



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Staff Paper Series

Staff Paper P92-16

July 1992

A SUMMARY OF RESEARCH STUDIES
ON THE
COMMUNITY IMPACTS OF RAIL ABANDONMENT
IN THE MIDWEST

by

Jerry E. Fruin



DEPARTMENT OF AGRICULTURAL AND APPLIED ECONOMICS

UNIVERSITY OF MINNESOTA

COLLEGE OF AGRICULTURE

ST. PAUL, MINNESOTA 55108

A SUMMARY OF RESEARCH STUDIES
ON THE
COMMUNITY IMPACTS OF RAIL ABANDONMENT
IN THE MIDWEST*

by

Jerry E. Fruin**

*This research was sponsored by the University of Minnesota Experiment Station and the North Central Regional Research Project NC-137 "Impacts of Transportation Changes on Agricultural Marketing and Local Community."

**Jerry E. Fruin is Associate Professor, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, MN 55108.

Staff Papers are published without formal review within the Department of Agricultural and Applied Economic

The University of Minnesota is committed to the policy that all persons shall have equal access to its program, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation."

Information on other titles in this series may be obtained from: Waite Library, University of Minnesota, Department of Agricultural and Applied Economics, 1994 Buford Avenue, 232 COB, St. Paul, MN 55108, U.S.A.

TABLE OF CONTENTS

	Page
INTRODUCTION	3
REVIEWER'S SYNOPSIS OF FINDINGS	6
POST-ABANDONMENT STUDIES	8
Spraggins' Study of 19 Abandonments in Minnesota	8
Ozment's Study of Firms on 16 Abandonments in Minnesota and Iowa	14
The Iowa State Study of Performance of Grain Elevators and Rural Communities	17
Allen's Study of 10 Communities Losing Rail Service	18
Ernst and Whinney Survey for the Federal Railroad Administration	22
Bunker's Study of Two Lines in Iowa and Illinois	23
Due's Study of the Union Pacific Grass Valley Line in Oregon	25
PROSPECTIVE-ABANDONMENT STUDIES	27
The Iowa State Study of 71 Branch Lines	27
The Ohio State Studies of 77 and 17 Branch Lines	30
The University of Nebraska Studies of Branch Lines in a Six-County Area	32
Johnson's Study of Clinton and Jones County in Michigan	35
The University of Minnesota Study of the Gary, South Dakota to Tracy, Minnesota Rail Line	36
COMMENTARY	38
REFERENCES	41

A SUMMARY OF RESEARCH STUDIES ON THE COMMUNITY IMPACTS OF RAIL ABANDONMENT IN THE MIDWEST

INTRODUCTION

Since the bankruptcy of the Penn Central Railroad in 1971 and the realization of the changed role of railroads in the United States, there have been a number of studies of the impacts of railroad abandonments upon the communities they formerly served. Most of the definitive studies occurred during the mid to late 1970s although some research continues today. Most recent research, however, tends to be on the potential viability of low density branch lines as independent "Short Lines" rather than on the community impacts of abandonment. A very limited number of studies were done prior to 1970.

The objective of this paper is to review the results of studies pertaining to the impacts of rail abandonments on rural communities in the Midwest. Since the possible effects of abandonment will flow into the local economy through the companies that used and lost rail service, it is necessary to determine the magnitude of the impact of abandonment on the former rail users. This magnitude depends on how the loss of rail transportation affects the profits of the former user and how management adjusts operations to minimize the adverse effects. A complete study of impacts then would require investigation into the following aspects of all the affected firms in the community:

1. The relative importance of transportation costs to total costs.
2. The availability of other modes of transportation and their substitutability for rail service.
3. The relative costs of using rail versus other modes.

4. The possibility of passing cost increases forward through price increases and whether the customers are local or national.
5. The possibility of passing the cost increase back to suppliers.

Obviously much of this information is difficult, if not impossible, to obtain in many instances. In any event, the mix of industry impacts and the cumulative effects of abandonment will vary. Consequently there is not and cannot be a definitive study with the answer. Rather a number of studies have been selected for review.

There are two major categories of rail abandonment community impact studies. First are the post-abandonment studies which review the changes in the status of communities after rail abandonment takes place. Various criteria of economic activity have been used to measure impacts. In some cases there have been comparisons with control communities that have retained rail service. Major studies in this category are:

1. Spraggins' Ph.D. dissertation (18, 19) at the University of Minnesota of the impact on all the rail users of the 19 lines abandoned in Minnesota between 1966 and 1975.
2. Ozment's 1984 Ph.D. dissertation (16), at the University of Minnesota examined the (then) current economic condition of 99 companies directly affected by the abandonment of 16 rail lines in southern Minnesota and northern Iowa. Economic conditions of the 45 grain elevators studied were then compared to the economic conditions of nearby elevators retaining rail service.
3. The Iowa State University study by Miller, Baumel and Drinka (15) comparing the performance of cooperative elevators and incorporated towns that had lost rail service with those retaining rail services.
4. Allen's 1974 University of Illinois Ph.D. dissertation (1) which examined and evaluated the actual effects on ten communities where abandonment had occurred 10 to 40 years previously.
5. Ernst and Whinney's survey (11) of 135 shippers who lost rail service between 1976 and 1980.

6. Bunker's 1975 study (7) of the effects of the abandonment of two lines in Illinois and Iowa on grain elevators, fertilizer and farm supply dealers, and agriculture. Bunker compared the impacts to those on two control lines that retained service.
7. Professor John Due's study (8, 10) of the effects of the flood induced abandonment of an agricultural line in Oregon.

The other major category of community impact study is the pre-abandonment or prospective abandonment study. This type of study projects the economic impact of abandonment by computing the changes in the costs of doing business that will occur if the railroad is abandoned. The costs considered may include the costs to the railroad of maintaining service and the costs of increased highway maintenance to the public as well as the changes to shippers in transportation costs, handling costs, inventory carrying costs and the costs of the various private investments required to adjust to the loss of rail service. Many of these studies attempted to determine and compare the total costs and benefits of abandonment to the railroad, shippers and communities. The major studies reviewed in this category are:

1. The Iowa State University studies done by Baumel, et al. (3, 4, 5, 15). These included benefit cost analyses of the potential upgrading of 71 branch lines in Iowa.
2. The Ohio State studies done by Larson, et al. They used modeling techniques similar to the Baumel studies to determine the grain transportation cost impacts of abandoning seven branch lines in west Ohio (14) and 17 branch lines in western and southwestern Ohio (17).
3. The University of Nebraska studies done by Bergland and Anderson (2, 6). They used benefit-cost analysis techniques to analyze rail lines in a six county area in southeast-central Nebraska.
4. Johnson's case study (13) of the potential effects of railroad abandonment on a two county area in central Michigan.
5. The University of Minnesota case study by Fruin, et al. (12) of the Gary, South Dakota to Tracy, Minnesota line.

REVIEWER'S SYNOPSIS OF FINDINGS

Fourteen studies completed between 1973 and 1984 were reviewed. The authors were Midwestern University researchers interested in the economic impacts of railroad abandonments on rural communities. These studies were done in different areas of the country (primarily in the Midwest) and used a number of different methodologies. Investigation of impacts both from actual abandonments and from theoretical abandonments were reviewed. After review and analysis of the studies, it is the reviewer's opinion that with a few possible exceptions due to unique circumstances, e.g, a large industrial shipper, the following conclusions generally hold:

1. Very few firms go out of business because of railroad abandonments. Spraggins found that only 2 or 40 grain elevators and one of 50 other firms closed as a direct result of abandonment. A limited number of relocations to towns with rail service will occur. (Spraggins found two relocations.) Ozment had similar findings. Relocations to nearby railroads result in no loss of jobs to the area's economy although relocation to more distant sites will.

2. Community impacts are generally more psychological than economic. Short-run economic impacts can and do occur in the form of increased transportation costs and investments in trucking facilities. In rare instances plant closures have resulted as there are industries that cannot compete without rail service today, for example, mining, or which are poorly located to begin with. However, in most instances competent management can adjust to loss of rail service with little change in long-run margins or operating costs. The studies generally did not find long-run differences in such economic variables as growth in sales,

bank deposits or population between communities losing rail services and similar communities that retained rail services.

3. Employment impacts of abandonment were generally negligible unless a manufacturing firm was forced to relocate outside of the area. In some instances increased use of trucks caused an increase in local employment.

4. Grain elevators frequently have no adverse impacts from rail abandonment. This is especially true if a truck-barge alternative is available, if large quantities of grain are fed in the area, if processing plants are in the region, or if the elevator is affiliated with a nearby subterminal capable of shipping unit trains. Adjustments must be made in internal operations and marketing strategies but due to the very fluid nature of the U.S. grain markets, impacts on bid prices and margins tend to be negligible.

Grain flows within a region frequently change with more grain near lines retaining service going long distances for export by rail and the grain near the elevators losing rail service being trucked to local processors.

5. Transport cost increases affecting agriculture are greatest for fertilizer (typically \$2 to \$6 a ton in the mid 70's). Fertilizer must either be transshipped by truck to the facility from a nearby railhead or barge facility or trucked a longer distance directly to the firm. Fertilizer dealers generally did not go out of business. It appears that most of any increased cost is passed on to the farmer but this represents a very small part (less than 1%) of total farm production costs.

Other inbound commodities for rural areas such as lumber and machinery generally were not as dependent on rail as fertilizer. Transport and/or handling costs increased but

inventory carrying costs sometimes decreased as much or more when truck transport was adopted due to smaller order sizes and more reliable service.

6. Rising fuel costs have little impact on the results of benefit-cost studies of abandonments. Results of studies that considered changes in fuel consumption due to modal changes were often inconclusive because of changed marketing patterns although trucks were found to be more efficient than rail for short distance-low volume movements.

7. Studies of the impacts of rail abandonment on highways were inconclusive. Highway wear increases due to increased truck traffic but in some instances the increases revenue from fuel and user taxes more than covered the costs of increased road damage. Revenue impacts vary both with state fuel and license structures and the allocation of road and highway funds to local jurisdictions so wear versus revenues cost could not be generalized.

8. The property tax impacts of abandonment were generally found to be negligible.

POST-ABANDONMENT STUDIES

1. Spraggin's Study of 19 Abandonments in Minnesota (1976)

The most detailed and comprehensive analysis of the effects of actual railroad abandonments on the business and communities served by rail was done by Spraggins (17, 18). His dissertation analyzed the impacts of all the railroad abandonments in Minnesota where communities lost rail service during the 10 year period from 1966-1975. There were 19 such abandonments affecting 43 communities and approximately 90 firms. (Another eight

abandonments did not involve complete loss of rail services to any community and were not included in his analysis.)

Method

a. The Shipper Impact Survey

Spraggins used a variety of sources to identify all former rail users on the abandoned line. These former users were mailed a 4-page questionnaire about the actual impacts of abandonment on their businesses. Mail and personal follow-up were used.

Approximately 90 firms were identified and 83 responded of which 76 responses were usable. Since nine firms had gone out of business virtually all the operating firms responded. The responses were analyzed by type and size of firm to assess the impacts of abandonment as perceived by the firms.

b. Comparing the Results of 10 Abandonments with the Protestant's Statements

Spraggins compared the impacts of abandonment as predicted by protestants during the ICC hearings with the actual impact on the protestants. He also compared the savings to the railroad as a result of abandonment with the actual costs to the rail users who lost service. There was sufficient information available to do this for 10 of the 19 lines in the study.

c. Ex-Post Evaluation of the Impacts of Rail abandonment on Grain Elevators

Since the dominant users of rail service in the communities studied by Spraggins were grain elevators (40 of the 76 firms responding), a major part of the research was focused on this type of firm.

To obtain data comparable to that for the grain elevators losing rail service (non-rail elevators), 64 elevators (rail elevators) in close proximity to the non-rail elevators were selected for study. Both groups of elevators were characterized as having the same crop conditions, road conditions and distances to market.

Several techniques were used in an attempt to assess the viability of elevators that lost rail service. A comparison was made of applicable rail and truck grain rates of nearby rail elevators with the truck grain rates of non-rail elevators. The volume of grain gained by nearby rail elevators from non-rail elevators as a result of abandonment was measured. The change in grain volume handled and the change in turnover rate between 1969 (pre-abandonment) and 1975 (post-abandonment) were compared for the rail and non-rail elevators. Finally, a comparison was made of the grain capacity changes between 19679 and 1975 of the non-rail elevators with all other Minnesota elevators.

Spraggins also investigated the existence of new or expanded elevators, especially subterminals and the impacts of spring road restrictions on highways serving elevators losing rail service.

Results

a. Analysis of Shipper Impact Survey

Abandonment of the 19 lines affected 43 communities with an average population of 889 in 1970. The largest community had a population of 1500. The respondents were in the following businesses:

	Number
1. Grain-type elevators	40
2. Fertilizer dealers	8
3. Lumber firms	13
4. Implement dealers	4
5. Miscellaneous industry	11

Forty-eight percent of the firms still used rail, meaning that they had to go to a nearby railhead for service. Fertilizer and implement firms had the highest dependence on railheads after abandonment.

Thirteen percent had facilities (generally rail car loading equipment) rendered useless by abandonment.

Twenty-seven percent had purchased trucks after abandonment.

Twenty-two percent had altered facilities to accommodate other transportation. Grain elevators and fertilizer firms made the most expenditures in this area.

Twenty-nine percent reported that they canceled plans for facility modification when abandonment became a certainty. Elevators were most affected in this regard.

More than one-half of the firms claimed to have experienced an increase in transportation costs. More than one-half claimed a decrease in profit although some were able to pass along cost increases.

Some firms in each category indicated some impact from abandonment. It did not appear that smaller firms were affected more severely than larger firms.

b. Results of the Case Studies of 10 Abandonments

The largest transportation cost increases were realized by firms handling fertilizer. Many of these firms were still utilizing rail via a nearby railhead. The cost increases for fertilizer firms resulted from trucking from the railhead to the firm.

Nine (of 90) firms are no longer in operation. Six are grain elevators, one a dry wall manufacturer, one a sugar beet loading facility and one a straw loading facility.

Abandonment was the direct cause of the closing of two of the elevators and the dry wall manufacturer. The sugar beet and straw loading facilities were moved to railheads in nearby towns after abandonment so area employment was unchanged in those cases.

Spraggins summarized, "many of the effects alleged by protestants during Commission hearings generally occurred subsequent to the rail line abandonments, but were often less severe than anticipated. Although abandonments have had significant impacts on a few of the individual protestants, and despite the negative effects reported by the responding firms in the questionnaire survey, most of the protestants appear to be as viable today as before abandonment."¹

c. The Viability of Elevators Losing Rail Service Compared to Nearby Elevators Retaining Rail Service

Differences in rates, capacity changes and volume changes were analyzed. Spraggins concluded that the elevators losing rail service had, in general, not suffered from abandonment and were as viable as nearby competitors with rail. Differences between truck and rail transportation costs were insignificant when compared to annual sales volumes.

¹Spraggins (1976), p. 300.

Some of the nearby rail elevator reported volume gains when an elevator lost rail service. However, most nearby rail elevators reported no gains in volume from abandonments.

Non-rail elevators increased storage capacity more than rail elevators from 1969-75. Non-rail elevators had a greater average percentage volume increase than nearby elevators retaining rail service. There were shifts in marketing patterns after abandonment and frequently rail and non-rail elevators shipped to different markets.

There were six elevators which lost rail service which ceased operation between 1969 and 1975. An intensive investigation was carried out to determine if these closings were a direct result of rail abandonment. (The number of nearby elevators located on rail lines that may have ceased operations in that time period was not investigated and is not known.)

Findings were that one elevator had burned down and was not rebuilt, one had already ceased most of its operations prior to abandonment because of poor business. Two elevators were serving as government storage facilities under government loan program until 1973 when all grain was removed from storage after the Russian Grain Sale.

It was concluded that two elevators closed as a direct result of abandonment. These were in an area where road capacity restrictions prevented economic truck rates.

Spraggins concluded, "The evidence indicates that the vast majority of elevators losing service in Minnesota have not been adversely affected in their ability to compete with nearby rail elevators. A few elevators are now paying higher transportation costs than they would have been if rail service still existed. However, their ability to expand in capacity and

output has not been significantly impeded by the loss of rail service. The elevators are as viable as their nearby competitors who have rail service."²

2. Ozment's Study of the Economic Condition of 99 Companies Losing Rail Service and Comparing Elevators Losing Rail Service

As part of his dissertation research Ozment (16) attempted to answer the following questions:

- a. Have rail abandonments forced many companies to close or relocate because they cannot remain competitive without rail service?
- b. Are companies which are not forced out of business due to rail abandonment left at a competitive disadvantage?
- c. Have companies that have lost rail service had to absorb increased costs themselves due to abandonment as opposed to passing the cost increases along to their customers or back to their suppliers?

Method

Questionnaires were sent to all firms on nine lines in Minnesota and seven lines in Iowa abandoned between May 1976 and April 1980. Questionnaires were sent to a total of 248 firms in 82 communities. Eighty-five of the firms were grain elevators.

Questionnaires were also sent to 140 nearby grain elevators which had retained rail service to determine if their current economic circumstances were better than those elevators which had lost rail service.

²Spraggins (1978), p. 16.

A second questionnaire mailing was followed by phone calls and personal visits to nonresponding and/or undelivered questionnaire locations to determine if any of the nonresponding firms had been forced out of business because of rail abandonment.

A total of 48 elevators (56%) and 51 other firms (31%) losing rail service responded. All of the Minnesota and all but 14 of the Iowa nonresponding were contacted by phone or in person to determine if the firm was still in business. Ozment was unable to contact the last 14 Iowa firms because of a lack of travel funds for further personal visits.

Sixty-five (46%) of the elevators retaining rail service responded to the questionnaire.

With respect to the question "Have rail abandonments forced many companies to close to relocate because they cannot remain competitive without rail service?" Ozment found that:

- a. All the respondents in business when the railroad was abandoned were still in business.
- b. Five (out of 63) nonrespondents in Minnesota were no longer in business. Discussions with community officials and ex-employees indicated that all had closed for reasons other than a lack of rail service. (It was found that frequently the nonresponding businesses were in operation under new ownership and/or new names).

Four (out of 57) contacted nonrespondents in Iowa were no longer in business but the closures were not due to a lack of rail service. Frequently the nonrespondents were operating under a new ownership or name.

There were 14 uncontacted nonrespondents in eastern Iowa. Ozment concluded that based on the followup contact with nonrespondents in Minnesota and Iowa, it was unlikely that these firms had quit business because of rail abandonments.

- c. In addition to the questionnaire analysis, Ozment compared the decrease in the number of elevators in 1980 from 1975 in all communities in Minnesota and Iowa which lost rail service with the decrease in the number of elevators from 1975 to 1980 in all communities retaining rail service.

In Minnesota the number of elevators in communities losing rail service decreased from 116 in 1975 to 110 in 1980, a decrease of 5.2%. Elevators in communities retaining rail service decreased from 213 to 205, a decrease of 3.8%. In Iowa the number of elevators in communities losing rail service decreased from 102 to 94 or 7.8% while the number of elevators in communities retaining rail service decreased from 431 to 391 or 9.3%. The differences were not statistically significant.

With respect to the question, "Are companies that have had to adjust to a rail abandonment left at a competitive disadvantage?", only 11 percent of those responding to the questionnaire indicated that they had not been able to adjust adequately to rail abandonment and had been left at a competitive disadvantage. However, 6 of the 18 fertilizer dealers (33%) responding indicated that they were competitively disadvantaged by the abandonment.

With respect to the question, "Have companies that have lost rail service had to absorb increased costs or have increased costs been passed on to customers or back to suppliers?", Ozment found that 65% of the grain elevators, 28% of the fertilizer dealers and 66% of the other businesses responding did not experience cost increases. Twenty-nine percent of the grain elevators, 56% of the fertilizer dealers and 22% of the other businesses were able to pass the cost to customers or suppliers. Only 6% of the elevators, 17% of the fertilizer dealers and 12% of the other businesses had to absorb the increased costs themselves.

Ozment also compared the responses of the responding grain elevators who had lost rail service with those of the nearby elevators which had retained rail service. He found that elevators in Minnesota retaining rail service increased capacity by an average annual growth

rate of 14.8% from 1975 to 1980 while elevator losing rail service increased capacity at an 11.8% annual rate. In Iowa rail based elevators capacity increased at a 10.7% while those losing rail service increased capacity at the faster rate of 11.4%. The differences in growth rates were not statistically significant.

Ozment compared the change in the volumes of grain handled by elevators losing and retaining rail service. Rail based elevators in Minnesota increased their volume at a 25% annual rate while elevators losing rail service increased their volume of grain handled at a 19% rate. In Iowa elevators losing service increased volume at a 20% annual rate compared to 19% for those retaining service. The differences in growth rates were not statistically significant.

3. **The Iowa State Study of Performance of Grain Elevators and Rural Communities (1976)**

Miller, Baumel, and Drinka (3, 15) of Iowa State University used statistical methods to compare growth performance measures of cooperative grain elevators and incorporated towns located on previously abandoned rail lines with those of cooperative grain elevators and incorporated towns on existing rail lines from 1969 to 1974. They found no significant differences for the two groups of cooperative elevators in:

- a. rate of growth of sales
- b. rate of growth of grain sales
- c. rate of growth of fertilizer sales
- d. rate of growth of earnings
- e. rate of growth of assets

- f. return on investment

They also compared performance measures of towns on previously abandoned rail lines with towns on the 71 branch lines studied. They found no significant differences in:

- a. rate of growth of population
- b. rate of growth of retail sales
- c. rate of growth of bank demand deposits
- d. rate of growth of bank loans
- e. rate of growth in bank surplus reserves and undivided profits

The authors concluded that "Contrary to popular opinion, cooperatives located on abandoned rail lines do not die, but rather continue to grow" and "The results of this statistical analysis tend to confirm the conclusions of case studies that suggest minor or negligible impacts or rail abandonments on rural towns and elevators."³

4. Allen's Study of 10 Communities Losing Rail Service (1974)

A study by Allen, undertaken as a doctoral dissertation in Economics at the University of Illinois (1), examined and evaluated the actual effects of abandonment in ten communities. This study is included in this survey because the ten community sample had a broad range of circumstances with respect to location, size, and time of abandonment (see Table 1). However (as a result), the lines are not primarily located in Midwestern agricultural areas as those in the other studies. The states represented in the sample were (communities abandoned indicated in parentheses): Texas (Kerrville, Yorktown); Oklahoma

³Miller, Baumel and Drinka, p. 748.

(Drumright, Sulphur); New York (Walton, Delhi); Michigan (Gladwin); Tennessee (Livingston); Missouri (Eldorado Springs) and Iowa (Waukon). The range of population (1970 census figures) for nine of the communities was between approximately 6,000 and 2,000 with Kerrville having a population of 12,762. All of the lines were abandoned after 1957 except for Livingston, which lost its rail service in 1934. With the exception of Walton and Livingston, these communities were at the endpoints of branch lines of major rail systems. Walton was on the main line of the New York, Ontario and Western; Livingston was on the endpoint of the Tennessee, Kentucky and Northern Company, a 17-mile railway company.

The study was broken down into three basic research problems estimating the effect of rail abandonment on: (1) the intra- and inter-regional transportation costs, (2) the primary, secondary, and tertiary activities in the community in the short-run, and (3) the long-run economic development of the community.

The conclusions of the study with respect to the effect of rail abandonment on transportation costs were as follows:

1. Increases in transportation costs were felt by shippers and receivers dealing in fertilizer, feed, lumber and coal products that have characteristics best suited for rail transport. With only a few exceptions, coal dealers were unable to survive the higher trucking costs. However, retail coal distribution was definitely a declining industry in the 60's and it is questionable how long the businesses would have survived in any event. In communities where feed and fertilizer were important inbound shipments, the typical increase was \$2 per ton for both feed and fertilizer.

2. Inventory costs were reduced when shippers were forced to switch from rail to truck. In many cases, these inventory costs became extremely important as the time of abandonment drew closer because the frequency of rail service decreased as the time of abandonment approached in most communities. With increased frequency of service and smaller minimum load requirements of trucking, some firms producing or handling higher value products found that the reduction in their inventory costs matched or exceeded the increment in their direct transport shipping costs.

3. In the communities under study, which were heavily unbalanced in favor of inbound traffic, the major expenses of firms losing rail service were the one-time expenses that resulted from having to rearrange the system of handling incoming goods. These additional costs included costs for building necessary warehouses at the nearest rail transshipment point, constructing unloading docks at the plant suitable for trucks and hiring the additional men required for the double handling of goods (from boxcar to truck, from truck to plant). Firms not located on rail sidings at the time of the abandonment had little or no additional costs.

The main conclusions reached concerning the short-run effects on the communities themselves were:

1. With the exceptions of Delhi and Walton, New York, the communities endured very little adverse employment effects as a result of rail abandonment. The Camp Milling Company in Walton, which had milling-in-transit privileges and shipped 1400 cars a year, laid off thirty employees as a result of the rail abandonment. Apparently, this lay-off affected retail sales for a period of time in Walton. Delhi lost the International Stock Food

Corporation due to the impending rail abandonment, though the workers could transfer to the plant's new location, also in New York state. In general, the employment effects were minimal because most businesses could pass through the increased transportation costs of incoming goods. Farmers, who were the recipients of most of these incoming goods, such as fertilizer, were simply forced to pay the higher prices--especially if no community still served by rail was nearby. The communities with manufacturing firms exporting their product by rail suffered little because the firms were either able to absorb or pass on any higher costs of trucking (the costs of trucking were not always higher, especially when lower inventory costs were considered). In the case of Drumright, Oklahoma it was obvious that the economic decline of the community preceded rail abandonment as a refinery had closed about six years before with a loss of 180 jobs.

2. Most of the communities lost tax revenues as a result of losing the rail property, but the tax revenue lost was not a significant amount when compared to the total tax collections. Walton and Delhi had not been able to collect property taxes from the New York, Ontario and Western for the twenty years preceding the actual abandonment.

It was difficult to arrive at conclusions with respect to the long-run effects on the communities which had been abandoned for at least ten years. For example, Livingston, Tennessee had stagnation, rapid increase, slight decrease, and an increase (in that order) of its population since losing its rail service in 1934. In general, the study concludes that consumers and producers who had purchased the products shipped in by rail continued to purchase these items after abandonment in the same community despite the higher prices resulting from the rail abandonment. In several instances, feed dealers and lumber dealers in

nearby communities still served by rail were able to capture some of the business from the community losing service.

The author cited several cases where the abandoned community lost out to a neighboring community still served by rail as a location site for a firm. He concluded that there was a reduction in the attractiveness of the community as a location site for industry but also noted that almost all of the communities have added one or more industrial firms since the abandonment.

It should be noted that although agriculture was an important industry for most of the communities, it was generally not the cash grain agriculture typical of the Midwest. The areas served generally had feed and grain deficits (with the exception of Eldorado, Missouri) so that inbound rail traffic exceeded and sometimes greatly exceeded outbound rail shipments.

5. Ernst and Whinney Survey for the Federal Railroad Administration (1981)

The firm of Ernst and Whinney carried out a telephone survey of 135 companies that lost rail service between 1976 and 1980 (11). Some shippers had been on lines that were closed when Conrail was formed in 1976. The remainder were on Rock Island and Milwaukee lines abandoned in 1979 and 1980.

Of the 135 companies contacted, only 2 firms were forced out of business as a direct loss of rail service. Three firms were forced to relocate. Most firms surveyed (83%) experienced an increase in transportation costs, but only 20 respondents (15% indicated that they had experienced a drop in sales as a result of the increase in transportation expenses. However, no comparisons were made with companies that continued to receive rail service

so it is not known whether the increased transportation costs were caused by the rail abandonment or simply due to inflation or to some combination of abandonment and the rapid price inflation of the late 70's.

Firms most likely to be hurt by rail abandonment were found to be those that met three conditions simultaneously. First, transportation cost must be a significant part of the total delivered cost of the firm's major products. Second, there must be little opportunity for product differentiation from those of competitors. Third, the firm's competitors must have rail service.

6. Bunker's Study of Two Lines in Iowa and Illinois (1974)

Method

Bunker's study (7) analyzed two abandoned lines, a 95-mile line of the Chicago and North Western extending from Oskaloosa, Iowa to Keithsburg, Illinois, abandoned in 1971 (Case I) and a 14-mile branch of the Rock Island extending from Menlo to Guthrie Center, Iowa abandoned in 1969 (Case II). Bunker sought to analyze the effects of the abandonment on grain elevators, fertilizer and farm supply dealers, and agriculture. The Case I region had access to Mississippi River barge terminals; the Case II region was too far inland for truck connections with the Missouri River to be a good alternative to rail service.

Changes in agricultural production patterns before and after the rail line abandonments were compared to changes over a comparable period of time in similar communities still having rail service. Comparisons were also made of the volume of grain

receipts by county elevators, and of feed and fertilizer sales, storage capacities and the employment levels of grain, feed and fertilizer firms.

Results

Although production of grain for cash markets tended to increase somewhat, Bunker concluded that loss of rail service had little or no impact on the types of agricultural production in the Case I area. In the Case II area, however, where grain-shipping costs increased significantly as a result of rail abandonment, a shift toward greater livestock production occurred. In the Case II area, increases were recorded in total grain production, number of acres in pasture, and livestock numbers.

Bunker concluded that the loss of the Case I line had little or no effect on grain elevators since virtually all grain was already being trucked, from points up to 90 miles distant, to the Mississippi River for shipment by barge. The loss of the Case II line, for which water transport as a substitute was not available, did adversely affect the elevators. Those losing rail service declined relative to those retaining rail service and no longer shipped to distant points, being confined to local markets. Capital expenditures were reduced and employment declined.

Feed firms were not adversely affected by abandonment in either region as both feed ingredients and customers were available locally. Neither feed or livestock had moved by rail prior to abandonment. Feed dealers in the Case II area were able to increase sales because of the expansion of local livestock production.

The study revealed a greater effect upon fertilizer distribution. Dealers on the Case I line did receive fertilizer by rail; they shifted to sources nearer by when they lost rail service, but their business was not affected seriously. On the Case II line, fertilizer dealers were seriously affected, experiencing up to \$6 per ton additional costs. Three of these dealers quit business, while those nearby retaining rail service experienced an increase in business. The net effects on regional employment were minimal as the fertilizer continued to move by rail to a nearby town where it was transferred to trucks at a cost of \$1.50 a ton and trucked to the place of business at a cost of 4 to 8 cents a ton-mile.

The overall net effect on agriculture in the Case I line was very limited due to alternative water transportation. These were impacts on agriculture in the Case II area resulting in more livestock production and less reliance on cash grain farming. The chief impact in the Case II area was on fertilizer dealers with some adverse effects on grain elevators although feed sales increased.

7. Due's Study of Union Pacific Grass Valley Line (Oregon) 1974

In the early 1970s, Due studied the community impacts, problems, and adjustments caused by a number of branch line abandonments that had occurred 10 or more years earlier (8, 9, 10). His study (10) in 1974 of the Union Pacific Grass Valley line abandonment is most applicable to this report. This branch line ran from Biggs, Oregon, on the Columbia River 52 miles south to Kent, Oregon. It ceased operations in 1964. The line, completed in 1900, initially carried a substantial portion of through traffic to central Oregon, but following the construction of direct lines to Bend depended upon local traffic, primarily wheat. The

entire county had a population of only 2,321 in 1940, and 2,139 in 1970, but shipped substantial quantities of wheat--about 1,800 cars a year, virtually all moving to Portland for export to the Far East. It apparently was marginally profitable right up until December 1964, when 8 miles of track were destroyed by a severe flood. The line was not rebuilt and did not operate following the flood. It was officially abandoned in 1965. Consequently there was not a long period of traffic deterioration and/or gradual community adjustment to reduced rail service. The railroad was in use and had moved an average of 82% of the grain shipped from the area during the 5 years immediately preceding abandonment.

The results of the 1974 study were as follows:

1. Following abandonment, one of the two principal grain cooperatives commenced to truck grain to the Columbia River and ship by barge to Portland, at a cost slightly less than the previous all rail rate. Investment in elevator facilities at the river was required. The cooperative nearest the Columbia River continued to ship by rail, trucking the grain from the country elevators to an elevator on the Union Pacific's main line, at a cost only slightly more than the previous all rail movement. Thus, the net effect upon the country elevators, the movement of grain, and farmer's income was negligible, and perhaps even beneficial, in causing one of the co-ops to develop facilities for shipping by barge.
2. Effects on inbound traffic were nominal; most petroleum and fertilizer was being trucked from the river before abandonment. There was a slight increase in the cost of bringing in feed, but this was negligible in total.
3. Other effects on the county were slight. There was no industrial development and not likely to be any because of the small population of the area. There was apparently a

small net loss in employment; the area lost \$9,000 in taxes which was a very small percentage of total taxes; and additional investment was required in county roads. The towns in the area had been declining steadily in population, and loss of the railroad was a psychological, but not necessarily an economic blow. The area remained a prosperous farming area but one with continuing deterioration of the towns.

PROSPECTIVE-ABANDONMENT STUDIES

1. The Iowa State Study of 71 Branch Lines (1976)

Method

A benefit cost analysis was used to evaluate the economics of upgrading each of Iowa's 71 branch lines by Baumel, et al. (3, 4, 5). The benefits from upgrading were defined as the total annual transportation and handling costs that shippers and receivers would save if the rail line that they used or would use were upgraded rather than abandoned.

The costs of upgrading were defined as the annualized total costs required to upgrade a line to 263,000 pound carrying capacity (100 ton hopper capability) and to FRA Class II standards (maximum speed of 25 mph) and to maintain the track at that level.

In the analysis a linear programming model was used to select the combination of product flows that would maximize farmers incomes from corn and soybeans (less the costs of marketing and transportation) and would minimize the transportation and handling costs of dry fertilizer and other inbound products. The model solution identified the "best" system of transporting the products on the upgraded rail line, given grain prices at all markets and all transportation and handling costs from origin to destination.

The linear programming model was then solved again assuming the abandonment of the rail line. That is, direct rail was not allowed for shippers on the abandoned line although truck, truck-barge, truck-rail and truck-rail-barge shipments were. This model solution identified the "best" system with a particular rail line abandoned.

The difference between the two computer solutions in terms of farm incomes and costs is the economic benefit of upgrading rather than abandoning the line. That is, the benefits of upgrading were the saving in transportation and handling costs to shippers and receivers if the line were upgraded rather than abandoned.

The cost of upgrading was defined as: the net cost of upgrading the line annualized over 35 years plus the fixed maintenance cost per year less the annualized discounted salvage value.

Two methods of upgrading were used to estimate upgrading costs. One was replacing existing light rail with 90-pound rail with an interest rate of 7 percent per year. The other was replacing light rail with new continuous weld 115-pound rail with an interest rate of 10 percent per year. The two methods were thought to provide the probable range of upgrading costs.

Separate benefit cost ratios were computed for:

- a. Single car rates only.
- b. The existing multiple car rate structure which included 3, 10, 25, and 50 car grain rates and 10 car fertilizer rates where applicable.
- c. Estimated rail costs for single, 3, 10, 25, and 50 cars for grain and fertilizer and for 85 car unit-trains to the Gulf. (85 car trains were not yet in use at the time of the study.)

The result was a set of six benefit-cost ratios for each of the 71 branch lines.

Findings

Of the 71 rail lines evaluated, only 10 had a benefit-cost ratio greater than one under any of the six possible solutions. The sixty-one lines that always had benefit-cost ratios less than one represented 27.9% of Iowa's rail mileage and originated or terminated only 6.1% of the total number of rail cars.

Only 4 of the 10 lines with benefit-cost ratios greater than one did so because of grain transportation and handling cost savings. Five did so on the basis of large industrial-product transportation and handling cost savings. The remaining line was in good condition and had a low upgrading cost. Consequently, only 4 of the 71 lines had benefit-cost ratio greater than 1 due to agriculture.

The different rail rate/cost structures and level of upgrading did not have much effect on the number of lines with benefit-cost ratios greater than one. (Ten with single car rates, 8 of 10 with multiple car rates and 7 of the 10 with 85 car unit trains.)

Only one line within 150 miles of the Mississippi River had a benefit-cost ratio greater than one. This was due to a large industrial plant and not to grain or fertilizer shipments.

The annualized cost to railroads, or shippers, or taxpayers to upgrade 63 of the branch lines would be about \$20 million. The average benefits to shippers would be 21.7 cents for each dollar invested in upgrading on those 63 lines.

A shift to the optimal multiple-car solution after abandonment would lead to a number of changes in grain flows or shipment distances. Large multiple car shipments on the remaining lines would increase the amount of grain from central and western Iowa shipped to export ports. Central and western Iowa grain shippers on abandoned lines near processors

would truck to those processors rather than ship to Illinois processors or export ports by rail. The results were relatively insensitive to rising fuel costs.

The Iowa State study found that abandoning rail lines would increase highway costs. In most cases the increased costs would not be fully covered by the license fees and fuel tax revenues at the rates then in effect in Iowa. Increased truck traffic did not appear to have adverse implications for safety.

Fuel consumption analyses were inconclusive as the primary market destinations differed between situations. If all grain were assumed to go to the Gulf under both the complete upgrading and abandonment alternatives, abandonment would produce major fuel savings.

2. The Ohio State Studies of 7 and 17 Branch Lines (1978)

Method

Linear programming models similar to those used by Baumel et al., at Iowa State were developed. Base line solutions that minimized the cost of grain marketing and transportation under the existing system including all branch lines were obtained and compared with survey data to determine their accuracy with respect to existing modes and flows. Volumes handled by mode, elevator type and branch line elevators recorded. Subsequent cost minimizing solutions to the model were obtained assuming all the branch lines were abandoned and solution costs and grain handling volumes by mode and type of facility were compared with the baseline solution.

Larson and Kane Study

Larson and Kane (14) examined a 31 county area of central and southwestern Ohio with a total of 17 rail lines totaling 134 miles in length that were subject to abandonment or eligible for subsidy under the Ohio State Branch Line Plan. There were 18 grain elevators that would lose service under the plan.

Findings

Rail abandonment has little impact on the aggregate total costs of grain transfer. After abandonment, total annual grain handling costs would increase only \$253,197. (The Ohio Branch Line Plan estimated that nearly \$4 million would be needed to upgrade and continue service on 17 branch lines.)

Substantial changes would occur in grain flow, storage and transport throughout the region. Elevators losing rail service showed substantially reduced grain receipts and reduced margins. However, the model indicated the facilities on abandoned lines would remain viable because of a need to satisfy intrastate grain demand by truck.

Solomon, Larson and Walker Study

Solomon et al. (17) examined a nine-county area in west-central Ohio containing seven rail line segments totalling 54.5 miles in length which faced abandonment. Sixteen of the approximately 115 commercial grain elevators in the study area were on the seven study lines. There were seven facilities on retained lines capable of handling unit trains in the study area. Eighty-four million bushels of grain were shipped from the region in 1975.

Findings

Net revenue to the district's producers from the sale of corn, soybeans and wheat declined an insignificant .18% from the baseline solution after abandonment. However, 8 of the 16 elevators showed volume decreases of 50% or more in the abandonment solutions. Some of these elevators would not remain viable in the long run.

3. The University of Nebraska Studies of Branch Lines in a Six-County Area

Method (Grain Studies)

Anderson, Gaibler and Berglund of the University of Nebraska studied the effects of the possible abandonment of light traffic lines which primarily served grain elevators in a six-county area in southeast-central Nebraska (2, 6). There were 84 county elevators which handled 39 million bushels of grain in 1970 in the six counties. The first study dealt only with grain shipments. Three alternatives were considered: abandonment of branch lines (25% of the total rail mileage) and concentration of shipments from subterminal elevators on main lines in unit train quantities (66% of the grain); retention of all of the existing (1974) track and shipment at single car rates; and upgrading of all lines to allow shipment in 100 ton hopper cars. The Iowa State methodology was utilized.

Findings

The first alternative (abandonment of branch lines) was found to yield the maximum returns, primarily because of the elimination of the cost of maintaining the light traffic lines and operating cost savings due to the increased use of unit trains. In addition, that

alternative would require only three-fourths as many rail cars as under the existing systems. Retention of the present system was the second best option. There was relatively little difference--only about 1% of total returns--between these two alternatives. Additional fuel tax revenue would far exceed additional road costs.

The general conclusion was that, given the circumstances and the feasibility of concentration of the shipments in larger elevators, loss of the light traffic lines would not have undesirable consequences. The elevators losing rail service would not be abandoned but would become temporary storage elevators, in a less advantageous position for the long-run compared to those on heavy main lines.

Method (Grain and Fertilizer Study)

A subsequent study of the same six-county area was undertaken to determine the effect of rail abandonment on dry-bulk fertilizer shipments and to measure the implications of abandonment for fertilizer dealers. The revenue maximizing grain flow model was again used along with the minimization of the costs of fertilizer (nitrogen, phosphorus and potassium) shipments. All variable costs of transporting and handling fertilizer from point of origin to the farm were accounted for and any fixed costs of new facilities required were annualized and included. Backhauls of fertilizer from grain shipment destinations were allowed when possible.

Five alternative transportation and handling systems including rail abandonment were evaluated. These were:

1. The existing rail line system with single line rates to all fertilizer bulk-blending plants and country elevators.

2. The existing rail line system, with multiple-car rail rates to all blending plants and elevators and the upgrading of all light lines so they could handle fully-loaded 100 ton hopper cars.
3. Abandonment of light-density rail lines, with multiple-car rail rates to subterminal elevators and existing fertilizer warehouses near the study area.
4. Abandonment of light-density lines with multiple car rail rates to subterminals and to new fertilizer warehouses in the study area.
5. Abandonment of light density rail lines with combined multiple car rates for grain and for fertilizer backhauls to the new warehouses in or near the study area.

The models were solved for the "best" solution using both rail rates and carrier costs.

Findings

1. Option 3 was least costly. Even though 25% of the rail mileage was abandoned, fertilizer could be shipped using 3 to 10 car rates to an existing warehouse in or near the study area for reshipment in trucks to blending plants. Blenders on abandoned lines would not be adversely affected because their total costs would be lower than for direct rail shipments in single car lots. Option 5 provided the second-best alternative.
2. The results were generally the same whether rail rates or rail costs were used.
3. Multiple-car shipments directly to blending plants were generally not economical because of the small sales volumes of each of the three basic blending materials.
4. It would generally cost less to move fertilizer by truck through blenders on abandoned lines than to expand the delivery territories of other blenders on the remaining lines.

4. Johnson's Study of Clinton and Jones Counties in Michigan

Method

Johnson developed a procedural manual for evaluating the community impacts of rail line abandonment prior to abandonment proceedings. He then applied the guidelines to a case study of a two-county area in Central Michigan (13). The two railroads in the area were providing every other day service at the same time and had not been proposed for abandonment.

Johnson interviewed each rail user to obtain freight volumes and employment. He then analyzed the areas' economic base, reviewed the trends in the transport modes serving the area and estimated future patterns of economic activity and levels of freight traffic. Johnson's method estimated future revenues from rail traffic, and the potential level of subsidies required to maintain service. He also surveyed private willingness to provide subsidies in order to maintain rail service.

Findings

1. Net loss of employment in the area resulting from rail line abandonment would be negligible except for the possible relocation of branch plants of national firms. Three such plants were identified. Abandonment would cause relocation of these plants to sites with rail service. However, relocation would be within the state with no loss of jobs to the state's economy.

2. The additional truck traffic caused by abandonment would generally have a minimal effect on highway life and cause a moderate increase in energy consumption.

3. Trucking from rail sidings in nearby towns was the least-cost alternative to rail service for lumber and bulk fertilizer at costs of \$400 per carload of lumber and \$2 per ton of fertilizer. Grain would be trucked to terminal elevators at an increased cost. In some cases the value of rail service to the shippers was large enough to make private subsidy of the rail deficit feasible for selected line segments. However, private subsidy of the entire railroad mileage did not appear feasible.

5. The University of Minnesota Gary, South Dakota to Tracy, Minnesota Rail Line Study (1977)

Fruin et al. (12) did a case study of a 57 mile Chicago and North Western branch line that originated or received 1223 cars in 1975. This was part of a study for the Minnesota Department of Transportation to develop a methodology for evaluating the feasibility of rail user participation in rail rehabilitation projects.

Method

All 41 users of the line in 1975 were identified and actual shipments and receipts determined. Total potential volume and the maximum probable volume after rehabilitation were estimated after analyzing crop production trends and alternative shipping methods. Differences in transportation costs with and without rail service were determined. Savings to the rail users due to continued rail service were compared to the costs of the shippers providing no-interest loans to the railroad. As provided in the Minnesota Rail Improvement legislation, the no-interest shipper loans would be made by a Shippers' Association and be equal to one-third of the cost of rehabilitation. The other two-thirds of the cost of

rehabilitation would be provided by loans from the state and/or railroad funds. Different interest rates to the rail users and different payback periods were analyzed using benefit/cost methodology.

Findings

1. Under stable business conditions, rail volume would not be likely to increase more than 20% due to improved rail facilities and services.

2. The typical truck rate was 5.5 cents less per hundredweight than the rail rate for corn, wheat and oats. However, bids for rail delivery were typically higher than for truck delivery so net prices were about the same for corn and wheat. Net prices for high quality rail oats were 20 cents a hundredweight higher because of the application of transit.

3. The typical inbound truck cost of fertilizer was estimated to be \$6 a ton higher than rail because it was trucked from river points. Alternative railheads were not considered.

4. If all shippers were to participate in the program, the overall benefit/cost ratios were generally favorable at interest rates up to 12%. However, individual benefit/cost ratios varied greatly and shippers of only corn and wheat would not have favorable benefit/cost ratios. Fertilizer dealers benefitted the most.

5. If only two-thirds of the shippers participated, the tangible benefits (transportation cost savings) would be inadequate (at 12 percent interest cost to the shippers) to justify a no-interest loan to the railroad amortized over five years for one-third of the rehabilitation cost.

6. If the entire rehabilitation cost was provided by the shippers and all shippers participated, favorable benefit/cost ratios could be obtained only if interest rates were 5% or less.

COMMENTARY

Most of these studies were done in the mid to late 1970s. The impetus for the studies were concerns over the future of railroad service in the agricultural areas of the Midwest. These concerns were caused by the Penn Central bankruptcy and the financial difficulties of the railroad industry. Time has generally confirmed the conclusions of the studies. However, continued technological trends and even more importantly, the economic deregulation of the transportation sector has changed the environment facing rural communities and businesses. Deregulation of transportation, particularly the Staggers Act and the Motor Carrier Act of 1980, have caused changes in conditions in rural areas. Given the current competitive environment in transportation, dependence on a low volume railroad by a rural community or business may be counterproductive. The trends and development that cause this include:

1. Motor carrier deregulation. Relaxed entry provisions have increased competition for truck load freight. This has frequently lowered motor carrier rates to small towns for two reasons. Small regional or local truck firms with low overhead can get rights to serve additional communities without much difficulty and large non-union firms with much lower wage levels have entered the marketplace with lower rates.

2. Continued growth and acceptance of the container- or trailer-on-flat car mode (COFC/TOFC). The deregulation of COFC/TOFC traffic, the labor and fuel economy of the rail portion of long-haul container or trailer movements and the marketing of COFC/TOFC by both railroads and aggressive trucking firms will continue the growth and expansion of COFC/TOFC. Many small shippers including those in small towns and rural areas will find it advantageous and be able to lower costs by having only one shipping and receiving dock, one set of equipment facilities for unloading, etc.

3. Unit train operations. The economies of unit trains, along with the railroads' increased rate setting flexibility, means that trainloading at multiple car loading facilities have major transportation cost advantages for access to distant markets. Elevators on lines that cannot move unit trains but which are located near elevators that can will have to adjust by transshipping grain at trains-loading facilities or by finding local truck markets. Single car rail shipments cannot be cost competitive with large multiple car shipments and grain elevators must adjust their operations to reflect this fact.

On the other hand, the development and evolution of short line and regional rail companies since the Staggers' Act has allowed some low volume rail lines to remain in business and in a few instances, prosper. The advantages of short line regional railroads include lower labor costs, more flexible work rules, ability to respond to local conditions and market opportunities, and the concern of community and local business interests in the success of the venture. As a result some of the short line regional companies will succeed if an adequate traffic base exists or can be developed. However, if an adequate traffic base

does not exist, then the short line will only survive if it is subsidized or until it's capital stock (i.e., the railbed and equipment) is exhausted.

REFERENCES

1. Allen, B. J. The Economics Effects of Rail Abandonment: A Case Study. Unpublished Ph.D. dissertation. Urbana: University of Illinois, 1974.
2. Anderson, Dale G., Floyd D. Gaibler, and Mary Berglund. Economic Impact of a Railroad Branch-Line Abandonments: Results of a South-central Nebraska Case Study. Agricultural Experiment Station Bulletin SB541. Lincoln: University of Nebraska, 1976, 26 pp.
3. 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 Administration, Springfield, Virginia, 1976, 21 pp.
4. _____. "Economics of Upgrading Seventy-one Branch Rail Lines in Iowa." American Journal of Agricultural Economics 59(1):61-70, 1977.
5. Drinka, Thomas P, Dennis R. Lifferth, and John J. Miller. An Economic Analysis of Alternative Grain Transportation Systems: A Case Study. Report No. FRA-OE-73-4 prepared for the Federal Railroad Administration, Springfield, Virginia: National Technical Information Service, 1973, 247 pp.
6. Berglund, Mary, and Dale G. Anderson. Impact of Branch-Line Rail Abandonment on Costs of Fertilizer Distribution. Unpublished Department of Agriculture Economics manuscript. Lincoln: University of Nebraska, 1977.
7. 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. 12-20.
8. Due, J. F. A Case Study of the Effects of the Abandonment of a Railway Line-- Sherman and Wasco Counties, Oregon. College of Commerce Working Paper #205 Urbana: University of Illinois, 1974.
9. _____. Long-Term Effects of Abandonment of Railway Lines. College of Commerce Working Paper #247 Urbana: University of Illinois, 1975.
10. _____. "The Effects of Railroad Abandonment on Agricultural Areas: A Case Study." Illinois Agricultural Economics 15(2):14-22, 1975.
11. Ernst and Whinney. Shipper Response to Service Loss: An Assessment of Case Studies. Federal Railroad Administration, Washington, D.C., April 1981.

12. Fruin, Jerry, Gordon Garry, K. William Easter, and Harold Jensen. Cost-Benefit Analysis for the Minnesota Rail Service Improvement Program: Methodology and a Case Study. Department of Agricultural and Applied Economics Staff Paper P77-1. University of Minnesota, January 1977, 54 pp.
13. Johnson, Mac A. Community Evaluation of Railroad Branch Lines: Principles and Procedures. Center for Rural Manpower and Public Affairs Report No. 38. East Lansing: Michigan State University, 1975, 111 pp.
14. Larson, Donald W. and Michael D. Kane. "Effects of Rail Abandonment on Grain Marketing and Transportation Costs in Central and Southwestern Ohio." North Central Journal of Agricultural Economics 1(2):105-113, 1979.
15. Miller, John J., C. Phillip Baumel, and Thomas P. Drinka. "Impact of Rail Abandonment Upon Grain Elevator and Rural Community Performance Measures." American Journal of Agricultural Economics 59(4):745-749, 1977.
16. Ozment, John Douglas, Jr. An Evaluation of the State Government's Role in the Preservation of Rail Service: An Analysis of Projects to Upgrade Rail Branch Lines in Minnesota and Iowa. Unpublished Ph.D. dissertation. Minneapolis: University of Minnesota, 1984.
17. Solomon, Seyoum, Donald W. Larson and Francis E. Walker. Rail Line Abandonment: Impact on Grain Marketing and Transportation Costs in Western Ohio. Ohio Agricultural Research and Development Center Research Bulletin 1131. Wooster, Ohio. Oct. 1981, 22 pp.
18. Spraggins, H. Barry. "Rationalization of Rail Line Abandonment Policy in the Midwest under the Railroad Revitalization and Regulatory Reform Act of 1976." Transportation Journal. Fall 1978, pp. 5-18.
19. _____. An Evaluation of Interstate Commerce Commission Rail Line Abandonment Policy and Procedure in Minnesota. Unpublished Ph.D. dissertation. Minneapolis, University of Minnesota, 1976.