

South Dakota State University

# Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange

---

Electronic Theses and Dissertations

---

1979

## The Magnitude and Timing of Rail Abandonment Impacts on Selected Economic Variables for Rural South Dakota Communities

J. Michael Alley

Follow this and additional works at: <https://openprairie.sdstate.edu/etd>



Part of the [Regional Economics Commons](#)

---

### Recommended Citation

Alley, J. Michael, "The Magnitude and Timing of Rail Abandonment Impacts on Selected Economic Variables for Rural South Dakota Communities" (1979). *Electronic Theses and Dissertations*. 4888. <https://openprairie.sdstate.edu/etd/4888>

This Thesis - Open Access is brought to you for free and open access by Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact [michael.biondo@sdstate.edu](mailto:michael.biondo@sdstate.edu).

THE MAGNITUDE AND TIMING OF RAIL ABANDONMENT  
IMPACTS ON SELECTED ECONOMIC VARIABLES FOR  
RURAL SOUTH DAKOTA COMMUNITIES

BY

J. MICHAEL ALLEY

A thesis submitted  
in partial fulfillment of the requirements for the  
degree Master of Science, Major  
in Economics, South Dakota  
State University  
1979

SOUTH DAKOTA STATE UNIVERSITY LIBRARY

58

**THE PROFITABILITY OF ALTERNATIVE  
MARKETING STRATEGIES**

This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable for meeting the thesis requirements for this degree. Acceptance of this thesis does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

---

**A. Clyde Vollmers**  
Thesis Adviser

Date

**John E. Thompson**  
Head, Economics Department

Date

## ACKNOWLEDGEMENTS

The author wishes to extend his sincere appreciation to Dr. Charles Lamberton for his guidance throughout the writing of this thesis. Thanks are also extended to Clyde Vollmers and Dr. William Kamps for their invaluable suggestions and review.

The author is also grateful to Dr. Lee Tucker and Craig Fischer for their statistical and computer assistance.

A special thanks is extended to Diane Armstrong for typing this thesis.

TABLE OF CONTENTS

	Page
LIST OF TABLES . . . . .	iii
LIST OF FIGURES . . . . .	iv
 Chapter	
I. INTRODUCTION . . . . .	1
Causes of Rail Abandonment . . . . .	1
Perspectives on Abandonment . . . . .	7
Justification . . . . .	12
Objectives . . . . .	12
Overview . . . . .	13
 II. REVIEW OF THE LITERATURE . . . . .	 14
 III. ANALYTICAL PROCEDURES . . . . .	 22
Background of Abandoned Lines . . . . .	22
Doland to Groton Line . . . . .	22
Veblen to Grenville Line . . . . .	26
Clear Lake to Minnesota Border Line . . . . .	28
Reville to Strandburg Line . . . . .	29
Strandburg to Watertown Line . . . . .	30
Astoria to Minnesota Border Line . . . . .	30
Selected Performance Variables . . . . .	31
Time Periods . . . . .	32
Objective One . . . . .	33

	Page
Community Analyses . . . . .	35
Bank Analyses . . . . .	35
Objective Two . . . . .	36
Objective Three . . . . .	37
Objective Four . . . . .	38
 IV. FINDINGS OF THE STUDY . . . . .	 40
Objective One . . . . .	40
Objective Two . . . . .	42
Objective Three . . . . .	43
Objective Four . . . . .	45
Interpretations . . . . .	46
Further Considerations . . . . .	49
 V. SUMMARY OF THE STUDY . . . . .	 55
Limitations of the Study . . . . .	56
Recommendations . . . . .	57
 BIBLIOGRAPHY . . . . .	 59
APPENDIX A . . . . .	63
APPENDIX B . . . . .	69
APPENDIX C . . . . .	72

LIST OF TABLES

Table	Page
1. Test Communities . . . . .	23
2. Control Communities . . . . .	24
3. Five Year Periods, Property Value and Utility Usage . . . . .	40
4. Three Year Periods, Property Value and Utility Usage . . . . .	41
5. Three Year Periods, Indexed Bank Deposits . . . . .	41
6. Three Year Periods, Non-Indexed Bank Deposits . . . . .	42
7. Five Year Periods, Non-Indexed Bank Deposits. . . . .	42
8. One Way Analysis of Variance, Property Value. . . . .	43
9. One Way Analysis of Variance, Utility Usage . . . . .	44
10. One Way Analysis of Variance, Bank Deposits (Indexed) . . . . .	45
11. One Way Analysis of Variance, Bank Deposits (Non-Indexed) . . . . .	46
12. Test Communities, 1950-1970 . . . . .	51
13. Control Communities, 1950-1970 . . . . .	52
14. Test Communities, 1970-1975 . . . . .	53
15. Control Communities, 1970-1975. . . . .	54

LIST OF FIGURES

Figure	Page
1. Abandonment Miles Per Decade . . . . .	2
2. Test and Control Community Location . . . . .	25



## CHAPTER I

### INTRODUCTION

This study examines the economic impacts of past branchline abandonments on rural South Dakota communities. In this chapter the factors and conditions leading to the abandonment of the branchlines are examined first. Then a section discussing the perspectives of the people and entities involved in the abandonment is presented. This is followed by the reasons for undertaking the study and the study objectives. Finally an overview of the remaining chapters is presented.

#### Causes of Abandonment

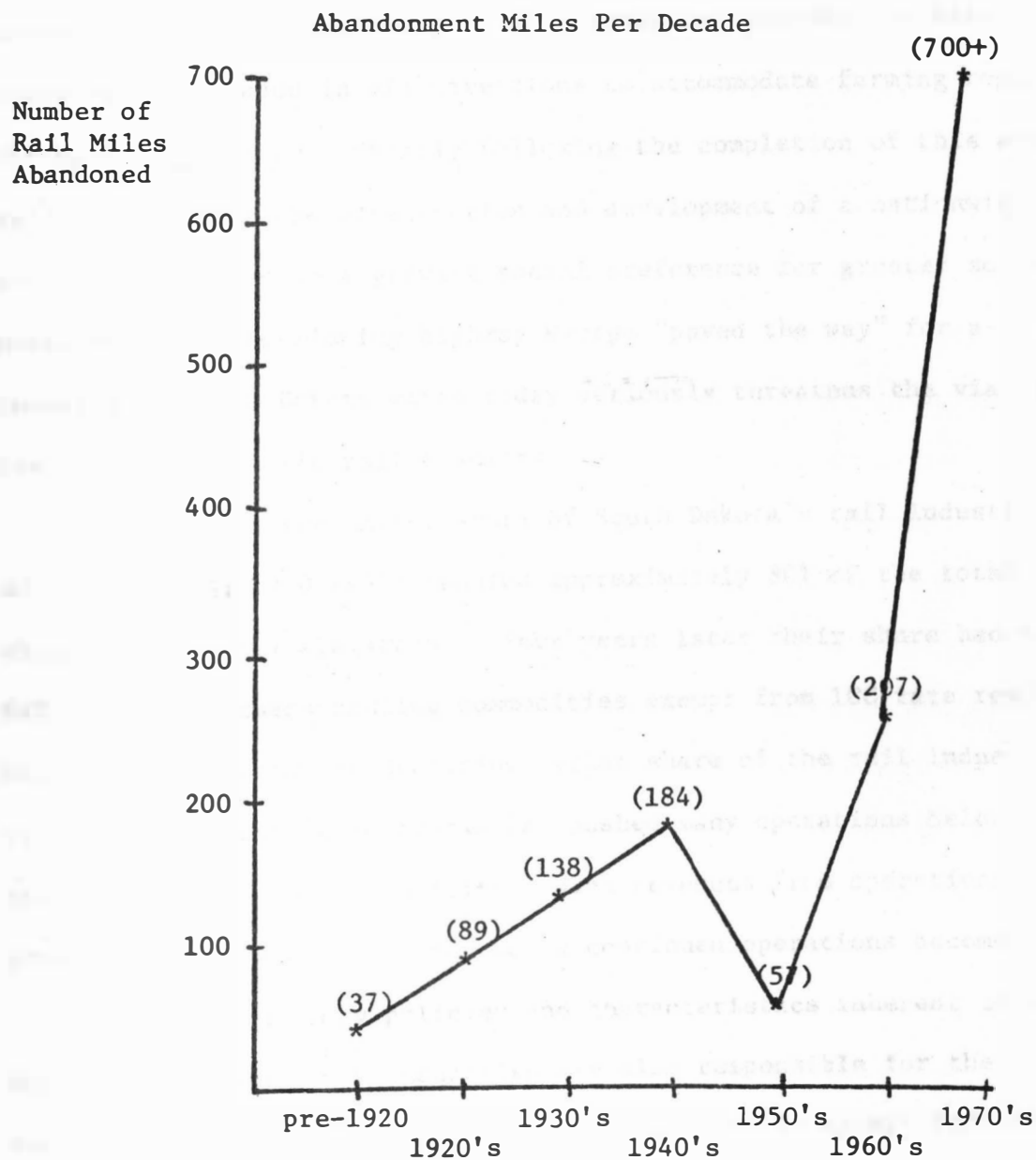
South Dakota has lost a significant amount of rail mileage to abandonment in recent years. With the exception of the 1950's rail abandonment has been increasing in South Dakota since the turn of the century (Figure 1). In addition to past abandonments South Dakota railroad companies, as of March 1, 1979, have filed to abandon 11 lines accounting for 653.8 more miles of track.<sup>1</sup> This track under consideration represents approximately 24% of the entire remaining rail network in South Dakota.

There are several factors and conditions responsible for this increased rate of branchline abandonment. The major factor has been the development of the motor carrier and ensuing technological innovations in transportation. The railroad, whose introduction to South Dakota dates

---

<sup>1</sup>Statement by Division of Railroad representative, South Dakota Department of Transportation, March 30, 1979.

Figure 1



SOURCE: The South Dakota Railroad Industry Yesterday and Today, Vol. V, South Dakota Public Utilities Commission.

back to the 1870's, was for several decades the only mode of transportation connecting South Dakota farmers to regional and national markets. Therefore, tracks were extended in all directions to accommodate farming regions throughout the state. Shortly following the completion of this extensive rail network came the construction and development of a nationwide highway system in response to a growing social preference for greater social mobility. This developing highway system "paved the way" for a trucking industry in South Dakota which today seriously threatens the viability of the once monopolistic rail industry.

As a result, the market share of South Dakota's rail industry has been decreasing. In 1970 rails handled approximately 80% of the total volume shipped by country elevators.<sup>2</sup> Four years later their share had fallen to 64%. Grain truckers hauling commodities exempt from ICC rate regulation have benefited from the declining market share of the rail industry. The rails loss of traffic to trucks has pushed many operations below or near the margin of economic viability. When revenues from operations fail to cover operating and rebuilding costs continued operations become questionable.

Certain regulatory policies and characteristics inherent to South Dakota's rail and truck industries are also responsible for the truck industry's growing prominence. The truck industry is exempt from ICC rate regulation and has no high barriers to market entry. The relatively small amount of capital required to start a small-scale truck firm makes market

---

<sup>2</sup>C.E. Lamberton and R.K. Rudel, A Pilot Study to Investigate Efficient Grain Transportation and Marketing Systems for South Dakota, South Dakota State University, June 1976, p. 20.

entry easy and likely in times of excess demand and/or profits. The railroads, on the other hand, are faced with enormous capital plant requirements making market entry at anytime next to impossible.

Deferred maintenance practices by railroads on lines operating in South Dakota have also led to problems. Historically, the railroads have held a distinct line haul advantage over trucks in transporting low value, bulky materials (grain) due to economies in shipment size. In South Dakota this advantage has been diminished because deferred maintenance has resulted in a serious deterioration of track and equipment which has caused derailments, weight limitations, and speed restrictions. All three conditions reduce the rail's line haul advantage by increasing transit time. Furthermore, because: 1) South Dakota's farmland generates less revenue per mile; and 2) maintenance and rebuilding costs per mile are comparatively constant from state to state; less net revenue per mile is realized in South Dakota. Where higher returns can be earned from more profitable lines in other states there is less incentive to invest in and maintain South Dakota lines.

Further repercussions of deferred maintenance are felt because South Dakota's rail operations are unable to adopt new technologies. Deteriorated track and other conditions prevent the adoption of larger jumbo covered hoppercars or unit train operations which have reduced costs in other states. Trucks, provided with well-maintained highways have been able to adopt new technologies and reduce their costs.

Several other factors helpful in explaining the present rate of branchline abandonment are: drought, inflation, subsidization of competing modes and increased on-farm storage. Drought and other natural disasters

that reduce crop yields have a greater impact on the rail industry than the trucking industry due to regulatory policies and relative capital requirements. When the demand for transportation services is reduced due to drought, the trucks exempt from rate regulation can cut their rates below regulated rail rates (as long as variable costs are covered) to capture what grain traffic there is. If truck firms fail, in these times of low demand, the industry's low capital requirements makes new entry, in times of higher demand, relatively easy. In contrast, the rail industry is faced with an "all-or-nothing" decision due to enormous rebuilding costs.

Inflation and the lag involved in rate changes is also injurious to the rail industry. When regulators fail to adjust rail rates to allow for inflation the railroad's real rate of return is reduced threatening their financial stability. This occurs as inflated operating costs approach or pass the unadjusted rates. The more flexible unregulated truck industry, in times of full rail utilization, can raise their rates to maintain financial stability. If excess rail capacity exists the smaller truck firms can survive through real wage cuts by owners who are the labor force.

The railroads have long claimed part of their relative decline is due to government subsidization of the truck industry. This subsidization takes the form of highway and interstate maintenance and construction. Railroads, on the other hand, have received virtually no federal aid since the period of initial land grants. Although trucks pay substantial user taxes, rail concerns believe they do not pay their fair share relative to

the wear and tear they cause. The following recent developments tend to support this accusation:<sup>3</sup> (1) Most states that have conducted studies to assess the road damage done by heavy trucks have concluded that trucks should be paying higher user taxes to defray expenses; (2) The Department of Transportation is making plans to restrict big trucks to a limited number of interstate highways (according to the Federal Highway Administration, interstates are wearing out much faster than they are being repaired); and (3) The federal government has threatened to cut off highway construction money from fourteen states accused of not enforcing truck weight laws. South Dakota has invested in several portable scales with plans for more purchases in the future.

On-farm grain storage in South Dakota has increased substantially in recent years hurting the rail industry. When grain prices are low farmers store their grain resulting in a weak demand for transportation services. With a weak demand unregulated trucks can cut their rates leaving rails with excess capacity. When grain prices rise farmers desire to ship stored grain resulting in a peak demand for transportation. The rails become fully utilized allowing trucks to raise rates above rail rates to capture excess profits. Rails cannot raise rates to profit from the greater demand.

Problems, whether of a competitive or regulatory nature have combined to leave South Dakota's rail industry in a troubled state. Unless measures are taken to alleviate some of the problems the trend will continue.

---

<sup>3</sup>David M. Elsner, "Highway Damage by Big Trucks Worries Various Agencies, and Crackdowns Loom," The Wall Street Journal, April 6, 1978, p. 1.

### Perspectives on Abandonment

Most abandonment petitions have opponents as well as proponents. James A. Hagen stated, "A light density line can be viewed as a liability to a carrier, a necessary transportation facility to a shipper, and a development tool to a state or local community. Understanding and resolving the light density problem requires complete cognizance of each viewpoint."<sup>4</sup> The perspectives usually in the forefront are: 1) the railroad companies; 2) the farmers and shippers directly affected; 3) the community businessmen and leaders; and 4) the state and local governments.

Railroad companies file for abandonment when revenues from operations fail to cover and justify operating and rebuilding costs. They contend that the continued operation of the unprofitable lines threatens the viability of their profitable lines. They further contend that investment in upgrading the line would be financially unsound given the low estimated demand for future services.

Farmers and shippers directly affected often oppose the abandonment claiming that the loss of the rail service will severely injure or close their operations. Often they anticipate higher transportation costs because trucks, being the only alternative in South Dakota, would have more rate charging leverage leaving both farmers and shippers at a disadvantage relative to competitors still served by rails. They contend, in contrast to the railroads, that investment in upgrading the track and improving the services would increase the traffic and profitability of the line.

---

<sup>4</sup>James A. Hagen, "Panel: Perspectives on the Light Density Line Problem," in Proceedings Symposium on Economic and Public Policy Factors in Influencing Light Density Rail Line Operations (Washington, D.C.: Federal Railroad Administration, 1973), p. 26.

Community interests contend that the loss of rail service will substantially increase transportation costs thus reducing the purchasing power and patronage of area farmers whose trade is considered essential for the community's viability.

Local businesses dependent on low cost rail service fear abandonment because there may be no feasible alternative transportation services. The utility plant near Big Stone City, South Dakota illustrates this point. The plant's energy source is coal which has been shipped on the Milwaukee line. If this service is discontinued the plant, according to the owners, will close because truck service would be too costly.<sup>5</sup>

Citizens and local governments fear employment and tax losses, declining property values and diminished prospects for future economic development. Employment losses may be directly related due to the closing of the local grain elevator or directly related due to the layoff of help at a general store that suffers from slowed business. Tax losses may reduce the provision of public services. Development may be retarded in two ways. First, businesses dependent on low cost rail services cannot be attracted to locate. Second, firms operating in the community but not using rail service may prefer to retain rail service as an option in the event it is needed at some future date. Retaining rail service as an option becomes important in light of today's oil shortage and the estimated availability of coal. As oil becomes more scarce its price will rise making coal more viable as the source of energy for electric power. Rails are far more economical than trucks in hauling coal.

---

<sup>5</sup>Testimony given October 27, 1978 by R.O.M. Grutle, Senior Vice President of the Otter Tail Power Company before the Joint Economic Committee, Congress of the United States, George McGovern Chairman.



The state's concern over branchline abandonment and the impacts thereof has recently intensified with the formulation of RAILPLAN SOUTH DAKOTA by the South Dakota Department of Transportation. This plan, the first of its kind in South Dakota, spells out the role which the state should play in determining the future of the rail industry.

The state's policy towards the rail industry and its future follows:<sup>6</sup>

1) South Dakota's recommended policy toward rail transportation can best be described as one of cooperation. Rail users, railroad companies, local governments and the State need to coordinate their efforts to solve transportation problems in the state.

2) The South Dakota Department of Transportation will not openly oppose all railroad abandonment applications, but will first consider the potential for the viable operation of the line, social and economic impacts caused by abandonment of the line, the determination of shipper and community interest in the affected area and other factors which may be unique to a given area or given line.

3) The South Dakota Department of Transportation will not advocate a subsidy for continued rail service unless it is for a short term in order to deter abandonment until other means of transportation are developed, to establish profitability of a line, or if it is found to be in the best interest of the state of South Dakota to foster such a program for a particular line.

---

<sup>6</sup> South Dakota Department of Transportation, Railplan South Dakota, submitted to the Federal Railroad Administration, U.S. Department of Transportation, March 1978, p. 5.

RAILPLAN also formulated eight workable goals which define the State's desired future characteristics of the railroad system in South Dakota. The goals are as follows:<sup>7</sup>

1) To foster a rail transportation system that will dependably, efficiently, economically and profitably move South Dakota's agricultural, natural resource and industrial production to market in a manner which will maintain and improve the competitive position of the State, its farmers and its industry.

2) To encourage and develop a rail system that will provide adequate rail service for all freight and passengers.

3) To promote increased use of rail service in those ways that it is best suited.

4) To develop in the rail system, flexibility and responsiveness to changing shippers requirements.

5) To develop, through multi-modal transportation arrangements, competitive transportation options for those communities that lose rail service.

6) To provide for the handling of unprofitable rail services where the loss of such services will cause severe economic or socio-economic hardship.

7) To promote financial stability and operational efficiency within the rail system serving South Dakota.

8) To develop, maintain and improve the institutional capability for implementing state railroad policy by legislation and funding.

---

<sup>7</sup>Ibid., p. 6.

Federal agencies and Congress have also taken a more active role in addressing the abandonment issue. Congress, in response to a growing concern over the financial difficulties for railroads in the Northeast and Midwest, enacted the Regional Rail Reorganization Act of 1973 (3 R's) and the Railroad Revitalization and Regulatory Reform Act of 1976 (4 R's). One of the sections in the 3 R's Act directed the Federal Railroad Administration (FRA) to evaluate the Northeast and Midwest railroads relative to abandonment and plant rationalization. The FRA's final report to the Secretary of Transportation recommended abandonment of the light density lines as a solution to the problem. Their report indicated that nearly 25% of the lines in the regions were potentially excess.<sup>8</sup>

The Interstate Commerce Act amended by the 3 R's and 4 R's Acts designated the responsibility of judging whether or not abandonment petitions should be granted to the Interstate Commerce Commission (ICC). Historically the ICC had required that rail services be maintained on lines that it considered necessary for public convenience regardless of the lines' financial difficulty. Their philosophy was to treat rail services as a public utility with social responsibility. This philosophy changed with enactment of the 3 R's Act. The 3 R's not only changed the procedure by which abandonment could be carried out, but it also put the burden of proof (whether or not abandonment would have social repercussions) on the

---

<sup>8</sup>The National Task Force on Rail Line Abandonment - Curtailment and Rural Development, The States and Rural Rail Preservations: Alternative Strategies (Lexington, Kentucky: The Council of State Governments Iron Works Pike, October 1975), p. 16.

users of the rail service. Since the passage of the 3 R's Act the ICC has approved approximately 95% of all abandonment petitions filed.<sup>9</sup>

#### Justification

This study is intended to fill an important gap in the knowledge regarding one of the impacts of branchline abandonment on South Dakota. This study will examine the impacts of branchline abandonment on rural South Dakota communities because the impacts are not known. Although opinions are publicized during many abandonment hearings, they are often those of vested interests and therefore potentially not objective.

The value of this knowledge is best revealed in several of the workable goals formulated in South Dakota's RAILPLAN. Goal six specifically requires knowledge as to the impacts of abandonment. The intent behind workable goal six is "to provide for the handling of unprofitable rail services where the loss of such services will cause severe economic or socio-economic hardship." Obviously correct information as to the actual impacts of abandonment on the community is imperative for correct policy design and implementation relative to this goal.

It is this study's purpose to enhance the public's ability to deal with railroad problems by providing an understanding of how South Dakota communities have adjusted to past abandonments.

#### Objectives

The general objective of this study is to estimate selected impacts of past branchline abandonments on rural South Dakota communities. The

---

<sup>9</sup>Ibid.

general hypothesis of this study is that small rural trade centers depend on the direct and indirect business activities generated by area farmers which in turn depend on low-cost rail service. The often heard argument that a farmer's viability depends on rail availability is based primarily on the expectations that substituted motor transport would prove too costly.

Specific objectives guiding the study are:

- 1) To estimate whether or not selected communities which have experienced abandonment have experienced a decline in selected performance measures relative to similar, nearby communities which still have rail service.
- 2) To estimate, for selected abandoned communities, any differences in selected performance measures between pre-abandonment and post-abandonment periods.
- 3) To estimate in which specific years (relative to the year of abandonment) any effects of abandonment occur.
- 4) To estimate if there is a relationship (and what kind) between community size and the ability to adjust to branchline abandonment.

#### Overview

This chapter identified the problem, justified the research and listed the objectives that guided the study. Chapter II reviews relevant literature. Chapter III presents the analytical procedures used. Chapter IV presents the findings and interpretations of the statistical analysis followed by some further considerations. The final chapter summarizes the study, presents the limitations of the study, and concludes with recommendations.

## CHAPTER II

### REVIEW OF LITERATURE

The majority of the studies available on branchline abandonment and the resulting impacts upon rural communities have concluded that the impacts are limited. The two approaches usually used are: (1) attempts to determine the impacts on a community's activity after the abandonment; and (2) attempts to project the potential impacts on a community facing abandonment. A few studies have attempted to analyze beyond the immediate economic impacts and have dealt with impacts on long run economic development.

Baumel, Drinka and Miller,<sup>1</sup> at Iowa State University, compared the growth of communities and grain elevators located on 71 Iowa branchlines still in operation with the growth of communities and grain elevators which had experienced rail abandonment. The study used an analysis of variance (anova) model to test for significant differences between selected performance variables for the two groups of communities. Community growth was estimated by the yearly changes in population and retail sales. The study also analyzed the differences in bank performance measures for the two groups of communities. Bank demand deposits and loans and discounts were interpreted as gross measures of community income whereas bank surpluses, reserves and undivided profits were approximations of bank

---

<sup>1</sup>C. Phillip Baumel, John J. Miller, and Thomas P. Drinka, "Impact of Rail Abandonment upon Grain Elevator and Rural Community Performance Measures," American Journal of Agricultural Economics, November, 1977, pp. 745-749.

profitability. Anova was also used to test for significant differences in grain sales, fertilizer sales, total sales and return on investment for the two groups of elevators. The results of the Anova test suggested that there were no significant differences in the yearly growth of the selected performance measures for the two groups of communities. The statistical analysis of the grain elevators also suggested no significant differences. Managers and owners of the grain elevators which had lost rail service revealed in conversation that the threat of abandonment induced them to invest in new product lines, eliminate unneeded labor and improve marketing practices. Baumel, Drinka and Miller's results cast doubt on the popular belief that grain elevators that lose rail service lose viability.

Ben J. Allen,<sup>2</sup> Washington State University, evaluated the impacts of rail abandonment on ten communities in ten states ranging from New York to Texas. Allen analyzed three time periods: (1) the immediate effects of abandonment on transportation costs; (2) the short run effects of increased transportation costs on primary and secondary community activities; and (3) the long run effects of rail abandonment on economic development.

The major findings pertaining to the immediate effects on transportation costs were: (1) the major increase in transportation costs were felt by shippers and receivers of bulky materials like fertilizer, feed, lumber and coal; (2) the major expenses of shippers losing rail services were "one time expenses" such as the building of loading docks suitable for

---

<sup>2</sup>Ben J. Allen, "The Economic Effects of Rail Abandonment on Communities: A Case Study," Transportation Journal 15, Fall 1975, pp. 52-61.

truck loading; and (3) piggyback service did not seem to be a feasible alternative.

The short run adjustments were limited. Firms either passed the added cost of transportation on to the consumers or were able to absorb the added costs due to sizable profit margins.

The effect of rail abandonment on community growth and development was also limited. No substantive income or substitution effects were evident to suggest that people in the communities losing rail would take their trade elsewhere.

Allen's case study also suggested limited impacts and shed light on shipper reactions. He contended that shippers who falsely perceive a significant increase in transportation costs might react in a manner injurious to a local economy. The anticipation of higher transport costs might lead to an uncalled for lay-off of labor plus it could generate a feeling of uncertainty through out the community.

The Business Research Bureau,<sup>3</sup> at the University of South Dakota, estimated the potential impacts of abandoning several branchlines on the area served. The following impacts were considered: (1) the added costs to area farmers; (2) the employment losses; (3) the loss of expenditures for goods and services; (4) the direct and indirect personal income lost; (5) the tax revenue lost; (6) the cost of additional fuel; (7) the added highway rebuilding and maintenance costs (40 years); (8) the cost to maintain (40 years) and rebuild the track; and (9) environmental considerations.

---

<sup>3</sup>Business Research Bureau, School of Business, University of South Dakota, Railroad Impact Study, Bulletin No. 111 (July 1975), 114 (October 1975), 116 (December 1975), 118 (March 1976).



All of the studies in the series suggested relatively "dramatic" costs due to abandonment. The severity of the cost estimates is revealed in the Winner, South Dakota to Norfolk, Nebraska study.<sup>4</sup> This particular study estimated that the abandonment of the branchline would increase the cost to farmers in the area by \$2,231,847 per year. The cost of maintaining and rebuilding the highways to handle additional trucks would be between \$97.6 million and \$128 million, whereas the cost to maintain and rebuild the track would be approximately \$25,816,000.

In contrast to the majority of other studies, the Business Research Bureau concluded that abandonment would result in relatively severe costs to the areas served. However, the Business Research Bureau failed to consider several offsetting benefits which should be included to net the actual costs. For example, the Bureau failed to consider: (1) the direct employment created by an expanded truck industry; (2) the added expenditures on goods and services by truck firms, their employees and suppliers; (3) the tax revenue received when the abandoned right of way is transformed into some other use; and (4) the taxes paid by trucks which are used to help maintain highways. The Bureau also used economic multipliers which caused indirect costs to contribute significantly to the total estimated cost of abandonment. Because the Business Research Bureau did not estimate the net costs of abandonment the results are incomplete and of limited usefulness.

---

<sup>4</sup>Business Research Bureau, School of Business, University of South Dakota, Railroad Impact Study, Bulletin No. 116, December 1975.

John Due,<sup>5</sup> University of Illinois, Urbana, analyzed the impacts of abandoning the Union Pacific's Grass Valley line in Sherman County, Oregon. Most of the effort was directed at determining the impacts on outbound traffic as the area was characteristically a wheat export area. Due concluded that the overall impacts were limited because one of the grain elevators was located near a river and could easily use barge service. Another grain elevator suffered little because the main line was nearby and could easily use trucks with relatively little additional costs.

Generalizations were drawn citing conditions which determined the overall impacts. Due concluded few, if any, economic consequences would be felt if: (1) water transportation was available; (2) truck costs were not substantially higher than rail costs; (3) the material being hauled can be easily and cheaply transferred from truck to barge; or (4) the traffic not capable of being transported by barge does not have to be hauled too far by truck.

Due emphasized that the effects of abandonment depend largely upon the relative rate structures for truck and rail service in the area. He also mentioned some intangible matters that should be considered when estimating abandonment effects. He emphasized that abandonment is a "once-and-for-all" act because of the tremendous rebuilding costs. Therefore, industries which need low cost rail service would be denied an

---

<sup>5</sup>John Due, "The Effects of Railroad Abandonment on Agricultural Areas: A Case Study," Illinois Agricultural Economics 15, No. 2, July, 1975, pp. 14-22.

opportunity to develop. Due concluded by suggesting that there exists a "psychology of deterioration" for a small rural community. A small rural community that loses what was once its lifeline to the rest of the nation could be pushed below the margin of economic viability.

Due's "margin of viability" contention that the loss of rail service could be the final blow to a small rural community may be relevant to South Dakota communities because of the similar profiles of the majority of South Dakota communities facing abandonment. Not only are many of these communities small and agriculturally based, they were also founded upon the arrival of the railroad. Analogous to the dilemma facing several large cities that lose their tax base, the small rural economy losing its agricultural base could gradually lose supporting services and suppliers needed to maintain social and economic balance.

The firm of Simat, Helliesen and Eichner, Inc.<sup>6</sup> compared the impacts projected by shippers at public hearings with the actual consequences incurred by several eastern communities. The major finding of the study was that the large majority of the firms survived and continued to grow. Although several firms were forced to close, they were considered marginally operable prior to the actual abandonment.

Other impacts suggested were: (1) commercial growth was slowed down in several communities; (2) transportation costs increased, but not substantially, for the majority of shippers; and (3) the shippers that survived held some market power and/or positions permitting them to pass costs either forward to consumers or backwards to grain elevators.

---

<sup>6</sup>Simat, Helliesen and Eichner, Inc., Retrospective Rail Line Abandonment Study, Prepared for Office of Secretary, U.S. Department of Transportation, Washington, D.C., 1973.

Simat, Helliesen and Eichner, Inc. concluded that the pre-abandonment allegations of the rail users were correct to an extent. Although transportation costs did increase in most cases they were not severe enough to close the firms down. This study supports the Baumel, Drinka and Miller study in the sense that the expected impacts of abandonment tend to be overstated by those most likely to be hurt.

John Due, University of Illinois, Urbana, also studied the long term development of communities along branchlines in Nevada and Oregon.<sup>7</sup> All lines studied were abandoned between 25 and 38 years before the study was conducted. In a few cases empirical tests were made to determine if there were significant differences in the growth of population, retail sales and mining output between the abandoned communities and similar communities with rail service. Because of the difficulty in finding and justifying a control group, most of the analysis depended upon interviews with people knowledgeable about agricultural transportation.

From the study's results Due formulated the following generalizations on community development: (1) overall impacts of abandonment were minimal; (2) abandonment did not prevent the development of some light industries, e.g. electronics; and (3) abandonment resulted in higher costs for several mining operations and halted revival of several others.

Due's analysis of the effects on agriculture suggested that effects were minimal if: (1) the area is characteristically a producer of feeder cattle with local access to hay supplies; (2) the markets for other agricultural products are located within 250 miles; (3) water transportation

---

<sup>7</sup>John Due, "Long Term Impact of Abandonment of Railway Lines," Transportation Research Paper, No. 7, (Urbana-Champaign: College of Commerce and Business Administration, University of Illinois, 1975).

is available; and (4) grain for cattle is available within 250 miles.

In conclusion, because of different geographic, demographic, regulatory and other conditions, the impacts of abandonment on community activity vary. However, most studies conclude that limited impacts occur.

## CHAPTER III

### ANALYTICAL PROCEDURES

This chapter first presents background material on the abandoned lines studied. The selected performance variables and the time periods used in the study are then discussed. Finally, the analytical procedures used to accomplish the study's objectives are presented.

The 16 communities selected for study that have experienced branchline abandonment are listed in Table 1 (Figure 2). These test communities were selected because their recent loss of rail service would best reflect the probable impacts of rail abandonment today. Another reason the test communities were selected was that they are located near communities of similar size and economic base still served by rails. The choice of test communities therefore allowed comparisons while reducing possible biases by eliminating factors such as drought that might also adversely affect a community. The control communities are listed in Table 2 (Figure 2).

#### Background of Abandoned Lines

##### Doland to Groton Line<sup>1</sup>

On July 25, 1969 the Chicago & North Western Railroad Company (C&NW) filed for abandonment on 38.4 miles between Groton and Doland, South Dakota. The abandonment, approved June 24, 1970, resulted in the loss of rail service to Turton, Verdon, and Ferney, South Dakota. The C&NW filed

---

<sup>1</sup>Certificate and Order issued by the ICC permitting the Chicago & North Western Railroad Company, to abandon its branchline extending between Doland and Groton, South Dakota, Finance Docket 25788, June 24, 1970.

Table 1

## Test Communities

Community	1970 Population	Year of Abandonment	Bank
1. Turton	121	1970	1
2. Eden	132	1971	1
3. Roslyn	250	1971	1
4. Grenville	154	1971	0
5. Toronto	216	1967	1
6. Brandt	132	1967	0
7. Revillo	142	1968	0
8. Strandburg	100	1968	0
9. Astoria	153	1970	0
10. Clear Lake	1152	1967	1
11. White	418	1967	1
12. Ferney	NA	1970	0
13. Verdon	18	1970	0
14. Hillhead	NA	1971	0
15. Bushnell	70	1967	0
16. Lake City	42	1971	0

NA, data not available.

Table 2

## Control Communities

Community	1970 Population	Year of Abandonment	Bank
1. Stockholm	116	1968	1
2. South Shore	199	1968	0
3. Ortley	111	1971	0
4. Pierpont	241	1971	1
5. Frankfort	192	1970	0
6. Raymond	114	1970	0
7. Bruce	217	1967	1
8. Andover	138	1971	0
9. Claire City	100	1971	0
10. Stratford	202	1970	0
11. Peever	106	1971	0
12. Mansfield	111	1970	1
13. Conde	279	1970	1
14. Estelline	624	1967	1
15. Albee	26	1968	0
16. Labolt	90	1968	0
17. Crocker	NA	1971	1
18. Castlewood	523	1967	1
19. Gary	366	1968	1
20. Britton	1465	1971	1*

NA, data not available.

\*The Britton bank was not included in the bank analyses because the information was unavailable.



Figure 2

## Abandonment Miles Per Decade

Test Communities

1. Hillhead
2. Lake City
3. Eden
4. Roslyn
5. Grenville
6. Ferney
7. Verdon
8. Turton
9. Revillo
10. Strandburg
11. Clear Lake
12. Brandt
13. Toronto
14. Astoria
15. White
16. Bushnell

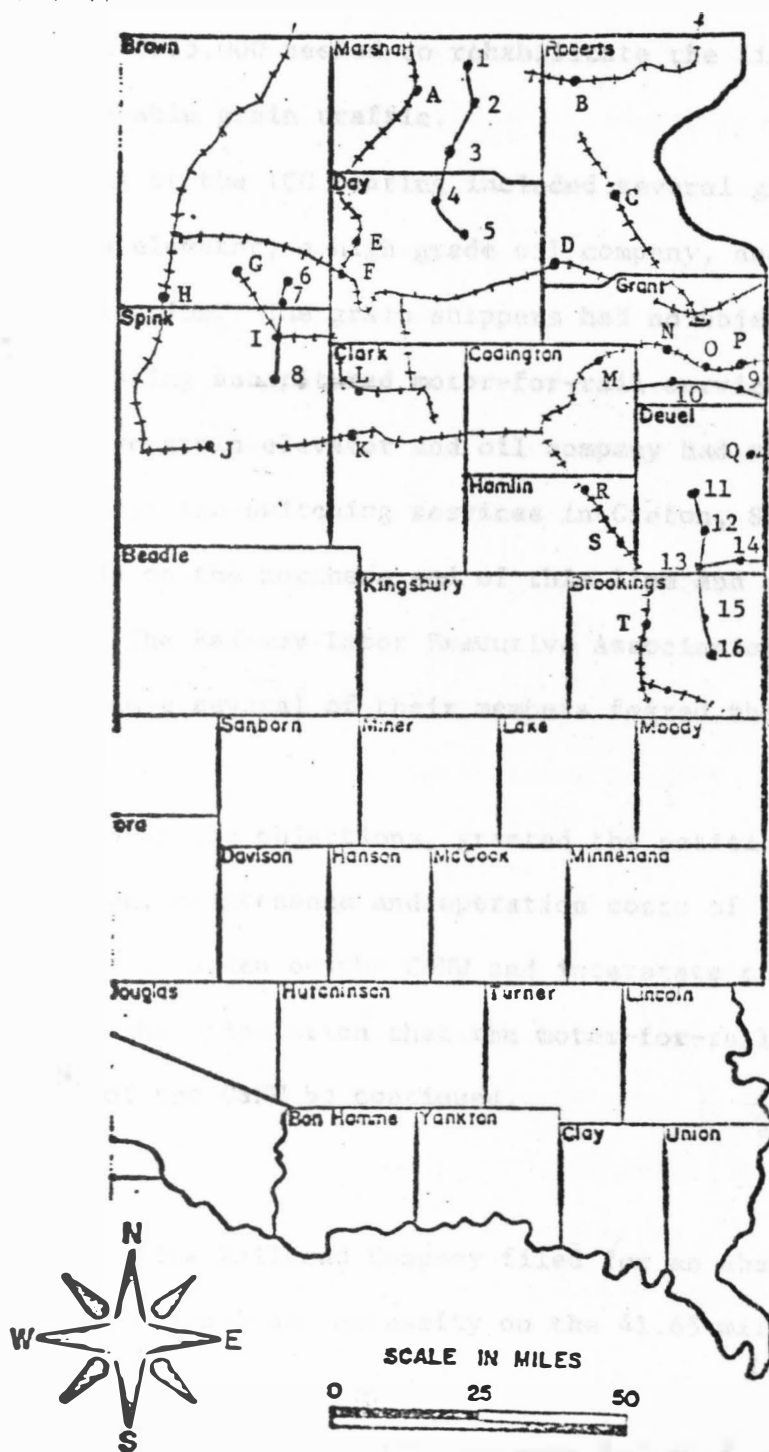
Control Communities

- A. Britton
- B. Claire City
- C. Peever
- D. Ortly
- E. Pierpont
- F. Andover
- G. Stratford
- H. Mansfield
- I. Conde
- J. Frankfort
- K. Ryamond
- L. Crocker
- M. South Shore
- N. Stockholm
- O. Labolt
- P. Albee
- Q. Gary
- R. Castlewood
- S. Estelline
- T. Bruce

Existing Track

+ + + + +

Abandoned Track



because the declining grain traffic, which resulted from the poor condition of the line, did not generate enough revenue to justify continued operation. C&NW claimed that \$965,000 needed to rehabilitate the line was too enormous given the foreseeable grain traffic.

The protestants appearing at the ICC hearing included several grain shippers, a cooperative grain elevator, a high grade oil company, and the Railway Labor Executive Association. The grain shippers had no objection to the abandonment if the existing substituted motor-for-rail services were continued. The cooperative grain elevator and oil company had no objections with the condition that the switching services in Groton, South Dakota be continued (Groton is on the northern end of this line and still has east-west rail service). The Railway Labor Executive Association objected to the abandonment because several of their members feared the loss of employment.

The ICC, in consideration of the objections, granted the petition holding that the rehabilitation, maintenance and operation costs of the line would impose an unnecessary burden on the C&NW and interstate commerce. The petition was granted with the stipulation that the motor-for-rail and switching service agreements of the C&NW be continued.

#### Veblen to Grenville Line<sup>2</sup>

On March 30, 1970 the Soo Line Railroad Company filed for an abandonment certificate of public convenience and necessity on the 41.65 mile line

---

<sup>2</sup>Certificate and Order issued permitting the Soo Line Railroad Company to abandon its branchline extending between Veblen and Grenville, South Dakota, Finance Docket No. 26139, March 30, 1970.

between Veblen and Grenville, South Dakota. The abandonment, effective January 17, 1971, eliminated rail service to Grenville, Roslyn, Lake City, and Hillhead, South Dakota. The Soo Line Company reported that the line, built in 1913, was unsafe for transport and in need of extensive rebuilding. They contended that the rehabilitation costs would be enormous and unjustified given the foreseeable demand for transport service.

Several elevator managers and a lumber company spokesman testified in opposition to the abandonment. Their major objection to the abandonment was that their operations were dependent on rail service and the loss of such services would result in their closing. They claimed that motor transport was not economically feasible due to the four to six cent differential in transport charges per bushel of grain. One elevator company spokesman made the argument that the operating losses suffered by the Soo Line Company could be eliminated if enough boxcars could be supplied.

In determining whether or not to grant the public convenience and necessity certificate the ICC weighed the adverse effects on the customers served by the branchline and the substantial operating losses suffered by the Soo Line Railroad Company. The ICC granted the certificate on the basis that there was no requirement the Soo Line should subsidize shippers using the line. In response to the boxcar shortage argument the ICC held that the substantial losses would not be offset given an ample supply of boxcars.

Clear Lake to Minnesota Border Line<sup>3</sup>

On September 17, 1965 the Chicago, Rock Island & Pacific Railroad Company (CRI&P) filed for abandonment on the 47.73 miles between the Minnesota border and Clear Lake, South Dakota. The proposed abandonment, granted May 18, 1967, resulted in the closure of stations in Bushnell, Elkton, White, Toronto, Brandt and Clear Lake, South Dakota. Of the stations served by the line, only Elkton was served by another railroad.

The line at the time was in poor condition with some of its ties dating back to 1908. To rehabilitate the line to allow for normal 40 mph speeds would necessitate spending approximately \$1,300,000 over several years. An additional \$150,000 would be needed to upgrade several budgets. The CRI&P also faced a boxcar shortage (although this shortage was prevalent throughout their system).

The CRI&P based their need to abandon on the enormous rebuilding costs and the substantial operating losses suffered over the past three years. The CRI&P management further claimed that increased services on the line increased deficits. The management testified that the savings that could be realized from the elimination of operating losses and the salvage value were badly needed to acquire equipment and upgrade physical plant elsewhere.

The South Dakota Public Utilities Commission, the Railway Labor Executives Association, and several local business interests opposed the abandonment petition. The Commission, in considering the economic destiny of the area dependent on rail service, wanted the final decision to be

---

<sup>3</sup>Certificate and Order issued permitting abandonment by the Chicago, Rock Island & Pacific Railroad Company of its line between Pipestone, Minnesota and Clear Lake, South Dakota, Finance Docket No. 23811, April 17, 1967.

deferred pending the outcome of a proposed rail merger which could make the branchline viable again. The Association opposed the abandonment fearing loss of employment for several of its members. The business interests testified that the rail service was their only viable mode of transport. Two arguments were made that would justify continued operations. First, it was argued that the CRI&P's operating losses would be eliminated if a sufficient number of boxcars were made available. Several shippers testified to storing grain on the ground waiting for car orders to be filled. Second, more traffic would result due to the release of a significant number of acres from Soil Bank.

In response to the PUC's request for a deferred decision, the ICC felt the pending merger was too speculative to warrant delaying action on the application. In response to the business interest's boxcar shortage and Soil Bank arguments, the ICC held that the increased revenue would not justify the rehabilitation costs and operating losses, the latter having been crippling the CRI&P's entire financial system.

#### Reville to Strandburg Line<sup>4</sup>

On June 11, 1968 the Chicago & North Western Railroad Company filed to abandon 10.5 miles between Reville and Strandburg, South Dakota. The South Dakota Department of Highways and Public Utilities Commission also filed a petition of intervention in support of the proposed abandonment on the grounds that the abandonment would eliminate the costs of building

---

<sup>4</sup>Certificate and Order issued permitting the Chicago & North Western Railway Company to abandon the branchline extending between Reville and Strandburg, South Dakota, Finance Docket No. 25142, August 22, 1968.

an underpass on Interstate Highway 29 East. The Railway Labor Executives Association filed an application of protest fearing loss of employment for several members.

On August 22, 1968 the ICC granted the petition holding that a hearing was not necessary because the interests of the employees were protected.<sup>5</sup> The line had been operated at a loss of approximately \$60,000 dating back to 1966.

#### Strandburg to Watertown Line<sup>6</sup>

On May 19, 1969 the C&NW filed for abandonment on 6.8 miles between Strandburg and Watertown, South Dakota. The Railway Labor Executives Association filed an application of protest. The ICC granted the petition holding that the employees were protected. The Commission further held that the lack of prospect for developing freight traffic in the future and the enormous rebuilding costs would impose an undue burden on the C&NW interstate commerce.

#### Astoria to Minnesota Border Line<sup>7</sup>

On May 19, 1969 the C&NW filed for abandonment of 32.3 miles between

---

<sup>5</sup>The ICC has authority to impose conditions for the protection of employees, Interstate Commerce Commission v. Chicago, Burlington and Quincy Abandonment, 257 ICC 700; see also Smith v. U.S., 211 F. Supp. 66, sustaining retroactive impositions of conditions for protection of rail employees adversely affected by abandonment.

<sup>6</sup>Certificate and Order issued permitting abandonment by the Chicago & North Western Railway Company of the branchline extending between Strandburg and Watertown, South Dakota, Finance Docket No. 25691, September 30, 1969.

<sup>7</sup>Certificate and Order issued permitting the Chicago & North Western Railway Company to abandon the branchline extending between Tyler, Minnesota and Astoria, South Dakota, Finance Docket No. 25690, August 4, 1970.

Astoria, South Dakota and Tyler, Minnesota. Only 6.8 of the miles were in South Dakota. The abandonment, approved on February 10, 1970, resulted in the loss of rail service to Astoria, South Dakota and several Minnesota communities. The C&NW filed because the line was in need of extensive rebuilding and because the line had been operating at a loss for several years.

The South Dakota protestants at the hearing included the Chairman of the South Dakota Public Utilities Commission, several Astoria elevator representatives and the Railway Labor Executives Association. The Chairman of the Commission argued that public convenience and necessity required continued operation of the line. The Astoria elevator representatives argued that the line could be profitable again if the track was reconstructed and maintained. They also blamed poor management for the poor financial condition of the line. The ICC granted the petition, subject to the conditions for the protection of the railway employees, based on the "public convenience and necessity" clause.

#### Selected Performance Variables

The variables were selected with the intent of estimating various responses of community activity that would be expected to occur if the loss of rail service had adverse effects on a community's economy. The three variables selected to be used in one or more of the four study objectives were the growth rates of: (1) estimated market value of real property; (2) utility usage (kilowatt hours); and (3) bank demand and time deposits.

The change in property value over time was selected because abandonment opponents often fear property devaluation as a result of abandonment.

An annual estimate of market value of real property was made by dividing the total assessed true and full property value<sup>8</sup> by a county weighted sales ratio calculated by the South Dakota Department of Revenue.<sup>9</sup> A county weighted sales ratio is the ratio of the total assessed true and full value of properties sold in a given year to the total of those properties' actual sale prices.

The growth of utility usage over time was selected to approximate community development and growth in size because commercial and residential expansion is positively correlated with increased utility usage. The growth of a community bank's time and demand deposits was selected to estimate the growth of community income and the level of economic activity.

#### Time Periods

Both five year and three year periods before and after the official year of abandonment were selected for study. The three year periods were selected because abandonment impacts might be averaged out if too long a period was analyzed. The periods prior to the year of abandonment were selected because abandonment impacts may be felt before the official abandonment takes place; e.g., the C&NW line running from Strandburg to Watertown, South Dakota had zero traffic four months prior to the official abandonment. Often the mere suggestion that a line is being considered for

---

<sup>8</sup>Because personal property could not be separated from real property it was included in the estimate. Personal property constitutes a relatively small percent of total property value and therefore adds little bias to the estimate.

<sup>9</sup>Property Tax Division, Department of Revenue, South Dakota, Annual Assessment and Sales Information 1962-76.



abandonment results in a "self-fulfilling prophecy." Farmers, for example, may begin to use alternative transport services and grain elevator managers may reduce overhead and change product mixes. The five year and three year post-abandonment periods were selected to encompass the community adjustment process which could be of variable duration.

#### Objective One

Two discriminant analysis models, one for the five year periods and one for the three year periods, were used to determine if several selected performance variables for communities that have lost rail service have significantly declined in comparison to the same performance variables of nearby, similar communities still served by rails. Discriminant models were also used to estimate if bank deposits in banks that are located in communities still served by rails have declined in comparison to banks located in communities still served by rails. The objective of discriminant analysis (DA) is to distinguish between two groups of observations that have been identified (prior to the analysis) by the researcher. In these analyses the two groups are either the test and control communities or the test and control banks whereas the observations are the individual communities or banks. Statistically DA weights and linearly combines the discriminating variables so that the two groups are forced to be as statistically distinct as possible.<sup>10</sup> In this study DA reduces a multivariate

---

<sup>10</sup>Norman Nie and others, Statistical Package for the Social Sciences 2 ed. McGraw-Hill, 1975, p. 435.

problem lacking inferential clarity into a simple univariate problem in which inferences can be drawn on one composite score. The single composite score is valuable not only because tests of significance can be made, but also because the classification of each individual observation as to which group it belongs can be made using probability tables based on the normal distribution.

In all objective one analyses a discriminant model of the general functional form

$$D = d_1Z_1 + d_2Z_2 + \dots + d_pZ_p$$

is used where  $D$  is the discriminant score, the  $d$ 's are the weighting coefficients, and  $Z$ 's are the standardized values of the  $p$  discriminating variables used in the model.<sup>11</sup> The stepwise method was used in all objective one analyses so that the discriminating variable that best contributed to the distinction of the two groups could be identified. Wilks' lambda was selected to control the stepwise discriminations.

Only communities in which data was available and with 1960 populations between 100 and 275 were selected for the statistical analysis relative to the growth of utility usage and property value. The test communities are the first nine in Table 1 and the control communities are the first ten in Table 2. The larger and smaller communities were not selected for the statistical analysis because their local economies were either larger and more diverse or smaller and beyond the point of no return making their ability to adjust to rail loss not representative of the majority of communities studied. The analyses made using the growth rates of bank

---

<sup>11</sup>Ibid.

deposits included the six test community banks and eight control community banks regardless of community size, (Tables 1 and 2). This less restrictive analysis assumes that deposits of small rural banks are more reflective of the general area rather than the community proper.

### Community Analyses

The four variables selected that were expected to differ for the test and control communities were:

- (1) The average pre-abandonment growth rate of real property market value measured in dollars.
- (2) The average post-abandonment growth rate of real property market value measured in dollars.
- (3) The average pre-abandonment growth rate of utility usage measured in kilowatt hours.
- (4) The average post-abandonment growth rate of utility usage measured in kilowatt hours.

Two different analyses were made using the above discriminating variables. One analysis used the five year pre-abandonment and post-abandonment periods whereas the other analysis used the three year pre-abandonment and post-abandonment periods.

### Bank Analyses

The two variables selected that were expected to differ for the test and control community banks were:

- (1) The average pre-abandonment growth rate of bank deposits.
- (2) The average post-abandonment growth rate of bank deposits.

Three analyses were made relative to the above variables. One analysis adjusted the growth rates of bank deposits to an index based on the annual farm receipts<sup>12</sup> for the farmers in the counties in which the banks were located. The index was used because:

- (1) The abandonments took place in different years; and
- (2) 1973 and 1974 were big years for farmers due to a high foreign demand for grain.

Both of these conditions could bias the results due to the sensitivity of the growth of bank deposits to inflation and increased farm income. Also, the communities that lost rail service in 1967, 1968, or 1969 would not reflect the increased farm receipts of 1972 and 1973 in their post-abandonment period. Because farm receipts data was unavailable for several years this analysis used only the three year periods. The other two analysis used average three year growth periods and the other used average five year growth periods. (Appendix A)

#### Objective Two

Paired difference t-tests were used to test whether or not the pre-abandonment growth rates of utility usage and property value for communities no longer served by rails were significantly different than their post-abandonment counterparts. The test communities were the same nine communities in the objective one analysis. Two tests on each variable were made. One test used the three year growth rates and the other used the five year growth rates.

---

<sup>12</sup>South Dakota Crop and Livestock Reporting Service, Agricultural Statistics, 1962-76.

Paired difference t-tests were also used to test for significant differences between pre-abandonment and post-abandonment periods relative to the growth of bank deposits. The farm receipt index was used for the three year period only. The analyses made without the farm receipt index included both the three year and five year periods.

The null hypothesis was to be accepted if no significant differences were found was

$$H_0 : M_1 = M_2$$

against the alternative hypothesis

$$H_a : M_1 \neq M_2$$

that was to be accepted if the pre-abandonment and post-abandonment periods were significantly different.  $M_1$  is the mean growth rate of the pre-abandonment period, whether it be property value, utility usage or bank deposits, and  $M_2$  is the mean growth rate of the post-abandonment period. (See Appendix A for data.)

### Objective Three

Several one-way analyses of variance (anova) models were used to estimate in which specific year(s) abandonment effects took place. The anova model took the form

$$Y_{ij} = u + t_i + E_{ij}$$

where  $Y_{ij}$  is the  $j$ th annual growth rate for the  $i$ th sample (treatment),  $u$  is the grand mean,  $t_i$  is the effect of the  $i$ th treatment and  $E_{ij}$  represents the deviation of the  $j$ th growth rate of the  $i$ th sample from the corresponding treatment mean.

The null hypothesis that was to be rejected if at least one of the treatment effects were significant was

$$H_0 : t_i = 0 ; i = 1, \dots, 6$$

against the alternative hypothesis

$$H_a : \text{at least one of the } t\text{'s is not equal to zero.}$$

The six treatments for each of the three analyses were the annual growth rates of utility usage, property value and bank deposits in the three years before and after the year of official abandonment.

Because sensitivity at detecting differences is lost when several means are tested simultaneously at a certain significance level, several one-way anova models were used to test for differences within the three year pre-abandonment and post-abandonment periods. Furthermore, several orthogonal contrasts<sup>13</sup> and paired difference t-tests were constructed to test for significant differences in various combinations of years.

(Appendix B)

#### Objective Four

All test communities in which information was available were used in the analysis to estimate if there is a relationship between community size and the ability to adjust to branchline abandonment. The hypothesis guiding this analysis is that larger communities are more capable of adjusting to abandonment due to their larger and more diverse economies. The growth of utility usage relative to the year of abandonment was selected to estimate the community's ability to adjust to abandonment.<sup>14</sup>

---

<sup>13</sup>Orthogonal contrasts are used when the experimenter is interested in partitioning the treatment variation into independent components. See Walpole and Meyers, 2 ed., Probability and Statistics for Engineers and Scientists, Macmillan Publishing Co., Inc., 1978.

<sup>14</sup>The average six year growth rate, three years before and after the official year of abandonment, was used.

Linear, logarithmic and semi-logarithmic relationships were explored. The simple least squares regression model is represented by the equation.

$$Y_i = B_0 + B_1X_i + E$$

where:

$Y_i$  is the mean growth of utility usage for community  $i$  given  $X$ ,

$X_i$  is the estimated population of community  $i$  for the year in which abandonment took place,

$B_0$  and  $B_1$  are the true regression coefficients,

$E$  is the error term.

The population for communities which experienced abandonment before 1970 was estimated by linearly interpolating between the 1960 and 1970 census figures. The population for communities which experienced abandonment in 1971 was estimated by linearly interpolating between the 1970 census figure and the 1975 estimate of the Bureau of Census. Linear interpolation was used after Objective 1, 2, and 3 analyses were completed. The findings of these analyses suggested that a linear interpolation was the proper interpolation. (Appendix C)

## CHAPTER IV

### FINDINGS OF THE STUDY

#### Objective One

The discriminant models used to test whether or not communities that have lost rail service have declined in the growth of selected performance variables in comparison to communities still served by rails failed to indicate a significant distinction. Wilks' lambda was the test criteria. Wilks' lambda represents the percentage change in the discriminant score that is unexplained by the discriminating variables. The percentage of observations correctly classified was also considered.

The community analysis which used the growth rates of utility usage and property value for the five year pre-abandonment and post-abandonment periods failed to yield either a significant stepwise or overall Wilks' lambda, (Table 3). Moreover, only 58% of the cases were correctly classified.

Table 3

#### Five Year Periods

Property Value and Utility Usage			
Variable	Period	Wilks' Lambda**	Univariate F
Property Value	Post-abandonment	.963	.656
Utility Usage	Post-abandonment	.932	.292
Property Value	Pre-abandonment	.910	.066
Utility Usage	Pre-abandonment	.909	.136

\*Indicates significance at .10 level.

\*\*The order (top to bottom) of the Wilks' lambdas is the order in which the variables were entered into the discrimination. The final Wilk's lambda is the overall Wilks' lambda.



The community analysis referring to the three year pre-abandonment and post-abandonment periods for the same discriminating variables also failed to yield a significant Wilks' lambda, (Table 4). This analysis classified 74% of the cases correctly counting marginal cases.<sup>1</sup>

Table 4

## Three Year Periods

Property Value and Utility Usage			
Variable	Period	Wilks' Lambda	Univariate F
Property Value	Post-abandonment	.949	.918
Property Value	Pre-abandonment	.907	.343
Utility Usage	Pre-abandonment	.897	.005
Utility Usage	Post-abandonment	.894	.046

\*Indicates significance at .10 level

The bank deposits analysis, referring to the growth of bank deposits adjusted to the farm receipts index, failed to indicate a distinction between the test and control banks, (Table 5). The overall Wilks' lambda was .815 and 71% of the cases were correctly classified.

Table 5

## Three Year Periods, Indexed Bank Deposits

Variable	Period	Wilks' Lambda	Univariate F
Bank Deposits	Post-abandonment	.895	1.407
Bank Deposits	Pre-abandonment	.815	.487

\*Indicates significance at .10 level

<sup>1</sup>A marginal case is an instance where the probability that a case has been correctly classified is slightly greater than .50. By classifying these borderline cases the probability of misclassification increases substantially.

The bank deposits analysis of both the five year and three year periods failed to indicate a significant distinction between the test banks and control banks. Neither analysis yielded a significant Wilks' lambda, (Tables 6 and 7). Moreover, the percentage of cases correctly classified for both analyses was 54% and 53% respectively.

Table 6

## Three Year Periods, Non-Indexed Bank Deposits

Variable	Period	Wilks' Lambda	Univariate F
Bank Deposits	Post-abandonment	.897	1.380
Bank Deposits	Pre-abandonment	.893	.405

\*Indicates significance at .10 level

Table 7

## Five Year Periods, Non-Indexed Bank Deposits

Variable	Period	Wilks' Lambda	Univariate F
Bank Deposits	Post-abandonment	.996	.044
Bank Deposits	Pre-abandonment	.995	.000

\*Indicates significance at .10 level

Objective Two

The paired difference t-tests used to test for significant differences between the pre-abandonment and post-abandonment periods relative to the growth of property value for test communities, indicated significant differences. The t-values for the five year period and three year periods were 4.59 and 4.35 respectively. Both are significant at the .01 levels.

No significant differences were found to exist between the pre-abandonment and post-abandonment growth rates relative to utility usage. The five year period t-value was .529, whereas the three year period t-value was .493. Both are insignificant at the .05 level.

The paired difference t-value for the indexed bank deposit analysis indicated no significant differences. The t-value for the three year periods analysis was .274. No analysis was made using five year periods.

The t-values for the bank deposit, non-indexed analysis indicated that significant differences existed between pre-abandonment and post-abandonment periods. The t-values for the five year period and three year period analyses were both 2.4 which is significant at the .05 level.

### Objective Three

All one-way anova models that simultaneously tested for significant differences in the means of the annual growth rates for the selected performance variables for the six years, three before and three after, failed to reject the null hypothesis that the six treatment effects were equal to zero, (Tables 8-11).

Table 8

Property Value				
Source of Variation	D.F.	Sum of Squares	Mean Square	F
among groups	5	361	72.17	1.452
within groups	48	2385	49.69	
Total	53	2746		

\*Significant at .05 level

Table 9

Utility Usage				
Source of Variation	D.F.	Sum of Squares	Mean Square	F
among groups	5	194.65	38.93	1.010
within groups	48	1848.72	38.52	
Total	53	2043.38		

\*Significant at .05 level

Table 10

Bank Deposits (Indexed)				
Source of Variation	D.F.	Sum of Squares	Mean Square	F
among groups	5	829.37	165.88	.834
within groups	30	5967.67	198.92	
Total	35	6797.05		

\*Significant at .05 level

Table 11

Bank Deposits (Non-indexed)				
Source of Variation	D.F.	Sum of Squares	Mean Square	F
among groups	5	805.425	161.08	1.702
within groups	30	2839.66	94.66	
Total	35			

\*Significant at .05 level

The one-way analysis of variance tests used to test for significant differences within the pre-abandonment and post-abandonment periods, also failed to indicate significant differences. Several orthogonal contrasts did indicate differences between pre-abandonment years and post-abandonment years for property value and bank deposits not adjusted to the farm

receipts index. Several t-tests also indicated differences in years with-  
in periods.

#### Objective Four

No significant linear, logarithmic or semi-logarithmic relationship was found to exist between estimated community population and the growth of utility usage. The  $r^2$  was .13 and insignificant for the estimated linear regression equation

$$Y_i = 4.97 + .003 X_i$$

where:  $Y_i$  is the growth of utility usage, for community  $i$ ;

$X_i$  is the estimated population for community  $i$  in the year of abandonment; and

4.97 and .003 are the estimated regression coefficients.

The  $r^2$  was .09 and insignificant for the estimated logarithmic regression equation

$$Y_i^* = 4.17 + .565 X_i^*$$

where:  $Y^*$  is the natural log of the growth of utility usage for community  $i$ ;

$X^*$  is the natural log of the estimated population for community  $i$ ; and

4.17 and .565 are the estimated regression coefficients.

The  $r^2$  was .14 and insignificant for the estimated semi-logarithmic regression

$$Y_i^* = 1.52 + .00056 X_i$$

where:  $Y^*$  is the growth of utility usage for community  $i$ ;

$X$  is the estimated population for community  $i$  in the year of abandonment; and

1.52 and .00056 are the estimated regression coefficients.

### Interpretations

The discriminant models failed to suggest that the test communities' growth of selected performance variables differed from that of the control communities. The weakness of all the discriminations is indicated by the overall Wilks' lambdas. For example, the overall Wilks' lambda was .909 for the analysis using the growth rates of property value and utility usage. This means that only 9% of the change in the discriminant score is explained by the discriminating variables. The univariate F ratios which are one-way anova F ratios also indicated the weak distinctions between the test and control groups when any single variable is considered. Furthermore, all the discriminating variables that were the best discriminators in their analyses, were insignificant.

Objective Two findings indicated mixed results. No significant differences between pre-abandonment and post-abandonment periods' growth rates of utility usage and indexed bank deposits were found. However, the pre-abandonment growth of property value was found to be significantly less than the post-abandonment growth for both five and three year periods.

Two plausible interpretations are possible:

- (1) abandonment effects could have occurred in the pre-abandonment period whether they be premature business closures or dampened prospects relative to perceived future values that could reduce sales prices; or
- (2) property values, in general, may have risen suggesting no abandonment effects.

To help determine if either was the case the ten control communities were put to the same test. The t-values were significant suggesting that the

pre-abandonment growth of property value for communities still served by rails was also significantly less than the post-abandonment growth lending support to the interpretation that a general, not abandonment related, rise in property value was responsible for the differences.

The post-abandonment growth of bank deposits not adjusted by the farm receipts index was also found to be significantly larger than the pre-abandonment growth. However, factors other than abandonment seem evident here too. For one, the pre-abandonment growth of unadjusted bank deposits for the control banks was also found to be significantly less than the post-abandonment growth. And the post-abandonment and pre-abandonment growth of bank deposits adjusted to the farm receipts index were not found to be significantly different. Both of these findings suggest that significant differences in growth rates between periods were not abandonment related, but due to extraneous factors such as inflation and the large increase in farm income in 1972 and 1973.

The analysis of Objective Three failed to disclose any additional information to suggest that abandonment affects a community in any specific year(s) because:

- (1) No specific year for any of the selected performance variables was found to be significantly different when the six years were tested simultaneously.
- (2) No specific year for any selected performance variables was found to be different within the periods when the three years were tested simultaneously.
- (3) The orthogonal contrasts that were significant only indicated a difference between pre-abandonment and post-abandonment years

and thus supported Objective Two findings.

- (4) The t-tests indicating significant differences within the pre-abandonment periods for either property value or bank deposits all indicated earlier year growth to be significantly less than later year growth. This agrees with both the general rise in property value, inflation and increased farm income propositions.

The absence of any significant linear, logarithmic, or semi-logarithmic relationship between estimated community population and the growth of utility usage suggests that, for the communities tested, larger communities do not adjust to rail abandonment any better than smaller communities.

In summary:

- (1) No significant differences between the growth of selected performance variables of test and control communities were found which would suggest that rail abandonment has had adverse effects on the test communities.
- (2) For the test communities, no abandonment effects were evident in the pre-abandonment period relative to the post-abandonment period.
- (3) No evidence was found to suggest that either temporary or permanent abandonment effects occurred in any specific year relative to the year of abandonment.
- (4) No relationship between community size and the growth of utility usage was found which would suggest that larger communities can more easily adapt to rail loss.



### Further Considerations

To this point the purpose of this study has been to estimate whether rail abandonment has had effects on the growth of selected performance variables for communities no longer served by rails relative to similar, nearby communities still served by rails. The question of whether rail abandonment retards the growth or hastens the decline of these communities has not been addressed. Furthermore, the direction of causation has not been considered. Does rail abandonment lead to community decline or does community decline lead to rail abandonment?

A definitive answer to the above question is not the purpose of the following considerations. Rather, the following discussion considers possible and, in the author's opinion, probable explanations.

The majority of rural South Dakota communities have declined in population for the past two intercensal periods. Between 1950 and 1970, 179 of the 278 communities with populations less than 2500 declined in population.<sup>2</sup> Between 1960 and 1970, approximately 76% of all rural communities with populations below 500 declined as well.<sup>3</sup> As shown in Tables 12 and 13 both the test and control communities of this study are representative of these trends. Twelve of the fourteen test communities declined in population between 1950 and 1960. Fifteen of the eighteen control communities declined in the same period. Between 1960 and 1970

---

<sup>2</sup>Goss concluded that county seats were more apt to gain in population between 1960 and 1970 than non-county seats.

<sup>3</sup>Ibid., p. 33.

eleven of the fourteen test communities declined in population. Of the three communities that experienced increases in both periods, (Clear Lake, Castlewood, Britton), Clear Lake and Britton are county seats and therefore less likely to experience decline.<sup>4</sup>

Although most data for the 1970 to 1980 period is unavailable, there is little evidence to suggest that this trend has changed significantly. Population estimates by the Bureau of Census<sup>5</sup> indicate that the majority of the test and control communities are still declining in population as indicated in Tables 14 and 15. On the average the test communities declined 14.6% whereas the control communities declined 16.2%.

The implications of these trends and the findings of this study suggest the following conclusions:

- (1) rural South Dakota communities, in general, have been declining in population and activity due to reasons other than rail abandonment.
- (2) rail abandonment does not hasten a pre-existing decline in community size and activity.

---

<sup>4</sup>Goss concluded that a greater percentage of non-county seats than county seats gained in population from 1960 to 1970.

<sup>5</sup>Bureau of the Census, U.S. Department of Commerce, Population Estimates and Projections, Series P-25, No. 689, April 77, pp. 3-26.

Table 12

## Test Communities (1950-1970)

	1950 Population		1960 Population		1970 Population	1950-1970 % Change
Turton	201	-	140	-	121	-13.6
Eden	149	-	136	-	132	- 2.9
Roslyn	222	+	256	-	250	- 2.3
Grenville	207	-	151	+	154	+ 2.0
Toronto	322	-	268	-	216	-19.4
Brandt	211	-	148	-	132	-10.8
Reville	249	-	202	-	142	-29.7
Strandburg	144	-	105	-	98	- 5.7
Astoria	206	-	176	-	153	-13.0
Clear Lake	1105	+	1137	+	1157	+ 1.8
White	525	-	417	+	418	+ 0
Bushnell	96	-	92	-	65	- 2.9
Verdon	34	-	28	-	18	-35.7
Lake City	110	-	81	-	44	-44.0
Ferney	NA*		NA		NA	--
Hillhead	NA		NA		NA	--

\*Information not available.

SOURCE: Population Change of Counties and Incorporated Places, South Dakota 1950-1970, Agricultural Experiment Station, South Dakota State University, Bulletin 586, July 1971.

Table 13

## Control Communities (1950-1970)

	1950 Population		1960 Population		1970 Population	1950-1970 % Change
Stockholm	114	+	155	-	116	-25.2
South Shore	269	-	259	-	199	-23.1
Ortley	144	-	127	-	111	-12.6
Pierpont	326	-	258	-	241	-18.2
Frankfort	331	-	240	-	192	-20.0
Raymond	174	-	168	-	114	-33.9
Bruce	305	-	272	-	217	-20.0
Andover	277	-	224	-	138	-38.0
Claire City	109	-	86	+	100	+16.7
Stratford	164	-	109	-	106	- 2.7
Peever	221	-	208	-	202	- 2.9
Conde	409	-	288	-	279	- 2.8
Estelline	760	-	722	-	624	-13.6
Albee	75	-	42	-	26	-38.0
Britton	1430	+	1442	+	1465	+ 1.6
Crocker	NA*		NA		NA	--
Mansfield	NA		NA		NA	--
Castlewood	498	+	500	+	523	+ 5.0
Labolt	164	-	125	-	90	-45.0
Gary	558	-	471	-	366	-34.4

\*Information not available.

SOURCE: Population Change of Counties and Incorporated Places, South Dakota 1950-1970, Agricultural Experiment Station, South Dakota State University, Bulletin 586, July 1971.

Table 14  
 Test Communities (1970-1975)

	1970 Population	Estimated 1975 Population	1970-1975 % Change
Turton	121	127	+ 5.0
Eden	132	115	-12.8
Roslyn	250	196	-21.6
Grenville	154	114	-25.9
Toronto	216	202	- 6.5
Brandt	132	106	-19.7
Revilla	142	129	- 9.2
Strandburg	98	85	-13.3
Astoria	153	147	- 3.9
Clear Lake	1157	1149	- .7
White	418	454	+ 8.6
Bushnell	65	51	-21.5
Verdi	18	11	-38.9
Lake City	44	39	-11.4
Ferney	NA*	NA	--
Hillhead	NA	NA	--

\*Information not available.

SOURCE: Population Estimates and Projections, Bureau of Census, U.S.  
 Department of Commerce, Series P-25, No. 689, April 1977.

Table 15  
Control Communities (1970-1975)

	1970 Population	Estimated 1975 Population	1970-1975 % Change
Stockholm	116	100	-16.0
South Shore	199	236	+18.6
Ortley	111	98	-11.7
Pierpont	241	221	- 8.2
Frankfort	192	159	-17.1
Raymond	114	117	+ 2.6
Burce	217	215	- 1.0
Andover	138	129	- 6.5
Claire City	100	94	- 6.0
Peever	202	218	+ 7.9
Conde	279	279	0
Estelline	624	624	0
Albee	26	14	-46.0
Britton	1465	1507	+ 2.9
Castlewood	523	538	+ 2.9
Labolt	90	65	-39.9
Stratford	106	141	-33.0
Gary	366	389	+ 6.3
Mansfield	NA*	NA	--
Crocker	NA	NA	--

\*Information not available.

SOURCE: Population Estimates and Projections, Bureau of Census, U.S. Department of Commerce, Series P-25, No. 689, April 1977.

## CHAPTER V

### SUMMARY OF THE STUDY

Railroads in South Dakota have fallen on difficult times. The frequency of rail abandonments has increased the concerns of people and shippers involved. Farmers fear abandonment will increase operating costs leaving them at a comparative disadvantage to farmers still served by rail. Businesses fear increased transportation costs and declining patronage. Communities contend that their economic viability is at stake. Regulators and governments at all levels face the task of balancing the immediate effects of abandonment with its future implications in order to best serve the public.

The major concern of this study was to estimate the impacts of past branchline abandonments on selected rural communities in South Dakota. A group of communities similar and near to the communities that lost rail service controlled the analysis. The comparison of the two community groups was based on the growth of selected performance variables that were expected to differ if abandonment effects took place. Both pre-abandonment and post-abandonment periods were studied.

The statistical analysis failed to discern a distinction between the two community groups regarding any of the variables in either the pre-abandonment or post-abandonment periods. Also, no specific year(s) relative to the years of official abandonment stood out suggesting when abandonment effects might have been evident. Finally, no relationship was found between community population and the growth of utility usage that would suggest that larger communities can more easily adapt to rail abandonment than smaller communities.

Further, less analytical, inquiry was made into several abandonment related questions. In considering the findings of no significant abandonment effects relative to:

- (1) the gradual decline of the majority of rural communities in South Dakota dating back to 1950; and
- (2) the similarity of population decline in percentage and duration for both the test and control communities studied;

it was concluded that;

- (1) rural communities in South Dakota, in general, have been declining in population and activity due to reasons other than rail abandonment; and,
- (2) rail abandonment does not hasten the pre-existing decline in rural South Dakota community populations and economic activity.

#### Limitations of the Study

Geographically, this study is limited to east river South Dakota with emphasis on the central, northeast, and eastern sections of this area. Whether or not this study's findings are relevant to other areas and states is questionable due to somewhat unique conditions in South Dakota which could make community adjustment in South Dakota the exception. South Dakota is unique in that:

- (1) there are relatively few major industrial or commercial bases;
- (2) land is on average less productive relative to other states;
- (3) there are no major north/south rail lines; and,
- (4) it is sparsely populated and characterized by a declining rural non-farm population.



Also, this study is limited relative to the adequacy of its basic assumptions. Are the selected performance variables correct in assessing community response? Are the time periods long enough to reveal the total adjustment processes?

Finally, this study's findings are limited in that they are based on an aggregate analysis. When one analyzes an aggregate response specifics are sacrificed for generalities. Because the profiles of most communities are different it is possible that some communities, due to some combination of characteristics, will react and adjust differently when faced with rail abandonment. For example, a community located near an interstate highway, or other rail line can more easily adapt to abandonment than a community isolated from alternative transportation. Therefore, any extrapolation of the findings of this study to other situations should be made with care.

#### Recommendations

The economic analysis of the role and viability of any branchline requires an evaluation of all of the costs and benefits of the inter-related transportation system. The transportation system is interrelated in that:

- (1) traffic originating and terminating on local branchlines moves over other lines in the state and region (and provides revenues supporting those other lines). Thus, local abandonment is more than just a local concern;
- (2) Truck and rail systems are often parallel and close substitutes so any evaluation of the need for branchline service requires an analysis of the effects on and costs of both modes.

1974

1974 - THE BIODIVERSITY OF THE GREAT PLAINS  
- A Study of the Great Plains Region

1974 - THE BIODIVERSITY OF THE GREAT PLAINS  
- A Study of the Great Plains Region

1974 - THE BIODIVERSITY OF THE GREAT PLAINS  
- A Study of the Great Plains Region

1974 - THE BIODIVERSITY OF THE GREAT PLAINS  
- A Study of the Great Plains Region

1974 - THE BIODIVERSITY OF THE GREAT PLAINS  
- A Study of the Great Plains Region

BIBLIOGRAPHY

1. *Journal of Ecology*, 1974, 62, 1-10

2. *Ecology*, 1974, 55, 1-10

3. *Journal of Animal Ecology*, 1974, 43, 1-10

4. *Journal of Applied Ecology*, 1974, 11, 1-10

5. *Journal of Theoretical Biology*, 1974, 42, 1-10

6. *Journal of Biological Sciences*, 1974, 104, 1-10

7. *Journal of Environmental Biology*, 1974, 5, 1-10

8. *Journal of Environmental Management*, 1974, 4, 1-10

9. *Journal of Environmental Education*, 1974, 5, 1-10

10. *Journal of Environmental Planning and Design*, 1974, 6, 1-10

11. *Journal of Environmental Quality*, 1974, 3, 1-10

12. *Journal of Environmental Health*, 1974, 4, 1-10

13. *Journal of Environmental Health Perspectives*, 1974, 12, 1-10

14. *Journal of Environmental Health Practice*, 1974, 1, 1-10

15. *Journal of Environmental Health Research and Public Health*, 1974, 2, 1-10

16. *Journal of Environmental Health Research and Public Health*, 1974, 3, 1-10

17. *Journal of Environmental Health Research and Public Health*, 1974, 4, 1-10

18. *Journal of Environmental Health Research and Public Health*, 1974, 5, 1-10

19. *Journal of Environmental Health Research and Public Health*, 1974, 6, 1-10

20. *Journal of Environmental Health Research and Public Health*, 1974, 7, 1-10

## BIBLIOGRAPHY

- Allen, Benjamin J. The Economic Effects of Rail Abandonment: A Case Study. Unpublished Ph. D. dissertation, University of Illinois, Urbana, Illinois, 1974.
- \_\_\_\_\_. "The Economic Effects of Rail Abandonment on Communities: A Case Study." Transportation Journal. Fall 1975, pp. 52-61.
- Baumel, C. Phillip, John J. Miller, and Thomas P. Drinka. A Summary of an Economic Analysis of Upgrading Branch Rail Lines: A Study of 71 Lines in Iowa. Report No. FRA-OPPD-76-3 prepared for the Federal Railroad Administrations, Springfield, Virginia, 1976.
- \_\_\_\_\_, John C. Miller, and Thomas P. Drinka. "Impact of Rail Abandonment Upon Grain Elevator and Rural Community Performance Measures." American Journal of Agricultural Economics. November 1979, pp. 746-49.
- Bunker, A.R. and L.D. Hill. "Impact of Rail abandonment on Agricultural Production and Associated Grain Marketing and Fertilizer Supply Firms." Illinois Agricultural Economics. January, 1975, pp. 14-22.
- Bureau of Census, U.S. Department of Commerce. Population Estimates and Projections. Series P-25, No. 689, April 1977.
- Business Research Bureau, School of Business, University of South Dakota. Railroad Impact Study. Bulletin No. 111, July, 1975.
- Business Research Bureau, School of Business, University of South Dakota. Railroad Impact Study. Bulletin No. 114, October, 1975.
- Business Research Bureau, School of Business, University of South Dakota. Railroad Impact Study. Bulletin No. 116, December, 1975.
- Business Research Bureau, School of Business, University of South Dakota. Railroad Impact Study. Bulletin No. 118, March, 1976.
- Commercial West Bank Directory of the Upper Midwest. Commercial West Magazine, Edina, Minnesota. 1962-77.
- Division of Property Tax, Department of Revenue, Pierre, South Dakota. Annual Assessment and Sales Information. 1962-1977.
- Due, John F. A Case study of the Effects of the Abandonment of a Railway Line - Sherman's and Wasco Counties, Oregon. College of Commerce Working Paper #205, University of Illinois, Urbana, Illinois, 1974.
- \_\_\_\_\_. Long Term Impact of Abandonment on Railway Lines. Transportation Research Paper #7, University of Illinois, Urbana, Illinois, 1975.

- \_\_\_\_\_. "The Effects of Railroad Abandonment on Agricultural Areas: A Case Study." Illinois Agricultural Economics. July, 1975, pp. 14-22.
- Elsner, David M. "Highway Damage by Big Trucks Worries Various Agencies, and Crackdowns Loom." The Wall Street Journal. April 6, 1978, p. 1.
- Friedlander, Ann F. The Dilemma of Freight Transport Regulation. Washington, D.C.: The Brookings Institution, 1979.
- Goss, Sidney G. Factors Associated with Population Changes in Rural South Dakota Communities. Unpublished Masters Thesis, South Dakota State University, 1974.
- Hagen, James A. "Panel: Perspectives on the Light Density Line Problem." In proceedings Symposium on Economic and Public Policy Factors in Influencing Light Density Rail Line Operation, Washington, D.C. & Federal Railroad Administrations, 1973.
- Hope, Keith. Methods of Multivariate Analysis. London: University of London Press, 1968.
- Johnson, Marc A. Community Evaluation of Railroad Branchlines. Report No. 38, Department of Agricultural Economics, College of Agriculture and Natural Resources, Michigan State University, April, 1975.
- \_\_\_\_\_. A Historical Perspective of South Dakota Grain Transportation and the Outlook for the Future. Agricultural Experiment Station Bulletin No. 653, January 1978.
- Lamberton, C.E. Why South Dakota's Branchlines Face Abandonment. Agricultural Experiment Station, South Dakota State University, Brookings, South Dakota, 1978.
- Lamberton, C.E. and R.K. Rudel. A Pilot Study to Investigate Efficient Grain Transportation and Marketing Systems for South Dakota, South Dakota State University, June, 1976.
- National Task Force on Rail Line Abandonment - Curtailment and Rural Development. The States and Rural Rail Preservation: Alternative Strategies. Lexington, Kentucky: The Council of State Government Iron Works Pike, October, 1975.
- Nelson, James R. "The Economics of Railroad Abandonment." Proceedings of a Symposium on Economics and Public Policy Factors Influencing Light Density Rail Line Operations, Held at the University of Colorado, Boulder, January 10-11, 1973.
- Norton, Hugh S. Modern Transportation Economics. 2nd Edition, Charles E. Merrill Publishing Company, 1971.

- Simat, Helliesen, and Eichner, Inc.. Retrospective Rail Line Abandonment Study. Prepared for Office of Secretary, U.S. Department of Transportation, Washington, D.C., 1973.
- South Dakota Crop and Livestock Reporting Service. South Dakota Agricultural Statistics. 1962-76.
- South Dakota Department of Transportation. Railplan South Dakota. Submitted to the Federal Railroad Administration, U.S. Department of Transportation, March, 1978.
- South Dakota Public Utilities Commission. The South Dakota Public Utilities Commission Presents a Report on the South Dakota Railroad Industry Yesterday and Today. Volume V, August 12, 1977.
- U.S. Department of Transportation. A Prospectus for Change in the Freight Railroad Industry. Submitted in accordance with Sections 504 and 901 of the Railroad Revitalization and Regulatory Reform Act of 1976 (P.L. 94-210), October 1978.
- U.S. Interstate Commerce Commission. Certificate and Order: Chicago & North Western Railway Co. Abandonment Between Doland and Groton, S.D. Finance Docket No. 25788, June 24, 1970.
- U.S. Interstate Commerce Commission. Certificate and Order: Chicago & North Western Railway Co. Abandonment Between Reville and Strandburg, S.D. Finance Docket No. 25142, August, 28, 1968.
- U.S. Interstate Commerce Commission. Certificate and Order: Chicago & North Western Railway Co., Abandonment Between Tyler, Minn., and Astoria, S.D. Finance Docket No. 25690, March 6, 1970.
- U.S. Interstate Commerce Commission. Certificate and Order: Chicago, Rock Island & Pacific Railroad Co., Abandonment Between Pipestone, Minn., and Clear Lake, S.D. Finance Docket No. 23811, April 18, 1967.
- U.S. Interstate Commerce Commission. Certificate and Order: Soo Line Railroad Company Abandonment Between Veblen and Grenville, S.D. Finance Docket No. 26139, December 18, 1970.
- Walpole, Ronald E. and Raymond Myers. Probability and Statistics for Engineers and Scientists. 2nd Edition, New York: MacMillan Publishing Company, Inc., 1978.

APPENDIX A

DATA FOR DISCRIMINANT ANALYSES

Table 1

Average Five Year Growth Rates (%) of Property Value  
and Utility Usage

Test Communities	Property Value		Utility Usage	
	Pre- abandonment	Post- abandonment	Pre- abandonment	Post- abandonment
1	2.84	4.08	3.76	10.26
2	2.26	7.02	5.02	5.04
3	3.45	3.56	3.42	1.08
4	5.68	7.44	2.64	4.72
5	.74	6.74	5.54	3.82
6	2.38	6.48	4.30	6.28
7	3.14	8.10	6.06	.40
8	5.80	8.48	6.64	7.52
9	7.44	14.92	3.34	7.32
<b>Control Communities</b>				
1	1.34	2.20	8.44	5.88
2	7.44	14.80	3.70	11.42
3	4.88	6.78	12.96	-2.52
4	1.94	5.44	.04	5.40
5	3.32	4.54	4.28	7.06
6	-1.10	3.26	1.70	11.98
7	6.14	5.90	2.52	2.66
8	6.28	5.96	3.30	4.34
9	.80	8.46	-.22	10.64
10	3.52	4.24	3.36	3.40

SOURCE: Total full and true property values were obtained from the county auditors. The sales ratios were obtained from the Annual Assessment and Sales Information reports of the Division of Property Tax, South Dakota Department of Revenue. The kilowatts-hours per year were provided by Otter Tail Power Company and Northwestern Public Service Company. The names of the communities are not given to ensure anonymity.

Table 2

Average Three Year Growth Rates (%) of Property Value  
and Utility Usage

Test Communities	Property Value		Utility Usage	
	Pre- abandonment Period	Post- abandonment Period	Pre- abandonment Period	Post- abandonment Period
1	1.80	5.16	6.33	14.80
2	7.10	8.50	2.33	6.87
3	2.00	4.60	9.20	7.73
4	5.03	5.73	1.96	6.46
5	-.60	4.93	4.00	.93
6	2.56	6.23	3.37	6.43
7	2.00	5.57	2.60	4.13
8	3.35	6.46	6.67	4.60
9	-5.60	3.76	7.53	-.57
<u>Control</u>				
<u>Communities</u>				
1	1.86	3.67	10.13	11.83
2	3.60	7.00	5.10	3.20
3	5.03	3.96	19.17	-5.90
4	2.17	5.60	-3.90	3.43
5	2.43	1.90	3.45	7.53
6	-6.07	2.87	3.20	16.30
7	7.46	4.50	.57	5.06
8	13.80	5.13	6.83	6.93
9	.10	9.60	-.03	9.60
10	1.43	4.26	5.47	4.30



Table 3

Average Three Year Growth Rates (%) of  
Non-Indexed Bank Deposits

Test Banks	Pre-abandonment Period	Post-abandonment Period
1	8.00	12.37
2	6.33	21.56
3	12.10	11.83
4	3.96	5.56
5	2.73	7.33
6	15.13	22.7
 <u>Control Banks</u>		
1	14.30	8.80
2	1.70	6.83
3	8.36	7.73
4	6.10	10.20
5	8.80	6.26
6	-3.36	8.17
7	6.63	20.80
8	7.97	10.23

SOURCE: Bank deposit information was taken from Bank Directories published by Commercial West Magazine, Financial Communications, Inc., 5100 Edina Industrial Blvd., Edina, Minnesota 55435. To ensure anonymity the bank names are not listed.

Table 4

Average Five Year Growth Rates (%) of  
Non-Indexed Bank Deposits

Test Banks	Pre-abandonment Period	Post-abandonment Period
1	8.36	9.78
2	5.30	17.00
3	13.68	13.40
4	4.78	5.84
5	-6.68	4.04
6	13.26	19.44
 <u>Control Banks</u>		
1	2.00	9.40
2	8.68	7.14
3	6.78	9.12
4	9.26	10.16
5	7.52	10.22
6	2.76	9.10
7	8.48	20.00
8	5.98	13.02

Table 5

Average Three Year Growth Rates (%) of  
Indexed Bank Deposits

Test Banks	Pre-abandonment Period	Post-abandonment Period
1	1.93	16.73
2	-2.12	7.83
3	-5.20	1.73
4	-1.33	1.40
5	16.30	3.86
6	10.86	-5.90
 <u>Control Banks</u>		
1	10.20	5.0
2	2.43	.67
3	-12.38	.43
4	4.86	-9.90
5	9.96	-8.06
6	-4.36	5.93
7	-1.56	3.60
8	-6.5	2.50

SOURCE: The farm receipts index was based on the South Dakota Crop and Livestock Reporting Services' annual Agricultural Statistics reports.

Engineering Tables

Year	Costs (in \$)		
	1950	1951	1952
1950	1.00	1.00	1.00
1951	1.00	1.00	1.00
1952	1.00	1.00	1.00
1953	1.00	1.00	1.00
1954	1.00	1.00	1.00
1955	1.00	1.00	1.00
1956	1.00	1.00	1.00
1957	1.00	1.00	1.00
1958	1.00	1.00	1.00
1959	1.00	1.00	1.00
1960	1.00	1.00	1.00

APPENDIX B

DATA FOR ONE-WAY ANALYSIS OF VARIANCE TESTS FOR  
 THREE YEARS BEFORE AND THREE YEARS AFTER THE  
 OFFICIAL YEAR OF ABANDONMENT

Year	Cost
1950	1.00
1951	1.00
1952	1.00
1953	1.00
1954	1.00
1955	1.00
1956	1.00
1957	1.00
1958	1.00
1959	1.00
1960	1.00

Table 1

## Annual Growth Rates (%) of Property Value

Test Communities	Pre-abandonment Years			Post-abandonment Years		
	1	2	3	4	5	6
1	0	10.90	- 3.20	7.20	8.90	2.60
2	- 2.00	4.40	- 4.20	4.40	6.00	4.40
3	-14.00	10.50	-13.30	0	6.5	4.80
4	8.50	17.90	- 5.00	9.00	-3.60	20.20
5	- 5.90	9.00	2.90	-2.30	9.70	6.40
6	11.60	-8.00	7.00	5.30	9.50	4.60
7	10.00	-9.60	5.60	6.60	3.70	6.40
8	8.90	3.70	2.50	10.60	5.50	1.00
9	- 7.80	5.20	8.00	-2.80	6.90	11.40

SOURCE: See Appendix A.

Table 2

## Annual Growth Rates (%) of Utility Usage

Test Communities	Pre-abandonment Years			Post-abandonment Years		
	1	2	3	4	5	6
1	-7.30	-4.60	22.00	10.40	5.20	3.70
2	4.00	3.00	5.00	3.60	3.40	-4.80
3	11.70	5.80	5.10	1.60	-10.30	7.00
4	2.00	2.80	1.90	9.40	3.20	8.00
5	16.10	6.80	4.70	9.20	9.90	4.10
6	4.40	1.30	2.10	4.90	6.40	1.10
7	7.80	4.50	7.70	4.10	7.00	2.60
8	.70	3.90	1.30	3.30	13.30	2.80
9	6.50	4.40	8.10	29.80	12.10	2.50

SOURCE: See Appendix A.

Table 3  
Annual Growth Rates (%) of Indexed Bank Deposits

Test Banks	Pre-abandonment Years			Post-abandonment Years		
	1	2	3	4	5	6
1	.60	10.60	21.40	3.20	6.10	-27.00
2	4.30	36.5	8.40	28.60	-30.00	13.00
3	-2.00	0	-2.00	8.20	3.25	3.30
4	-5.20	-9.90	-.50	-8.50	5.70	8.00
5	-9.90	24.00	1.70	25.60	6.00	18.70
6	-3.57	-6.90	4.10	1.30	15.00	7.20

SOURCE: See Appendix A.

Table 4  
Annual Growth Rates (%) of Non-Indexed Bank Deposits

Test Banks	Pre-abandonment Years			Post-abandonment Years		
	1	2	3	4	5	6
1	8.00	14.40	14.70	5.20	11.30	9.90
2	8.00	8.00	8.10	8.80	19.00	9.30
3	.70	5.80	14.80	18.40	9.32	11.90
4	-10.00	21.00	8.00	35.00	9.70	20.00
5	4.10	4.50	3.30	-2.20	9.40	9.50
6	7.90	38.50	-1.00	36.40	7.50	24.20

SOURCE: See Appendix A.

Year	Population	Utility Usage
1950	10,000	100
1951	10,500	105
1952	11,000	110
1953	11,500	115
1954	12,000	120
1955	12,500	125
1956	13,000	130
1957	13,500	135
1958	14,000	140
1959	14,500	145
1960	15,000	150

**APPENDIX C**

**DATA FOR LINEAR, SEMI-LOGARITHMIC AND LOGARITHMIC  
REGRESSIONS RELATIVE TO ESTIMATED COMMUNITY POPULATION  
AND GROWTH OF UTILITY USAGE**

Table 1

Test Communities	1	2	3	4
1	10.56	121	4.80	2.36
2	4.60	131	4.88	1.53
3	8.47	249	5.52	2.14
4	3.50	156	5.05	1.25
5	5.78	230	5.44	1.75
6	3.36	138	4.93	1.21
7	4.90	154	5.04	1.59
8	2.46	100	4.61	.90
9	4.21	153	5.03	1.44
10	8.53	1152	7.05	2.14
11	5.81	418	6.04	1.76
12	7.80	42	3.74	2.05
13	4.18	70	4.25	1.43

Column 1: Average 6 year growth rates of utility usage, three years before and three years after the official year of abandonment.

Column 2: Estimated Community Population.

Column 3: Natural log of column 2.

Column 4: Natural log of column 1.