

ASSESSING ECONOMIC IMPACTS OF RAILROAD ABANDONMENT ON RURAL COMMUNITIES

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INTRODUCTION

The growth of trucking, air freight, and other forms of transportation have reduced the role of the railroads in transporting many products. In the United States, for example, the railroads' share of total ton-miles of surface freight transported fell from almost 70 percent in 1929 to less than 50 percent in 1984 (Transportation Research Board 1989). Railroads are still important in transporting a number of bulk commodities, including grain and oilseeds, however. And agricultural areas, especially those that lack ready access to water transportation, are still highly dependent on the railroads for economical movement of their products. For example, rail transportation has accounted for about 75 percent of all grain and oilseed shipments from North Dakota elevators (rural facilities designed for grain storage and handling) in recent years (Andreson and Vachal 1995).

The railroad system of North America was developed during a period when rail was the predominant mode of land transportation. In recent decades, however, increasing competition, both inter-modal (e.g., trucks) and intra-modal (other railroads), has led to substantial restructuring of railroad systems. This restructuring has often included abandonment (discontinued service) of low-volume branch lines. During the period 1980–1992, U.S.

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railroads abandoned more than 33,000 miles (53,400 km) of Class I and II rail line, or 17.9 percent of the mileage of Class I and II rail line operated at the end of 1979 (Bitzan et al. 1996). The percentages of rail lines abandoned were particularly high in a number of agricultural states in the United States, including Iowa (38.0 percent), Montana (29.5 percent), South Dakota (26.7 percent), and Nebraska (23.1 percent).

Although railroad restructuring has improved the efficiency of the rail system overall, branch line abandonment may adversely affect rural communities that depend on those lines for shipment of agricultural products. The loss of rail service may increase costs to shippers, can lead to increased truck traffic on local roads, and may diminish current and future employment and economic opportunities. While several previous studies have addressed the local economic impacts of branch line abandonment (for example, see University of South Dakota 1975; Babcock et al. 1992; Bitzen et al. 1991), these efforts often have been based heavily on qualitative judgments of direct and secondary effects. The purpose of this paper is to demonstrate a method for quantitatively assessing the local economic impacts of branch line abandonment.

BACKGROUND

The Carrington-to-Turtle Lake (CTL) rail line, used to demonstrate the impact assessment approach, was originally constructed by the Northern Pacific Railroad in the late 1880s. The 84.9-mile rail line was designed to service several small towns in central North Dakota, United States (see figure 1). Agriculture was, and continues to be, the major basic industry in the area, with wheat as the main crop. This area is, therefore, quite typical of many agricultural areas in the Great Plains region in North America that are faced with loss of rail service.

The CTL rail line passed into the control of the Burlington-Northern Railroad through merger. By the mid-1980s the line was in need of substantial rehabilitation, but because it was a low-volume branch line, it was not seen by the company as a particularly good candidate for such an investment. Then in 1987, the CTL line was divested by Burlington-Northern to a short line railroad company, Red River Valley and Western (RRV&W) Railroad, headquartered in North Dakota. RRV&W operated the CTL line from 1987 to 1995, but was unable to finance rehabilitation of the line. By

1995, deterioration had reached a point where attempts to move rail cars generally resulted in derailment. As a result, nearly all service on the line was discontinued by 1996 (Bangsund et al. 1996).

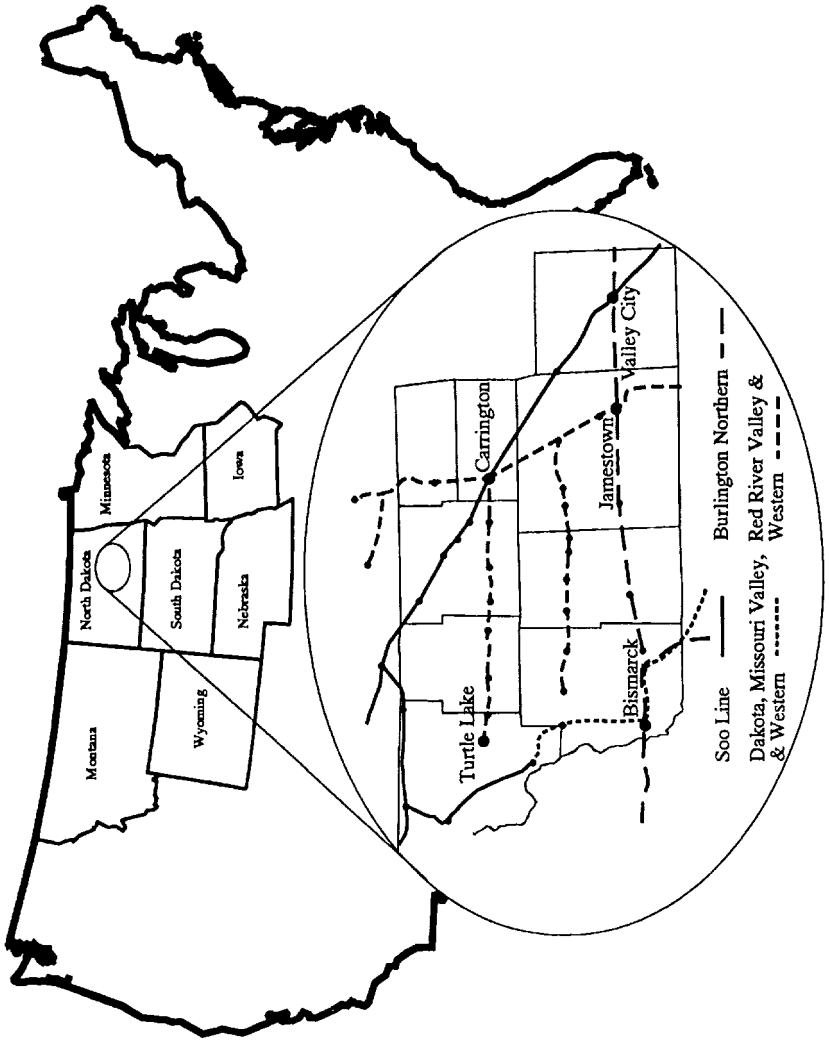
The loss of service on the CTL line was a particular problem to the five grain elevators served by the line. These firms have joined together with other business and community leaders to seek resources to rehabilitate the line. This group, known as the Central Dakota Shippers Association, believes that rehabilitation is warranted because (1) the line was profitable when in adequate operating condition and (2) a recent study indicated a positive benefit-cost ratio if the line were rehabilitated (Tolliver and Andres 1995). In order to strengthen their case for rehabilitation, the Central Dakota Shippers Association requested an assessment of the economic impacts of the loss of rail service on the CTL line.

PROCEDURES

Impacts of railroad abandonment on small communities can take many forms. Impacts include losses of business activity in the local and regional economy, often categorized as direct and secondary economic impacts. Other impacts that reflect losses in economic values included road/highway damage, forgone economic development opportunities, and forgone tax collections. Methods used to calculate the direct economic impacts and other related losses were adapted from Honeyman (1995). Those techniques included estimating changes in costs incurred moving commodities by truck compared to costs using rail, the effects of increased truck traffic on local road systems, and the local property tax revenue consequences of rail line abandonment.

Secondary impacts (sometimes further categorized into indirect and induced effects) result from subsequent rounds of spending and respending within the economy. In the case of rail line abandonment in rural communities, some impacts result in economic leakage (i.e., less money available in the local economy). The economic leakage that occurs reduces the amount of economic activity in other sectors of the economy.

Figure 7. illustration of Carrington-to-Turtle Lake rail line



The North Dakota Input-Output Model was used to estimate gross business volume, personal income, retail activity, and economic activity in major economic sectors in the communities affected by railroad abandonment. Input-output (I-O) analysis is a widely used method for estimating the secondary economic impacts resulting from a change in business activity in a particular economic sector (Leistritz and Murdock 1981). The North Dakota I-O Model provides estimates of gross business volume for each of the **17** major economic sectors in the North Dakota economy based on changes in the level of primary economic activity in an economic sector (Coon et al. 1985). To develop estimates of secondary employment, estimates of gross business volume by sector were used with estimates of the amount of gross business volume required in each sector to support a full-time employee.

Businesses currently using rail transportation were informally surveyed to assess their shipment intentions after abandonment. The businesses on the CTL rail line are local country elevators. Thus, the survey inquired about shipping patterns and options for agricultural commodities that may be employed upon rail line abandonment. Survey results were used to develop shipping patterns, and from that information, state highways used for grain shipments were identified.

IMPACTS OF RAILROAD ABANDONMENT

While the railroad industry has realized efficiency and productivity gains through branch line abandonment, rural communities have generally been negatively impacted with the loss of rail service. These impacts have included (1) increased transportation costs to shippers, (2) increased highway and local road use and associated costs, (3) reductions in economywide personal income and gross business volume, (4) employment implications for the local work force, (5) reductions in local tax revenue, and (6) reduced economic development opportunities.

Direct Impacts

Direct impacts can be generally defined as the changes in output, employment, or income that represent the initial or direct effects of a project, program, policy, or activity. In the case of the CTL rail line, railroad abandonment will directly affect five grain elevators located along the line.

Country grain elevators (shippers) served on rail lines that are abandoned are forced to ship products by truck to final market or transship to the nearest railhead. Transshipping is the process of moving commodities by truck to the nearest railhead (facility capable of loading grain from trucks onto rail cars) for continued movement to final destination. Transshipping usually raises transportation costs due to extra handling costs. **Also**, truck rates generally are not competitive with rail in the absence of rail access. In addition, the reduction of competitive factors in rural areas, including a lack of intra-modal and inter-modal competition, often raises transportation costs (Bitzan and Tolliver 1991).

The increased transportation costs affect the competitiveness of grain elevators on the abandoned line. Due to the competitive nature of the grain-handling industry in the upper Great Plains (operations are limited by narrow margins) (Case 1996), it is unlikely an elevator on the line could absorb much of the increased cost of transportation. In light of the increased cost of transportation and the competitive situation within the industry, shippers pass some of the increased transportation costs onto farmers in the form of reduced commodity prices.

Lower commodity prices mean lost revenues (direct impacts) for farmers; consequently, farmers may deliver grain to other elevators in the region that can offer more favorable prices. Therefore, the competitiveness of shippers on the abandoned line would presumably be a function of the truck shipping cost (farmer's costs) to competing elevators and the price differential between elevators. Presumably, if the cost of moving grain to an alternative elevator is greater than the price differential received, there would be no economic advantage to move grain to other elevators.

Rail line abandonment diverts rail traffic onto local highways and roads. In rural areas, these usually consist of light-duty, low-volume roads not designed for heavy traffic (Tolliver 1994). As a result, state and local governments are burdened with greater road maintenance and construction costs. Ultimately, taxpayers are forced to cover the costs of maintenance and rehabilitation of local roads. Alternatively, in the absence of necessary road maintenance and construction, increased vehicle operating costs and opportunity costs associated with deteriorated and overused rural roads are borne by local residents (Zink 1986).

Transportation costs

In the absence of rail service, shippers are forced to transport grain by truck to the nearest railhead for transshipping or ship directly to the final market by truck. Highway routes, transshipping destinations, grain volumes by route and destination, and direct shipments by truck to final destinations were obtained by surveying the shippers on the line. The commodity flow information obtained from the survey provided the basis for calculating post-abandonment transportation costs (Bangsund et al. 1996).

The number of rail cars moved on the line prior to abandonment were converted into truckloads. The number of truckloads were then used with the commodity flow information to assess the volumes and destinations. Traffic patterns, determined from the survey, were used for determining transshipment distances. Based on mileage to transshipment points and final destinations, truck costs were estimated (Faucett and Associates 1986; U.S. Department of Agriculture 1995).

Railroad shipment costs prior to abandonment were estimated based on pre-abandonment rail rates, commodity volumes, and final destinations (Burlington-Northern Railroad 1995). The pre-abandonment shipment costs (aggregated for all shippers on the line) were estimated to be \$2,138,500 (table 1). The largest portion of the pre-abandonment transportation cost was for shipments of grain to Minneapolis, Minnesota, and Portland, Oregon.

Table 1. Pre-abandonment railroad shipping cost, Carrington-to-Turtle Lake rail line, 1996

Commodity	Destinations				Total
	Portland	Duluth	Minneapolis	N.D.	
	----- dollars -----				
Wheat-HRS	32,700	67,700	1,027,900	900	1,129,200
Durum	100	7,400	85,800	4,000	97,300
Barley	193,300	0	671,300	30,000	894,600
Sunflowers	0	0	12,200	5,200	17,400
Total	226,100	75,100	1,797,200	40,100	2,138,500

The estimated annual post-abandonment transportation cost was estimated at \$2,467,200 (table 2). The cost represents the combination of direct shipments to final market and transshipment costs.

Table 2. Post-abandonment shipping costs, Carrington-to-Turtle Lake rail line, 1996

Commodity	Destinations				Total
	Portland	Duluth	Minneapolis	N.D.	
	----- dollars -----				
Wheat-HRS	38.500	95.200	1,269,600	600	1,403,900
Durum	200	11.000	112,500	2.600	126.300
Barley	203.800	0	672.400	30.500	906.700
Sunflowers	0	0	18.700	11.600	30.300
Total	242.500	106,200	2,073,200	45.300	2,467,200

The total change in shipper costs (post-abandonment costs less pre-abandonment costs) due to an abandonment was estimated at \$328,700 annually. In the case of the CTL rail line, the increased transportation cost represents a loss of economic activity for the local economy (economic leakage). Sufficient capacity exists within the trucking industry within North Dakota to handle the additional traffic volume; therefore, expenses paid by shippers for additional truck transportation were assumed to be made to existing firms and operations (Wilson and Dooley 1991). The trucking firms involved were headquartered outside the affected communities; consequently, profit from operating the line remains in North Dakota, but not in the local economy.

Highway infrastructure impacts

Rail abandonment diverts rail traffic onto local highways and roads. In rural areas, the local highway infrastructure usually consists of light-duty, low-volume roads not designed for heavy traffic (Tolliver 1994). Increased truck traffic accelerates road and highway deterioration. The increase in deterioration caused by increased truck traffic can be measured as resurfacing or reconstruction costs.

Resurfacing and reconstruction are two potential highway improvements that may be implemented to repair damaged roads. These costs represent an annual measure of the incremental damage (not expenditures to repair) to local roads and highways resulting from rail abandonment.

A Modified Pavement Deterioration Model (MPDM) was used to estimate the per mile resurfacing and reconstruction costs (Tolliver 1994). The MPDM accounts for pavement deterioration that occurs from environmental decay and normal use (Federal Highway Administration 1987; American Association of State Highway and Transportation Officials 1986). The MPDM estimates road deterioration based on highway attributes, axle loads, axle configurations, vehicle miles of travel, and repair costs per mile. Highways impacted by the additional traffic were identified from the shippers' survey. Attributes for the impacted highways were obtained from the North Dakota Department of Transportation's Pavement Management System Database (North Dakota Department of Transportation 1993). Incremental truck vehicle miles of travel were estimated for each impacted highway. Subsequently, an annual measure of equivalent single axle loads, representing vehicle miles of travel, typical truck weights, axle configurations, and axle weight distributions, were estimated for each impacted highway.

The loss of rail service results in increased truck activity. Additional truck traffic results in increased user revenues (i.e., fuel taxes and registration fees) from the trucking industry. The increase in revenues was based on average industry fuel efficiency, state fuel tax rates, and vehicle registration fees (North Dakota Department of Transportation 1994). The increase in annual user revenues was estimated at \$61,000. The net cost of annual road and highway damage (damages less user revenues) was estimated at \$297,000 for resurfacing improvements and \$868,000 for reconstruction repairs.

Resurfacing improvements are the most appropriate measure of road damages as most highways affected by truck traffic in the study area will probably undergo resurfacing improvements as opposed to reconstruction. This study limited the assessment of road damages to state highways only, although county and township roads also are affected. Other road and highway impacts are likely to occur as truck routes fluctuate to bypass construction and avoid traffic congestion on main routes or as market forces dictate (i.e., change in destinations and transshipment points).

Effects on local employment

Sufficient capacity exists within the trucking industry to absorb the additional grain flow caused by the CTL rail line abandonment without noticeably increasing employment or capital expenditures (Wilson and Dooley 1991). The marginal gains in employment that may be obtained in the trucking industry are basically offset by marginal employment losses in the railroad industry (Red River Valley and Western Railroad 1996). Thus, the branch line abandonment is expected to have little-to-no change in the level of direct employment in the local economy.

Reductions in local tax revenues

The attractiveness and profitability of businesses on the CTL rail line may be reduced due to rail line abandonment, which may subsequently translate into reduced property values, particularly for businesses using the rail line and for those adjacent to the line. Reduced property values, in an absence of changes in millage rates or tax base, result in decreased tax revenues for local governments. A loss of property tax revenue can have serious consequences for local governments in North Dakota, which rely on property taxes for a substantial portion of their revenues (Bangsund and Leitch 1990; North Dakota Tax Department 1996).

The effects of rail line abandonment on property tax revenues were based on methods developed by Honeyman (1995). Increased transportation costs were discounted over time and capitalized into local property values. Losses in property values were used with property tax calculations to arrive at an estimated loss in property tax collections.

Local property tax rates, discounted changes in transportation cost, and the corresponding losses in local tax revenues were estimated collectively for the four counties affected by the abandonment. Total property tax losses to the four-county area were estimated at \$155,000 annually.

Reduced economic development opportunities

Diminished economic development opportunities may result from a loss of rail service. The attractiveness of a local community for some businesses and industries is reduced by a loss of rail service (Babcock et al. 1992). Energy and processing industries, which require shipments of large or heavy equipment and bulky material (e.g., coal, grain), are especially reliant on rail service. Details regarding future development opportunities, that would

be lost as a result of rail line abandonment, would be required before those impacts could be estimated.

Secondary Impacts

Secondary impacts occur when initial expenditures (*direct* impacts) are spent and respent within an economy. In the absence of increased transportation costs, the money spent on the additional transportation cost would represent revenue for farmers and cooperatives (i.e., the elevator operators). Thus, in this study, the increase in transportation costs was viewed as forgone revenues or an economic leakage from the local economy. The loss in government revenues does not represent less money available in the area economy. In an absence of a change in the tax base or a change in the tax rate, reduced property taxes would represent a shift from government spending to private spending. The exception is property taxes paid by railroads to local governments, which likely represent a loss to the area. The loss would be evident by fewer county government services, increased user fees, and/or an increased tax burden distributed throughout the tax base.

The overall effect, the combination of direct and secondary impacts, is often measured in terms of personal income, gross business volume, and secondary employment. The North Dakota I-O Model was used to estimate the secondary effects of rail line abandonment in the four-county area served by the CTL rail line. Direct impacts (i.e., transportation costs and farmer revenues) were allocated to various sectors of the North Dakota I-O Model.

Much of the financial burden of increased transportation costs will be shifted from the shipper to its customers. Shippers pass the costs on to patrons in the form of lower prices. Shippers felt that about 75 percent of the increase in transportation costs would be borne by farmers in the form of lower grain prices. The portion of the increase in transportation costs borne by farmers was allocated to the *Households* sector, while the remaining transportation costs absorbed by shippers was allocated to *Transportation* (table 3).

Total direct impacts of \$329,000 would generate \$682,000 in secondary impacts. The \$682,000 in secondary impacts represent the amount of economic activity that would be created if the direct impacts would remain in the local economy. The economic sectors with the greatest secondary impacts included *Retail trade* (\$229,000), *Households* (\$201,000), and *Finance, insurance, and real estate* (**\$51,000**) sectors (table 3). A loss in economywide personal income was estimated at \$448,000 annually. The

annual decrease in retail sales in the regional economy was estimated at \$229,000. The economywide loss in gross business volume resulting from the rail line abandonment was estimated to be \$1 million annually.

Table 3. Direct, secondary, and total economic impacts of the Carrington-to-TurtleLake rail line abandonment, North Dakota, 1996

Annual Economic Impacts (in \$)			
Economic sector	Direct	Secondary	Total
Agriculture-livestock		20,000	20,000
Agriculture-crops		8,000	8,000
Nonmetal mining		2,000	2,000
Construction		26,000	26,000
Transportation	82,000	3,000	85,000
Communication & public utilities		33,000	33,000
Ag processing & misc. mfg		13,000	13,000
Retail trade		229,000	229,000
Finance, insurance, & real estate		51,000	51,000
Business & personal service		19,000	19,000
Professional & social service		29,000	29,000
Households	247,000	201,000	448,000
Government		48,000	48,000
Totals	329,000	682,000	1,101,000
Secondary employment (full-time-equivalent jobs)			11

The loss of economic activity in a region can affect secondary employment. Secondary employment estimates represent the number of full-time jobs generated based on the volume of business activity created by an industry.

Secondary employment is proxy for the jobs that exist outside of an industry, but employment that is dependent on the existence of that industry. Productivity ratios (measures of the amount of economic activity needed in each economic sector to support one full-time job) were used with estimates of business activity to obtain estimates of secondary employment. Economy-wide secondary employment losses from the rail line abandonment were estimated at 11 full-time-equivalent jobs (table 3).

CONCLUSIONS

This study demonstrates methods for quantitatively measuring the economic impacts of railroad abandonment on rural economies. These methods included estimating the direct and secondary economic impacts as well as public sector effects of rail line abandonment. Specific techniques included measuring the change in transportation costs for shippers on the rail line, the secondary economic impacts associated with the change in shipper's costs, the property tax implications for local governments, and effects of increased traffic on rural road systems. This approach to estimating the impacts of railroad abandonment was demonstrated with a case study involving a branch line abandonment in North Dakota.

The Carrington-to-Turtle Lake rail line serves five agricultural shippers in a four-county area in central North Dakota. Service on the line has been affected by recent embargoes, floods, and poor, deteriorating track condition. The line is a strong candidate for abandonment as efforts to rehabilitate the line have lacked financial support. Losing rail service in rural areas is of great concern to communities and businesses.

Railroad abandonment affects communities and local economies in a variety of ways. Businesses that use rail transportation usually experience a change in their transportation options. Instead of sending and receiving materials and supplies by rail, those items must be moved by truck. The severity of the change is often a function of the amount of material shipped and distance hauled. In the case of bulk agricultural commodities and inputs, transportation by truck increases handling requirements and, depending upon quantity and distance moved, usually increases per-unit hauling rates. The combination of increased handling costs and greater per-unit hauling rates results in additional transportation expenses. As a result of the competitive situation within the rural grain-handling industry, much of the increased costs of

transportation are passed on to patrons in the form of lower commodity prices.

The structure of the transportation industry in North Dakota suggests that a shift from rail to truck transportation, for agricultural interests, in most rural regions would result in an economic leakage from the local economy. The result of that economic leakage further impacts local areas by reducing economic activity in other sectors of the economy. Thus, the overall effect is greater than just the initial change in transportation costs for businesses affected by the rail line abandonment. In the case of abandonment of the Carrington-to-Turtle Lake rail line, overall local employment should remain steady as some jobs are transferred from rail activities to trucking activities.

Rail abandonment affects property values. In the absence of tax rate changes, reduced property values translate directly into lower property tax revenues for local governments. Lower tax revenues mean fewer services or additional burdens on the existing tax base.

Rural areas, especially in North Dakota, often do not have adequate road and highway infrastructure to absorb movements of grain and agricultural inputs exclusively by truck. The transference of rail movements to truck traffic accelerates the deterioration of local roads and highways. Hence, the costs of increased road damages are another impact of rail abandonment. Besides costly resurfacing and reconstruction outlays, local road degradation affects the quality of travel in rural areas.

This study was not without limitations. County and township road impacts were not assessed, but are likely to occur as (1) truck routes fluctuate to bypass construction and avoid traffic congestion on main routes, (2) market forces dictate changes in destinations and transshipment points, or (3) grain volumes change from competition or other factors. The effects of abandonment on the sustainability and long-term competitiveness of shippers on the line were not addressed. The economic impacts of a loss of railroad profits from line operations were not addressed. Since the railroad company is headquartered some distance from the affected rail line, company profits would have little effect on the impacted communities.

Nevertheless, it is clear that the impacts of rail abandonment extend beyond a change in transportation costs for businesses using the rail line, and even beyond reduced economic activity. Both private **and** public sectors of the

economy are affected by these impacts. Losses in gross business volume in the affected communities, measured as direct and secondary economic impacts, will be greater in scope than the change in transportation costs. Rail line abandonment creates additional impacts by reducing local property values, which result in lost property tax revenues, and damages to the local road infrastructure create burdensome financial responsibilities for state and local governments.

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