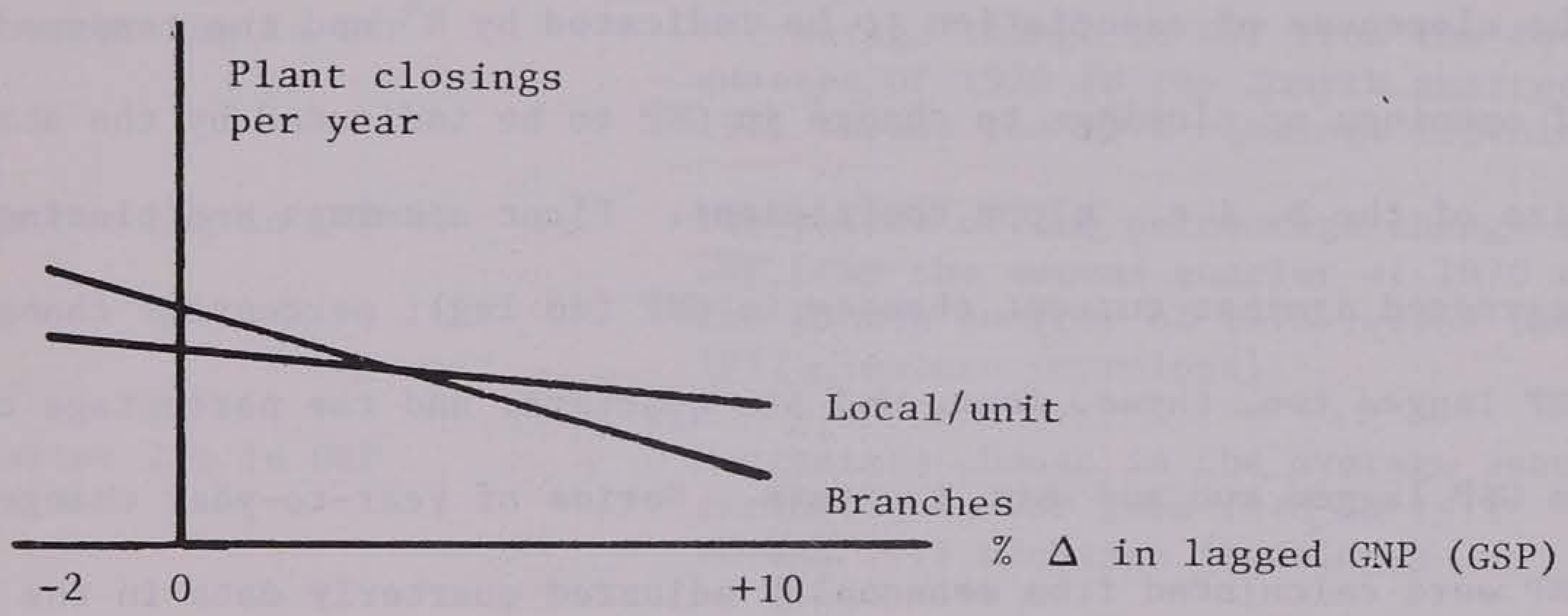
Table 7. Annual branch and local plant openings for eastern and western Iowa, 1965-1975[a]

Year	Region					
	Eastern Iowa			Western Iowa		
	Local	Branch	Total	Local	Branch	Total
1965	13	14	27	13	13	26
1966	9	14	23	18	17	35
1967	8	15	23	6	9	15
1968	10	10	20	14	9	23
1969	7	22	29	10	5	15
1970	12	19	31	11	4	15
1971	10	20	30	8	4	12
1972	17	15	32	13	18	31
1973	20	21	41	18	12	30
1974	14	16	30	20	12	32
1975	15	10	25	10	6	16
Total	135	176	311	141	109	250

[a]SOURCE: calculated from [14-19].

Table 8. Annual branch and local plant closings for eastern and western Iowa, 1965-1975

Year	Region					
	Eastern Iowa			Western Iowa		
	Local	Branch	Total	Local	Branch	Total
1965	5	3	8	2	2	4
1966	3	2	5	0	0	0
1967	2	0	2	0	1	1
1968	2	7	9	2	1	3
1969	3	4	7	1	1	2
1970	1	4	5	3	8	11
1971	0	5	5	2	2	4
1972	7	2	9	2	2	4
1973	2	1	9	2	3	5
1974	6	5	11	1	5	6
1975	2	7	9	5	4	9
Total	33	46	79	20	29	49



Closings = A + B(Δ GNP)

H_0 = slope of both regression lines negative and branches more negative than unit plants.

Figure 1. Hypothesized relationship between change in GNP and number of plant closings

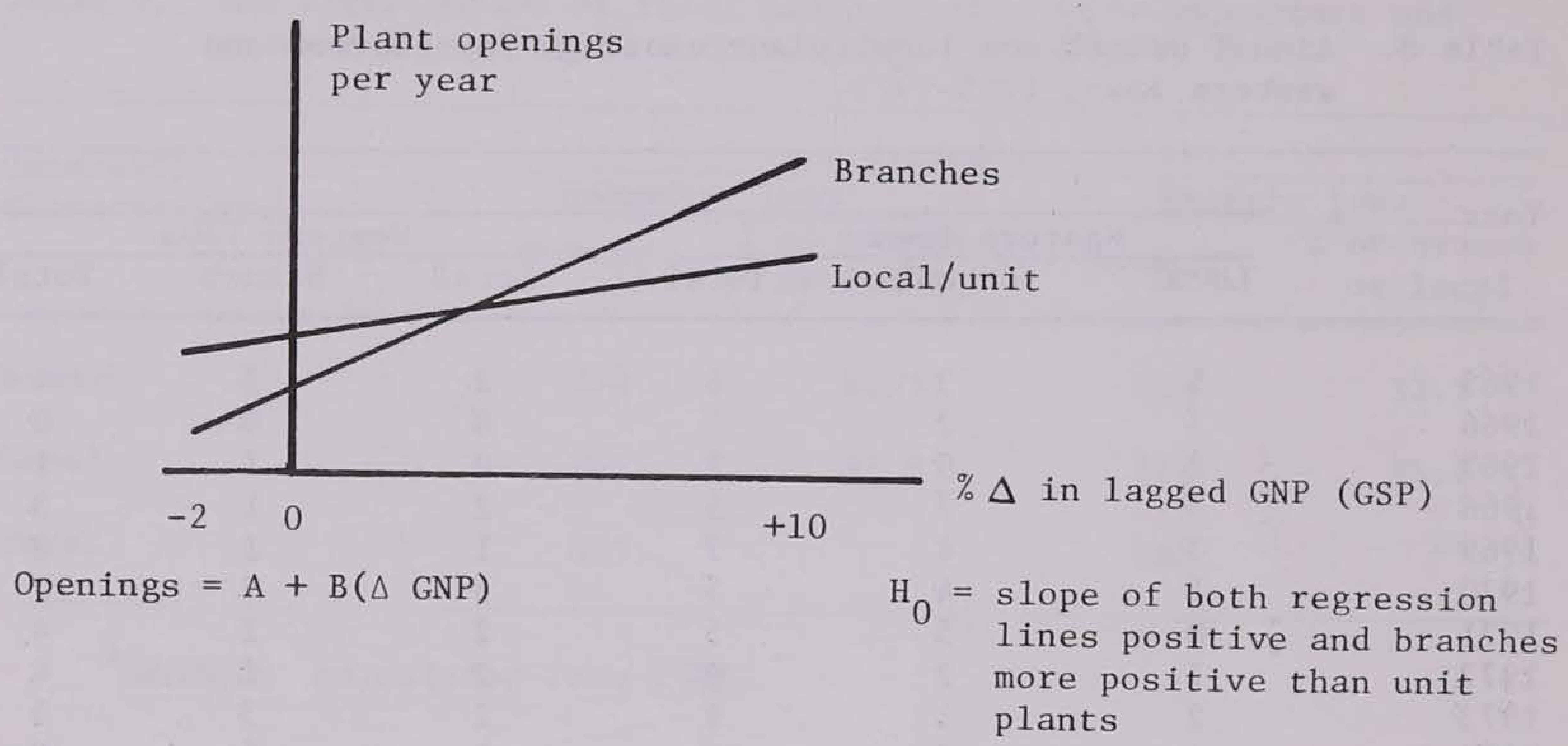


Figure 2. Hypothesized relationship between change in GNP and number of plant openings

the closeness of association to be indicated by R^2 and the responsiveness of openings or closings to change in GNP to be indicated by the absolute size of the B, i.e., slope coefficient. Plant openings and closings were regressed against current changes in GNP (no lag); percentage change in GNP lagged two, three, four, and six quarters; and the percentage change in GSP lagged two and six quarters. Series of year-to-year changes in GNP were calculated from seasonally adjusted quarterly data in the <u>Survey of Current Business</u>. All year-to-year changes in GNP were expressed as a percentage change from one quarter to another four quarters hence. Thus, for GNP change current with plant closings in Iowa during 1971 the percentage change in GNP from fourth quarter 1970 to fourth quarter

1971 was used. The closings or openings in all of calendar 1971 were associated with a two-quarter lag in GNP by calculating the percentage change in GNP from the second quarter of 1970 to the second quarter of 1971 (see Table 9).

Table 9. Examples of methods applied to estimate the various lags in real GNP and GSP

Lag	Example
No lag in GNP	Percentage change in GNP from the fourth quarter of 1970 to the fourth quarter of 1971 versus the 1971 closings (openings)
Two-quarter lag in GNP	Percentage change in GNP from the second quarter of 1970 to the second quarter of 1971 versus the 1971 closings (openings)
Three-quarter lag in GNP	Percentage change in GNP from the first quarter of 1970 to the first quarter of 1971 versus the 1971 closings (openings)
Four-quarter lag in GNP	Percentage change in GNP from the fourth quarter of 1970 to the fourth quarter of 1971 versus the 1972 closings (openings)
Six-quarter lag in GNP	Two-thirds of the percentage change in GNP from the second quarter of 1970 to the fourth quarter of 1971 versus the 1972 closings (openings)
Two-quarter lag in GSP	Percentage change in the average annual estimates in GSP from 1970 to 1971 versus 1971 closings (openings)
Six-quarter lag in GSP	Percentage change in the average annual estimates in GSP from 1970 to 1971 versus 1972 closings (openings)

The percentage changes in GNP are, of course, a series of first differences. These percentage annual first differences vary considerably from year to year and from lag to lag in the same year (see Table 10). The U.S. economy grew relatively rapidly in 1963 through 1965 and 1971 through 1973. It grew relatively slowly in 1969 and 1970 and again in 1974 and 1975. In fact, the growth was negative in 1970 and 1974. These periods of rapid growth and slow growth are indicated by larger or smaller year-to-year percentage changes in GNP. The year-to-year changes in the number of rural manufacturing plants are indicated by the number of openings per year and the number of closings of plants with more than 20 employees. By regression analysis the variation in percentage change in GNP year-to-year is associated with the variation in number of plant openings or closings in rural Iowa year-to-year.

Larger Slope Coefficients Expected for Branch Plants

Branch plants were expected to exhibit a significantly larger slope coefficient. This would be consistent with the hypothesis but would not, of course, guarantee that ownership was responsible. Large slope coefficients could also result from branch plants being more heavily composed of plants producing cyclically sensitive durable goods. To control for the influence of product differences, the sample of Iowa openings and closings were partitioned into durable and nondurable manufacturers within each ownership group. The series of year-to-year openings or closings in each subgroup was then regressed on year-to-year changes in GNP and GSP. By this process only variation in number of closings or openings

Table 10. **Annual percentage change in GNP (GSP) lagged from zero to six quarters**[a]

	Lag						
Year	Zero (GNP)	Two quarter (GNP)	Three quarter (GNP)	Four quarter (GNP)	Six quarter (GNP)	Two quarter (GSP)	Six quarter (GSP)
1963	5.10	3.18	3.22	3.72	5.08	6.84	4.13
1964	4.25	5.86	5.85	5.10	4.08	3.34	6.84
1965	7.70	5.09	4.91	4.37	4.90	9.35	3.43
1966	4.29	6.54	7.38	7.70	6.14	7.86	9.35
1967	2.89	2.56	2.56	4.29	5.59	1.20	7.86
1968	4.23	4.80	3.72	2.89	3.10	1.17	1.20
1969	1.20	2.88	4.21	4.23	4.24	1.93	1.17
1970	- .57	- .51	- .11	1.20	1.80	-3.37	1.93
1971	4.58	2.72	2.02	- .57	- .51	3.17	-3.37
1972	7.29	5.44	4.19	4.59	2.89	6.02	3.17
1973	3.22	5.62	7.58	7.92	6.00	15.44	6.02
1974	-4.35	- .91	.08	3.22	4.49	-7.22	15.44
1975	2.45	-4.03	-5.71	-4.36	-2.27	--[b]	-7.22

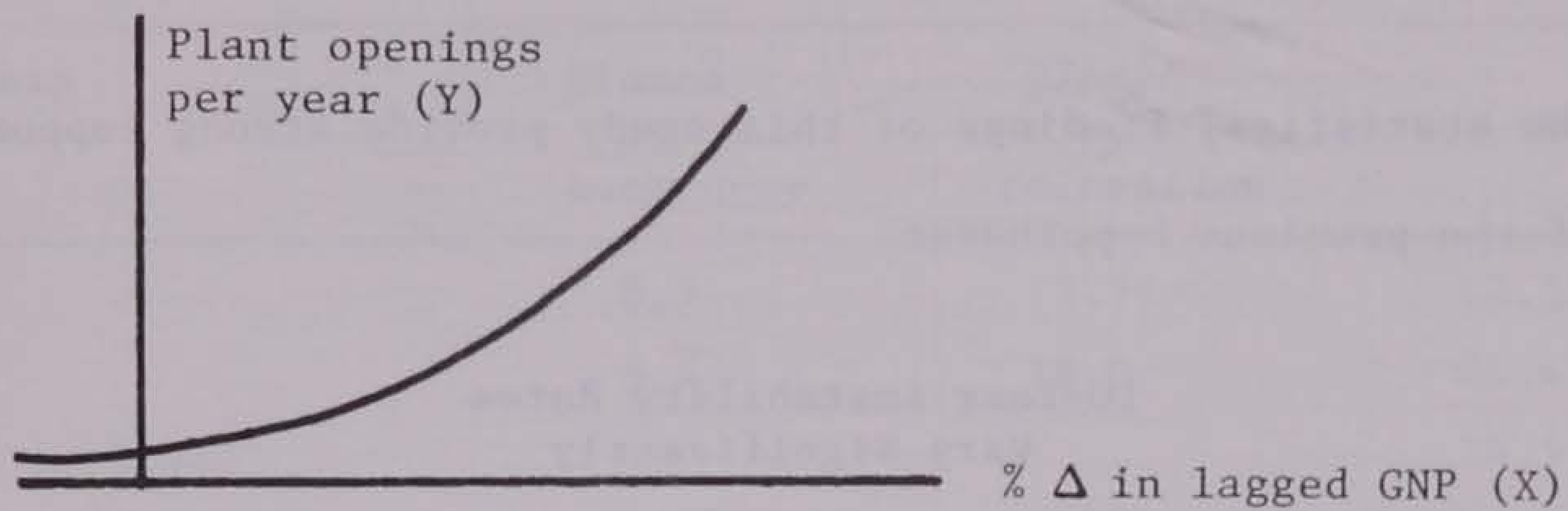
[a]SOURCE: all data for percentage changes in GNP were calculated from information contained in the Survey of Current Business [47, 48]. GSP data were calculated from [21].

[b]Not available in [21].

for the same type of manufacturing plant was associated with the variation in change in GNP or GSP. If the coefficients for branches in each product class were significantly larger than those for unit plants, in the same class, it can be concluded that branches are more sensitive to fluctuations in the business cycle.

More Peripheral Western Iowa Expected to Have a Threshold Effect

It is expected theoretically that western Iowa will show a different pattern of industrial inmigrations over the business cycle because of its greater transport cost from Chicago (see Figures 3 and 4). This will be tested by regressing the number of year-to-year branch and local plant openings and closings (Tables 7 and 8) for eastern and western Iowa on various lagged changes in GNP (Table 10) and on squared changes in GNP. Eastern Iowa is part of the ever-enlarging Chicago industrial zone. Thus, western Iowa is the more "geographically peripheral" region. The theory says that openings of branch plants by corporations in such remote transit cost regions should occur later after prosperity has returned, but then take place more responsively to high rates of growth. The openings and closings of Western Iowa's branches are expected to be less cyclically sensitive to small changes in GNP than those of eastern Iowa but more responsive to high rates of change in GNP. This difference in cyclical sensitivity if it exists will be indicated by significant coefficients between closings and squared changes in GNP. Steeper slopes on linear terms and higher R^2's for the regressions will also indicate better explanation of the year-to-year variations in plant openings and closings in western Iowa by changes in GNP than in eastern Iowa.



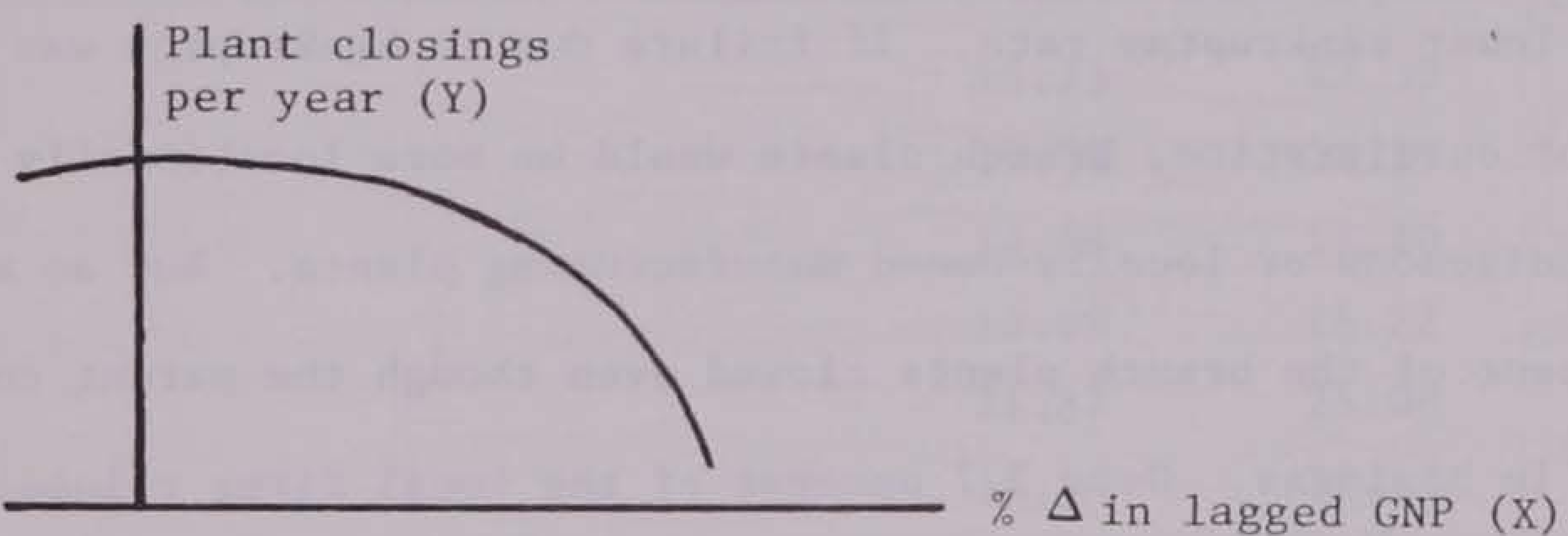
$$Y = \beta_0 + \beta_1 X + \beta_2 X^2$$

where $\beta_1 + 2\beta_2 X > 0$

$\beta_2 > 0$

H_0 = the number of plant openings per year would increase at an increasing rate as the change in lagged GNP increased.

Figure 3. Hypothesized "threshold" effect for plant openings



$$Y = \beta_0 + \beta_1 X + \beta_2 X^2$$

where $\beta_1 + 2\beta_2 X < 0$

$\beta_2 < 0$

H_0 = the number of plant closings per year would decrease at an increasing rate as the change in lagged GNP increased.

Figure 4. Hypothesized "threshold" effect for plant closings

V. EMPIRICAL FINDINGS OF THE STUDY

The statistical findings of this study provide strong support for most of the previous hypotheses.

10-Year Instability Rates Vary Significantly

Several general hypotheses and expected relationships were checked using the decade-long rates of plant closings. Standard statistical procedures were used to check the differences among ratios.

The percentage of all locally-owned plants which failed exceeded the failure rates of all multiplant firms. Nineteen plant closures resulted from branch company failure while 37 plant closures resulted from local company failures. These represented 5.43 percent of all 1973-74 branch plants and 8.73 percent of all local concerns. Thus, branch plants have a lower bankruptcy rate. If failure due to bankruptcy was the only cause of outmigration, branch plants would be more locationally stable than indigenous or locally-owned manufacturing plants. But an additional 18 percent of the branch plants closed even though the parent company stayed in business. Only 3.7 percent of the local firms relocated. Thus, there is a much greater total tendency for branch plants to close due to relocation or consolidation during recessions. The total rate of closings for branch plants over the decade was 24.5 percent compared with 12.5 percent for local plants. The relocation rate for branch plants was about the same whether the corporate headquarters was in Iowa or outside Iowa (see Table 11).

Table 11. Decade long instability rates for branch and local plants, non-SMSA Iowa, 1965-1975

Ownership class	Closed by bankrupcy	Closed by relocation	Total
Local	8.7	3.7	12.50
Branch	5.4	18.0	21.43 *****
Branch (HQ in Iowa)			24.53
Branch (HQ not in Iowa)			21.21
All rural Iowa plants			16.54

*****Significantly different at the .5 percent level.

Table 12. Decade long instability rates for rural Iowa plants by size of employment and branch versus local, 1965-1975

Size of Employment	Total	Branch	Local
21-50	15.73	22.32	12.93
51-100	19.30	26.19	12.64
101-250	14.68	17.20	10.00
251-500	15.09	16.22	12.50
501+	21.87	25.00	12.50
All Iowa plants	16.54	21.43	12.50

The whole decade instability rate for branch plants in rural Iowa was significantly higher for each plant size than was the similar decade instability rate for local plants. However, no pattern or trend in instability rates among employment size was discernible (Table 12). The variation in decade stability rates among size classes of plants can be attributed almost entirely to differences in proportion of each size class which were branch plants. The percentage of local firms which failed was not significantly influenced by plant size. Within each employment category, the locational instability rates of branch plants due to relocation consistently exceeded the rate of closing for all causes by indigenous concerns. Therefore, the greater instability rate in branch plants over the decade cannot be attributed to size economies or inflexability associated with plant size.

The decade instability rate of rural Iowa's manufacturing plants producing durable goods is about 20 percent or about 50 percent greater than the 13.5 percent closing rate among those producing nondurable products (Table 13). Within the group of plants manufacturing durable goods the branch plants exhibited decade instability rates of 28 percent, more than two times larger than the 13.7 percent rate among locally-owned durable goods plants. The decade instability rates of all plants producing electrical and lumber products was 28 and 26 percent, respectively--the highest instability rate of any class of manufacturers. The rate of branch plant closings in 10 years in the electrical and lumber categories was more than 40 percent of the number operating in 1973-74. Within product groups, branch plants were consistently and significantly more locationally unstable than indigenous firms. Only for nondurable products was the difference small and statistically not significantly different between branch and unit plants. Many of these nondurable plants produce food-related products. The instability rates for branch plants varied widely from a low of 16 percent for nondurable goods to a high of 43 percent for lumber products. The decade-long instability rates for local plants were lower and varied less from 11 to 19 percent.

Table 13. Locational instability rates for groups of rural Iowa manufacturing plants classified by ownerships and products produced, 1965-1975 closures over 1973-1974 population

	Instability rates (expressed as a percent)		
Product classification	Branch	Local	All Plants
Durable goods	28.10	13.74	19.78
Nondurable goods	16.24	11.27	13.55
All Iowa manufacturers	21.43	12.50	16.54
Food and kindred products (SIC #20)	24.42	14.77	20.11
Electrical equipment and supplies (SIC #36)	41.67	13.64	28.26
Lumber, wood products, furniture, and fixtures (SIC #24 and #25)	43.75	19.04	25.86

The relatively large migration rates for branch plants producing electrical and lumber goods may have resulted from the following factors:

1) Many lumber and electrical products are incorporated in the production of durable investment goods such as houses, buildings, etc., and, therefore, are susceptible to the well-known wide fluctuations in demand for capital goods from recession to boom years.

2) The production of wood products and electrical equipment in Iowa may be losing comparative advantage. These products may be migrating to areas with lower labor wages and nearer raw material sources. Thus, Iowa may have relatively high cost plants which are sensitive to competition from "lower cost" locations.

There are differences in instability rates in Iowa among product classes, however, these larger instability rates resulted primarily from larger proportions of some product classes which were branch plants. Furthermore, it seems likely that Iowa's rural manufacturing employment has not been unstable because it is agriculture and food-related but because it has a larger percentage of its manufacturing in the more unstable durable manufacturing. The most unstable combination seemed to be branch plants producing durable goods. Conversely, the most stable were locally-owned nondurable manufacture. The losses Iowa experienced were mostly due to consolidation of branch plants during recession or bankruptcy of locally-owned plants. The migration rate of locally-owned manufacturing plants was affected only minimally by product mix.

Over the decade the rate of plant closings in eastern Iowa was 16 percent versus 17.4 percent in western Iowa. No significant influence of region on long-term migration rates existed for rural Iowa manufacturing plants in aggregate or for branch or locally-owned plants (Table 14). The rate of instability of indigenous firms over the decade was 12.3 and 12.5 percent in each region--almost identical. Although the decade-long rate of branch plant closings in western Iowa (24.6 percent) exceeded that of eastern Iowa branches by 4.8 percentage points, that difference was not statistically significant and may have been due to chance. In both regions branch plants were significantly less locationally stable than unit concerns, however, branch plants in western Iowa were twice as likely to move in or out as locally-owned ones.

Table 14. Plant closing rates for eastern and western Iowa by branches and locals 1965-1975

Location	Outmigration Rates		
	All Plants	Branch Plants	Local Plants
Eastern Iowa	16.02	19.83	12.54
Western Iowa	17.44	24.58	12.26
Iowa	16.54	21.43	12.50

In summary, both plant ownership and product mix both had statistically significant impacts on the local rate of plant closings in Iowa over the decade 1965-75. More instability was associated with branch plants and durable products, as expected. Plant size and location in Iowa had no effect on the rate of plant closings for 1965-75. Outmigration of branch plants was the most important reason for closings in Iowa. For indigenous firms the failure rate was the most important reason for closing.

Branch Plant Migration Closely Associated with Business Cycle[1]

As expected, branch plant closings were negatively and significantly responsive to fluctuations in GNP and more closely associated than local manufacturers (Table 15). On an average for the decade, 50 to 75 percent of branch plant closings were associated with each 1 percent variation in the GNP. The number of branch plant closings increased as the growth rate of both GNP and GSP decreased. The slope coefficients of the regressions were significantly different from zero when GNP was the independent variable. A two-quarter lag between closings and a slow-up or decline in gross national product provided the highest percentage explanation of the year-to-year variation in plant closings and the most statistically significant slope coefficients. A two-quarter lag indicates a quick six-month response between national economy slowdown and Iowa branch plant closings. Of course, the downturn in employment at any Iowa manufacturing plant would follow the decline in demand for that specific product. However, an average six-month lag was observed between a downtrend in the national business cycle and Iowa branch plant closings. The total impact of a national downturn on a rural area would, of course, depend on 1) the composition of the area's manufacturing industry and 2) its relative dependence on branch plant durable manufacturing relative to all other sources of community employment.

---

[1]The main text reports mostly the linear regression of plant openings and closings on changes in GNP and GSP. In two cases, the quadratic regressions improved the results provided by the linear regressions. These exceptions will be noted in this section. The remainder of the quadratic results were not significant and are not reported.

Table 15. Coefficients resulting from regressing the number of local and branch plant closings per year on the percentage change in GNP and GSP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept	Slope (β)	R^2	F
No lag in GNP				
Branch	8.759	-.618**	.307	3.99*
Local	4.621	.066	.009	.09
Two-quarter lag in GNP				
Branch	8.878	-.715***	.386	5.68***
Local	5.175	-.129	.034	.32
Three-quarter lag in GNP				
Branch	8.426	-.541**	.287	3.63*
Local	5.272	-.162	.069	.67
Four-quarter lag in GNP				
Branch	8.577	-.517*	.228	2.66
Local	5.119	-.093	.021	.18
Six-quarter lag in GNP				
Branch	9.110	-.666*	.225	2.61
Local	5.279	-.139	.026	.25
Two-quarter lag in GSP				
Branch	7.582	-.226	.145	1.53
Local	4.928	-.037	.011	.09
Six-quarter lag in GSP				
Branch	7.353	-.125	.041	.38
Local	4.813	.0015	.000	.00

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

Only small insignificant slope coefficients and extremely low coefficients of determination and F values were found in regressing the closures and outmigration of indigenous firms on state and national indicators of cyclical business fluctuations. We did not obtain and did not expect a close "fit" for locally-owned plant closings when only the GNP explanatory variable was utilized. There are many reasons for locally-owned factory closings that are completely unrelated to demand fluctuations; e.g., union troubles, plants destroyed by fire, changing technology, the demise of mussels in the Mississippi River, and even closings resulting from safety or antipollution regulations. The employment at locally-owned plants are affected by business cycles but they do not completely close in response to business slow-down.

The relationships between plant openings and changes in GNP (Table 16) support the hypothesis that branches are more sensitive to cyclical variations than unit firms. About 1.1 to 1.3 branch plant openings were associated with each 1 percent increase in GNP. This coefficient is significantly different from zero and exceeded those of the local concerns which were not significantly different from zero. Plant openings were also regressed against lagged GSP with similar but smaller and less significant results (see Tables 15 and 16).

The number of branch plant openings was significantly associated with two-, three-, four-, and six-quarter lags of GNP. However, the largest and most significant explanation of plant openings was with the change in GNP lagged four quarters. Thus, branch plant openings are apparently not as quick to respond to prosperity as branch plant closings are to recession.

Table 16. Coefficients relating openings of local and branch plants per year with the percentage change in GNP and GSP lagged from zero to six quarters, 1963-1975

Lag	Y Intercept	Slope (β)	R^2	F
No lag in GNP				
Branch	25.231	.236	.020	.23
Local	26.580	-.107	.002	.02
Two-quarter lag in GNP				
Branch	22.827	1.097****	.430	7.53***
Local	25.230	.555	.005	.59
Three-quarter lag in GNP				
Branch	22.681	1.104*****	.549	12.17*****
Local	25.171	.552	.007	.75
Four-quarter lag in GNP				
Branch	21.594	1.293****	.630	18.84*****
Local	23.302	.860	.130	1.64
Six-quarter lag in GNP				
Branch	21.597	1.259***	.362	6.24***
Local	23.891	.668	.047	.55
Two-quarter lag in GSP				
Branch	25.542	.338*	.019	2.42
Local	24.824	.374	.075	.81
Six-quarter lag in GSP				
Branch	23.892	.550***	.349	5.90***
Local	24.180	.534*	.152	1.98

*Significant at the 10 percent level.

**Significant at the 2.5 percent level.

***Significant at the 1 percent level.

****Significant at the .5 percent level.

The three- and four-quarter lags provided coefficients of determination of .55 and .63 and F values indicating over 99 percent confidence of significance. Perhaps a shorter lag for closings than openings can be explained simply by the shorter process of closing doors than starting up production. Consolidating production to fewer plants requires less time than opening a new branch--identifying a suitable site, negotiating a lease, remodeling, and setting up production. Cautiousness about the strength and duration of any upturn in the business cycle may also influence multiplant managers to wait longer to respond with openings.

Branch plant openings seem to be susceptible to a mild "threshold" effect, i.e., plant openings increase at an increasing rate as the percentage change in GNP rises (see Figure 3). This is indicated in equations 1 and 2 which use a three- and four-quarter lag in GNP and a quadratic function to explain variation in the number of branch openings. Both the first and second derivatives were positive indicating the number of openings per year increases at an increasing rate as GNP lagged three- or four-quarter increases. The F values were highly significant at the 0.5 percent level. The coefficient on the squared terms is significant.

Four-quarter lag in GNP

$$Y = 21.134 + 1.067X + 0.32X^2 \qquad (1)$$

Three-quarter lag in GNP

$$Y = 22.219 + .987X + 0.14X^2 \qquad (2)$$

The practical implication of this finding is that if Iowa branch plant openings exhibit a "threshold" effect then a less than average response can be expected in plant openings after a mild upturn, but an above average number of openings in rural areas will occur a year after a large upturn in the business cycle. A greater than proportional impact on branch plant employment in rural areas may occur the year after the threshold is exceeded.

Fluctuations in the growth rates of GNP and GSP were of little help in explaining the number of openings by local firms per year. It would seem that Iowa business cycles have only a minor influence, if any, on the local entrepreneurs' decisions to initiate, halt, or transfer operations.

Migration Volume of Durables Greater Than Nondurables

The number of openings and closings of durable and nondurable manufacturing plants were each regressed against changes in GNP and GSP (Tables 17 and 18, respectively). About 1.2 openings among durable manufacturers were associated with each 1 percent increase in GNP lagged four quarters. This rate of openings among durables is about twice as large as the rate among nondurables (.45). The equations explaining year-to-year variation in openings are very significant for both nondurables and durables (Table 17). In contrast, the equations that link closings to fluctuations in GNP are not significant for nondurables and only marginally significant for durable closings. Closings of durables seem to be more responsive to each 1 percent fluctuation in GNP than nondurables (Table 18). These results are consistent with a 1961 study by Borts [4].

Next, durables and nondurables are each partitioned into branch plants and locally-owned plants. The openings of durable goods branch plants emerge as the most unstable combination. According to the history

Table 17. Coefficients resulting from regressing the number of durable and nondurable plant openings per year on the percentage change in GNP and GSP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept	Slope (β)	R^2	F
No lag in GNP				
Durable	30.373	-.490	.051	.48
Nondurable	19.492	.200	.059	.56
Two-quarter lag in GNP				
Durable	27.631	.464	.043	.40
Nondurable	18.924	.423*	.249	2.98
Three-quarter lag in GNP				
Durable	26.836	.740	.141	1.47
Nondurable	19.107	.351*	.215	2.56
Four-quarter lag in GNP				
Durable	25.300	1.119**	.280	3.50*
Nondurable	18.639	.450**	.316	4.18*
Six-quarter lag in GNP				
Durable	25.023	1.175*	.183	2.02
Nondurable	18.198	.572**	.304	3.95*
Two-quarter lag in GSP				
Durable	27.604	.438	.144	1.51
Nondurable	19.613	.160	.139	1.40
Six-quarter lag in GSP				
Durable	26.740	.612*	.255	3.09*
Nondurable	19.017	.302***	.438	7.04**

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

Table 18. Coefficients resulting from regressing the number of durable and nondurable plant closings per year on the percentage change in GNP and GSP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept	Slope (β)	R^2	F
No lag in GNP				
Durable	7.748	-.402	.174	1.88
Nondurable	5.353	-.088	.010	.09
Two-quarter lag in GNP				
Durable	7.855	-.476*	.229	2.66
Nondurable	6.015	-.336	.135	1.41
Three-quarter lag in GNP				
Durable	7.667	-.400*	.211	2.38
Nondurable	5.887	-.284	.121	1.30
Four-quarter lag in GNP				
Durable	7.984	-.446*	.226	2.63
Nondurable	5.621	-.164	.033	.34
Six-quarter lag in GNP				
Durable	8.636	-.632*	.266	3.33*
Nondurable	5.716	-.189	.029	.27
Two-quarter lag in GSP				
Durable	7.030	-.162	.101	1.00
Nondurable	5.316	-.075	.026	.24
Six-quarter lag in GSP				
Durable	6.910	-.104	.037	.35
Nondurable	5.273	-.051	.011	.10

*Significant at the 10 percent level.

of 1965 to 1975, we can be very confident that about three openings of durable branch plants occurred somewhere in rural Iowa for each 4 percent increase in GNP four quarters earlier. Both durable and nondurable manufacturing plant openings are significantly related to changes in GNP lagged three or four quarters. About one opening of a branch plant producing nondurable goods can be confidently expected in Iowa for each 2 percent increase in GNP four quarters earlier. The F values indicate a very significant regression relationship (see Table 19).

The number of closings of branch plants producing durable goods was significantly associated with GNP slow-up. The slope coefficient of .3 and .5 indicates that, on an average, about one closing of a durable goods branch plant employing more than 20 people can be expected for each 1 to 2 percent slow-up or downturn of GNP. A two-quarter lag seems most significant for closings as opposed to four-quarter for openings. Nondurable branch plants closings are less responsive (have a slope coefficient only half as large) to cyclical slow-ups in GNP growth (See Table 20).

In summary, the migration rates of branch plants producing durable goods were very responsive to cyclical variations in aggregate demand. Branch plants manufacturing both durable and nondurable products exhibited a stronger procyclical behavior than local plants. For all lags, at least twice as many branch plants of both durable and nondurable industries were associated with a 1 percent change in GNP as indigenous corporations. In prosperity branch plants are more likely to be the community growth opportunity. Nondurable branches were more likely to open and more likely to close with changes in aggregate demand than durable unit concerns.

Table 19. Coefficients relating openings of branch and local plants, durable and nondurable, to percentage change in GNP lagged from zero to six quarters, 1965-1975

Lag		Y Intercept	Slope (β)	R^2	F
No lag in GNP					
Durable	Branch	12.04	.105	.007	.09
	Local	18.44	-.607*	.171	2.26
Nondurable	Branch	12.48	.160	.031	.35
	Local	7.71	.159	.022	.24
Two-quarter lag in GNP					
Durable	Branch	10.67	.568*	.218	3.07*
	Local	16.66	-.065	.002	.02
Nondurable	Branch	11.51	.492**	.287	4.43**
	Local	7.52	.234	.045	.52
Three-quarter lag in GNP					
Durable	Branch	10.46	.626***	.338	5.60**
	Local	16.05	.135	.010	.12
Nondurable	Branch	11.71	.421**	.267	4.01*
	Local	7.72	.167	.029	.33
Four-quarter lag in GNP					
Durable	Branch	9.78	.765****	.424	6.63***
	Local	15.18	.377	.068	.66
Nondurable	Branch	11.45	.456**	.263	3.93*
	Local	7.65	.170	.026	.29
Six-quarter lag in GNP					
Durable	Branch	10.00	.680*	.203	2.79
	Local	15.01	.415	.049	.58
Nondurable	Branch	11.37	.465*	.166	2.18
	Local	7.51	.207	.023	.26

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

****Significant at the 1 percent level.

Table 20. Coefficients relating closings of branch and local plants, durable and nondurable, to percentage change in GNP lagged from zero to six quarters, 1965 to 1975

Lag		Y Intercept	Slope (β)	R^2	F
No lag in GNP					
Durable	Branch	5.449	-.484**	.303	3.92*
	Local	2.579	.019	.003	.02
Nondurable	Branch	3.311	-.134	.064	.61
	Local	2.042	.047	.011	.10
Two-quarter lag in GNP					
Durable	Branch	5.291	-.469*	.268	3.29*
	Local	2.747	-.040	.011	.10
Nondurable	Branch	3.587	-.246*	.200	2.28
	Local	2.428	-.089	.043	.35
Three-quarter lag in GNP					
Durable	Branch	4.988	-.352*	.196	2.19
	Local	2.823	-.067	.038	.36
Nondurable	Branch	3.439	-.189	.152	1.64
	Local	2.449	-.095	.055	.52
Four-quarter lag in GNP					
Durable	Branch	5.289	-.400*	.222	2.52
	Local	2.787	-.047	.016	.15
Nondurable	Branch	3.289	-.118	.052	.49
	Local	2.332	-.047	.011	.10
Six-quarter lag in GNP					
Durable	Branch	5.662	-.503*	.207	2.34
	Local	3.011	-.113	.060	.54
Nondurable	Branch	3.448	-.163	.061	.57
	Local	2.268	-.026	.002	.02

*Significant at the 10 percent level.

**Significant at the 5 percent level.

Branch plants producing durable goods closed rapidly during a recession but opened slowly during prosperity. Nondurable branches reacted less to the business cycles but with a similar pattern of lags. The lags providing the most significant coefficients and the best fit for branch closings were the "no lag" for durables ($\beta = -.484$, $R^2 = .303$) and the two-quarter lag for nondurables ($\beta = -.246$, $R^2 = .200$). For plant openings, durable branches responded best to a four-quarter lag in GNP ($\beta = .765$, $R^2 = .424$), while the two-quarter lag explained most accurately the openings of nondurable branches ($\beta = .492$, $R^2 = .287$). Therefore, we could expect rural areas with a large concentration of branches producing durable goods will closely follow the nation into a recession, but they will not return to full employment as rapidly as areas engaged primarily in the production of nondurables.

The responsiveness of local plant openings and closings to variations in the GNP is very small and depended little on whether the facility was producing durable or nondurable goods. In either case, almost no relationship existed. Local entrepreneurs seemed to initiate production with a somewhat greater frequency during a prosperous period, and close plants somewhat more readily during a recession; however, their rate of opening and closing was not consistent.

The response of plants to changes in Iowa's economic activity (GSP) is so near zero that little statistical significance can be attached to the coefficients (see Table 21). Branch plants show more response with nondurables reacting more slowly. Local plants again seem unresponsive.

Table 21. Coefficients resulting from regressing the annual number of branch and local plant openings, durable versus nondurable, on the percentage change in GSP lagged two and six quarters, 1965-1975

Lag		Y Intercept	Slope (β)	R^2	F
Two-quarter lag in GSP					
Durable	Branch	11.23	.348**	.296	3.78*
	Local	16.28	.054	.005	
Nondurable	Branch	12.64	.109	.051	1.16
	Local	8.05	.055	.009	.09
Six-quarter lag in GSP					
Durable	Branch	11.44	.246	.134	1.70
	Local	15.01	.378*	.210	2.92
Nondurable	Branch	12.04	2.50**	.242	3.51*
	Local	7.64	.154	.063	.74

*Significant at the 10 percent level.

**Significant at the 5 percent level.

These results indicate that industrial ownership characteristics will affect the degree and severity with which national and state cyclical impulses are transmitted to rural communities. Areas dominated by branch plants will exhibit greater cyclical fluctuations in manufacturing employment than those with primarily indigenous firms. Communities attempting to attract new industry probably will find they can much easier attract durable branch plants than nondurable local ones, especially in periods of prosperity.

Western Iowa Manufacturing Plants More Significantly Affected by GNP

The results of regressing eastern and western plant openings and closings on changes in GNP and GSP (Tables 22 and 23) provide expected results consistent with the previous theory. The rate of plant in- and outmigrations associated with phases of cyclical variations in GNP are smaller in east than west. Plants in western Iowa opened and closed at a rate several times as high as those of eastern Iowa for every lag. Openings and closings in the western region of Iowa were very closely associated with business cycles as indicated by the high coefficients of determination, the significant F values, and slope coefficients. These findings indicate that the "geographically peripheral" western half of the state was responsible for most of Iowa's plant migration associated with the cyclical fluctuations of the national economy.

A surprising or unexpected phenomenon was the much greater rate of plant immigration into western Iowa during prosperity than that of eastern Iowa. Personal interviews with newly arriving plants in Area V (the six counties around Fort Dodge) uncovered several reasons for selecting northwest Iowa. Two factors were most frequently mentioned: First, there was a number of already built but empty factories available for immediate occupancy. In some cases these plants had been vacated during the preceding recession. Second, labor was readily available in western Iowa. These characteristics made western Iowa a favorable location to accommodate quickly the need for a branch plant to meet temporary peak production stemming from high national growth.

Table 22. Coefficients resulting from regressing (linear) the number of eastern and western Iowa plant openings per year on the percentage change in GNP and GSP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept	Slope (β)	R^2	F
No lag in GNP				
West	21.967	.254	.012	.10
East	28.858	-.196	.011	.12
Two-quarter lag in GNP				
West	19.312	1.241*	.239	2.81
East	27.914	.130	.006	.05
Three-quarter lag in GNP				
West	19.500	1.151*	.266	3.26*
East	27.331	.336	.049	.47
Four-quarter lag in GNP				
West	17.627	1.581***	.436	5.96***
East	26.956	.408	.064	.61
Six-quarter lag in GNP				
West	16.773	1.801**	.336	4.56**
East	27.566	.214	.010	.09
Two-quarter lag in GSP				
West	21.222	.505	.148	1.58
East	27.236	.348	.153	1.63
Six-quarter lag in GSP				
West	19.540	.899***	.431	6.82***
East	27.954	.090	.009	.09

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

Table 23. Coefficients resulting from regressing (linear) the annual number of eastern and western Iowa plant closings on the percentage change in GNP and GSP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept	Slope (β)	R^2	F
No lag in GNP				
West	5.601	-.383	.159	1.72
East	7.499	-.106	.019	.17
Two-quarter lag in GNP				
West	6.418	-.713****	.522	9.84****
East	7.451	-.098	.014	.14
Three-quarter lag in GNP				
West	6.131	-.598****	.477	8.18****
East	7.422	-.086	.014	.14
Four-quarter lag in GNP				
West	6.287	-.568**	.374	5.37**
East	7.318	-.042	.003	.03
Six-quarter lag in GNP				
West	6.850	-.724**	.361	5.09**
East	7.502	-.097	.010	.09
Two-quarter lag in GSP				
West	5.113	-.221*	.187	2.10
East	7.233	-.017	.002	.02
Six-quarter lag in GSP				
West	5.092	-.179	.114	1.16
East	7.094	.025	.003	.03

*Significant at the 10 percent level.

**Significant at the 5 percent level.

****Significant at the 1 percent level.

Of course, in both eastern and western Iowa branch plant migrations were more sensitive to changes in aggregate demand than those of unit concerns (Tables 24 and 25). However, the effect of western Iowa was so great that even the closings of indigenous firms were significantly responsive to cyclical GNP variations. It seems the strong "peripheral" effect of western Iowa overpowered the ubiquitous stability of locally-owned plants. The relatively large coefficients relating change in GNP to western local closings indicate that a western Iowa community will have some cyclical outmigration even of unit plants.

The coefficients obtained from regressing eastern branch and local plant closings on changes in GNP (Table 25) were less than half of those for western Iowa. For the four- and six-quarter lags, local western firms closed at a significantly higher rate than western branch plants. Furthermore, the pattern of local plant closings in western Iowa exhibited a mild "accelerator" effect, i.e., plant failures and outmigration increased at an increasing rate as the percentage change in GNP declined (Table 26). Apparently, closings of local plants in the most "geographically peripheral" areas will be little affected for two or three quarters or for small changes in GNP, but then will be strongly affected by persistent and large changes in demand which exceed the threshold. When the growth in aggregate demand slowed or became negative, multiplant firms maintained efficient operations by consolidating production. The branches first to be closed were those on the periphery of the market area. Unit firms in the periphery do not have the option of consolidating production, and thus remain open for the first year but

Table 24. Coefficients resulting from regressing the number of branch and local plant openings per year, eastern versus western Iowa, on the percentage change in GNP lagged from zero to six quarters, 1965-1975

Lag		Y Intercept	Slope (β)	R^2	F
No lag in GNP					
East	Branch	16.882	-.295	.060	.53
	Local	11.977	.099	.007	.06
West	Branch	8.234	.560	.149	1.58
	Local	13.733	-.306	.056	.53
Two-quarter lag in GNP					
East	Branch	15.533	.170	.019	.17
	Local	12.380	-.039	.001	.01
West	Branch	7.444	.895**	.358	5.03**
	Local	11.867	.346	.067	.64
Three-quarter lag in GNP					
East	Branch	14.983	.363	.113	1.13
	Local	12.347	-.027	.001	.01
West	Branch	7.894	.719**	.300	3.85*
	Local	11.607	.432	.135	1.41
Four-quarter lag in GNP					
East	Branch	14.901	.341	.085	.84
	Local	12.056	.067	.003	.03
West	Branch	6.918	.927***	.433	6.9 ***
	Local	10.708	.654	.270	3.33*
Six-quarter lag in GNP					
East	Branch	14.953	.317	.044	.41
	Local	12.613	-.103	.005	.04
West	Branch	6.464	1.042**	.325	4.35**
	Local	10.309	.759	.216	2.48

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

Table 25. Coefficients resulting from regressing the number of branch and local plant closings per year, eastern versus western Iowa, on the percentage change in GNP lagged from zero to six quarters, 1965-1975

Lag		Y Intercept	Slope (β)	R^2	F
No lag in GNP					
East	Branch	4.936	-.222	.102	1.02
	Local	2.843	.053	.007	.06
West	Branch	3.823	-.396**	.349	4.82**
	Local	1.778	.013	.001	.01
Two-quarter lag in GNP					
East	Branch	4.964	-.251	.125	1.26
	Local	2.671	.120	.035	.32
West	Branch	3.915	-.464***	.450	7.35***
	Local	2.504	-.249**	.347	4.76**
Three-quarter lag in GNP					
East	Branch	4.820	-.195	.096	.96
	Local	2.747	.090	.026	.23
West	Branch	3.606	-.346**	.324	4.30**
	Local	2.525	-.252***	.459	7.66***
Four-quarter lag in GNP					
East	Branch	5.071	-.247	.136	1.40
	Local	2.339	.205	.113	1.15
West	Branch	3.507	-.270*	.171	1.86
	Local	2.781	-.298*****	.561	11.46*****
Six-quarter lag in GNP					
East	Branch	5.456	-.358	.168	1.81
	Local	2.084	.277	.122	1.26
West	Branch	3.655	-.308	.133	1.38
	Local	3.195	-.416*****	.648	16.61*****

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

*****Significant at the .5 percent level.

Table 26. Coefficients resulting from regressing (quadratic) the number of branch and local plant closings per year, western Iowa, on the percentage change in GNP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept (β_0)	Coefficient of χ (β_1)	Coefficient of χ^2 (β_2)	R^2	F
No lag in GNP					
Branch	3.611	-.495**	.026	3.75	2.40
Local	1.864	.053	-.010	.013	.05
Two-quarter lag in GNP					
Branch	4.151	-.386*	-.026	.461	3.42*
Local	1.978	-.422***	.052*	.513	4.21**
Three-quarter lag in GNP					
Branch	3.811	-.309*	-.015	.337	2.03
Local	2.137	-.322*****	.028*	.587	5.69***
Four-quarter lag in GNP					
Branch	3.657	-.200	-.017	.185	.91
Local	2.532	.414*****	.029	.612	6.31***
Six-quarter lag in GNP					
Branch	3.924	.024	-.078	.181	.88
Local	3.128	-.499***	.019	.658	7.70****

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

****Significant at the 1 percent level.

*****Significant at the .5 percent level.

eventually they merge or may have to cease production. It seems that if the recession persists and is severe, the indigenous firms may then rapidly cease production. Western branch plants exhibited a higher slope coefficient with a shorter lag (zero, two, and three quarters). But western local firms also had a significant slope coefficient for four- and six-quarter lags. For local plants a mild accelerator or threshold effect seems to be operating. Several western Iowa branch plants terminated production at the onset of each recession and a few local plants closed later in severe recessions.

VI. IMPLICATIONS

A total of 128 Iowa manufacturing plants which were located in rural areas and employed at one time 20 or more employees closed from 1965 to 1975. This 10-year accumulative outmigration is 16.5 percent of the 774 rural plants with more than 20 employees in 1973-74. Thus, in Iowa some rural industrialization, i.e., opening of plants, is needed to maintain the level of manufacturing employment. Net industrial growth in rural areas can occur only if the plant inmigration rate exceeds the outmigration rate.

Both the outmigration and inmigration rates of branch plants are higher than such rates for locally-owned unit plants. If unit plants closed, it was more likely to be because of bankruptcy than relocation. Western Iowa contributed more than its proportionate share to rural Iowa's industrial plant openings and closings. It seems likely these more peripheral western Iowa rural areas will continue to experience the most instability.

Plant ownership influences a community's plant closure risk. Unit concerns have the highest bankruptcy rate in severe business cycles. They cannot save fixed costs by closing branches and thus, may find per unit costs exceed price when demand falls. Branch plants on the other hand have a low propensity for bankruptcy, but their total instability rate is higher in eastern and western Iowa among durable and nondurable products and for large and small plant size. Branch plants will provide many of the available and attractive opportunities for rural area industrialization and associated development in times of expansion.

Rural branch plant migration in Iowa from 1965 to 1975 was very responsive to fluctuations in the national business cycles. Branches exhibited a strong tendency to open during prosperous periods in western Iowa and close during recessions. Such a migration pattern probably will continue, and western Iowa communities should be alert to expect more success for efforts at attracting industry the year after a large growth in GNP. Similarly, when the national economy turns down, Iowa communities should expect a greater chance of closure. However, if national prosperity is strong and sustained, most "geographically peripheral" regions in Iowa may experience a large influx of new industry.

Little can be done by local leaders to alter these opportunities and difficulties presented to them by procyclical plant migration patterns. Opportunities for self-determination by selection and service are limited. Rural regions on the fringe are advised to understand, predict, and adjust to cyclical interest in their industrial sites by big city corporations. What cannot be changed may be more easily accommodated if understood and anticipated. Finally, it should be reemphasized that most rural industries are stable. Closures over 10 years by rural manufacturing plants represented only 16.5 percent of total manufacturing operating in rural areas in 1973-74.

VII. BIBLIOGRAPHY

1. Albert, L.D., and Kellow, James H. "Decision-Makers' Reactions to Plant Location Factors: An Appraisal." Land Economics 45 (August, 1969): 376-81.

2. Alexanderson, Gunnar. Geography of Manufacturing. Foundations of Economic Geography Series. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1967.

3. Bain, Joe S. "Economies of Scale, Concentration, and the Condition of Entry in Twenty Manufacturing Industries." American Economic Review 44 (March, 1954): 15-39.

4. Borts, George H. Regional Cycles of Manufacturing Employment in the United States, 1914-53. National Bureau of Economic Research (Princeton University Press) Occasional Paper No. 73, 1961.

5. Brue, Stanley L. "Local Employment and Payroll Impacts of Corporate Mergers." Growth and Change 6 (October, 1975): 8-13.

6. Bruning, James L., and Kintz, B.L. Computational Handbook of Statistics. Glenview, Illinois: Scott, Foresman, and Company, 1968.

7. Burns, Arthur F. Production Trends in the United States Since 1870. New York: National Bureau of Economic Research, 1934.

8. Estall, R.C. and Buchanan, R. Ogilvie. Industrial Activity and Economic Geography. 3rd (revised) ed. London: Hutchinson and Co., Ltd., 1973.

9. Eversley, D.E.C. "Social and Psychological Factors in the Determination of Industrial Location." Papers on Regional Development. Edited by Thomas Wilson. Oxford: Basil Blackwell, Ltd., 1965.

10. Hamilton, F.E. Ian, ed. Spatial Perspectives on Industrial Organization and Decision-making. London: John Wiley and Sons, Ltd., 1974.

11. Haren, C.C. "Rural Industrial Growth in the 1960's." American Journal of Agricultural Economics 51 (August, 1970): 431-37.

12. Hoover, E.M. The Location of Economic Activity. New York: McGraw-Hill, 1948.

13. Iowa Development Commission. Directory of Iowa Manufacturers: 1963-1964 (5th edition). Des Moines: Iowa Development Commission, 1964.

14. ___________. Directory of Iowa Manufacturers: 1965-1966 (6th edition). Des Moines: Iowa Development Commission, 1966.

15. ___________. Directory of Iowa Manufacturers: 1967-1968 (7th edition). Des Moines: Iowa Development Commission, 1968.

16. ___________. Directory of Iowa Manufacturers: 1969-1970 (8th edition). Des Moines: Iowa Development Commission, 1970.

17. ___________. Directory of Iowa Manufacturers: 1971-1972 (9th edition). Des Moines: Iowa Development Commission, 1972.

18. ___________. Directory of Iowa Manufacturers: 1973-1974 (10th edition). Des Moines: Iowa Development Commission, 1974.

19 ___________. Directory of Iowa Manufacturers: 1975-1976 (11th edition). Des Moines: Iowa Development Commission, 1976.

20. ___________. "Lost Jobs Must Be Replaced." Iowa Digest, November, 1974, 1-4.

21. ___________. 1976 Statistical Profile of Iowa. Des Moines: Iowa Development Commission, 1976.

22. Isard, Walter. Methods of Regional Analysis: an Introduction to Regional Science. Cambridge: The M.I.T. Press, 1960.

23. Kaldor, Don, and Dahlke, Mike. Industrialization Efforts and Experiences in Iowa's Rural Communities. Rural Development Special Series. Ames: Center for Agricultural and Rural Development, 1973.

24. Kamerschen, David R. "The Influence of Ownership and Control on Profit Rates." American Economic Review 58 (June, 1968): 422-47.

25. Krumme, Gunter, and Hayter, Roger. "Implications of Corporate Strategies and Product Cycle Adjustments for Regional Employment Changes." Locational Dynamics of Manufacturing Activity. Edited by Lyndhurst Collins and David F. Walker. London: John Wiley and Sons, Ltd., 1975.

26. Kuznets, Simon. Economic Change: Selected Essays in Business Cycles, National Income, and Economic Growth. London: William Heinemann, Ltd., 1954.

27. Lever, William F. "Cyclical Changes in Factors Affecting Industrial Location." Land Economics 49 (May, 1973): 218-21.

28. Logan, M.I. "Locational Decisions in Industrial Plants in Wisconsin." Land Economics 46 (August, 1970): 325-8.

29. Lonsdale, R.E. "Manufacturing Decentralization, The Discouraging Record in Australia." Land Economics 48 (November, 1972): 321-38.

30. Moroney, J.R. The Structure of Production in American Manufacturing. Chapel Hill: The University of North Carolina Press, 1972.

31. Mueller, Eva; Wilken, Arnold; and Wood, Margaret. Location Decisions and Industrial Mobility in Michigan, 1961. Ann Arbor: The University of Michigan Institute for Social Research, 1961.

32. Nishioka, Hisao, and Krumme, Gunter. "Location Conditions, Factors and Decisions: An Evaluation of Selected Location Surveys." Land Economics 49 (May, 1973): 195-205.

33. North, David L. "The Process of Locational Change in Different Manufacturing Organizations." Spatial Perspectives on Industrial Organization and Decision-making. Edited by F.E. Ian Hamilton. London: John Wiley and Sons, Ltd., 1974.

34. Perloff, Harvey S.; Dunn, Edgar S., Jr.; Lampard, Erid E.; and Muth, Richard F. Regions, Resources, and Economic Growth. Baltimore: Johns Hopkins Press, 1960.

35. Pred, Allan. Behavior and Location, Foundations for a Geographic and Dynamic Location Theory. Lund Series in Geography, No. 28. Lund, Sweden: C.W.K. Gleerup, Publishers, 1969.

36. Rees, John. "Decision-Making, the Growth of the Firm and the Business Environment." Spatial Perspectives on Industrial Organization and Decision-making. Edited by F.E. Ian Hamilton. London: John Wiley and Sons, Ltd., 1974.

37. Richardson, Harry W. Elements of Regional Economics. Baltimore: Penguin Books Inc., 1969.

38. Riley, R.C. Industrial Geography. London: Chatto and Windus, 1973.

39. Scherer, F.M. Industrial Market Structure and Economic Performance. Chicago: Rand McNally and Co., 1970.

40. Steiner, Peter O. Mergers, Motives, Effects, Policies. Ann Arbor: The University of Michigan Press, 1975.

41. Till, Thomas. "The Extent of Industrialization in Southern Nonmetro Labor Markets in the 1960's." Journal of Regional Science 13 (December, 1973): 453-61.

42. Townroe, Peter M. "Post-Move Stability and the Location Decision." Spatial Perspectives on Industrial Organization and Decision-making. Edited by F.E. Ian Hamilton. London: John Wiley and Sons, Ltd., 1974.

43. U.S. Bureau of the Census. Census of Manufacturers, 1967. Washington, D.C.: Government Printing Office, 1971.

44. ______________. Census of Manufacturers, 1972. Washington, D.C.: Government Printing Office, 1976.

45. ______________. Statistical Abstract of the United States: 1975. (96th edition). Washington, D.C.: Government Printing Office, 1975.

46. ______________. Statistical Abstract of the United States: 1970. (91st edition). Washington, D.C.: Government Printing Office, 1970.

47. U.S. Department of Commerce. Social and Economic Statistics. Bureau of the Economic Analysis. Survey of Current Business 56, No. 1 (1976): 6-13.

48. ___________. Survey of Current Business 56, No. 2 (1976): 6-8.

49. Whiting, Larry R., ed. Rural Industrialization: Problems and Potentials. Ames: Iowa State University Press, 1974.

50. Williams, Sheldon W.; Vose, David A.; French, Charles E.; Cook, Hugh L.; and Manchester, Alden C. Organization and Competition in the Midwest Dairy Industries. Ames: Iowa State University Press, 1970.

APPENDIX TABLES

Table A-1. New Iowa industry according to standard industrial classification and year of opening, 1963-1975[a]

	Food and kindred products (SIC #20)		Textile mill products (SIC #22)		Apparel and other finished products made from fabric and similar materials (SIC #23)		Lumber and wood products (SIC #24)	
	Ownership characteristics							
Year	Local	Branch	Local	Branch	Local	Branch	Local	Branch
1963	4	8	0	0	0	0	1	1
1964	5	6	1	0	0	0	1	1
1965	9	4	0	0	1	2	1	2
1966	4	6	0	0	0	2	5	2
1967	1	5	0	0	0	3	3	0
1968	4	9	0	0	0	1	3	2
1969	4	6	0	0	0	0	1	2
1970	3	6	1	0	0	1	2	2
1971	4	6	0	0	0	1	0	1
1972	4	4	0	0	1	4	2	2
1973	4	3	0	0	0	1	3	2
1974	4	9	0	0	0	1	1	0
1975	2	5	0	0	1	0	2	1

[a]SOURCE: calculated from [13-19].

Table A- 1. (Continued)

	Furniture and fixtures (SIC #25)		Paper and allied products (SIC #26)		Print, pub., and allied industries (SIC #27)		Chemicals and allied products (SIC #28)	
	Ownership characteristics							
Year	Local	Branch	Local	Branch	Local	Branch	Local	Branch
1963	1	0	0	3	0	0	2	2
1964	0	0	0	1	0	0	8	9
1965	0	0	0	0	1	1	1	4
1966	0	0	0	0	0	1	0	4
1967	0	1	0	0	1	0	2	5
1968	2	0	0	0	0	0	2	1
1969	1	0	0	1	0	0	0	0
1970	1	0	0	0	0	1	0	0
1971	0	1	0	1	0	1	0	2
1972	1	0	0	0	1	0	0	1
1973	3	0	1	0	0	1	2	3
1974	2	0	0	1	0	0	1	4
1975	0	0	0	0	0	1	3	0

Table A-1. (Continued)

	Petroleum refin. and related ind. (SIC #29)		Rubber and misc. plastic products (SIC #30)		Leather and leather products (SIC #31)		Stone, clay, glass and concrete prod. (SIC #32)	
	Ownership characteristics							
Year	Local	Branch	Local	Branch	Local	Branch	Local	Branch
1963	0	1	0	1	0	0	3	0
1964	0	0	0	0	2	2	6	1
1965	0	0	0	0	0	1	3	2
1966	0	0	1	2	0	0	1	1
1967	0	0	2	1	0	0	0	0
1968	0	0	3	0	0	0	4	0
1969	0	0	0	4	0	0	0	1
1970	0	0	3	3	0	0	1	0
1971	0	0	1	4	0	0	2	1
1972	2	0	3	7	0	0	1	1
1973	1	0	2	5	0	0	3	1
1974	0	0	3	1	0	0	1	4
1975	0	0	2	2	0	0	2	1

Table A-1. (Continued)

	Primary metal industries (SIC #33)		Febricated metal prod., except machinery and (SIC #34)		Machinery, except electrical (SIC #35)		Electronical and electronic machinery, equipment and supplies (SIC #36)	
	Ownership characteristics							
Year	Local	Branch	Local	Branch	Local	Branch	Local	Branch
1963	0	0	6	5	4	0	2	1
1964	1	1	6	4	4	2	0	1
1965	2	1	6	4	1	3	1	2
1966	0	0	5	4	7	0	0	1
1967	1	0	2	6	2	1	0	1
1968	1	1	4	5	0	0	1	0
1969	0	0	4	4	5	2	0	3
1970	1	1	6	5	1	2	1	1
1971	0	1	7	3	1	1	0	1
1972	2	0	1	8	4	2	0	3
1973	1	0	6	3	4	3	0	7
1974	2	0	7	3	7	3	2	1
1975	2	1	3	2	3	0	4	3

Table A-1. (Continued)

	Transportation equipment (SIC #37)		Measuring, analyzing and controlling instruments (SIC #38)		Miscellaneous manufacturers (SIC #39)	
	Ownership characteristics					
Year	Local	Branch	Local	Branch	Local	Branch
1963	0	0	0	0	0	0
1964	1	1	0	0	4	1
1965	0	1	0	0	0	0
1966	2	5	0	0	2	1
1967	0	1	0	0	0	0
1968	0	0	0	0	0	0
1969	2	2	0	0	0	2
1970	3	1	0	0	0	0
1971	1	1	1	0	1	0
1972	2	1	1	0	5	0
1973	4	4	0	0	5	0
1974	3	1	1	0	0	0
1975	1	0	0	0	1	0

Table A- 2. Manufacturing industries classified according to durable or nondurable goods[a]

SIC	Durable goods	SIC	Nondurable goods
24	Lumber products	20	Food and kindred products
25	Furniture and fixtures	21	Tobacco manufacturers
32	Stone, clay and glass products	22	Textile mill products
33		23	Apparel and related products
33	Primary metal industries		
34	Fabricated metal products	26	Paper and allied products
35	Machinery (except elec.)	27	Printing and publishing
36	Electrical machinery	28	Chemicals and allied products
37	Transportation equipment		
38	Instruments	29	Petroleum and coal products
		30	Rubber products
		31	Leather products

[a] SOURCE: [4, p. 156].

The research upon which this publication was written was partially funded through Title V, Rural Development Act of 1972. Single copies of this publication are available free of charge.