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The factors contributing to industrial outmigration from rural areas of Iowa

by

David Lane Barkley

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I. INTRODUCTION

In recent years, renewed interest has been shown in rural development. Regional, state, and local organizations were formed to undertake the measures necessary to raise areal incomes, reduce the rural to urban migration, and augment the amenities offered by rural areas. The inducement of industry into rural communities has been viewed as one means of achieving the above goals. The methods employed to attract such industry have varied from simply expounding the virtues of a nonmetropolitan location to providing complementary site, facility, and utilities. The results of the above efforts have been favorable. The rate of 1959-1969 manufacturing employment growth for nonmetropolitan counties had exceeded that of all SMSA subareas except the communities on the urban fringe (Table I-1).

The rates for manufacturing employment growth somewhat exaggerate the progress small towns have experienced in attracting new industry because the base from which they started was very small. Many rural communities have not participated in, or are not satisfied with, the degree of industrialization that has occurred. Competition among cities for additional manufacturers remains intense, and each new addition to the community is eagerly reported by industrial promotion boards.

Plant closings, which often nullify some of the gains realized through new acquisitions, are not so eagerly brought to the public's attention. Yet the employment loss resulting from these closures is

Table I-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].

significant. In non-SMSA Iowa alone, an average of over 4,000 jobs were eliminated during each of the last eleven years because of plant failures or outmigration. Despite the magnitude and consequences of this phenomena, industrial outmigration has been studied relatively little by rural development organizations or regional economists. Too frequently plant closings have been dismissed as simply a random

happening over which the community has no control. However, these closings are not as random as casual observation would lead one to believe. Manufacturers are not homogeneous; they differ in the types of goods produced, plant size, resources required, and ownership characteristics (branch plants versus independent concerns). These factors can affect the locational stability of firms just as disparities in age, sex, race, and education affect the outmigration rates of workers.

The purpose of this study is to demonstrate both theoretically and empirically why and how specific plant characteristics (plant location with respect to the markets, ownership characteristics, and ownership changes resulting from mergers) can alter the outmigration rates of a community's manufacturers. In the following chapters it shall be shown that: (1) firms located on the periphery of the market area, and recently merged concerns are not locationally stable; and (2) the locational instability of branch plants exceeds that of unit concerns even though the local firm exhibited much higher probability for failure. As a result of these inherent instabilities, communities with a heavy concentration of branch plants, or those areas located at relatively great distances from industrial and population centers, can expect to experience greater difficulty in maintaining or increasing their industrial base.

The characteristics of a region's industry will also alter the susceptibility of that area to fluctuations in the business cycle. Previous studies have found that the regional industrial mix between

durable versus nondurable goods, and high growth versus slow growth industries, will affect a region's cyclical pattern. However, according to Borts, "...the difference in severity of state cycles are wider than would be expected on the basis of industrial composition alone" [4, p. 152]. This unexplained difference could result from the same plant characteristics that reduced locational stability, i.e., the ownership mix of a state's industry and the location of the state with respect to national and regional markets. In rural Iowa, branch plants have exhibited a greater propensity than unit firms for opening during prosperity and closing during a recession. Such a pattern of migration, which becomes more pronounced for isolated regions, contributes a procyclical factor to the region's economy.

The findings underlying the above conclusions are presented in the following chapters. First, a theoretical analysis of the impact of demand changes on branch and unit plant migrations is provided. Secondly, the data and statistical procedures adapted to empirically test for locational instability differences are presented. Finally, interpretations of the statistical findings are suggested.

II. THEORETICAL FOUNDATIONS

A. Branch Plants Versus Unit Plants

1. Introduction

In the following section it shall be demonstrated, with the aid of certain restrictive assumptions, that situations may occur where a branch plant will cease production at a location while a unit firm will continue to operate. Since this chapter is concerned with the locational stability of multi-plant versus single plant firms, the theoretical market structure is restricted to monopolistic competition, oligopoly, and monopoly. A market consisting of primarily monopolistically competitive firms would be the most realistic assumption; however, the complicity of diagraming long run demand changes in such a market (due to the Chamberlinian concept of presenting industry and firm demand curves on the same axis) weakens its effectiveness as an explanatory model. Oligopoly would also closely approximate reality, but the behavior of firms operating within such a market structure is difficult to analyze due to the interdependencies of firms' actions. Therefore, in order to most easily demonstrate the impact of market demand alterations on plant closings, the highly simplified assumption of monopolistic firms is adopted. The monopolistic market structure will more closely approximate reality if transportation costs are sufficient to delineate market areas and reduce competition within these regions (as in a Christallerian Central Place System). In summary, the firms in the following models shall face a less than

perfectly elastic demand for their product. Of the market structures adhering to this criteria, monopoly is the easiest to analyze.

It shall also be assumed that the average cost of producing a given output at a select site will not differ between branch and unit plants, i.e., the long run average cost curves for a branch plant at site A will be similar to that of a unit operation producing the same good at the same location. This may appear to be a grossly unrealistic assumption since many economies are often associated with multi-plant operations. The more frequently mentioned economies are (1) savings on management services, (2) centralized research and development, (3) massed reserves, (4) pecuniary economies, (5) transportation costs, and (6) marketing, advertising, and image benefits. However, Bain concludes after his in-depth analysis of 20 manufacturing industries that

> The economies of large multi-plant firms are left in doubt by this investigation. In half the cases in which definite estimates were received, such economies were felt to be negligible or absent, whereas in most of the remainder of cases they seemed slight or small. Perhaps the frequently expressed suspicion that such economies generally are unimportant after all is supported... [3, p. 38].

Therefore, in the following models all firms producing good X at site A will have similar cost curves, regardless of their ownership characteristics.

The first sections of this chapter will compare the locational stability of branch plants versus unit plants. Part C demonstrates why plant closings may closely follow the merger of a local firm with

an "outside" concern. Throughout this chapter a highly simplified model will first be presented, and subsequently select assumptions will be deleted to make the model conform more closely with reality. At this point it should be emphasized that the following theory does not attempt to prove that branches and acquired firms are always less locationally stable than local-homeowned concerns; only that realistic conditions frequently occur making them so.

2. Theoretical models

Case I. No Transportation Costs, Firms are Profit Maximizers.

Assume:

(1) The market demand curve for good X is linear.

(2) The plants experience both economies and diseconomies of scale, i.e., face a U-shaped long run average cost curve.

(3) There are no transportation costs for either inputs or outputs.

(4) Both the multi-plant and unit concerns behave as profit maximizing monopolists.

(5) The market demand for good X is sufficient to encourage the evolution of either one firm with two branches of optimal size (minimum long run average costs) or two individually owned plants of such size.

(6) The plants are located such that the market is equally divided between the two.

(7) The firms producing good X are members of a constant cost industry.

(8) The individually owned firms do not collude.

Given the above assumptions, the multi-plant monopolist faces the market demand curve. The two branch plants (or each of the unit firms) will experience exactly one-half of the market demand at each price, and therefore, D_1 is their respective demand curve (Figure II-1). Initially the profit realized by each unit or branch plant is the same

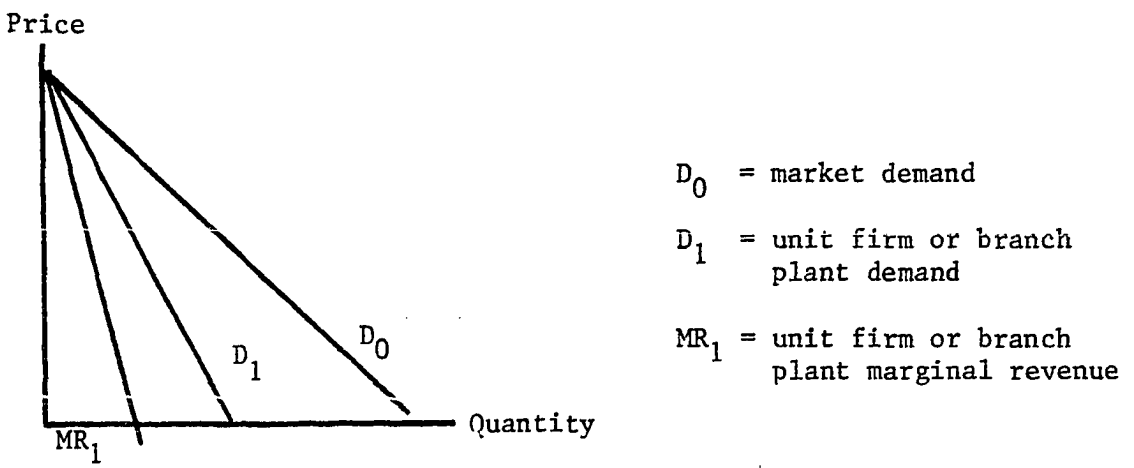

Figure II-1. Market, branch, and unit plant demand and marginal revenue curves

(area ABC in Figure II-2), and the multiplant monopolist reaps a profit of exactly twice this amount. Now assume the demand for good X falls exactly in half, and producers of this item consider this a permanent change. D_1 now represents the total market demand, MR_1 is

the demand facing each branch or unit plant, and MR_2 is the new plant marginal revenue curve. Under the depressed demand situation, the locally owned firms will continue to operate because an economic profit is still obtainable. Each concern will operate at level q_1 and realize a net return of $AEq_10 - FGq_10$. The multi-plant monopolist has two options: (1) operate the two branches at level q_1, or (2) close one branch and increase production the other to q_0, i.e., allow one plant to face the new market demand and marginal revenue curves (D_1 and MR_1). From Figure II-2 it is evident that profit will be maximized by eliminating production at one plant and allowing the other to satisfy the entire market demand.[1] Therefore, in Case I the multi-plant monopolist is induced by scale economies to close one of the branches. Both unit concerns will continue to operate, though at a much reduced level.

If the market demand is great enough to support many plants of optimal size, even a small reduction in sales may precipitate a closing of branches. For example, Bain [3] estimates that the optimal multi-plant firm in the shoe industry includes four or five plants each providing approximately .5 percent of the national industry capacity (Table II-1). Therefore, if the industry consisted of 40 firms each with five plants, a decline in the demand for shoes by 20 percent could encourage every multi-plant firm to eliminate one of their branches.

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[1]Profit for each branch after the change in demand is AFD minus DGE. Twice this amount is less than ABC.

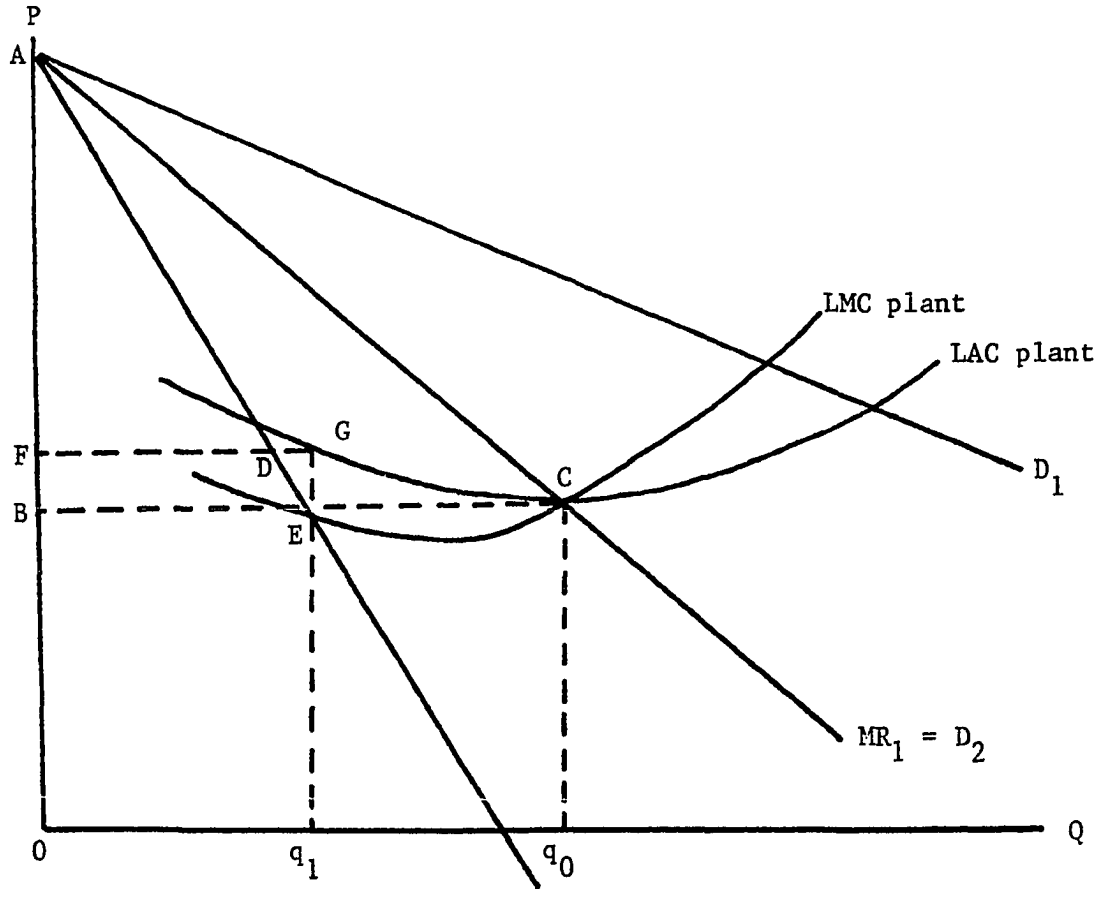


Figure II-2. Production changes in Case I

Case II. No Transportation Costs, Firms are Revenue Maximizers.

All the assumptions of Case I will be maintained except for #4. Since revenue has replaced profit as the decision variable, two additional assumptions are required. These are:

(4a)' The multi-plant monopolist or the unit firms will alter their output, plant size, and the number of plants so as

Table II-1. Estimated absolute capital requirements for plants of estimated most efficient scale, circa 1951, for 20 industries[a]

Industry	Percentage of national industry capacity provided by one efficient plant	Total capital required for one efficient plant[b] (expressed in millions of dollars)
Category 1:		
Flour milling	1/10 to 1/2	.7 to 3.5
Shoes	1/7 to 1/2	.5 to 2.0
Canned fruits and vegetables	1/4 to 1/2	2.5 to 3.0
Cement	4/5 to 1	10.0 to 25.0
Distilled liquor	1 1/4 to 1 3/4	193.0
Petroleum refining	1 3/4	225.0 to 250.0
Meat packing (fresh)	1/50 to 1/5	very small
Meat packing (diversified)	2 to 2 1/2	10.0 to 20.0
Tires and tubes	3	25.0 to 30.0
Category 2:		
Steel	1 to 2 1/2	265.0 to 665.0
Metal containers	1/2 to 3	5.0 to 20.0
Rayon	4 to 6	50.0 to 135.0
Soap	4 to 6	13.0 to 20.0
Farm machines ex tractors	4 to 6	no estimate
Cigaretts	5 to 6	125.0 to 150.0
Category 3:		
Gypsum products	2 1/2 to 3	5.0 to 6.0
Automobiles	5 to 10	150.0 to 500.0
Foundtain pens	5 to 10	6.0
Copper	10	no estimate
Tractors	10 to 15	125.0
Typewriters	10 to 30	no estimate

[a]Source: [3, p. 30].

[b]These estimates generally exclude anticipated "shakedown losses" of new entrants, which in some cases may be large and prolonged.

to maximize revenue subject to a minimum target profit level.

(4b)' The level of market demand is such that the profit constraint is not initially binding, i.e., the firms may maximize revenue and simultaneously exceed the target profit.

The locational stability of branches versus unit plants in Case II is more easily analyzed if the multi-plant monopolist's long run average cost curve is constructed. The unit firm must adopt larger and larger plant sizes if it attempts to increase its production, i.e., it is restricted to movement along its long run average cost curve. However, the multi-plant concern has the option of constructing new facilities if the demand is sufficient to support more than one plant. In the hypothetical situation depicted by Figure II-3, the multi-plant firm will desire two plants once the anticipated output level exceeds

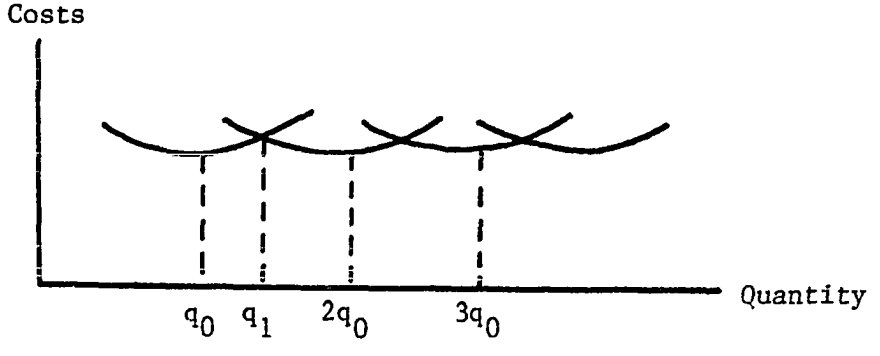
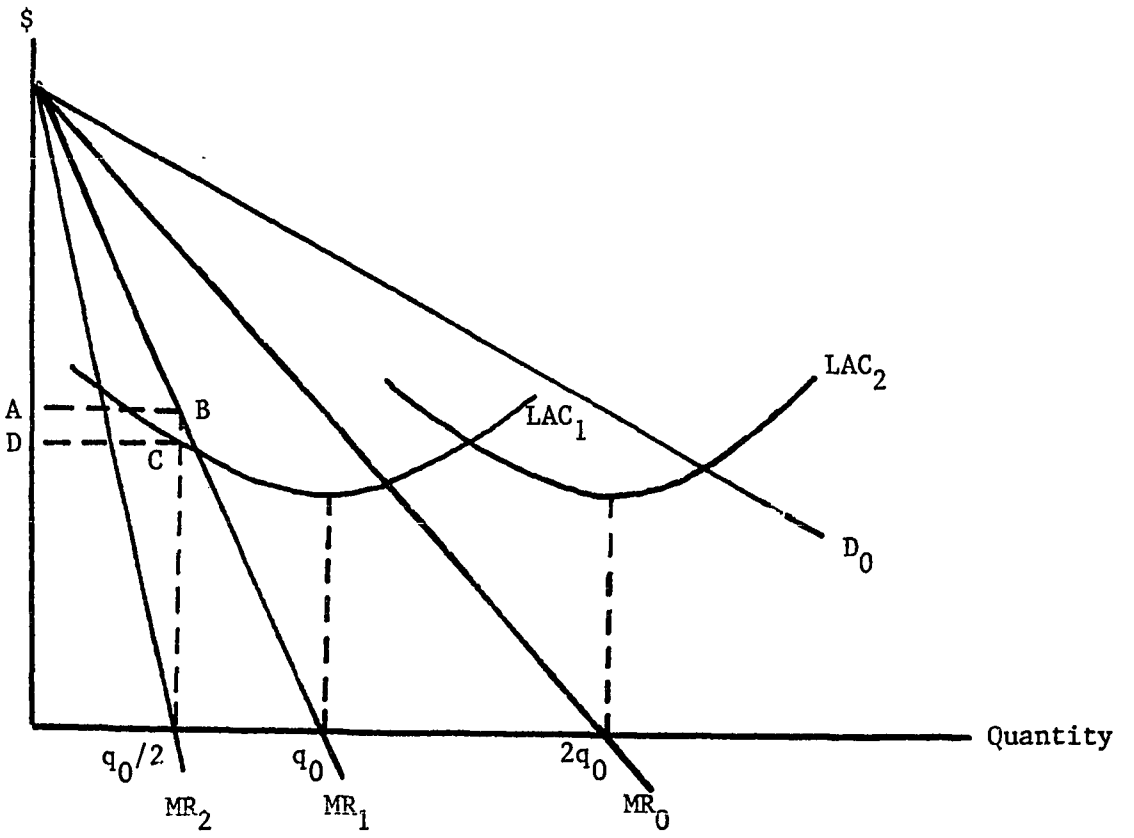


Figure II-3. Multi-plant monopolist's LAC

q_1, and shall construct three plants of optimal size if demand warrants the production of $3q_0$ units of good X. The long run average cost curve facing the multi-plant monopolist is the envelope of the individual branches' cost curves; and as the number of plants approaches infinity, the long run average cost curve of the constant cost multi-plant monopolist approaches a horizontal line.

In Figure II-4, the original market demand (D_0) is sufficient to (1) encourage the revenue maximizing multi-plant firm to construct two branches of optimal size (q_0), or (2) support two locally owned concerns of same size. Now if demand should fall by one-half, MR_0 will represent the new market demand. MR_1 and MR_2 are respectively the demand and marginal revenue of each branch/unit firm in the depressed market. After the fall in demand, branch or unit plants will maximize revenue at $q_0/2$ and realize a profit of ABCD. The unit concerns experience a positive economic profit, and therefore, will continue to operate. The multi-plant monopolist has the option of operating one plant at q_0 or two at level $q_0/2$. Both options provide the multi-plant firm with the same total revenue, but a consolidation of production into one facility would increase profits. Whether the multi-plant company elects to maintain production at two branches or service the market from only one plant will depend on the importance of profits relative to locational inertia, proximity to customers, etc..

However, if the drop in sales is sufficient to reduce profits below the target level, the multi-plant monopolist will no longer behave as a revenue maximizer. To maintain the prescribed profit level,



where D_0 = original market demand

MR_0 = original market marginal revenue

= original demand facing each branch

= original demand facing each unit firm

MR_1 = original marginal revenue facing each branch or unit firm

= the demand faced by each branch or unit firm after the decline in demand

MR_2 = the marginal revenue of each branch or unit firm after the decline in demand

Figure II-4. Production changes in Case II

production will be consolidated into fewer plants to allow more efficient utilization of scale economies. In conclusion, unless the profit constraint is binding, the behavior of the revenue maximizing multi-plant firm will depend on secondary considerations and may not differ from that of the individually owned plants.

Case III. No Transportation Costs, Firms are Utility Maximizers.

Again assume all the assumptions of Case I are maintained except #4. Now the output of the firms is adjusted in an attempt to maximize to utility of the owners (managers) where utility is some function of sales and profit.

$$U = f(\pi, \Sigma)$$

where

π = profit

Σ = sales

$$\frac{\partial f}{\partial \pi} > 0 \qquad \frac{\partial^2 f}{\partial \pi^2} < 0$$

$$\frac{\partial f}{\partial \Sigma} > 0 \qquad \frac{\partial^2 f}{\partial \Sigma^2} < 0$$

Assume the initial market situation is identical to that depicted in Case I (Figure II-5). Both branches or unit plants are producing between q_0 and q_2 units of X and realizing a positive profit

less than ABC. After a reduction in demand by one-half, both locally owned concerns will decrease production, but not below q_1. The multiplant firm is again given the option of operating two branches at an output above q_1 (but less than q_0) or only one plant at a level between q_0 and q_2. Since $2q_1$ is greater than q_0, $2q_0$ exceeds q_2, and the profit for one plant will exceed that of two branches, the multiplant firm is confronted by a tradeoff. Which option is selected will depend on the relative utility of sales versus profit.

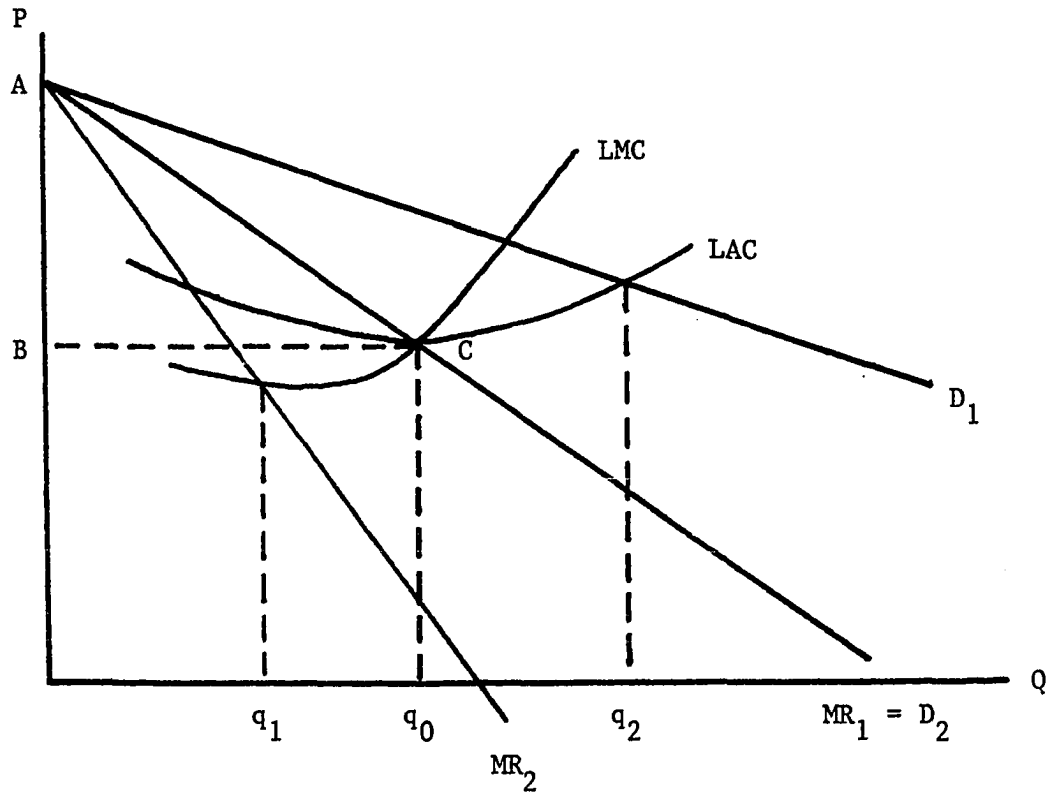
In conclusion, when transportation costs are ignored, a decrease in demand may encourage branches to close while unit plants remain open regardless of the decision variables employed by the owners. However, branches operated by managers desiring to maximize profits are more susceptible to closings than those of revenue or utility maximizing owners.

Case IV. Transportation Costs Exist, Firms are Profit Maximizers.

The introduction of transportation costs into the analysis of locational stability increases greatly the complicity of the problem. In order to maintain a manageable model of firm behavior, Case I (the profit maximizing firms) will be adopted with the following alterations made in assumption #3.

It will now be assumed that:

(3a) Customers are homogenous and uniformly distributed, at a density of τ sales per linear mile (τ^2 sales per square mile), throughout the market area.



where D_1 = one-half of the original total market demand

= original demand confronting each of the two branch or unit plants

= demand facing the plant if only one plant is utilized in supplying the depressed market

MR_1 = original MR confronting each of the two branch or unit plants

= the demand curve facing each of the two branch or unit plants after demand has fallen by one-half, i.e., from D_1 to D_2.

= MR facing the plant if only one plant is utilized in supplying the depressed market.

MR_2 = MR curve facing each of the two branch or unit plants if two plants are utilized in supplying the depressed market.

Figure II-5. Production changes in Case III

(3b) Market areas for each branch or unit plant are circular with a radius of d miles.

(3c) Terminal costs are constant and equal to t dollars per unit.

(3d) Transportation costs consist solely of transporting the final product to the consumers. No costs are associated with acquiring inputs, and the firm pays the transit costs.

(3e) The total cost of shipping each unit will increase with distance, but at a decreasing rate (Figure II-6).

Let

c = total transportation cost per unit of X

$c = f(d)$

$c = d^{\alpha} + t$

where

$0 < \alpha < 1$.

Therefore, the average cost of transporting each unit will decline at an increasing rate with respect to distance.

Figure II-6. Transit costs as a function of distance

Finally, assumption #9 presents the relationship between the density of sales, range of the product, and the demand for good X.

(9) Assume the market demand facing the multi-plant firm is as illustrated below (Figure II-7). Also assume that at each price P_i, customers are distributed at a density of τ_{P_i} per linear mile in rings at distance d_i (where $d_i = d_0$ to d^*) around the plant. To sell the quantity stipulated by the aforementioned demand curve at each price, the firm must ship goods to the limit of its market area, i.e., d^* miles. If the price of X should fall to P_i', the density of sales per ring will increase so that at the lower price ($P_i' < P_i$) more sales could be conducted within a closer proximity of the plant. However, all consumers willing to pay P_i', regardless of their distance from the plant, must be served in order to market the q_i' units of X. So as the price of X falls, τ will

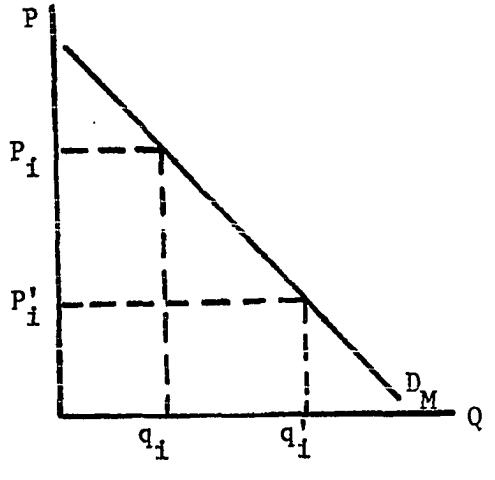


Figure II-7. Multi-plant monopolist demand curve

increase, but the same proportion of goods must be shipped to each ring in order to sell the quantity designated by the market demand curve.

Given the above assumptions, transportation costs can be expressed as a function of quantity and then incorporated into the long run average cost curve of the firms. After this is accomplished, the impact of changes in demand on transportation costs, total costs, and the behavior of multi-plant versus independent concerns will be analyzed.

1) Derivation of transit costs:

Let

TT_{d^*} = Total cost of transporting good X to all the customers within d^* miles of the plant

$TT_{d^*} = \sum_{i=0}^{d^*}$ (quantity of X shipped to customers d_i miles from the plant) · (Cost of transporting one unit of X d_i miles.)

Under assumptions (3a) and (3b), the number of customers in a ring of width $\Delta\mu_i$ miles, and at a distance d_i miles from the plant, equals $(2\pi d_i \tau)\Delta\mu_i$. Therefore, total transit costs may be formulated as:

$$TT_{d^*} = \sum_{i=0}^{d^*} (2\pi d_i \tau^2)(d_i^{\alpha} + t)\Delta\mu_i \ . \qquad (1)$$

So, in the limit

$$TT_{d^*} = \int_0^{d^*} 2\pi d\tau^2 (d^{\alpha} + t)\,dd$$

$$= 2\pi\tau^2 \left[\frac{(d^*)^{\alpha+2}}{\alpha + 2} + \frac{t(d^*)^2}{2}\right] \qquad (1')$$

where d^* = the maximum distance from the plant for which goods are sold.

Equation (1') provides the total transit cost required to transport goods throughout the market area. To ascertain the average transportation cost with respect to quantity, TT_{d^*} is divided by quantity, where $q = \pi\tau^2 d^2$.

$$\frac{TT_{d^*}}{q} = \frac{2\pi\tau^2 \left[\frac{(d^*)^{\alpha+2}}{\alpha + 2} + \frac{t(d^*)^2}{2}\right]}{\pi\tau^2 (d^*)^2} \qquad (2)$$

$$AT_q^{d^*} = 2\left[\frac{(d^*)^{\alpha}}{\alpha + 2}\right] + t \ .$$

In this model, average transit costs in terms of quantity are only a function of the range (d^*) of the market area. This should be expected because as we move down along the firm's demand curve, the increase in quantity sold results solely from a change in the value of τ. At a lower price and higher quantity, both TT_{d^*} and q will increase by the same proportion ($\tau_1^2 = \tau_0^2$); therefore, average costs will not change (Figure II-8).

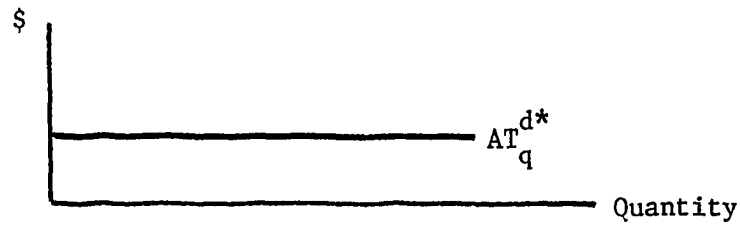


Figure II-8. Average transportation costs expressed as a function of quantity

The only factor that could alter the average transit costs is the range of that plant's goods. For example, if the market was shared by two plants, each with a range of $d^*/2$, then the average transportation cost with respect to quantity would be determined as follows:

$$TT_{d^*/2} = \int_0^{d^*/2} 2\pi d\tau^2 (d^\alpha + t)\,dd$$

$$= 2\pi\tau^2 \left[\frac{(d^*/2)^{\alpha+2}}{\alpha+2} + t\frac{(d^*/2)^2}{2}\right] \qquad (1')$$

$$AT_q^{d^*/2} = 2\left[\frac{(d^*/2)^\alpha}{\alpha+2}\right] + t\ . \qquad (2)$$

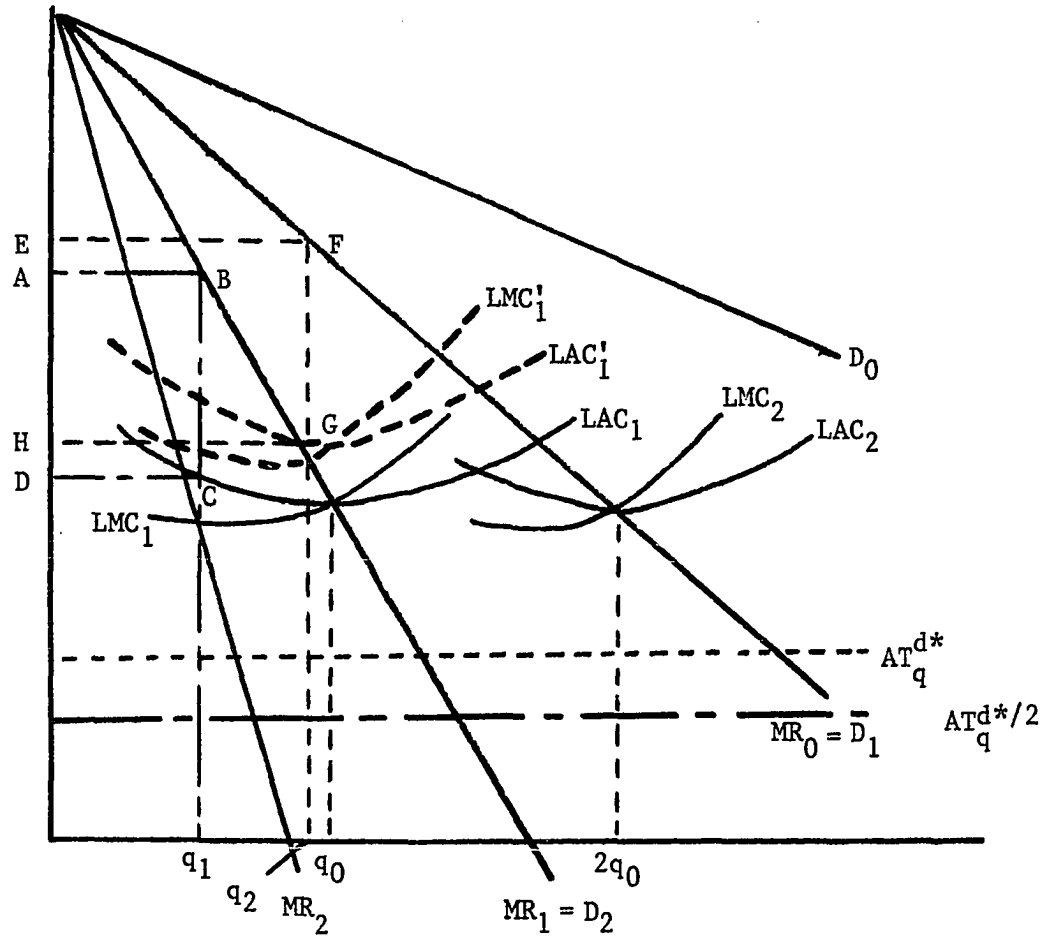
Since $(d^*/2)^\alpha < (d^*)^\alpha$, then the average cost of distributing the product from two plants is less than that of having one plant meet the entire market demand.

2) The impact of transit costs on locational stability:

As should be expected, the effect of a change in demand on the locational stability of multi-plant versus unit plant concerns is less

predictable once transit costs are introduced. If transportation expenses are relatively unimportant, the impact of a decline in sales on the closings of branch plants should not differ from that of Case I. However, industries which experience high transport costs will be less likely to sacrifice locational proximity for the production efficiencies to be gained by consolidating in fewer plants. Figure II-9 provides the example of a firm in which transportation costs represent a large portion of total costs. As in the previous cases, demand is originally sufficient to warrant the use of two branch plants. Now if sales again fall by 50 percent, the demand and marginal revenue curves will shift as before. The multi-plant monopolist must now select between operating one plant at level q_2 or both facilities at q_1. If the firm elects to use only one plant to service the entire market area, average transportation costs will increase from $2[\frac{(d^*/2)^\alpha}{\alpha + 2}] + t$ to $2[\frac{(d^*)^\alpha}{\alpha + 2}] + t$, and the long run average cost curve will shift upward by the amount of the increase in average transit costs, i.e., from LAC_1 to LAC_1'. The profit realized by maintaining production at both branches, 2(ABCD), exceeds the net return of the consolidated plants, EFGH. In the above case, the multiplant firm is no less locationally stable than the independent concerns. However, if α is small relative to 1, or if terminal costs are subject to economies of scale, transit costs may not be sufficient to warrant two plants.

A further inducement to maintain production at all branches is the phenomena that α and t may increase relative to other prices during a cyclical downturn. Hoover notes that during depression



D_0 = initial market D

MR_0 = initial market MR

= market D after decline in sales

MR_1 = MR facing the plant if only one plant is utilized is supplying the market

= demand faced by each of the two branches after the decline in sales

MR_2 = MR faced by each branch after the decline in sales

$AT_q^{d*/2}$ = average transportation costs with two plants

AT_q^{d*} = average transportation costs with one plant

Figure II-9. Production changes in Case IV

periods, the importance of procurement and distribution costs is enhanced because transportation rates are cyclically less flexible. He concludes that, "It is significant that these depression effects predominantly favor a decentralization of both employment and population" [12, p. 147].

3. Additional factors and conclusion

The previous discussion has left the problem of the locational stability of branches versus local plants in considerable doubt. The analysis is further complicated if the assumption of identical long run average cost curves is eliminated. In Bain's [3] study on the economies of multi-plant operations, he discovered some cases in which multi-plant economies equaled two to five percent of total costs. These savings may just be enough to differentiate between branch plant realizing an economic profit and a unit firm not making a "fair" return. Given these economies, branch plants may more easily be able to survive a cyclical or secular downturn in demand. So the oft noted ability of multi-plant firms to attract more capable managers, maintain easier access to the financial markets, and benefit from the aforementioned scale economies implies that the survival rate of multi-plant firms should exceed that of independent operations. The threat of a branch moving out of a community may exceed that of a unit plant, but the possibility of the parent company failing is often viewed as less likely than the closing of a local concern. However, there also exist two factors which would increase the propensity of branch closures

relative to independent firms. First, branches could achieve a savings in overhead costs by consolidating production when sales decline.

North notes that multi-plant firms often react to the stresses of low growth rates and profitability levels by "planned contraction of capacity and a reduction of overheads, thereby enabling more intensive use of capital assets" [33, p. 230]. This is consistent with the previous theoretical cases. Secondly, homegrown-locally owned firms are more likely to experience locational inertia than plants whose owners reside outside the community. Mueller, Wilken, and Wood state that

> In the choice between staying or migrating elsewhere inertia plays a major role. Attitudes are important because they affect sensitivity to changes in the economic environment. If satisfaction prevails, relocation is not likely to come under consideration, unfavorable costs or market changes will tend to be ignored, unless they are of considerable magnitude [31, p. 20].

The owner's satisfaction with a location will be enhanced if he maintains personal ties with the community. A study by the University of Michigan [31] comparing the relative importance of different variables in selecting a location, indicates that the impact of personal factors on the locational decision was much more pronounced in unit concerns than multi-plant firms (Table II-2). Since personal factors weighed heavily on the unit firm's decision to initially locate in an area, it should not be presumptious to assume that they would affect a decision to relocate or not. In fact, North's analysis of industrial migration in England found that,

Table II-2. Explanations given for location of plant by number of plants operated by firm[a]

Main reasons for locating plant at particular site	Number of plants operated by firm: one plant	2-4 plants	5 or more plants
	% of employment represented		
Personal reasons; chance	55	32	20
Opportunity - found good site, etc.	27	16	14
Proximity to customers	16	15	14
Proximity to auto industry	7	14	12
Labor advantages	4	9	7
Proximity to materials	7	6	15
Local concessions and inducements	2	4	7
Better tax situation	4	6	2
Area already established as a center for the industry	1	2	4

[a]Source: [31, p. 16].

> ...very small, privately-owned firms, usually concerned with trade conversion, confined their search to a radius of no more than ten miles about the present factory. Dominating the search was the constraint of retaining most of the existing workers since it often took a small firm several years to build up a loyal labour force: the loss of key workers could be disasterous to the firms development. The avoidance of moving executives' homes and familiarity with the local business environment were added inducements for a short distance transfer [33, p. 233].

So ties to the community and a lack of information about other areas and opportunities may discourage the homegrown concern from seeking a more profitable location. This inertia is largely responsible for Hoover's observation that "branch plants are more responsive to change in locational advantage than independent plants under otherwise similar circumstances" [12, p. 151].

In conclusion, while the probability of a multi-plant firm failing is less than that of a independent concern, three principal factors encourage greater locational mobility for branch plants versus homegrown firms during periods of depressed demand. These are:

(1) The ability of multi-plant firms to increase production efficiencies by consolidating production into fewer plants.

(2) The ability of multi-plant concerns to reduce overhead costs by closing branches and transferring production elsewhere.

(3) The relative lack of locational inertia.

The primary impetus for maintaining production at all facilities would be to minimize transportation costs. Therefore, whether branches are less locationally stable than independent firms will depend on the

relative importance of efficiency (determined by the shape of the long run average cost curve), overhead costs, and inertia versus transportation costs and the differential survival rate.

Note that the same factors that precipitated branch closings will have the opposite effect during a boom period. As sales increase and existing plants are forced to produce at levels beyond the optimal output, the multi-plant firm will open additional branches in order to maintain efficient production and minimize transportation costs. A community that attracts branches, due to certain locational advantages or its position in the urban hierarchy, may experience an influx of new industry during prosperity and an exodus in a depression. Thus, if branch plants are in fact less locationally stable than independent firms, the cyclical sensitivity of the region will be affected by the ownership characteristics of its industry.

B. The Locational Bias of Plant Openings and Closings

The previous theoretical models provided situations in which the multiplant monopolist elected to close some plants and transfer production to the remaining facilities. However, because the production and transportation costs of all branches were assumed similar, the monopolist was indifferent as to which plants to close. In reality, production and transit costs will vary among the different locations, and all of the multi-plant corporation's branches are not equally susceptible to closings. Those facilities whose operations are considered the least efficient (from a production or location

standpoint) will be terminated in order to maintain efficiency in the remaining plants. According to Krumme and Hayter,

> Often the opportunity (recession) is used to close branch plants which are marginal, possibly, however, only from an intra-corporate point of view.... In industries with comparatively mobile and short-lived capital goods (such as the clothing industry), the only function of such marginal plants may have been to accommodate temporary peak production during a preceding economic boom or a period of overlapping product cycle stages [25, p. 331].

These "marginal" plants are not distributed in a locationally unbiased manner. A study of plant closures in Great Britain found that,

> In all cases it was the most geographically peripheral factory relative to the market distribution that had these problems (falling profits, poor access to market areas, and excess production capacity during a recession) and was closed [33, p. 241].

Therefore, regions whose manufacturers must endure higher transit costs, because of greater distances from the population and industrial centers, may be the first to lose their branch plants during a recession. Such communities may have been able to originally attract branches to their high transport cost location because of labor availability. However, during slow growth periods other locations will also have surplus labor; and as a result, their compensating advantage is eliminated.

The peripheral regions that were the first to experience branch closing will be attractive locations once prosperity returns. Resources freed by the previous recession (labor, land, and factories) will induce firms back into the area as such factors of production become less available in regions not as severely affected by plant

closings. The multi-plant firm is now willing to incure the higher transit costs of these locations because of their relative abundance of resources.

According to Lever, evidence of the above cyclical pattern is available. His studies have found that

> ...the five years of peak plant establishment are each preceded by peaks in the unemployment rate and it seems possible that the resources which are used or underused in depressed economic condition form an important incentive to new industry once the process of upswing begins [27, p. 219].

In conclusion, locations which have shown the greatest propensities for plant closings during a recession should also experience the largest relative number of plant openings during prosperity. The procyclical nature of these regions will be quite pronounced.

C. Mergers and Industry Locational Stability

The industrial base of a community may also be affected if one of its firms is acquired by an 'outside' concern. Estall and Buchanan noted that,

> Direct spatial consequences often follow from expansion by takeover or merger as the enlarged company sets out to 'rationalize' its affairs. This process often involves the closing of plants in some centers and regrouping activities in some preferred location [8, p. 114].

So an ownership change through merger may be detrimental to the locational stability of that particular firm.[1]

This section will provide an explanation as to why plant closings may closely follow acquisitions. First, a review of the principal

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[1]Note that mergers shall always refer to local companies being acquired by 'outside' concerns.

motives for merger will be presented. Secondly, three of the motives encouraging horizontal acquisitions shall be analyzed to demonstrate their consistency with subsequent closures. Finally, suppositions as to the negative impact of vertical and circular mergers on location stability and the implications of all mergers on rural development shall be discussed.

1. Motives for merger

A merger is a transaction in the market for corporate control. There exists both a buyer and a seller, and the transaction will occur when the benefits to each party exceed the costs and inertia which may exist. Both parties are influenced by a separate set of expectations which they believe a merger will fulfill. However, it is the acquiring firm that decides whether plants shall be relocated or closed; therefore, it is their desires and expectations that are of primary interest to this study. The following list provides a summary of the buyer's possible motives [39, 40].

(1) The expectation of reduced competition and increased monoply power for the acquiring firm.

(2) A desire to acquire new capacity at bargain prices.

(3) A desire to expand production without depressing prices.

(4) To 'rationalize' the existing production operations of the acquiring firm.

(5) A desire to secure production and/or physical distribution scale economies.

(6) A desire to achieve sufficient size to have efficient access to capital markets or inexpensive advertising.

(7) A desire to diversity to reduce the risks of business or to move from declining to expanding fields.

(8) A desire to overcome critical lacks in one's own company by acquiring the necessary complementary resources, patents, or factors of production.

(9) A desire of managers to control an evergrowing set of subordinates (empire building motive).

(10) A desire of managers to create an image of themselves as aggressive managers who recognize a good thing when they see it.

(11) A desire to utilize tax loopholes not available without merging.

(12) A desire to reap the promotional or speculative gains attendant upon new securities, or changed price earnings ratios.

A firm influenced by motives 1, 2, 3, or 4 will be primarily interested in a horizontal merger. Circular and vertical mergers usually result from expectation 7 and 8, respectively. The remaining motives (5, 6, 9, 10, 11, and 12) may encourage acquisitions of all forms; i.e., either horizontal, vertical, or circular. Of course, all 12 of the aforementioned reasons for merging will not inherently result in subsequent plant closures. However, as shall be demonstrated below, horizontal mergers initiated under motives 3, 4, and 5, in conjunction

with increased monopoly power, could easily lead to closings of the acquired firm's plants.

2. Horizontal mergers[1]

As the demand for an industry's product declines, firms are confronted with excess plant capacity in the short run or a less than optimal plant size during the long run. It was previously noted that multi-plant firms with low distribution costs would consolidate production in such a situation. An alternative response to these detrimental conditions may take the form of mergers and acquisitions. Estall and Buchanan hypothesized that during a recession, "the dangers of overcapacity in an industry can be avoided by 'phasing out' certain production plants after acquisition, and the remaining plant and equipment can be used more intensively..." [8, p. 113]. In other words, mergers enhance the ability of acquiring firms to shut down redundant plants in an industry plagued by excess capacity. However, some degree of imperfect competition must exist prior to or result from the merger, otherwise plant closings may have a detrimental effect on the firm's profitability. This may be easily demonstrated by analyzing the results of a merger in the two extreme market situations (perfect competition and duopoly).

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[1]To show that a recently acquired firm is less locationally stable than a similar locally owned concern, it will again be demonstrated that under certain assumptions the former will be closed while the latter continues to operate.

Case I. Horizontal Merger of Two Single Plant Competitors.

Assumptions:

(1) All firms are profit maximizing competitors.

(2) All firms have identical cost curves.

(3) The relevant time period is the short-run.

(4) Market supply and demand conditions are such that the product price covers average variable costs but not average total costs.

Given the above assumptions, each firm will minimize losses by producing output q_0 at price P_0 (Figure II-10). Now if one firm merges with more than one of its competitors, and subsequently closes the acquired firms' plants, market supply will decrease to S_1 and the remaining firms' losses will be reduced. However, all firms have benefited

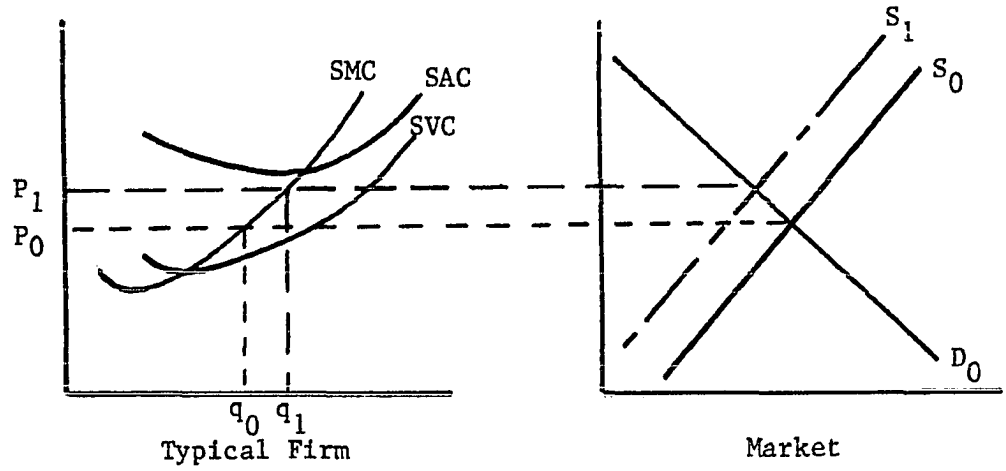


Figure II-10. Mergers and perfect competition

equally from the merger with only the acquiring firm bearing the costs. A company in the above situation would not initiate a merger but instead hope that it would be able to sustain losses for a greater length of time than its competitors.

Case II. Horizontal Merger of Single Plant Duopolists.

Assumptions:

(1) The duopolists are profit maximizers and share the market equally.

(2) The two firms have identical cost curves.

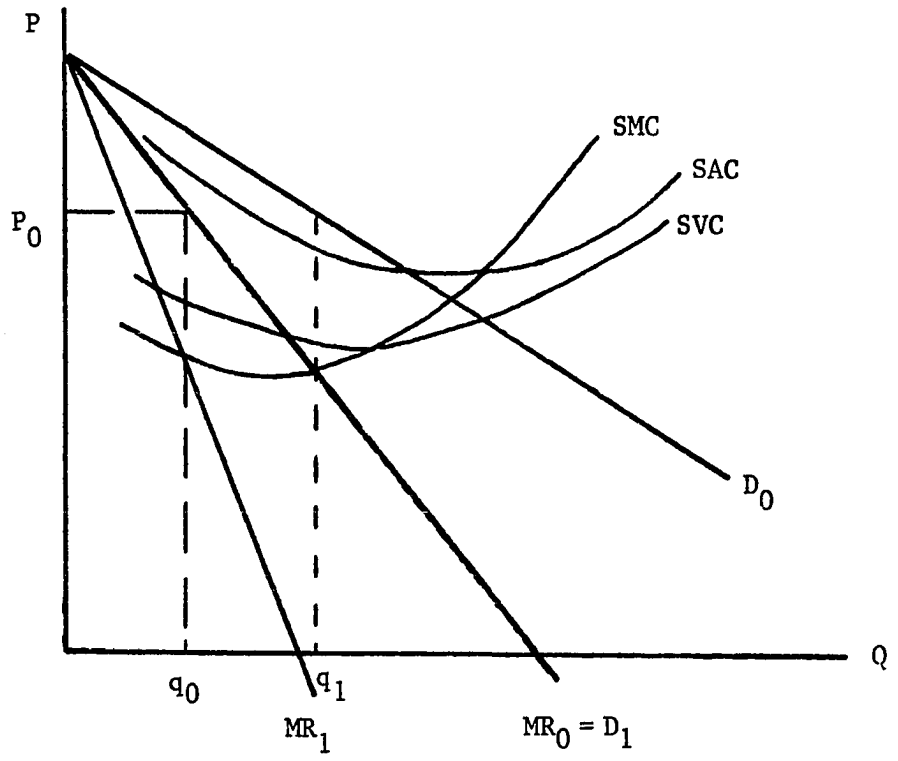
(3) Transportation costs are insignificant.

(4) The relevant time period is again the short run.

(5) The single plant duopolists do not collude.

(6) Market demand conditions are such that the duopolists are plagued by excess plant capacity and short-run loses.

Figure II-11 graphically depicts a situation for which the above assumptions hold. In this example, SAC, SVC, and SMC represent the short-run average total, average variable, and marginal cost curves of the two plants and each firm faces demand and marginal revenue curves D_1 and MR_1, respectively. Initially, each duopolist is minimizing loses by producing q_0 units of X. However, if a merger and subsequent closure occurs, the remaining facility will face the entire market demand (D_0), increase production from q_0 to q_1, and realize a positive profit. Should the discounted value of current and future profits be sufficient to cover the acquisitions costs, a merger will be consummated.



D_0 = market demand

D_1 = demand per plant if two plants share the market equally

MR_0 = marginal revenue if only one plant exists

MR_1 = marginal revenue if two plants share the market equally

Figure II-11. Mergers and duopoly

Case III. Horizontal Mergers and Scale Economies.

A horizontal merger initiated by the desire to secure production scale economies may also lead to plant closures. One firm may acquire another to insure that their market will support a new facility of optimal size. An increase in plant size and output without a

concomitant increase in demand would just result in a decrease in product prices. Therefore, the desire for more efficient production must be accompanied by the expectations of reduced competition and increased monopoly power. Scherer states that "...there simply does not appear to be much opportunity to realize plant scale economies through mergers, unless an interaction effect with monopoly exists" [39, p. 117].

To demonstrate the scale benefits from merger and subsequent closures, a model quite similar to that found in Case IV of the preceding section is adopted. Assume:

(1) Two distinct noncolluding firms (A and B), each with two identical plants, are providing product Z to two circular market areas.

(2) Each company has a plant at location I and II.

(3) The market is divided equally among the four plants.

(4) Each plant is operating at below the optimum scale, but transportation costs are sufficiently high to discourage consolidating into one plant per firm.

(5) As in Case IV of Section B, the average cost of transporting a given quantity of Z varies only with the range of the market area, i.e., the radius of the market.

(6) Firms are profit maximizers.

Given the above simplifying assumptions, the following model shall demonstrate that the profit accruing to the producers of Z would

be increased by merging firms A and B and eliminating a plant at both locations I and II. Figure II-12 depicts the initial market situation. Originally each plant is producing q_0 units of Z at a profit of ABCD. If A and B merge and construct two plants of optimal size, one at each location, the new plants will face the demand and marginal revenue curves $D_m/2$ and $D_m/4$, respectively.[1] The merged company, A and B Incorporated, will be producing q_1 items in each plant and realizing a total profit of 2(EFGH). Since 2(EFGH) is greater than 4(ABCD), the advantages of merger, construction of larger scale plants, and closures exist in this model.

In conclusion, the closures predicted by the previous cases are consistent with North's findings regarding the merger movement in Great Britain. His studies have shown that,

> Occasionally, the decision to take over a company was followed by a decision to close one or more of its factories and move plant, machinery, management, and skilled labour to the parent company's plants. It was the size (market), profitability, and assets of the new company which were important, not its factory or location. Rationalization plans were drawn up to concentrate production activities at a restricted number of sites and so reduce expenditure on overheads, minimize management and administrative duplication and produce a tightly, efficiently run company [33, p. 241].

3. Circular and vertical mergers

Locational instability of the acquired firm is not inherent in any of the motives influencing vertical or conglomerate mergers.

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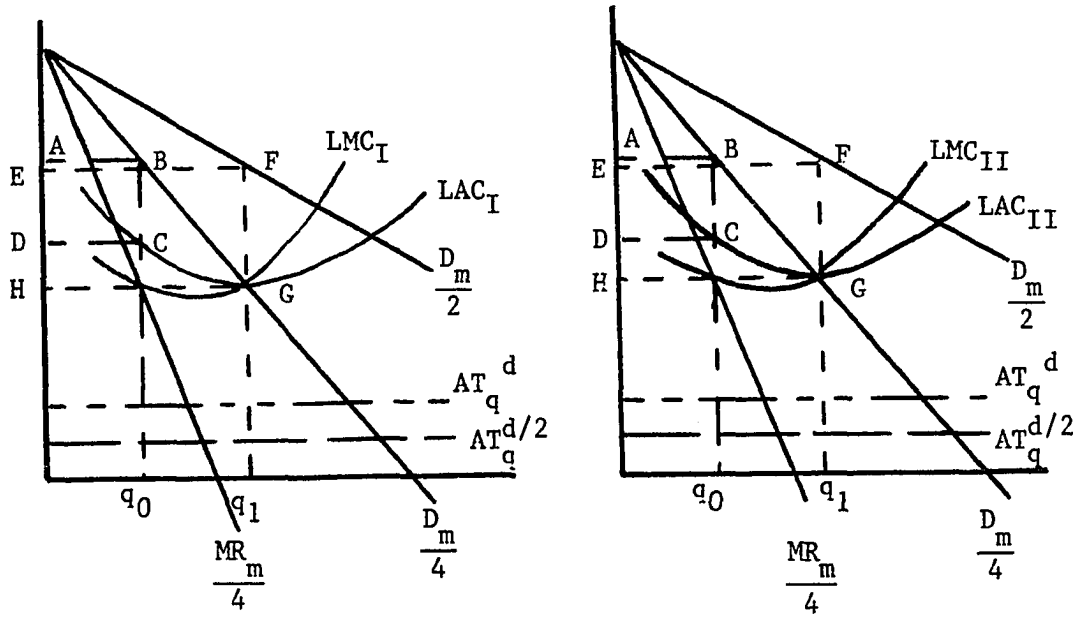
[1]Since average transit costs with respect to quantity are only a function of the radius of the plant's market area, and since the acquisition has not affected this, the cost curves shall remain unchanged.



Location I Location II

Firms A and B

$\frac{D_m}{2}$ = demand for good Z in each submarket (location)

= demand confronting the plant if only one plant exists at each location

$\frac{D_m}{4}$ = demand confronting each plant if two plants exist at each location

= MR if only one plant exists at each location

$\frac{MR_m}{4}$ = marginal revenue if two plants share the market at each location

Figure II-12. Mergers and scale economies

However, there exist two factors which may increase the propensity for plant relocation or closure of recently acquired firms over similar locally owned concerns. First, the ownership change resulting from the acquisition should reduce the locational inertia accruing from the previous owner's personal ties to the community. The new management

should be more responsive to locational advantages that have developed elsewhere. Secondly, managerial problems may prevent the merger from becoming a success.[1] As the acquiring company increases in size, the ability of management to oversee and coordinate all aspects of the operation may decline. The increased remoteness of management and decision making may create problems in the more distant plants and lead to labor difficulties. These difficulties may in turn lead to dissatisfaction with the current location and encourage either relocation or closing of the facility.

4. Mergers and regional development

Even if the merger of a local company with an 'outside' concern has no impact of the locational stability of that firm, it may still be detrimental to the development of the region. A study by Brue on the local employment and payroll impacts of corporate mergers in Nebraska found that,

> Rather than serving to increase employment and payroll growth, it would appear that corporate mergers may, in fact, adversely affect employment and payrolls in the localities of the acquired firms. This is, of course, a generalized conclusion. In many cases post-merger growth rates far exceeded pre-merger rates and the rates of comparable firms; in other instances, the opposite was true. On the average, and in the aggregate, however, the local employment and payroll impacts were adverse [5, p. 10].

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[1] This failure rate is not insignificant. A study noted by Scherer [39] found that one merger in every six ended in failure in the sense that the acquired firm failed to make a profit within three years, or acquired products had to be changed radically, or the acquired company was subsequently sold.

Furthermore, the acquired company may abandon his local suppliers (banking, materials, legal services) in favor of those selected by the new management. These abandonments will generate additional adverse employment and payroll impacts throughout the community.

Another detrimental effect of mergers is the decline in the quality and quantity of endogenous entreprenuerial and managerial talent. These talents will be attracted to those regions with the greatest possible opportunities, and as corporate headquarters move out of a region, so will this talent.[1] The Scottish Council for Development and Industry has long appreciated the consequences of mergers on the location of entreprenuerial talent. They feared that,

> ...the quantity and quality of management in Scotland was in danger of declining through business mergers and takeovers, which were removing decision-making powers (and thus the decision makers themselves) from the country. As management posts decline in this way so does the vigour and drive of the whole public life of the community run down [8, p. 106].

D. Conclusions

The preceding theoretical models have provided this study with three general hypotheses. These are:

(1) Unless transportation costs are high, the locational stability of unit plants will exceed that of branch plants. Furthermore, branches will exhibit a greater propensity for closing

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[1] Iowa has experienced a fairly substantial net loss of corporate control in manufacturing. From 1955 to 1968, Iowa companies acquired 42 out-of-state concerns; however, during the same period 110 Iowa firms were purchased by companies outside the state [5].

during a recession and opening in prosperity than local concerns.

(2) Plant locational instability is not geographically unbiased. Those regions located at the periphery of the market area should realize relatively greater plant outmigration during a recession and inmigration during prosperity than areas more centrally located.

(3) Recently acquired firms should be less locationally stable than plants where an ownership change has not occurred. This instability will be greatest among firms engaged in horizontal, product extension, and market extension mergers.

In the following chapter, the data and methods employed to test the above hypotheses are presented. Chapter IV provides a summary of the results.

III. DATA SOURCES AND STATISTICAL METHODS

A. Data Sources for the Plant Openings and Closings

1. Plant openings

To analyze the impact of demand fluctuations and mergers on the migration of rural manufacturers, a sample of inmigrating and outmigrating plants for non-SMSA Iowa was required and procurred.[1] The names and characteristics (Iowa location, principal products, year production was initiated, ownership characteristics, and headquarters) of all the inmigrating firms were acquired from annual Iowa Development Commission publications [13-19]. The Development Commission applied a two stage process to insure that the information obtained about the new firms was complete and accurate. First, the names and characteristics of the incoming plants were acquired from public reports (newspapers, Chamber of Commerce newsletters, etc.) and contacts with local organizations or individuals (local development commissions or Chambers of Commerce, city clerks of incorporated communities, and county clerks for data pertaining to unincorporated towns). Secondly, the inmigrating company was contacted and requested to verify the information collected in step one. The Iowa Development Commission believes that they were

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[1]The term outmigrating is interpreted loosely to refer to plants that had either actually transferred production from one community to another or those that had ceased production altogether. Inmigration is also a slight misnomer. It refers to both the "birth" of a company and the movement of an already existing firm into the community. Since plant inmigrations and "births" or outmigrations and "deaths" affect community development in a similar fashion, the above definitions will be considered interchangeable.

quite diligent in their search for the names and characteristics of new industry. They estimate their reply rate to be near 98 percent. My own experience with the data leads me to conclude that it is quite accurate, though in a very few cases firms that were listed as opening never evolved past the planning stage into actual production.

The criteria used for selecting which plant openings to include in the survey differed in two ways from that applied to plant closures. (1) Information on inmigrants was selected for the period 1963-1975. The sample of outmigrating firms was collected from a shorter time horizon, 1965-1975. (2) Only firms employing twenty or more were considered for the outmigrating sample. No information pertaining to the projected employment of new firms was available, therefore, the list of plant openings contains firms of all sizes. It is unfortunate that the two samples are not more similar; however, since the procedures used to obtain data on closed plants relied heavily on the respondents' memories, these alterations (shorter time horizon and larger plants) were necessary to insure greater accuracy in their answers. Because of the above disparities, the reader must be careful when comparing and contrasting the openings and closings of Iowa firms.

The data collected from the Iowa Development Commission on plant openings according to ownership characteristics (branch versus local) are presented below in Table III-1. Additional characteristics pertaining to the new firms are provided in Tables III-6 and A-2 of the Appendix.

Table III-1. 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].

2. Plant closures

The sample of plant closures, and the data concerning each (Iowa location, date closed, peak employment, principal products, ownership characteristics, merger partner and date of merger [if any], and reason for closing), had to be generated. The following series of operations were required. First, the outmigrating firms were isolated from the survivors. This entailed comparing the listings in the 1965 through 1975 Iowa Directory of Manufacturing [14-18] with the 1975-76 edition [19], and noting those companies whose names appeared in the earlier

directories but not in the latest publication.[1] Next, these apparently "deceased" firms were classified according to communities and size. Finally, knowledgeable individuals in each community, and whenever possible, executives associated with the "potentially outmigrating" firm were contacted by telephone.[2] These persons were requested to confirm or deny the closing or outmigration of particular plants in their community or with their company. In many cases, the plants provided by the "survival" method were too small to include, or they were still in operation but under a different name. If the operation had in fact ceased, 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; i.e., was the facility locally owned, not locally owned but an independent operation, a branch or subsidiary of another company.

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[1]The Iowa Directories of Manufacturing are bi-annual publications of the Iowa Development Commission. The information contained in each edition (company name, Iowa location, principal products, employment, plant manager or owner, and location of headquarters) is acquired through surveys with local development commissions and Chambers of Commerce, city or county clerks, and the manufacturers. Again, my experience with the data leads me to conclude that the Directories are quite accurate. However, a degree of underreporting was noticed during my interviews with local Chambers of Commerce.

[2]The most frequently contacted individuals in the communities were persons of leadership in the local development commissions of Chambers of Commerce, Iowa State Extension personnel, or the mayors or bank presidents of the smaller municipalities.

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

(6) Had the plant, or parent company of the plant, been acquired by another individual 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 any management personnel who had remained in the area after the local operation had ceased.

If other sources of information (such as corporate executives, previous employees, or the original owners) were available, they were also contacted and requested to answer the above questions.

In total, 197 communities plus numerous companies and employees were contacted. The data obtained through these surveys (location of the closed plant, peak employment, principal products, headquarters, parent company [if any], date of and reason for closing, names of the merged firms and date of acquisition) are provided in Table A-1 of the Appendix. The ownership characteristics of the 128 outmigrating or closed plants are summarized below in Table III-2.

With only rare exception, the individuals contacted were extremely cooperative and willing to provide the necessary information. Frequently, the initial interviewees were able to provide additional sources and even closed firms that the "survival" method had not

Table III-2. Branch and local plant closings in rural Iowa, 1965-1975[a]

	Closings		
Year	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

[a]Source: Appendix Table A-1.

isolated. Because of this high degree of cooperation, it is my judgment that this survey had located almost all of the rural Iowa manufacturers which had employed over twenty workers and outmigrated or ceased production during the last ten years. It is also my opinion that the information concerning each firm is accurate, though this accuracy is probably less for those plants closed several years ago.

It should be noted at this time that two specific classes of firms have been segregated from the lists of migrating plants. The categories receiving separate consideration were the milk processors and fertilizer blending operations. They were excluded because:

(1) All creamery closings resulted from changes in milk processing technology. The large number of new fertilizer blending plants that were constructed from 1965-1968 was due to the oil companies' attempts to establish retail outlets for their products. Since members of the above manufacturing groups reacted similarly to the "stresses" of the period, a case study of these firms was not warranted.

(2) These migrations occurred in such great magnitude as to dominate the relationships to be estimated for Iowa firms.

(3) It would have been extremely difficult to differentiate between plant openings and closings and mere name changes resulting from mergers and acquisitions.

Due to these problems, the creameries and fertilizer blending plants were analyzed separately. An explanation for the migration trends exhibited by the above industries is presented in Section B of the Appendix.

In conclusion, the following information concerning rural Iowa plant openings and closings has been obtained. This data will be analyzed (using methods introduced in the following section) to determine the influence of ownership characteristics, plant size, product line, location, mergers, and business cycles on industrial migration.

Plant openings (1963-1975)	Plant closings (1965-1975)
1. Iowa location	1. Iowa location
2. Principal products	2. Principal products

Plant openings (1963-1975)

3. Year of opening
4. Ownership characteristics
5. Headquarters

Plant closings (1965-1975)

3. Year of closure
4. Ownership characteristics
5. Headquarters
6. Reason for closing
7. Ownership changes, i.e., mergers (if any)
8. Peak employment

B. Statistical Methods and Expected Relationships

1. Migration rates

It was previously hypothesized that the probability of a unit firm failing exceeded that of a multi-plant corporation, yet branch plants were still less locationally stable because of their greater propensities for migration. To test these hypotheses, outmigration rates were computed for the sample of closed Iowa firms. These migration rates are simply the ratio of the number of outmigrating firms in a select classification (SIC, employment size, branch plants, local plants, location, etc.) to the total number of rural Iowa manufacturers in such a category at a particular point in time (in this case 1973-74). Plant closures for the entire period of study (1965-1975) were included in the computation of these rates to minimize the importance of cyclical variations in migrations. The denominators for the ratios were obtained from the 1973-1974 Directory of Iowa Manufacturers [18].

If branch plants were in fact less locationally stable than unit concerns, their migration rates must be significantly greater than those of the indigenous plants.[1] However, this rate differential does not conclusively prove that ownership characteristics were the source of the instability differences. Branches and local plants also differ in the types of products produced and in average plant size (see Tables III-3 and III-4). If a disproportionately large number of rural Iowa's branches were producing in "declining" or "footloose" industries, or if large plants were more responsive to changes in locational advantage than the smaller companies (possibly because of better access to the capital markets or superior management), the locational instability credited to ownership may have actually resulted from disparities in industrial composition and plant size. The influence of these variables was controlled for by computing outmigration rates within select industrial and employment classes. Had multi-plant firms exhibited a greater propensity for plant closings due to the possibility of achieving scale economies and the relative absence of locational intertia, the outmigration rate of branches should exceed that of indigenous companies regardless of the product type or employment categories utilized. A higher rate of closings for branches could also result if branch plants were more heavily concentrated in the higher transit cost western

[1] The statistical method used to test for significance of difference between two proportions is explained in Section B of the Appendix.

Table III-3. The employment characteristics of rural Iowa manufacturers, branch versus local, 1973-1974[a]

Employment classes	Local	% of local	Branch	% of branch	Total	% of 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		350		774	

[a]Source: calculated from [18].

Table III-4. The industrial composition of rural Iowa manufacturers, branch versus local, 1973-1974[a]

Ownership characteristics	Industrial composition[b]		
	Durable	Nondurable	Total
Branch	153	197	350
Local	211	213	424
Total	364	410	774

[a]Source: calculated from [18].

[b]The deliniation between durable and nondurable goods is presented in Table A-5 of the Appendix.

region of the state than unit concerns.[1] However, such a distribution did not occur. The proportion of the state's branch plants in each region (eastern and western Iowa) was almost identical to the proportion of the state's unit firms in those areas (see Table III-5). Since no significant difference existed, controlling for the influence of location on long term migration rates was not necessary.

Table III-5. The distribution of rural manufacturers between eastern and western Iowa, branch versus local, 1973-1974[a]

	Region			
	Eastern Iowa		Western Iowa	
Ownership characteristics	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].

2. Plant migrations and the business cycle

The ownership mix, branch versus local, of a community's manufacturers may also affect that community's unemployment rate over the business cycle. Branch plants should exhibit a greater propensity

[1]The line of demarcation closely followed the route of Interstate Highway #35.

than unit firms for opening during prosperity and closing during a recession. If Iowa's branches were relatively more responsive to demand fluctuations, the relationships graphed below (Figures III-1 and III-2) will result from regressing plant openings and closings on the percentage change in GNP or Gross Iowa State Product (GSP).[1] However, realization of these slope relationships does not guarantee that the ownership mix was responsible for the observed differences. Similar coefficients would have resulted if branch plants were more heavily concentrated than indigenous firms in the production of the most cyclically sensitive durable goods. Therefore, it is possible that the observed dissimilarity in unit and branch plant cyclical sensitivity resulted from differences in industrial composition and not ownership characteristics; the true relationship being disguised by correlation. To control for the influence of industrial mix, the sample Iowa openings and closings were divided into durable and nondurable manufacturers and again regressed against changes in GNP and GSP. If the coefficients resulting from these regressions conform to the previous diagrams, it can be concluded that the ownership characteristics of an area's industry affect the severity of that region's business cycles.

To obtain additional information on the patterns of plant migration, plant openings and closings will also be regressed quadratically

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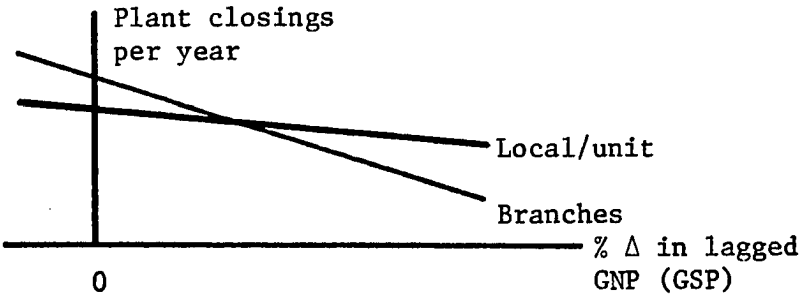
[1] Plant openings and closings were regressed against current changes in GNP (no lag); percentage change in GNP lagged two, three, four, and six quarters; and the percentage change in GSP lagged two and six quarters. Examples of the above lags are provided in Tables A-3 and A-4 of the Appendix.



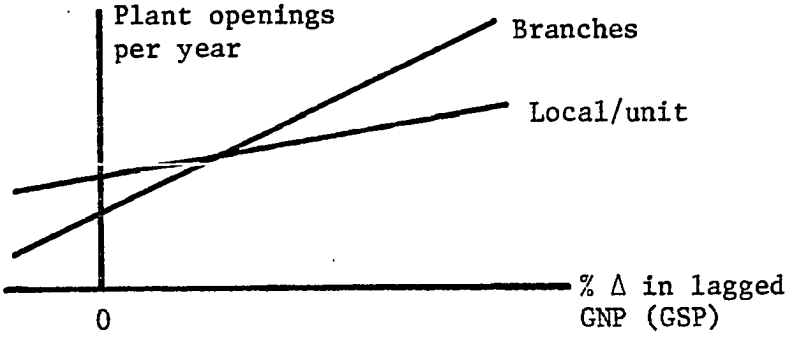
Branch closings = $A + B(\Delta \text{ GNP})$

Local closings = $\alpha + \beta(\Delta \text{ GNP})$

where $B, \beta < 0$

$|B| > |\beta|$

Figure III-1. Hypothesized regression results for plant closings



Branch openings = $E + D(\Delta \text{ GNP})$

Local openings = $\varepsilon + \partial(\Delta \text{ GNP})$

where $D, \partial > 0$

$D > \partial$

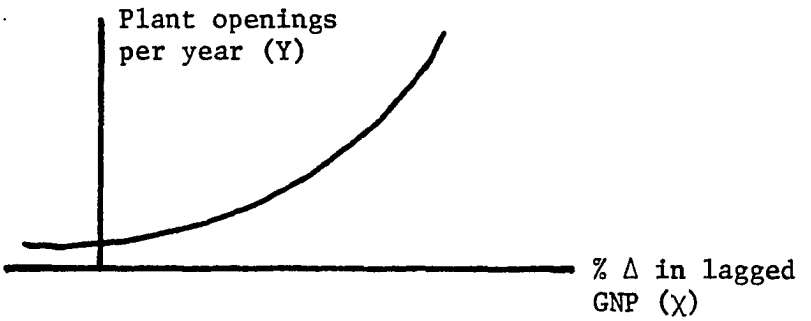
Figure III-2. Hypothesized regression results for plant openings

on changes in GNP. If these regressions are significant and conform to Figures III-3 and III-4; plant migration may be susceptible to a "threshold" effect, i.e., the annual number of plant openings and closings will remain fairly stable until the change in GNP exceeds a certain level. An alternative pattern is what I shall refer to as the "accelerator" effect (Figures III-5 and III-6). Under the accelerator concept, annual plant openings and closings are fairly constant when the percentage growth rate of GNP is above a certain level. However, as the percentage change in GNP falls below this rate, plant closings increase and plant openings decline very rapidly. Intuitively, I find the "accelerator" effect for closings, and the "threshold" effect for openings, the most attractive of the four nonlinear relationships.

3. Branch plant migration, eastern versus western Iowa

The locational bias of cyclical industrial migrations will be tested by regressing changes in GNP on the branch and local plant openings and closings of eastern and western Iowa (Tables III-6 and III-7).[1] Since most of the headquarters and markets for Iowa branches are located in the East, and since eastern Iowa is a part of the everenlarging Chicago industrial zone, western Iowa could be considered the more "geographically peripheral" region. If the findings of North [33], Krumme and Hayter [25], and Lever [27] are applicable to rural Iowa,

[1] The line of demarcation closely follows the route of Interstate Highway #35.

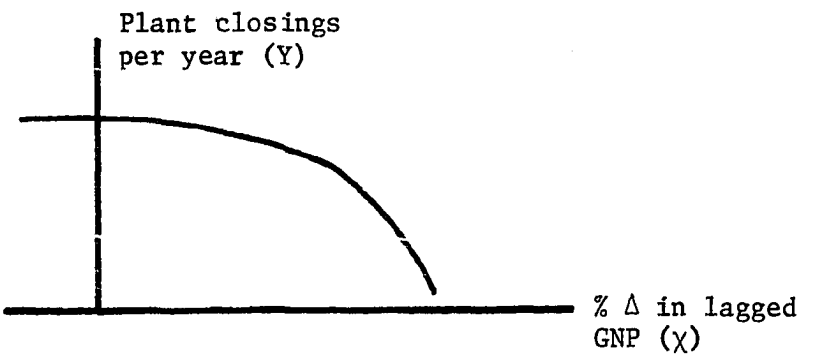


$$Y = \beta_0 + \beta_1\chi + \beta_2\chi^2$$

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

$\beta_2 > 0$

Figure III-3. "Threshold" effect for plant openings.

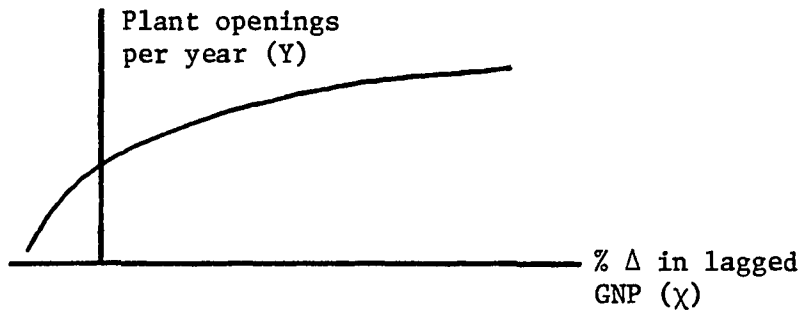


$$Y = \beta_0 + \beta_1\chi + \beta_2\chi^2$$

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

$\beta_2 < 0$

Figure III-4. "Threshold" effect for plant closings.

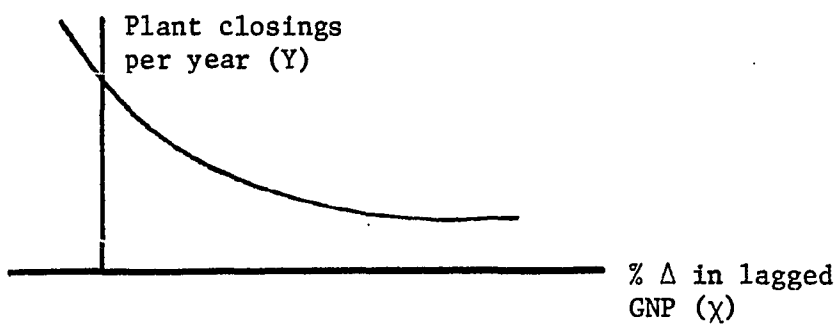


$$Y = \beta_0 + \beta_1\chi + \beta_2\chi^2$$

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

$\beta_2 < 0$

Figure III-5. "Accelerator" effect for plant openings



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

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

$\beta_2 > 0$

Figure III-6. "Accelerator" effect for plant closings.

Table III-6. Annual branch and local plant openings for eastern and western Iowa, 1965-1975[a]

	Region					
	Eastern Iowa			Western Iowa		
Year	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 III-7. Annual branch and local plant closings for eastern and western Iowa, 1965-1975[a]

	Region					
	Eastern Iowa			Western Iowa		
Year	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

[a]Source: Appendix Table A-1.

Table III-7 (Continued)

	Region					
	Eastern Iowa			Western Iowa		
Year	Local	Branch	Total	Local	Branch	Total
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

western branch plant migrations should be more cyclically sensitive than those of eastern Iowa. This sensitivity difference is indicated by steeper slopes and higher R^2's for the regressions on western branch openings and closings than on eastern migrations.

4. Mergers and locational instability

Finally, the outmigration rates of acquired firms were estimated to determine if mergers affected the locational stability of rural manufacturers. These rates are simply the ratio of the number of merged firms that closed their plants within two years after being acquired to the total number of rural Iowa manufacturers that were acquired from 1965-1975. Unfortunately, no data was available on the number of Iowa firms that merged furing the period of study; therefore, this information had to be estimated. The following two procedures were applied to determine a proxy for the base.

1) Estimation from Current National Data:

Assume that every manufacturing plant in the U.S. had an equal probability of being acquired. In 1967, rural Iowa had .575 percent of the nation's manufacturing plants with employment greater than 20 [43]. This percent had increased to .612 by 1972 [44]. Given the above assumption, approximately .594 percent of the nation's acquired plants should have resided in Iowa. From 1965 through 1975, about 10,652 mergers concerning manufacturing plants occurred with the United States [45, 46]. The estimated number of acquisitions that were consummated in the study area is .594 percent of 10,652 or 63.

2) Estimation from Past Iowa Data:

Again assume that every manufacturing plant in the nation had an equal probability of being acquired. From 1955 through 1968, 110 Iowa companies were acquired by "out of state" firms, an average of 7.86 mergers per year [5]. Assuming that the average annual merger rate for 1965 to 1975 did not differ greatly from that of 1955 to 1968 (see Table III-8), approximately 86 Iowa firms were acquired during the eleven years covered by this study. Non-SMSA Iowa had an average of 59 percent (59.7 percent in 1972 and 58.1 percent in 1967) of Iowa's plants with an employment greater than 20 [43, 44]; therefore, 59 percent of 86, or 51 mergers should have occurred in rural Iowa from 1965 to 1975. Since the merger data from which this base was derived did not include the acquisition of Iowa companies by in-state corporations, the estimate of 51 firms is biased downward.

Table III-8. Acquisitions of manufacturing firms, United States, 1955-1975[a]

Year	Number	Year	Number
1955	491	1966	826
1956	569	1967	1,261
1957	506	1968	1,948
1958	503	1969	1,766
1959	734	1970	1,045
1960	742	1971	760
1961	780	1972	627
1962	744	1973	578
1963	716	1974	500 est.[b]
1964	712	1975	500 est.
1965	826		

[a]Source: [45, 46].

[b]The 1975 Statistical Abstract of the United States did not have merger data for 1974 and 1975. The 1974 and 1975 figures are estimates made by the author and based on extrapolation.

The above estimates of 63 and 51 will be used to calculate the outmigration rates for merged firms.

To ascertain if particular forms of mergers (horizontal, product extension, market extension, vertical, or conglomerate) were more detrimental to the locational stability of the acquired firm than others, migration rates were calculated according to the type of acquisition. However, the denominators for these migration ratios also had to be estimated before any comparisons could be attempted. No data were available pertaining to the percent of U.S. mergers of each type, but the percentage distribution of assets acquired in large mergers was procurred for the period 1964 to 1972 (Table III-9). If there existed

Table III-9. Distribution of assets acquired in large mergers by type and period (percentages)[a]

	1964-67	1968	1969	1970	1971	1972[b]	1973-75[c]
Horizontal	11.4	4.2	19.4	15.2	20.4	30.0	15.0
Market extension	8.7	5.9	3.1	4.2	2.2	0.0	5.6
Vertical	8.9	7.2	7.7	4.5	3.2	7.6	7.3
Subtotal	29.9	17.3	30.2	23.9	25.8	37.6	27.9
Product extension	49.9	39.0	31.7	43.6	30.8	44.5	43.2
Pure conglomerate	21.2	43.6	38.1	32.5	43.4	17.9	28.8
Subtotal	71.1	82.6	69.8	76.1	74.2	62.4	72.1
TOTAL[d]	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[a]Source: [39, p. 24].

[b]Excludes companies for which data not publicly available. The FTC is now revising all series to exclude such companies. The exclusion does not alter the trends.

[c]The 1973-1975 data were not available. The percentages reported for the 1973-1975 period are the averages for the preceding nine years (1964-1972).

[d]Details do not always add to totals due to rounding.

little bias in the size of firms acquired in each type of larger merger, the percentage distribution of assets will provide a good proxy for the percentage distribution of firms by merger type. By applying these percentages to the total number of U.S. manufacturing firms acquired annually (Table III-8), the number of U.S. mergers of each category was obtained. From this data, the number of rural Iowa mergers of each type was estimated using the methods previously discussed. Table III-10 provides the results of these estimating procedures.

Table III-10. Estimated number of rural Iowa mergers by type of acquisition, 1964-1975[a]

	Type of acquisition					
Estimation method	Total	Horizontal	Market extension	Product extension	Vertical	Conglomerate
Current U.S. data	63	9	3	26	5	20
Past Iowa data	51	7	3	21	4	16

[a]Source: derived from Table III-8.

If the locational stability of rural Iowa manufacturers was affected by mergers as previously hypothesized, the migration rates of the acquired firms should be significantly greater than those of indigenous companies. Since this locational instability differential was predicted to result primarily from horizontal mergers, acquisitions of this type should exhibit the highest rate of outmigration.

IV. SUMMARY OF THE FINDINGS[1]

A. Long Term Plant Outmigration Rates

1. Branch plants versus local firms

The statistical findings of this study (Table IV-1) provide strong support for the previous hypotheses. The probability of a local company failing exceeded that of a multi-plant firm. Plant closures resulting from branch and local company failures were 19 and 37, respectively. These represented 5.43 percent of the 1973-74 base for multi-plant firms and 8.73 percent for local concerns. However, in spite of a lower bankruptcy rate, Iowa branch plants were still less locationally stable than indigenous manufacturers. The migration rate of branches was approximately 50 percent greater than that of local firms, and this differential was not significantly influenced by the location of the multi-plant corporations headquarters (Iowa vs. not Iowa).

2. Migration by employment size

The difference in branch and unit firm migration rates cannot be attributed to a skewed distribution of plant sizes. There existed no significant differences among the rates of the five smallest employment classes (Table IV-2). Also, the outmigration rates for branches and local plants of most size categories were quite similar to those derived

[1]The data used for the calculation of all migration rates is presented in the previous chapter and the Appendix; therefore, no table sources will be provided.

Table IV-1. Outmigration rates for branch and local plants, non-SMSA Iowa, 1965-1975

Ownership characteristics	Migration rates (expressed as a percent)	
Local	12.50	*****
Branch	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 IV-2. Outmigration rates for rural Iowa plants according to size of employment, branch versus local, 1965-1975

Employment classes	Outmigration rates (expressed as a percent)		
	Aggregate	Branch	Local
21-50	15.73	22.32	12.93
51-100	18.71	26.19	12.64
100-250	17.48	17.20	10.00
251-500	15.09	16.22	12.50
501-1000	15.79	15.38	16.67
1000+	30.77	--	--
All Iowa plants	16.54	21.43	12.50

from the aggregate sample (21.4% and 12.5%, respectively). The locational instability of branches actually fell as branch plant size increased; therefore, if a size factor had existed, it would have contributed to smaller, not larger, branch plant migration rates.

3. Outmigration and industrial composition

The locational stability of rural Iowa's manufacturers was significantly affected by the type of products they produced (Table IV-3). The manufacturers of durable goods exhibited outmigration rates significantly larger than the producers of nondurable goods, and the locational instability of firms in the electrical and lumber industries was significantly greater than that of all Iowa plants. Still, within product groups, branch plants were more locationally unstable than indigenous firms. The branch plant propensity to outmigrate was significantly greater than that of unit firms for all product classifications except nondurable goods. Multi-plant corporations in the electrical equipment and wood products industries had instability rates significantly higher than those of other Iowa branch plants. The relatively large migration rates for branches of these SIC's may have resulted from the following factors:

1) The lumber and electrical industries are engaged in the production of durable goods, and therefore, more susceptible to fluctuations in aggregate demand.
2) The South and Japan had developed comparative advantages in the production of wood products and electrical equipment,

Table IV-3. Outmigration rates of rural Iowa manufacturers according to types of goods produced and ownership characteristics, 1965-1975

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

*Significantly different at the 10 percent level.

**Significantly different at the 5 percent level.

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

respectively. Competition from these regions forced Iowa manufacturers to seek "lower cost" locations.

The locational instability of indigenous firms varied little among the product classes. With the exception of the wood products manufacturers, the migration rates within the SIC's never varied more than three percent from the Iowa average for unit concerns. Therefore, the differences between the aggregate migration rates of each product group resulted primarily from changes in branch plant instability.

In conclusion, the locational instability of a region's industry will be affected by that region's industrial composition. However, that instability will be transmitted to the industrial base through the area's branch plants. The outmigration rates of a community's manufacturers will be only minutely altered by product mix if all the community's industries are locally owned.

4. Outmigration and plant location

Location (eastern Iowa versus western Iowa) had no significant influence on the long term migration rates of rural Iowa branch and local plants (Table IV-4). The locational instability of indigenous

Table IV-4. Outmigration rates of eastern and western Iowa plants, branch versus local, 1965-1975

	Outmigration rates		
Location	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)*****

** Significantly different at the 5 percent level.

**** Significantly different at the 1 percent level.

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

firms in each region was almost identical to the state average for local concerns. The outmigration rate of western branch plants exceeded

that of eastern branches, but not by a statistically significant amount. However, in all regions, branch plants were significantly less locationally stable than unit concerns. Controlling for location did not alter the migration rate differential between branch and local firms.

5. Mergers and plant locational stability

From 1965 through 1975 thirteen rural Iowa manufacturers failed or migrated within two years after merging with another company (Table IV-5). All of these firms participated in the types of mergers inherently consistent with subsequent plant closures; i.e., horizontal, market extension, and product extension. Five of the acquisitions (Embalming Burial Case, Continental Manufacturing, Johnson Block, Vilas, and Bonaparte Rendering) were treated as strictly horizontal mergers. There existed some question as to whether Nefco, Silent Sioux, Randolph Foods, Anamosa Concrete, Marshalltown Foundry, and Comfort were horizontal or market extension mergers. So as not to bias the migration rates in favor of the hypothesis, these six "ambiguous" acquisitions were classified in the latter category.

The outmigration rates of the acquired firms (Table IV-6) provide some support for the previous hypothesis. The merged plants migration rate was significantly greater than that of indigenous concerns, but no more so than that of branch plants. Companies acquired through horizontal mergers were quite locationally unstable, exhibiting an outmigration rate double that of branch plants. The locational instability

Table IV-5. Iowa manufacturing plants which closed within two years after being acquired by another company, 1965-1975

Iowa firm	Acquiring firm	Type of merger[a]	Approximate lag between merger and closing (in years)
Ajax Manufacturing Co.	Chromalloy American Corp.	PE	1
Embalming Burial Case Co.	Iowa Casket Co.	H	1
Continental Manufacturing Co.	Big Smith, Inc.	H	0
Silent Sioux Corp.	Metal Engineering Corp.	H or ME	1
Randolph Foods, Inc.	Seymour Foods	H or ME	0
Anamosa Concrete Products	Van Dale Corp.	H or ME	1
Johnson Block Co.	Tantex Corp.	H	0
Marshalltown Foundry Co.	Grey Iron Foundry	H or ME	2
Comfort Inc.	Pontiac Chairs	H or ME	2
Vilas Co.	Thompson Industries	H	0
Bonaparte Rendering Co.	National By-Products	H	1
Frito-Lay Co.	Nefco Co.	H or ME	2
Atlas Motor Homes	AMF, Inc.	PE	2

[a] H - Horizontal.
ME - Market extension.
PE - Product extension.

Table IV-6. Outmigration rates for acquired firms by merger type, rural Iowa, 1965-1975[a]

Merger type	Outmigration rates (expressed as percents)	
All mergers	*** 20.63	
Horizontal	55.56	
Horizontal, product extension, and market extension	34.21	*
All Iowa plants	***	
Local	12.50	
Branch (including mergers)[b]	21.43	**
Branch (excluding mergers)	18.02	

[a]The instability rates were calculated using the bases estimated from current national data. If significant differences existed with this base, they will also exist when the migration rates are derived using bases estimated from past Iowa data.

[b]In calculating the outmigration rate of Iowa branches, the acquired firms were considered branch plants and therefore included.

*Significantly different at the 10 percent level.

**Significantly different at the 5 percent level.

***Significantly different at the 2.5 percent level.

of plants engaged in horizontal, product extension, and market extension mergers was also quite high, approximately 50 percent greater than that of branch plants. If the denominators from which the above migration rates were calculated are accurate, it may be concluded that horizontal and market extension mergers reduce the locational stability of the acquired firm.

The above migration rates may somewhat exaggerate the influence of acquisitions on stability. As stated previously, horizontal mergers were often initiated to insure a market of sufficient magnitude to permit efficient production. If the merged firms were operating inefficiently at the time of their acquisition, the probability of their failing in the absence of merger should have been greater than that of the "average" rural Iowa plant. The thirteen acquired firms might have exhibited a greater propensity to close than other Iowa companies even without merging.

6. Summary of the findings

The influence of plant ownership characteristics, plant size, product mix, plant location, and mergers on the long term outmigration rates of rural manufacturers has been analyzed. All the above variables except plant size and location had a statistically significant impact on the location stability of Iowa's firms. The behavior of branch and unit firm outmigration was consistent with the previous theory. The outmigration rates of branch plants always exceeded those of indigenous firms, and these rate differentials were not altered by cross-classifying ownership characteristics with product mix, plant size, or plant location. In light of the above findings, it must be concluded that the ownership characteristics of a community's manufacturers will affect the locational stability of that community's industrial base.

B. Plant Migration and Business Cycles[1]

1. Branch plants versus unit plants

a. Plant closings Branch and unit firm closings had behaved in a manner consistent with the theory presented in Chapter II, i.e., branch plant outmigration was significantly more responsive to fluctuations in GNP than the migration of local manufacturers (Table IV-7). Regardless of the lag utilized (see Tables A-3 and A-4 of the Appendix for an explanation of these lags), branch closings were inversely related to the growth rate of GNP and GSP. Also, the branch plant's marginal propensity for closing (β) always exceeded that of the local firms, though the slopes were no longer significantly different from zero when GSP was the independent variable. The shortest lags (no lag, two and three quarter lags) provided the highest explanatory values and most significant coefficients. Such a quick response indicates that the downturn in a region's economy attributed to plant ownership characteristics will closely follow the national cycle.

The small and insignificant slope coefficients and the extremely low coefficients of determination and F values imply that the closures and outmigration of indigenous firms were influenced only minutely by cyclical fluctuations. The R^2's and F's for branch closings were also

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[1]The following results pertain only to the linear regressions of changes in GNP and GSP on plant openings and closings. With the exception of two cases, the quadratic regressions failed to improve on the results provided by the linear regressions. These exception will be noted in this section. The remainder of the quadratic results are contained in Tables A-6 to A-11 of the Appendix.

low, but markedly greater than those of the local firms. It would have been unrealistic to expect a closer "fit" when only one explanatory variable was utilized. A review of the reasons for factory closings indicates that many of the factors were completely unrelated to demand fluctuations; e.g., union troubles, plants destroyed by fire (in one case the owners were suspected of arson), the demise of mussels in the Mississippi River, and closings resulting from OSHA or antipollution regulations.

b. Plant openings The relationships between plant openings and changes in GNP (Table IV-8) also support the hypothesis that branches are more sensitive to cyclical variations than unit firms. With the exception of no lag in GNP, the branch plant marginal propensities for openings (β) were always significantly different from zero and exceeded those of the local concerns. Only when regressed against lagged GSP did indigenous and multi-plant corporations behave similarly.

Branch plant openings were not as quick to respond to prosperity as closings were to a recession. The three and four quarter lags in GNP provided the highest coefficients of determination and F values, and most significant slope coefficients. A shorter lag for closings should be expected since the process of transferring production elsewhere is less time consuming than constructing a new facility or negotiating for an existing plant. A generally cautious nature on the part of multi-plant managers would also result in such a lag differential.

Table IV-7. 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.

Table IV-8. Coefficients resulting from regressing the number of local and branch plant openings per year on 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.

Branch plant openings appear to be susceptible to a mild "threshold" effect, i.e., plant inmigration increased at an increasing rate as the percentage change in GNP rose. When a three or four quarter lag in GNP was regressed (using a quadratic equation) on branch openings, both the first and second derivatives were positive and the F values were significant at the .05 level [Equations (3) and (4)]. A plant inmigration pattern with a "threshold" effect will possibly

$$Y = 21.134 + 1.067\chi + .032\chi^2 \qquad (F = 7.43)$$

Four quarter lag in GNP (3)

$$Y = 22.219 + .987\chi + .014\chi^2 \qquad (F = 4.70)$$

Three quarter lag in GNP (4)

induce an even greater procyclical impact on local employment than a strictly linear relationship between changes in GNP and plant openings.

Fluctuations in the growth rates of GNP and GSP were no more helpful in explaining unit firm openings than they had been in predicting closures. The marginal propensities for local openings were much larger (and for the six quarter lag in GSP also significant) than those for plant closings, but the F values of the regression equations were still too small to attribute much importance to the coefficients. It would appear that business cycles had only a minor (if any) influence on the local entreprenuers' decisions to initiate, halt, or transfer their operations. In light of the above findings,

it must be concluded that openings and closings of rural Iowa's branch plants were more responsive to changes in aggregate demand than those of indigenous firms.

2. Durable versus nondurable

It is possible that the above dissimilarities in local and branch plant cyclical sensitivity was due to differences in industrial composition and not ownership mix. The results of regressing openings and closings of durable and nondurable manufacturers against changes in GNP and GSP (Tables IV-9 and IV-10 respectively) indicate that the producers of durable goods were more sensitive to cyclical fluctuations than nondurable manufacturers. With only the exception of a zero lag in GNP, members of the durable goods industries exhibited a greater marginal propensity to open during prosperity and close during a recession than firms producing nondurables. However, the F values for the regression equations imply that the relationship between product mix and plant migration for most lags was weak.

The timing of plant openings for durable and nondurable goods producers was similar. Members of both groups responded best to four and six quarter lags in GNP and a six quarter lag in GSP. Durable manufacturers had reacted slightly more rapidly in closing their plants after a fall in aggregate demand than they had in initiating production during prosperity. The two, three, four, and six quarter lags in GNP all provided slope coefficients of equal significance and comparable R^2's. The closings of nondurable manufacturers were not influenced

Table IV-9. 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 IV-10. 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.

greatly by cyclical fluctuation in aggregate demand. None of the slope coefficients for nondurable plant closings were significant, and the regression F values were never respectable (.10 to 1.41).

The above findings are consistent with Borts' study [4]; however, the disparities in branch and unit plant cyclical migrations cannot be attributed solely to product differences. The results of regressing durable and nondurable local and branch plant migrations against changes in GNP (Tables IV-11 and IV-12) indicate that ownership characteristics were an explanatory variable. As should be expected, the migration rates of branches producing durable goods were by far the most responsive to cyclical variations in aggregate demand. But regardless of whether the firm was a manufacturer of durable or nondurable products, branch plants exhibited a stronger procyclical behavior. When any type of lag was instituted, the branches of both durable and nondurable industries had higher marginal propensities to open than similar indigenous corporations. Not only were nondurable branches more responsive than nondurable local manufacturers, they were also more sensitive to changes in aggregate demand than durable unit concerns. For the two, three, and four quarter lags, nondurable branch plant's marginal propensities to open always exceeded those of the indigenous manufacturers of durable goods.

Branch plants producing durable goods closed more rapidly during a recession and opened more slowly during prosperity than did nondurable branches. The lags providing the most significant coefficients

Table IV-11. Coefficients resulting from regressing the annual number of branch and local plant closings, durable versus nondurable, 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					
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.

Table IV-12. Coefficients resulting from regressing the annual number of branch and local plant openings, durable versus nondurable, 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					
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.

and the best fit for branch closings were the "no lag" for durables (β = -.484, R^2 = .303) and the two quarter lag for nondurables (β = -.246, R^2 = .200). For plant openings, durable branches responded best to a four quarter lag in GNP (β = .765, R^2 = .424), while the two quarter lag explained most accurately the openings of nondurable branches (β = .492, R^2 = .287). Therefore, regions 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 unit plant openings and closings to variations in the GNP depended little on whether the facility was producing durable or nondurable goods. In either case, almost no relationship existed. Local entreprenuers did initiate production with greater frequency during a prosperous period, and close plants more readily during a recession; however, their marginal propensities to open and close were consistently below those of branch plants. The F values of the regression equations were also so low (from .09 to .66) that little significance can be attributed to these slopes. Only when local durable and nondurable plant openings were regressed against a six quarter lag in GSP were significant coefficients and somewhat respectable R^2's achieved (Table IV-13). Since indigenous manufacturers are primarily engaged in servicing a local market, a closer relationship with GSP than GNP should be expected. However, even this relationship was relatively weak.

Table IV-13. 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	.250**	.242	3.51*
	Local	7.64	.154	.063	.74

*Significant at the 10 percent level.

**Significant at the 5 percent level.

The previous results indicate that industrial ownership characteristics will affect the transmission and severity of cyclical impulses to regions. Areas whose production is dominated by branch plants (regardless of whether they are durable or nondurable) will tend to exhibit cyclical fluctuations in manufacturing employment larger than those regions with primarily indigenous firms. Communities attempting to attract new industry should realize that the addition of "footloose" branch plants will reduce the stability of its industrial base and add a procyclical factor to its local economy.

3. The locational bias of cyclical plant migrations

The results of regressing eastern and western plant openings and closings on changes in GNP and GSP (Tables IV-14 and IV-15) are consistent with the previous theory. Plant migrations resulting from cyclical variations were not geographically distributed in an unbiased fashion. The marginal propensities of western plant openings and closings exceeded those of eastern Iowa for every lag. The western region had not only the highest coefficients of determination but also all of the significant F values and slopes. These results indicate that the "geographically peripheral" half of the state was responsible for most of the cyclical flustuations exhibited by Iowa plants.

The somewhat surprising phenomena was the great dissimilarity between the two regions' marginal propensities for plant openings. Plant inmigration into western Iowa showed a much stronger relative response to prosperity than that into eastern Iowa. Through interviews with new Area V manufacturers I was able to obtain their reasons for selecting northwest Iowa. Two of the factors frequently mentioned help to explain the attractiveness of this area during boom periods. First, there existed a number of factories available for immediate occupancy. In some cases, these plants were vacated during the preceding recessions. Secondly, labor was readily available in western Iowa. These characteristics made western Iowa a favorable location to "accommodate the temporary peak production" that exists during high growth periods.

Within the two regions, branch plant migrations were generally more sensitive to changes in aggregate demand than those of unit concerns

Table IV-14. 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 IV-15. 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.

(Tables IV-16 and IV-17). Eastern and western Iowa branches exhibited greater propensities to open than local firms in their areas for all five lags in GNP. However, the openings of western indigenous firms were always more sensitive to cyclical variations than those of eastern branch plants. The relatively large coefficients for the regressions on western local openings indicate that plant location will affect the cyclical migration rates of unit as well as branch firms.

The coefficients obtained from regressing eastern and western branch and local plant outmigration on changes in GNP (Table IV-17) indicate that branch plants closed more readily than unit concerns during a recession. However, for the longest lags (four and six quarters), local western firms exhibited a greater marginal propensity for closing than western branch plants. Furthermore, the pattern of local firm 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 IV-18). This result was expected. As the previous theory predicted, the most "geographically peripheral" firms, whether branch or local, will be strongly affected by changes in demand. When the growth in aggregate demand slowed or became negative, multi-plant firms attempted to maintain an efficient operation by consolidating production. The branches first to be closed were those on the periphery of the market area. Unit firms did not have the option of consolidating production, except through mergers. However, if the local company was covering its variable costs, it would continue to operate in the short-run. Should

Table IV-16. 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	.58
	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	6.90***
	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 IV-17. 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 IV-18. 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.

the recession persist or be severe, the indigenous firm would also eventually cease production. Therefore, the fact that western branch plant's exhibited a higher marginal propensity to close for the shortest lags (zero, two, and three quarters), and western local firms had higher slope coefficients for the four and six quarter lags and an accelerator effect is not inconsistent with the previous theory. Branch plants were still contributing a procyclical factor to the region's economy by terminating production at the onset of the recession.

The migration of plants into western Iowa in response to positive percentage changes in aggregate demand occurred only after a fairly long lag. Both unit and branch plant openings responded best to the four quarter lag in GNP. The theory in Chapter II hypothesized that the primary influx of new industry into western Iowa would occur only after labor and production facilities had become scarce in the industrial centers. The above lags tend to support such a hypothesis.

V. CONCLUSION

Local development organizations are very interested in obtaining new industry for their communities. Such a concern is understandable because the existence of a healthy industrial base is beneficial to the provision of a viable areal economy. However, since all firms do not exhibit the same degree of locational stability, the characteristics of the community's manufacturers will influence its ability to maintain or expand the existing industrial base. According to Isard,

> The percent of a regions activities in durables, the presence of growth industries in its industrial mix, the diversity of its industrial structure, the sensitivity of each of its individual production lines, the direction and rate of change of its underlying secular position are all factors to be considered in the formulation of policy for the region and in the programming of its development [22, p. 188].

The results of this study indicate that the ownership mix of a region's industry should also be included with the above factors.

Plant ownership characteristics will affect a firm's migration rate and its ability to survive adverse changes in demand, i.e., its locational stability. Unit concerns have experienced the highest failure rate, possibly due to the fact that they cannot close branches and maintain production efficiency in the remaining facilities when demand falls. In spite of this high propensity for bankruptcy, the locational instability of branch plants significantly exceeded that of local firms; and this differential existed regardless of the plant location, product mix, or plant size. However, among the branches, those producing

durable goods were the least stable. The branch plants relatively high degree of instability was primarily due to outmigration and not failure. This high outmigration rate resulting from the multi-plant companies' inclination to consolidate production into fewer facilities when demand falls, and the relative unimportance of locational inertia.

Branch plant migration was also more responsive to fluctuations in the national business cycles than that of local firms. Branches had exhibited a propensity for opening during prosperous periods and closing during recession. Such a migration pattern, which was even more pronounced if the branch plants were producing durable goods or located in the western half of Iowa, contributed a procyclical factor to the region's economy.

Local plants producing durable and nondurable goods reacted similarly to cyclical variations in aggregate demand. In both cases, plant openings and closings were unresponsive to percentage changes in GNP. Only the local manufacturers of western Iowa displayed any response to the business cycle; however, a relatively long lag (four to six quarters) existed between prosperity and openings, and recession and closings.

The cyclical plant migrations that occurred during the period under study were primarily concentrated in western Iowa. The pattern of branch plant migration for the western half of the state; a short lag (two quarters) between declines in GNP and closings, and a

relatively long lag (four quarters) between prosperity and plant openings, was consistent with the previous theory concerning the timing of cyclical plant openings and closings for "geographically peripheral" regions. Western local plant openings responded to changes in aggregate demand in a manner similar to that generally displayed by branch plants, i.e., local firm inmigration was most prevelant four quarters after an increase in GNP. However, unit closings occurred approximately a year after the branches had outmigrated. Since branches are outmigrating soon after the national recession begins, and local plants are closing much later in the recession stage; plant closings may contribute to further employment declines in the region during a national recession and retard employment gains if recovery closely follows the decline in demand. The long lags between increases in GNP and branch and local plant openings also infers that the cyclical benefits accruing to western Iowa as a result of national propserity will be realized late in the recovery stage. Therefore, plant openings and closings will lengthen and deepen the recession and shorten the recovery and prosperity stages of rural regions relatively isolated from population and industrial centers. However, if national prosperity can be sustained for a relatively long period, these "geographically peripheral" regions will experience a large influx of new industry and a highly prosperous economy. In summary, Figure V-1 graphically presents the cyclical fluctuation of a peripheral region that would result from plant migrations. Unfortunately, little can be done by local leaders to alter

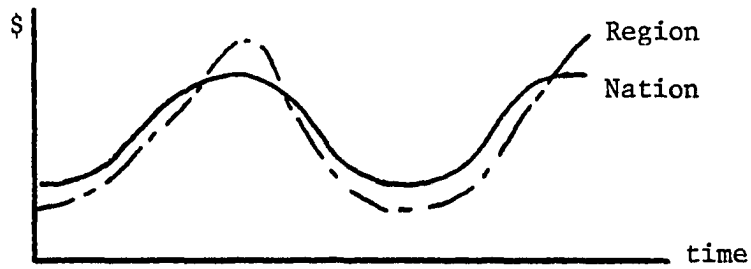

Figure V-1. Hypothetical regional and national business cycles.

these procyclical plant migration patterns. Those rural regions on the fringe must accept a share of the national business cycle through cyclical plant openings and closings. Perhaps by understanding that variations are likely, they can adjust and prepare for them as best they can.

Finally, the location stability of manufacturing plants appears to be affected by ownership changes as well as the original ownership characteristics. Plants acquired through horizontal, market extension, and product extension mergers exhibited an outmigration rate far in excess of even the highly mobile branch plants' migration rates. However, in spite of the high probability of a community losing one of its manufacturers as a result of a merger, an acquisition initiated to insure a market of sufficient size to support efficient production should not be discouraged. The merger allowed the formation of one efficient operation out of two or more inefficient plants. Without the acquisitions, both firms may have failed; whereas the merger may increase the locational stability of the augmented operation. This

benefit will not accrue from acquisitions undertaken solely to increase monopoly power.

In conclusion, rural communities must expect occasional plant outmigration and failures. The probability of losing a company is high (approximately 15 percent of rural Iowa's industrial base closed during the last 10 years), and the impact on the local economy can be serious. In general it seems the chance of plant loss increases with the concentration of branch plants relative to local firms in the industrial base and the number of operating firms merging with "outside" concerns.

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VII. APPENDIX A: TABLES

Table A-1. The characteristics of Iowa plants which have outmigrated or ceased production, 1965-1975

Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
1. Honeggers	Indianola	Branch plant	Fairbury, Illinois	30	1970	Hog and cattle feed
	Reason: The Indianola plant suffered fire damage in 1970. The parent company elected to transfer production to the other branches instead of rebuilding the facility.					
2. Kayot Inc.	Indianola	Branch plant	Mankato, Minnesota	250	1974	Motor homes
	Reason: Due to excess production capacity, resulting from a decline in demand for mobile homes, the parent company decided to consolidate production in the other branches (Forest City, Iowa and Mankato, Minnesota).					
3. Rob Ross Farms, Inc.	Kingsley	Local	--	50 (seasonal)	1975	Pickled corn
	Reason: Bankrupt.					
4. Kalonial Industries, Inc.	Kalona	Local	--	50	1974	Mobile homes
	Reason: Bankrupt.					

5. Chef-Quik	Kalona	Local	--	120	1972	Pre-cooked meats

Reason: The company's plant was damaged by fire, and it couldn't be repaired fast enough to keep their customers from turning to their competitors.

6. Mid-States Packing	Hawarden	Branch plant	Sioux City, Iowa	45	1970	Meat packing

Reason: The Hawarden facility was only in operation 8 to 9 months before the parent company found itself in financial difficulty. This branch was closed 3 to 4 months prior to Mid-States declaring bankruptcy.

7. Victor-Metal Products Corp.	Iowa City	Branch plant	Newport, Arkansas	100	1975	Metal tubes

Reason: Due to a decline in their sales of metal tubes, production was consolidated in the company's Cincinnati, Ohio branch.

8. Glenwood Packing	Glenwood	Local	--	300	1968	Meat packing

Reason: Glenwood purchased the old Roth facility in 1965 or 1966. They went bankrupt two years later.

9. Fryer Farms, Inc.	Forest City	Local	--	70	1964	Chicken processing

Reason: The company moved to Forest City from Mason City in 1962. Bankruptcy resulted from the shift of the broiler industry to the South.

10. Wadco Foods	Estherville	Branch plant	Estherville, Iowa (now Lakeland, Florida)	450	1974	Chicken processing

Reason: The company was not satisfied with Estherville because of labor shortages and union difficulties. The community thought that Wadco was creating a

Table A-1 (Continued)

Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
		pollution problem and wanted them to abandon their downtown location However, the firm didn't think Estherville was being helpful in finding a new site. When some contracts with the government expired, they elected to transfer their entire operation (including headquarters) to Florida.				
11. Ajax Manufacturing Company	Ft. Madison	Branch plant (Merger-1)	Compton Plaines, New Jersey	200	1971	Fences, trailers, metal lawn and garden buildings
	Reason: Arrow Group (a subsidiary of Chromalloy American Corporation from St. Louis) purchased Ajax in 1970 from Montgomery Wards. In 1971 the product line was transferred to two other Arrow plants (Harvard and Breese, Illinois) after the production capacity of the Breese facility had been augmented. The production of these products was later discontinued.					
12. American Paper Products, Inc.	Ft. Madison	Branch plant	Philadelphia, Pennsylvania	100	1973	Ammunition tubes
	Reason: The Ft. Madison facility was supplying ammunition tubes to the Burlington ordinance plant. Demand fell after the Vietman War ended; therefore, production was consolidated in American's Ohio plant.					

13.	Nodaway Valley Foods	Corning	Branch plant (Merger-9)	Morristown, New Jersey	130	1972	Septic canners
	Reason:	Allied Chemicals purchased Nodaway in 1963 when the company was interested in diversification. Later new management in AC decided to concentrate their efforts in areas related to chemicals and energy. Nodaway was not profitable, and was one of a number of their companies that was subsequently sold. The equipment was moved to Australia by the new owners.					
14.	Cherokee Bottling Co.	Cherokee	Local	--	20	1970	Soft drinks
	Reason:	The owner died and the company that acquired the Cherokee market is located in another community.					
15.	William's Industrial Corporation	Cherokee	Local	--	20	1972	Pickup campers
	Reason:	Bankrupt.					
16.	Purolator Filter	Creston	Branch plant	Rahway, New Jersey	175	1975	Air, fuel, and oil filters
	Reason:	Purolator started production in Iowa in 1964. The company considered labor costs to be too high, therefore, they transferred production to their other plants (New Jersey and Georgia).					
17.	Whatoff Co. (Trailer Totter)	Ames	Local	--	120	1974	Modified trucks
	Reason:	Whatoff, a local concern for almost 25 years, altered trucks for the purpose of hauling mobile homes. The company failed when mobile home sales declined in 1974.					

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
18.	Donaldson's	Ames	Local	--	45	1973	Bicycles and recreation vehicles
		Reason: The owner had a dispute with the City Council over a proposed highway development. He moved his production to Tyler, Texas.					
19.	Belmond Homes	Belmond	Branch plant	Prairie Du Chien, Wisconsin	35	1974	Mobile homes
		Reason: A decline in mobile home sales had resulted in excess plant capacity at both Belmond and the headquarters. When the Iowa law regulating the hauling of mobile homes was revised to allow longer trips, production was consolidated in Prairie Du Chien.					
20.	Advance Ross Electronics Corporation	Burlington	Branch plant	Chicago, Illinois	380	1968	Electric compressors and coils
		Reason: Advanced Ross had purchased the Burlington facility in 1959. They also had a branch in Washington, Iowa; and when sales fell they consolidated production at the larger and newer plant (Washington).					

21.	Campbell Chain Co.	West Burlington	Branch plant	York, Pennsylvania	150	1971	Automobile chains

Reason: The company complained that there didn't exist sufficient room to expand at their Iowa location. They built a new plant in California and elected to transfer production there.

22.	Electric Design and Manufacturing Company	Burlington	Local	--	50	1966	Instruments to measure electrical current

Reason: The individual who was both owner and president died, and the business failed.

23.	Sylvania Electric Products Inc.	Burlington	Branch plant	New York, New York	650	1969	TV and radio tubes

Reason: The Burlington plant, which started production in 1954, was providing tubes for Sylvania's TVs and radios. When the industry went to transistors, the product and facility were no longer needed.

24.	DeJon Company	Burlington	Local	--	25	1972	TV antennas

Reason: The company went bankrupt after about 6 years of operation.

25.	Atomic Energy Commission	Burlington	Branch plant	Washington, D.C.	7,000	1975	Munitions for the U.S. Army

Reason: Production at the Burlington facility had been phased out and transferred to Armarillo, Texas as a result of peace in Vietnam. At the time of its closing, the facility was employing approximately 1,100 individuals.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
26.	Selby Food Company, Inc.	Burlington	Branch plant	Ft. Wayne, Indiana	25-100 (seasonal)	1974	Frozen turkeys and chickens
	Reason: Selby Foods was purchased by Central Soya in the mid-1950's. The plant was closed because Central Soya didn't consider it worth the time, effort, or money to make the alterations necessary to conform to OSHA standards.						
27.	Embalming Burial Case Company	Burlington	Branch plant (Merger-1)	Des Moines, Iowa	30	1973	Caskets
	Reason: Embalming Burial Case was originally a local firm which had been in business for nearly 100 years. In the 1960's it became a division of Murry Iran Works. Trane purchased Murry in 1972 but they were not interested in the casket company. EBC was sold to Iowa Casket Company of Des Moines in 1972, and production was transferred to Des Moines in 1973.						
28.	Compact Industries	Lake Mills	Local	--	55	1967	Coffee machines
	Reason: The company was owned by individuals from Boston and Chicago. The Chicago stockholders acquired controlling interests in the firm and moved production to Chicago.						

29.	Snowden, Inc.	Knoxville	Branch plant	Osceola, Iowa	20	1969	Ladies lingerie and sleep-wear

Reason: A decline in sales of the company's products encouraged the consolidation of production at the firm's Osceola plant. Knoxville and Osceola are approximately 50 miles apart.

30.	Continental Manufacturing Company	Knoxville	Branch plant (Merger-0)	Carthage, Missouri	200	1969	Mens work clothing

Reason: Big Smith, Inc. purchased Continental in 1969 because they needed extra capacity for the production of style goods. Continental's Oskaloosa plant provided sufficient additional capacity, therefore, the Knoxville vacility was closed immediately after the acquisition.

31.	Adel Clay Products Inc.	Centerville	Branch plant	West Des Moines, Iowa	35	1966	Clay bricks and blocks

Reason: Adel acquired Centerville Firebrick in 1955. The facility was closed in 1966 because it was antiquated and inefficient.

32.	George P. Smith Company	Charles City	Local	--	50	1968	Windows and fixtures

Reason: The plant was destroyed by tornadoes in 1968. The owners decided to pocket the insurance money instead of rebuilding. About 50 percent of the owners resided outside of Charles City.

33.	Hoag Duster Company	Monticello	Local	--	20	1972	Feather dusters

Reason: Hoag Duster had been in business for almost 100 years. Sales fell to such an extent that the family chose to dissolve the company and auction off the equipment and buildings.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
34.	Marlboro Plastics (Style Pak, Inc.)	Newton	Local	--	25	1972	Plastic goods
		Reason: Marlboro started production in 1967. They declared bankruptcy in 1972.					
35.	Kaul Glove Company	New London	Branch plant	Detroit, Michigan	75	1973	Industrial work gloves
		Reason: Kaul Glove had three branch plants (Ohio, Michigan, and Iowa). The company wanted to expand and elected to move operations to Tennessee to take advantage of lower wages. Production from the Iowa facility was transferred to the new plant.					
36.	Manchester Industries, Inc.	Manchester	Local	--	40	1969	Plywood and veneers
		Reason: The hometown owner wanted to try another line of work. He sold the Manchester facility to a fiberglass company and moved to Arkansas.					
37.	Emerson Electric Company	Mount Pleasant	Branch plant	St. Louis, Missouri	385	1970	Electrical components

Reason: The Emerson Company relied heavily on government contracts and the aerospace program. When these contracts were terminated, they consolidated production in their other plants (St. Louis).

38. Superior Continental Corporation	Mount Pleasant	Branch plant	Hickory, North Carolina	105	1975	TV cables

Reason: Superior had four branch plants in 1975. When sales for their product declined, they decided to consolidate production in fewer plants.

39. Silent Sioux Corporation	Orange City	Branch plant (Merger-1)	St. Paul, Minnesota	100	1973	Fabricated sheet metal products

Reason: The Silent Sioux Corporation was originally locally owned. In 1972 the owner and owner's son died and the company was acquired (by sale of stock) by Metal Engineering Corporation out of St. Paul. Silent Sioux was highly liquid and had large cash reserves. The community believes MEC drained the company of its assets and forced it into bankruptcy.

40. Evangel Aircraft	Orange City	Local	--	25	1975	Bush aircraft for South America

Reason: The company had problems with marketing the product and collecting on delivered goods. They dissolved the operation in 1975 after eight years of business in Iowa.

41. Otis Radio and Electric Corporation	Orange City	Branch plant	Cary, Illinois	45	1973	Electrical components

Reason: Otis had branches in Orange City and Hawarden, Iowa, and Canton, South Dakota. Both the Orange City and Canton facilities were leased. Because of competition from abroad, these leased plants were closed and production was moved to Mexico.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
42.	Randolph Foods, Inc.	Guthrie Center	Branch plant (Merger-0)	Topeka, Kansas	400	1965	Egg processing and butter
		Reason:	Randolph Foods was originally an Iowa company with its headquarters at Guthrie Center and branches in Des Moines, Marshalltown, Sac City, Lenox, Carroll, Boone and Harlan. Randolph was sold to Seymour Foods of Topeka, Kansas in 1965. Seymour closed all the plants except Sac City in order to concentrate production in the South.				
43.	North American Golf Corporation	Manson	Local	--	50	1975	Golf bags
		Reason:	This company was only producing for a short time before it declared bankruptcy.				
44.	Lawhorn, Inc.	Bellevue	Branch plant	Cedar Rapids, Iowa	85	1975	Wheel balancers, auto hoists, and alignment equip.
		Reason:	Lawhorn, which had plants in Bellevue and Rock Island, Illinois, was acquired by Quik-Way Industries of Cedar Rapids in 1973 in order to diversify their line of auto repair products. After Quik-Way lost its contracts with John Deere, production was consolidated in the Rock Island facility.				

45.	Funk Seeds International, Inc.	Belle Plaine	Branch plant	Bloomington, Illinois	20-100 (seasonal)	1969	Hybrid seeds

Reason: Funk Seeds wanted to transfer all their production to Bloomington, but the Belle Plaine manager (Lewis Falck) convinced them to keep the facility open. In 1968 Funk Seeds was acquired by Corn Products Corporation of Englewood Cliffs, New Jersey. When Falck retired they were ready to consolidate production at the headquarters.

46.	Mull Food Services	Muscatine	Local	--	50	1974	Food marketing and warehousing

Reason: Mull was marketing and warehousing for small independent grocerers. The recession and competition from the chain grocery stores forced them out of business.

47.	Audubon Manufacturing Company	Audubon	Branch plant	Milford, Iowa	20	1970	Chairs and upholstered furniture

Reason: The Audubon Chair Company was originally a local concern. In 1969 it was acquired by Style-Craft Furniture of Milford, Iowa. A year later the Audubon branch was closed in order to consolidate production at a new, larger facility in Milford.

48.	American Button Company	Muscatine	Local	--	500	1965	Buttons

Reason: American was a family owned and operated concern. They did not keep abreast of the new button making methods and subsequently went bankrupt.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
49.	Hawkeye Pearl Button Company	Muscatine	Local	--	75	1965	Buttons
	Reason: Hawkeye was no longer competitive for the same reasons as American Button. They liquidated their assets and closed down.						
50.	Ronda Button Company	Muscatine	Local	--	50	1965	Buttons
	Reason: Ronda had problems similar to those of American and Hawkeye. They also declared bankruptcy.						
51.	G. E. Richard and Sons, Inc.	Muscatine	Local	--	50	1972	Meat packing
	Reasons: The company decided to close its plant because it could not afford to meet the USDA regulations.						
52.	Curtis Company, Inc.	Clinton	Local	--	750	1965	Woodworking and windows
	Reason: Curtis was quite prosperous during the 1950's but their technology and products became outmoded. They declared bankruptcy in 1965.						

53. Inland Homes	Clinton		Branch plant	Piqua, Iowa	75	1964	Pre-fabricated homes
	Reason:	Inland closed the Clinton branch in an effort to consolidate it production.					
54. Pennsylvania Tire Company	Clinton		Branch plant	Mansfield, Ohio	40	1968	Tread rubber for retreading tires
	Reason:	The equipment at the Clinton plant was antiquated, and Pennsylvania Tire considered it too costly to update. Branches in Pennsylvania and Georgia were expended just enough to assume the additional production.					
55. Huiskamp Brothers	Keokuk		Local	--	65	1965	Shoes
	Reason:	Huiskamp failed to remain competitive with the larger show companies. They elected to cease production and sell their supplies and machinery.					
56. Swift and Company	Keokuk		Branch plant	Chicago, Illinois	100	1973	Turkey processing
	Reason:	The Keokuk facility was old and poorly located with respect to its suppliers. Maintenance, transport, and overhead costs (it was only open six months a year) were high, so the plant was closed and production transferred elsewhere.					
57. Air Reduction Chemical and Carbide Company	Keokuk		Branch plant	New York, New York	70	1965	Calcium carbide
	Reason:	The plant was closed because (1) it was old and obsolete and too expensive to convert to an effecient operation, and (2) the demand for calcium carbide had fallen.					

Talbe A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
58.	Sethness Products	Keokuk	Local	--	20	1966	Corn starch derivatives
		Reason:	Sethness moved their production out of Keokuk because the company lost its working relationship with its supplier (Keokuk Corn Starch Company).				
59.	Triggs Manufacturing	Perry	Local	--	20	1965	Farm wagons, stock trailers, front-end loaders
		Reason:	The company did not think that the community and bankers were concerned with the well-being of local industry. After the owner died, the son moved the company to Belmond, Iowa. Belmond is about 85 miles from Perry.				
60.	Kohout Cap Company	LeMars	Local	--	30	1970	Hats and caps
		Reason:	Kohout was a family-owned corporation. When the president died, the son moved the company to Orange City, Iowa. The president simply felt that this would be a more successful location. Orange City is about 70 miles from LeMars.				

61. New Clarion Produce	Clarion	Branch plant	Tripoli, Iowa	50	1965	Poultry processing

Reason: New Clarion was a subsidiary of Kramer-Crittenden Produce. After the broiler industry moved South, Kramer-Crittenden went bankrupt.

62. Clarkbuilt	Clarinda	Local	--	110	1975	Modular homes

Reason: Clarkbuilt moved to Clarinda in 1974 from Kansas City, Missouri. "Poor management" forced them to liquidate their operation one year later.

63. Ocoma Foods	Carroll	Branch plant	Omaha, Nebraska	80	1970	Turkey and chicken processing

Reason: Two factors contributed to the closing of the Carroll plant: (1) the facility was old and inefficient; (2) Ocoma Foods elected to abandon their poultry lines because their suppliers had moved out of the area.

64. Electronetics	Carroll	Branch plant	Martin Grove, Illinois	175 (proposed)	1970	Movie screens

Reason: Electronetics opened the Carroll facility the same year it closed. A truckers' strike, which lasted months, prevented the company from shipping its product to the parent plant in Illinois and forced it into bankruptcy.

65. Hyland Manufacturing Company	Carlisle	Local	--	70	1973	Fifth wheel travel trailers

Reason: Hyland wanted to expand their operation but they couldn't find an adequate site in Carlisle. Subsequently, they transferred production 45 miles away to Osceola, Iowa.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year Production ceased or transferred	Principal products
66.	Carlisle Brickyard	Carlisle	Local	--	20	1972	Bricks and blocks
		Reason: The owner retired and closed the company.					
67.	American Agricultural and Chemical Company (Agrico)	Humboldt	Branch plant	Tulsa, Oklahoma	50	1972	Chemically processed fertilizers
		Reason: The chemically processed fertilizers could no longer compete with the blended fertilizers, therefore, Agrico eliminated this good from their product line. The Humboldt plant, which was built in 1952, was also polluting the surrounding area.					
68.	Collins Radio Company	Anamosa	Branch plant	Dallas, Texas	250	1971	Transistors
		Reason: The Anamosa facility was not efficient (overloaded with personnel) because of too many years of U.S. government cost-plus contracts. The company elected to resolve the problem by phasing out the Anamosa operation and transferring production to the Cedar Rapids plant.					
69.	Anamosa Concrete Products	Anamosa	Branch plant (Merger-1)	Wayzata, Minnesota	20	1973	Silo staves and doors,

						concrete products

Reason: The Van Dale Corporation purchased Anamosa Concrete in 1972 and moved production to Maquoketa, Iowa one year later. Proximity to raw materials and fewer market area conflicts were mentioned as justifications for the move. Maquoketa is 34 miles from Anamosa.

70. Wilson and Company	Eagle Grove	Branch plant	Oklahoma City Oklahoma	120	1970	Pre-cooked frozen dinners

Reason: The Eagle Grove facility was destroyed by fire in 1970. The frozen foods industry was overexpanded at the time so production was transferred to under-utilized plants instead of rebuilding in Eagle Grove.

71. Selected Casings Inc.	Odebolt	Branch plant	San Antonio, Texas (later Sacremento, California)	21	1974	Sausage casings

Reason: Selected Casings, a subsidiary of A. Dewied Casing Company, was creating a pollution problem in Odebolt. The community asked them to either improve their waste disposal methods or leave. Selected decided to move all their equipment back into their suppliers' packing plants and slaughter houses (Iowa Falls, Denison, Sioux City).

72. Machine Products Inc.	Corydon	Branch plant	Kansas City, Missouri	70	1971	Camping trailers

Reason: Machine Products moved to Corydon from Des Moines in order to take advantage of lower taxes. Poor management at the Corydon plant forced the temporary abandonment of this product line. Later, camping trailers were again produced by Machine Products but this time in Kansas City.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
73.	The Coats Company	Fort Dodge	Branch plant	Chicago, Illinois	200	1974	Tire changing equipment
	Reason: The Coats Company, originally a local concern, was acquired by Hennessy Industries in 1962. The firm was dissatisfied with Fort Dodge for two reasons: (1) they had problems with the union representing their labor force; and (2) they wanted to expand their operation but could not find an adequate site in Fort Dodge. Hennessy moved their Coats Division to Nashville, Tennessee in 1974.						
74.	Gus Glaser Meats, Inc.	Fort Dodge	Local	--	250	1973	Meat processing, luncheon meats
	Reason: Gus Glaser Meats was a locally owned, family concern started in 1935. When the owner was ready to retire, he sold the business to a group of individuals from Minnesota. The new owners managed the company poorly and it went bankrupt.						
75.	Pan-O-Gold	Fort Dodge	Branch plant	Minneapolis, Minnesota	100	1970	Bakery goods
	Reason: The parent company went bankrupt.						
76.	Bulk-Pak Inc.	Fort Dodge	Local	--	40	1975	Paper containers

Reason: Bankrupt.

77. Sargent Engineering	Fort Dodge	Branch plant (Merger-3)	Cleveland, Ohio	70	1970	Cranes

Reason: Sargent, originally a subsidiary of McNally Machinery and Supply Corporation, was purchased by Warner-Swasey in 1967. The recession in 1969-1970, and the subsequent decline in construction activity, resulted in excess plant capacity at Warner-Swasey's Winona, Minnesota and Fort Dodge facilities. Production was consolidated at the larger of the two plants (Winona).

78. Vincent Clay Products	Fort Dodge	Local	--	55	1972	Clay bricks and tile

Reason: Vincent Clay was a family-owned corporation started in about 1910. Four factors contributed to its closing: (1) the plant was old and obsolete; (2) the surviving relatives were not interested in running the company; (3) the company had difficulty in attracting labor; and (4) rail service to the facility was terminated.

79. Kalo Brick and Tile Company	Fort Dodge	Local	--	55	1971	Clay bricks and tile

Reason: Kalo had essentially the same problems as Vincent Clay Products (#78).

80. Johnston Block Company	Fort Dodge	Branch plant (Merger-0)	Des Moines, Iowa	50	1969	Concrete products

Reason: The Goodwin Company purchased Johnston in 1956, and in 1969 Goodwin was acquired by Cantex Corporation of Des Moines. The Fort Dodge facility was obsolete and did not comply with OSHA standards. Production was transferred to a new plant in Redfield, Iowa.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
81.	Allied Products Corporation	Fort Dodge	Branch plant	Chicago, Illinois	90	1975	Farm implements
	Reason: Allied moved their Kraus line to Fort Dodge in 1974. At about the same time they purchased a Jerseyville, Illinois company which produced a similar product. Allied had overestimated the demand for these goods, and as a result, both facilities were operating well below capacity. In 1975 production was consolidated at the Jerseyville plant.						
82.	AVCO-New Idea	Fort Dodge	Branch plant	Coldwater, Ohio	450	1971	Farm implements
	Reason: A recession in the farm equipment market, and the resulting excess plant capacity, lead to consolidation at the headquarter's plant. Also, the Paul Revere Corporation had just obtained controlling interest in AVCO, and they were more interested in financial investments than manufacturing. Paul Revere wanted to sell New Idea, and they thought it would be easier to unload if it only consisted of one plant.						
83.	Elsheimer Meat Products	West Union	Local	--	60	1974	Meat processing
	Reason: Elsheimer was a family-owned corporation which started production in the early 1940's. Their closure was the result of managerial problems, undercapitalization, and inability to conform to USDA standards.						

84.	Coltra, Inc.	Waverly	Branch plant (Merger-3)	Manheim, Pennsylvania	20	1974	Decorated glassware
	Reason:	Coltra, a locally owned company which was founded in 1969, was purchased by the Rimar Company of Pennsylvania in 1971. Poor sales resulted in the termination of this product line and the closing of the Waverly plant.					
85.	Advance Ross Electronics Corporation	Washington	Branch plant	Chicago, Illinois	400	1970	TV components
	Reason:	During the 1965-66 color TV boom, Advance Ross opened its Washington, Iowa facility. In 1970, production was moved to Mexico in order to compete with the Japanese imports. Advance Ross later stopped producing these goods entirely.					
86.	Hayword Manufacturing Company	Tama	Local	--	40	1969	Aluminum windows and doors
	Reason:	Hayword went bankrupt after 10 years of operation.					
87.	Nivco Company	Vinton	Local	--	20	1975	Metal lock boxes for banks
	Reason:	Nivco started in 1969 as an offshoot of ACRO Manufacturing of Cedar Rapids. All products were sold to the LeFebure Corporation of Cedar Rapids. When LeFebure refused to renew their contract with Nivco, the company was forced out of business.					
88.	Sumner Packing Company, Inc.	Sumner	Local	--	30	1974	Separating and freezing eggs
	Reason:	Sumner's plant was destroyed by fire in 1974. The owners elected not to rebuild it because they were near retirement.					

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
89.	Marshalltown Foundry Company	Marshalltown	Branch plant (Merger-2)	St. Louis, Missouri	130	1973	Low tensil iron
		Reason: Marshalltown Foundry was started in 1904 as a division of Lenox Industries, and in 1942 it became a separate corporation. In 1971, after a series of union contract disputes, it was sold to Grey Iron Foundry of St. Louis. Another bitter labor strike occurred in 1972-73, and as a result, Grey Iron decided to close the plant and transfer the production to its other foundries.					
90.	Kummeth Wood Products, Inc.	New Hampton	Branch plant	Owatonna, Minnesota	45	1968	Baby furniture
		Reason: The parent company elected to eliminate this product from their line of goods. Kummeth had been in New Hampton for only three years.					
91.	Continental Sales Company	Nevada	Local	--	120	1969	Fertilizer plants, bins mixtures
		Reason: Continental had a factory in Nevada and 65 small branches for the construction of fertilizer plants. The owner had difficulty managing such a diffused operation, and as a result, the company failed.					

92.	Acme Brass Foundry Company	Ottumwa	Local	--	85	1966	Brass fittings, etc.
	Reason:	Acme had been in operation 25 years when the owner became ill and decided to close the company.					
93.	Comfort, Inc.	Ottumwa	Branch plant (Merger-2)	Pontiac, Illinois	100	1968	Over-stuffed chairs, and recliners
	Reason:	Comfort was a locally-owned concern until acquired by Pontiac Chairs of Pontiac, Illinois in 1966. After labor difficulties and a prolonged strike, production was consolidated in Pontiac.					
94.	Long-Airdox Company	Ottumwa	Branch plant (Merger-3)	Oak Hill, West Virginia	65	1965	Coal mining equipment
	Reason:	The Ottumwa plant was originally locally owned (Hardsoag Company) and most of their equipment was sold to the Iowa coal mines. Hardsoag was first acquired by Long-Airdox and later by the Marmon Herrington Company (1962). In recent years coal production in Iowa had declined, and all of Long-Airdox's products were being shipped East. In 1965 production was transferred to West Virginia to provide proximity to the coal fields.					
95.	Standrad Kollsman Industries	Ottumwa	Branch plant	Melrose, Illinois	1,200	1968	TV tuners and components
	Reason:	All of the Standrad Kollsman branches producing TV tuners were retooled in preparation for producing a new product. The company could not get the flaws out of the new item, and subsequently, they closed all plants producing it.					

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
96.	Riverside Manufacturing Industries, Inc.	Ottumwa	Branch plant	Detroit, Michigan	100	1971	Wiring interiors for autos and trucks
		Reason:	Riverside lost part of their market during the autoworkers' strike and decided to consolidate production.				
97.	Bogden Industries, Inc.	Ottumwa	Local	--	55	1974	Beauty shop fixtures
		Reason:	Bankrupt.				
98.	John Morrell and Company	Ottumwa	Branch plant	Chicago, Illinois	3,500	1973	Meat products
		Reason:	(1) The Ottumwa facility was antiquated (built in 1877) and inefficient; and (2) Morrell was unhappy with the union representing their Ottumwa employees.				
99.	Iowa Muffler Company, Inc.	Columbus Junction	Local	--	20	1973	Automobile mufflers
		Reason:	The company declared bankruptcy after only two years of operation.				

100.	Travelcraft Corporation	Holstein	Local	--	30	1968	Travel trailers and campers

Reason: Travelcraft started production in 1966 and went bankrupt two years later.

101.	The Vilas Company	Holstein	Branch plant (Merger-O)	Storm Lake, Iowa	25	1975	Turkey hatchery and processing

Reason: In 1970 the headquarter's plant burned down and was replaced by a much larger facility. Part of Holstein's production was transferred to Storm Lake's at this time. After the owner's death, Vilas was sold to Thompson Industries of Storm Lake (in 1975). Thompson did not need the Holstein plant because of excess capacity at their Ellsworth facility.

102.	Iowa Lumber and Supply (Payless-Cashway)	Iowa Falls	Local	--	50	1975	Products for lumber yards and hardware stores

Reason: Iowa Falls was originally the national headquarters of Payless-Cashway. The administrative functions were moved to Denver, Colorado in order to take advantage of international airport facilities.

103.	Excel Industries	Wilton	Branch plant	Hesston, Kansas	20	1974	Tractor and combine cabs

Reason: In 1969 Excel established an assembly and distribution plant in Wilton to supply cabs on contract to implement dealers. The contract was lost in 1974, and Excel discontinued their production of this item.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
104.	National Distillers Products Company	Tipton	Branch plant	Memphis, Tennessee	60	1970	Barrel staves for whiskey
		Reason:	National constructed a very large barrel stave facility in Memphis and closed many of their smaller plants. Logs were to be shipped to Memphis by river and rail.				
105.	McColloughs, Inc.	Webster City	Local	--	20	1974	Swine feeders and waterers
		Reason:	This family-owned corporation went bankrupt after over 50 years of operation.				
106.	Morton Foods (Division of I.T. and T.)	Webster City	Branch plant	New York, New York	900	1968	Frozen dinners and deserts
		Reason:	In March of 1968 the U.A.W. and the Amalgamated Meatcutters (supported by the Teamsters) initiated a bitter strike which was to last seven months. Governor Rockefeller of Arkansas heard about Morton's problems in Webster City and offered to provide them with a free site, plant, and utilities if they would move their operation to Russellville, Arkansas. The transition was made in September of 1968.				

107.	Hart-Carter Company	Webster City	Branch plant	Minneapolis, Minnesota	125	1971	Screens for combines and thrashers
	Reason:	Hart-Carter had 14 plants, three of which were producing screens. New management took control of the company and decided to consolidate all screen production at the Gridley, Illinois facility. They considered this to be a more efficient method of production.					
108.	Continental Egg Corporation (Division of Henningson Foods)	Malvern	Branch plant	Omaha, Nebraska	100	1975	Dried eggs
	Reason:	The Malvern plant was producing dried eggs for pet foods, but a decline in the supply of eggs and in the profit margins for inedible eggs forced them to halt production for this market. The Malvern plant was not used for the production of edible dried eggs because the facility was old (built in the early 1900's) and it would entail too great an investment to bring the plant up to USDA standards. Also, the demand for edible dried eggs (primarily used in candy) fell when England joined the Common Market. Because of the above factors, production was discontinued at Malvern.					
109.	Crownline Plastics Company	Hamburg	Local	--	20	1970	Plastic pipe
	Reason:	Crowline transferred its production 7 miles away to Nebraska City, Nebraska. The reasons cited for such a short move were better tax and transportation benefits in Nebraska.					

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
110.	Bonaparte Rendering Company	Bonaparte	Branch plant (Merger-1)	Des Moines, Iowa	23	1966	Hides, grease, and meat scraps
	Reason: Bonaparte Rendering was started in the 1930's. In 1959 the company was acquired by Cedar Rapids Hide and Fur, and in 1965 it was sold to National By-Products of Des Moines. It was operated for less than one year by National By-Products before they dismantled the facility and transferred production to their Clinton and Des Moines plants.						
111.	Mid-Equipment Corporation	Wellsburg	Local	--	20	1968	Truck hoists and flatbeds
	Reason: Mid-Equipment needed a larger facility and they requested that the community provide them with a new plant under a lease-purchase plan. Wellsburg would not cooperate but Grundy Center did, so production was transferred to that city. Grundy Center is 15 miles from Wellsburg.						
112.	Darling-Delaware Company	Alpha	Branch plant	Chicago, Illinois	35	1972	Animal by-products
	Reason: The Alpha plant was old and the company considered it more practical to build a new facility than refurbish the one at Alpha. Tama was selected as the site for the new building because of greater proximity to suppliers. Tama is about 100 miles from Alpha.						

113.	Elgin Asparagus Corporation	Elgin	Local	--	25	1967	Asparagus and corn canning
	Reason: This company started production in Elgin in 1945. High labor costs (they had to import Mexicans to pick the asparagus) prevented the operation from being profitable in recent years. The owners elected to liquidate the company's assets and close the business in 1967.						
114.	Cargill, Inc.	Redfield	Branch plant	Minneapolis, Minnesota	30	1967	Soybean processing
	Reason: Production was transferred to Des Moines, Cedar Rapids, and Wichita, Kansas in order to minimize transportation costs.						
115.	Oskaloosa Clay Products (Goodwin Company)	Oskaloosa	Branch plant	Des Moines, Iowa	25	1968	Brick and tile products
	Reason: The Oskaloosa facility was old and inefficient. Production was transferred to Ottumwa after the construction of a new plant in that community.						
116.	Herters, Inc.	Iowa Falls	Branch plant	Waseca, Minnesota	25	1975	Clay Targets for trap shoot shooting
	Reason: The parent company wanted a plant in the Southwest to serve that market area. Demand by Iowa consumers could be met by production at the Minnesota facility so the Iowa Falls plant was closed, and the equipment was moved to Enos, Texas.						
117.	Gilbert Manufacturing and Building	Iowa Falls	Local	--	20	1972	Building and construction firm

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
		Reason:	The owner retired and liquidated the company's assets.				
118.	Sturdy-House Manufacturing Company	Waukon	Branch plant	Flagler Beach, Florida	20	1974	Portable storage buildings
		Reason:	Sturdy-House opened their Waukon plant in 1972. Two factors lead to its brief existence in Iowa. (1) Waukon did not have a large enough pool of unemployed labor from which to draw a work force; (2) Iowa customers were not interested in assembling these buildings during the winter months, therefore, production was transferred South where there existed a year round market for the product.				
119.	Federated Industries, Inc.	Waukon	Branch plant	Grayslake, Illinois	150	1968	Loud speakers and battery chargers
		Reason:	The Waukon facility was opened in 1964. Federated's president stated that the plant was losing money because it could not get supplies from the other branches on schedule. Subsequently, the Waukon facility was closed and production was consolidated back into the headquarter's plant.				
120.	The Shannon Company	Bancroft	Local	--	30	1971	Furniture

Reason: Local investors purchased Shannon from the Stitchcraft Company (a subsidiary of Winnebago) and moved it to Bancroft in 1969. The company failed to make a profit, and the assets were liquidated two years later.

121. Midwest Speaker Company	McGregor	Local	--	40	1970	Speakers

Reason: Midwest was located in McGregor about 15 years before it moved over 200 miles away to Nebraska. The reason cited for the move was that Midwest wanted to expand but lacked the necessary capital, therefore, part ownership in the business was sold to an Omaha individual. The transfer to Nebraska was a prerequisite to acquiring the additional funds.

122. Farmer's Produce Company	Clarion	Local	--	30	1969	Chicken and egg processing

Reason: Farmer's Produce was purchased by individuals from Minneapolis in about 1967. The plant was operated at night and on weekends in order to avoid state and federal inspection. In 1969 the facility was destroyed by fire. The owners were suspected of arson.

123. Page and Hill Homes, Inc.	Clarinda	Branch plant (Merger-3)	Kansas City, Missouri	54	1973	Pre-fabricated homes and components for apartments

Reason: The Clarinda plant was opened in 1955. In 1970 part interest in Page and Hill was sold to Engineering Components of Kansas City (suppliers of components for Kansas City apartment complexes). Engineering Components were forced out of business when some of the contractors they were supplying declared bankruptcy and were unable to pay for components ordered.

Table A-1 (Continued)

	Company	Previous Iowa location	Ownership characteristics	Headquarters (if not local)	Estimated peak employment	Year production ceased or transferred	Principal products
124.	Central Farm Products	Allerton	Branch plant	Trenton, Missouri	50	1970	Dried milk, butter and cheese
		Reason: Bankrupt.					
125.	Frito-Lay Company	Ottumwa	Branch plant (Merger-2)	Atlanta, Georgia	65	1972	Potato chips
		Reason: The Ottumwa plant was opened by the Red Dot Potato Chips Company in 1955. Later, in 1961, Red Dot was acquired by the Frito-Lay Company. In 1970 a government anti-trust ruling forced Frito to dispose of nine of their plants. Subsequently, the Ottumwa facility was sold to the Nefco Company of Atlanta, Georgia. In 1972 Nefco was losing money, and they closed their Ottumwa plant in an effort to consolidate production and reduce costs. Later, the company declared bankruptcy.					
126.	Jacob E. Decker and Sons	Mason City	Branch plant	Phoenix, Arizona	1,300	1975	Meat products
		Reason: The Mason City facility was purchased by the Armour Food Company in 1935 and operated until August 15, 1975. The plant was closed because it was obsolete and inefficient. Armour intends to open a new plant in Mason City in 1977, but it will have only about 400 employees.					

127.	Fingerhut Corporation	Mason City	Branch plant	Minnetonka, Minnesota	120	1975	Offset printing

Reason: The Mason City plant mailed sales circulars for company products to potential mail order customers. When sales declined severely during the 1975 recession, several of Fingerhut's manufacturing and mailing plants were closed. The Mason City facility was about the last of the mailing branches organized and was the first one closed during the recession.

128.	Atlas Motor Homes	Mason City	Branch plant (Merger-2)	White Plains, New York	165	1974	Motor homes

Reason: AMF purchased Atlas in 1972 to give their Skamper Division (which at that time was producing only camping trailors) a motor home capability. The Skamper plant in Higgins, Pennsylvania was at that time under-utilized so production of the motor homes was transferred there. This move was further encouraged by the fact that Atlas was leasing what AMF considered a less than adequate facility.

Table A-2. 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-2 (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-2 (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-2 (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-2 (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-3. 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)

Talbe A-4. 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].

Table A-5. 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		
		29	Petroleum and coal products
38	Instruments		
		30	Rubber products
		31	Leather products

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

Table A-6. Coefficients resulting from regressing (quadratic) the number of branch and local plant openings per year on the percentage change in GNP lagged from zero to six quarters, 1965-1975

Lag	Y Intercept (β_0)	Coefficients of χ (β_1)	Coefficient of χ^2 (β_2)	R^2	F
No lag in GNP					
Branch	23.675	-.051	.090	.097	.42
Local	23.770	-1.373*	.213*	.311	1.81
Two quarter lag in GNP					
Branch	22.468	1.037*	-.003	.420	2.90
Local	21.689	-.904	.263	.164	.78
Three quarter lag in GNP					
Branch	22.219	.987**	.014	.540	4.70**
Local	21.636	-.243	.138	.144	.67
Four quarter lag in GNP					
Branch	21.134	1.067***	.032	.649	7.43***
Local	21.385	-.108	.129	.137	.63
Six quarter lag in GNP					
Branch	21.288	1.323	-.022	.403	2.70
Local	21.378	-.173	.171	.084	.37

*Significant at the 10 percent level.
**Significant at the 5 percent level.
***Significant at the 2.5 percent level.

Table A-7. Coefficients resulting from regressing (quadratic) the number of branch and local plant closings per year 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	8.507	-.542*	-.003***	.261	1.41*
Local	3.711	-.355*	.111***	.498	3.97*
Two quarter lag in GNP					
Branch	8.387	-.783*	.034	.378	2.43
Local	4.434	-.404	.090	.187	.92
Three quarter lag in GNP					
Branch	7.867	-.597*	.030	.302	1.71
Local	5.042	-.203	.017	.086	.38
Four quarter lag in GNP					
Branch	8.235	-.534*	.029	.254	1.36
Local	5.098	-.103	.002	.021	.09
Six quarter lag in GNP					
Branch	9.235	-.482	-.047	.255	1.37
Local	5.480	.107	-.058	.054	.23

*Significant at the 10 percent level.

***Significant at the 2.5 percent level.

Table A-8. Coefficients resulting from regressing (quadratic) the number of durable branch and local plant closings per year 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	5.277	-.371	-.013	.254	1.36
Local	2.257	-.130	.039*	.201	1.01
Two quarter lag in GNP					
Branch	5.243	-.391	-.015	.253	1.35
Local	2.185	-.225	.061	.296	1.68
Three quarter lag in GNP					
Branch	4.776	-.345	.005	.193	.96
Local	2.558	-.115	.019	.109	.49
Four quarter lag in GNP					
Branch	5.102	-.444	.011	.241	1.27
Local	2.618	-.125	.019	.069	.30
Six quarter lag in GNP					
Branch	5.670	-.464	-.012	.240	1.26
Local	3.018	-.105	-.002	.061	.26

*Significant at the 10 percent level.

Table A-9. Coefficients resulting from regressing (quadratic) the number of eastern and western Iowa plant openings per year 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					
West	19.426	-.922	.310*	.299	1.71
East	28.461	-.380	.049	.029	.12
Two quarter lag in GNP					
West	15.707	.052	.392*	.455	3.34*
East	28.371	.281	-.050	.014	.06
Three quarter lag in GNP					
West	17.513	.791	.144	.357	2.22
East	26.790	.238	.039	.064	.27
Four quarter lag in GNP					
West	16.463	1.041	.134	.494	3.91*
East	26.416	.157	.062	.091	.40
Six quarter lag in GNP					
West	16.356	1.289	.120	.346	2.12
East	27.653	.320	-.025	.011	.04

*Significant at the 10 percent level.

Table A-10. Coefficients resulting from regressing (quadratic) the number of eastern and western Iowa plant closings per year 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					
West	5.475	-.441	.015	.165	.79
East	6.742	-.456*	.092*	.279	1.55
Two quarter lag in GNP					
West	6.130	-.809***	.031	.531	4.53**
East	6.601	-.379	.093	.138	.64
Three quarter lag in GNP					
West	5.949	-.631***	.013	.481	3.32*
East	6.960	-.170	.034	.065	.28
Four quarter lag in GNP					
West	6.189	-.614*	.013	.378	2.43
East	7.144	-.123	.020	.022	.09
Six quarter lag in GNP					
West	7.052	-.476	-.058	.375	2.40
East	7.663	.100	-.046	.023	.09

*Significant at the 10 percent level.

**Significant at the 5 percent level.

***Significant at the 2.5 percent level.

Table A-11. Coefficients resulting from regressing (quadratic) the number of western Iowa branch and local plant openings per year 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	6.780	-.113	.177**	.380	2.45
Local	12.646	-.809*	.133*	.245	1.30
Two quarter lag in GNP					
Branch	5.391	.217	.223**	.552	4.93**
Local	10.317	-.165	.169	.210	.94
Three quarter lag in GNP					
Branch	6.994	.552	.067	.357	2.22
Local	10.540	.239	.077	.230	1.19
Four quarter lag in GNP					
Branch	6.374	.675*	.063	.469	3.53*
Local	10.089	.366	.072	.332	1.99
Six quarter lag in GNP					
Branch	6.205	.724	.074	.335	2.02
Local	10.015	.565	.045	.219	1.12

*Significant at the 10 percent level.

**Significant at the 5 percent level.

VIII. APPENDIX B: SPECIAL CASES

A. Test for Significance of Difference Between Two Proportions[1]

When dealing with data on a logically dichotomous variable, the formula for the significance of the difference between two proportions is:

$$Z = \frac{P_1 - P_2}{\sqrt{\frac{p(1-p)}{N_1} + \frac{p(1-p)}{N_2}}}$$

where

P_1 and P_2 are the proportions for sample 1 and 2 respectively

N_1 and N_2 are the number of cases in sample 1 and 2 respectively

$$p = \frac{N_1P_1 + N_2P_2}{N_1 + N_2}$$

and

Z is distributed normally.

Note that the probability of finding a significant difference between two proportions is directly related to the magnitude of the difference and the number of observations (cases). For example:

$$Z(\tfrac{1}{2} \text{ versus } \tfrac{1}{3}) = .373$$

$$Z(\tfrac{100}{200} \text{ versus } \tfrac{100}{300}) = 3.73 \ .$$

[1]Source: [6, p. 199].

B. Rural Iowa Milk Producers

1965-1975 was a decade of major transition for the Iowa dairy industry. During this period Iowa's creameries were converting to the production and marketing of whole milk instead of just cream. The whole milk processors were decisively more efficient, but scale economies could not be achieved unless the volume of production was increased almost twenty fold. Milk drying equipment and the continuous churn were mostly responsible for the need of increased volume and larger capital investments. However, even if the creameries could afford to adopt the new technology, survival was not guaranteed. Supplies of raw milk to, and sales from the creameries had to be sufficient to support the larger operations. Distribution and sales economies in the form of milk bottling plants were required to achieve production economies, therefore, capital requirements for an efficient facility were further increased.

In conclusion, the local independent creameries were forced to merge to insure that their supply and market areas would support a more efficient plant (a phenomena predicted by the merger theory of Chapter II). The two primary consolidation efforts occurred in 1964-1965 and 1967-1970. Those companies not fortunate enough to join a cooperative or dairy association usually became distributors for one of their previous competitors or they were forced out of business. About fifteen independent rural Iowa creameries were closed during the period of study.

C. Rural Iowa Fertilizer Blending Plants

From 1965 through 1968 six major chemical and oil companies established over 160 small fertilizer blending plants throughout rural Iowa (Table B-1). The reasons for such a large magnitude of inmigration were: (1) the profits of the small fertilizer blending plants had been good in the late 1950's and early 1960's, (2) the chemical and oil companies had extra gas which could be converted to ammonia; and therefore, elected to vertically integrate down to the retail outlets, and (3) the bulk blending of dry fertilizer in small retail plants within ten to twenty miles of the fields became more profitable after an inexpensive method of providing diammonium phosphate was developed.

The oil companies efforts to control part of the fertilizer market ended in failure. The new blending plants created a tremendous excess supply of fertilizer, and as a result, price cutting was prevalent and profits were not realized. The oil and chemical companies' failure to realize the anticipated profits encouraged them to withdraw from retail sales. Almost all of the plants established by the oil companies were purchased (at less than cost) by the same local dealers and coops that the oil companies had hoped to eliminate.

Table B-1. Rural Iowa fertilizer blending plants which initiated production from 1965-1968[a]

Company	Number of Iowa branches
American Cyanamid Company	18
Armour Agriculture Company	5
W. R. Grace - Davis Chemical Division	64
Custom Farm Service	26
Tennesse Corporation	8
Kerr-McGee Oil	3
Sinclair Petrochemicals	40

[a]Source: [14, 15].