Community Impacts of Local and Regional Railroads: A Kansas Case Study

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A methodology to measure the direct economic impacts of local and regional railroads on small communities in Kansas is provided. An economic model is used to evaluate the economic impacts of decreased transportation costs on a community as a result of rail-using firms contracting with local and regional railroads instead of Class I railroads. Relative changes in employment, payroll, value added, and nonlabor income are estimated for individual counties in Kansas. A majority of the counties can expect slight to moderate (0 to 2 percent) increases in employment, payroll, nonlabor income, and value added. However, there are some counties for which the expected increases in economic activity are substantial. These counties should be examined in greater detail when rail financial assistance programs are considered. The estimated economic benefits from the establishment and continued operation of local and regional railroad systems need to be considered when allocating limited public resources among competing interest groups and development assistance programs.

As Class I railroads continue to downsize their systems, local and regional railroads have acquired rail lines that otherwise would have been abandoned or that major carriers wanted to spin off. From 1970 to 1992, 294 local and regional railroad enterprises with 33 350 km (20,714 mi) were formed in the United States (*1*). At present, they operate 42 665 km (26,500 mi) of road, or roughly a quarter of total U.S. trackage.

The Association of American Railroads defined regional railroads as non-Class I, line-haul freight railroads that operate at least 565 km (350 mi) of road or earn at least $40 million in revenue. Local railroads are freight railroads that are not Class I or regional railroads. They operate less than 565 km (350 mi) of road and earn less than $40 million annually. Local railroads that primarily perform terminal and switching services for other railroads are excluded from the analysis. In this report, the term "short line railroads" is used interchangeably with local and regional railroads.

The short line railroad industry in Kansas has experienced remarkable growth in recent years. In 1989 there were three local railroads in Kansas with total trackage of 678 km (421 mi). In 1993 Kansas had two regional and five local railroads operating 3616 km (2,246 mi) of road (*2*). More may be formed in the future.

Due (*3*) has identified state or local government assistance as one of the determinants of success for short line railroads. Many states and local governments have played an active role in the formation of successful short lines, particularly through the purchase of track. However, the severe budget restrictions facing many states and localities may force them to reevaluate their role in future financial assistance programs.

Although local and regional railroads have proven to be viable transportation alternatives for most rural branch lines, the precise linkage between successful short lines and local economic development is not clear. Further, other interest groups competing for limited public resources (educators, highway users, social welfare programs, tax relief advocates, for example) may question the cost-effectiveness of state aid to short line development as a means of achieving the desired gains in employment, income, and production in rural areas. Therefore, there is a need for more rigorous examination of the impact of short lines on local job creation, income growth and distribution, and increased value-added production, before scarce public funds are allocated to the local short line industry. Estimating the community impacts of local and regional railroads can help redefine the nature, scope, and degree of assistance state and local governments should give to the short line industry in the interest of economic development.

OBJECTIVES

The primary objective of this paper is to provide a methodology to measure the economic impacts of local and regional railroads on small communities in Kansas. The specific objectives are

- To provide a theoretical framework identifying the nature of economic impacts on local communities of local and regional railroads;
- To develop an empirical model to measure the economic impacts of local and regional railroads on income, employment, and production levels in the affected communities; and
- To test the accuracy of the model at the county (community) level.

This study benefited from previous research by Rogstad et al. (*4*), Ferguson et al. (*5*), and Eusebio et al. (*6*) regarding methodology and estimation techniques.

SCOPE OF STUDY

A community or local economy is defined as a county. The analysis given here deals with estimating the economic impacts of successful local and regional railroads on individual counties. It is assumed that the benefits of short line railroad operations are

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spread proportionately among all firms in the industry and among all affected industries in a county.

Total benefits from short line rail service at the state level do not necessarily equal the sum of the estimated benefits locally. An increase in economic activity in communities with successful short line rail service may be partly offset by declines in other communities. However, a statewide net gain in investment and jobs is the more likely result.

This study provides an estimate of the community impacts of successful short line rail service using available secondary data at the local and state level. In cases requiring a more refined analysis, the same model can be used with the relevant local primary (field survey) data incorporated.

THEORETICAL BACKGROUND

There is evidence that short line railroads have benefited local shippers. A 1989 joint staff study by the U.S. Department of Transportation and the Interstate Commerce Commission (*7*) compared rate levels and quality of service provided to shippers by Class I railroads in the past with those currently provided by short line railroads. Eighty-eight percent of respondents from a nationwide survey of short line railroad shippers reported that their rate levels decreased or remained the same. The same survey also indicated a clear pattern of shipper satisfaction regarding quality of service, with over 94 percent of survey respondents believing that service levels had been maintained or improved.

Babcock et al. (*8*) developed several performance indicators to compare the rate and service levels of current short lines with those of previous Class I railroads. In a survey of 264 shippers in Iowa and Kansas, 85 percent of Iowa shippers and 100 percent of Kansas shippers reported that their outbound freight rate levels (a performance indicator) either decreased or remained the same.

How transportation cost savings that are gained by rail-using firms as a result of rate reduction and improved service quality translate into benefits for the community is an empirical issue addressed in the study.

With the establishment of successful local or regional railroad service in a community, transportation costs, and hence the total costs of rail-using firms, are likely to decrease. The magnitude of decrease depends a lot on the volume of outbound and inbound rail traffic that the firms generate. Conversion from Class I to short line rail operations may mean substantial cost reductions for rail-using firms. Furthermore, the decrease in transportation cost can result in the following: (*a*) an increase in real income of residents in a community arising from lower prices paid for goods and services and (*b*) gains in income or wealth by resource owners in the community in the form of higher factor prices or higher factor usage.

Distribution of transportation savings in terms of gains in real income for rail-using firms, consumers, and resource owners will depend on the nature of product demand and resource supply (Figures 1 and 2). Figure 1 shows a hypothetical example in which a representative rail-using firm faces a fairly elastic product demand curve. A decrease in the cost of rail transportation will enable the firm to decrease its production costs, causing a rightward shift (MC_1 to MC_2) in its supply curve. Rail-using firms benefit by decreasing product price (P_1 to P_2) and increasing sales (Q_1 to Q_2). Consumers benefit from the price decrease by buying more of the commodity rather than higher-priced substitutes. In the example,

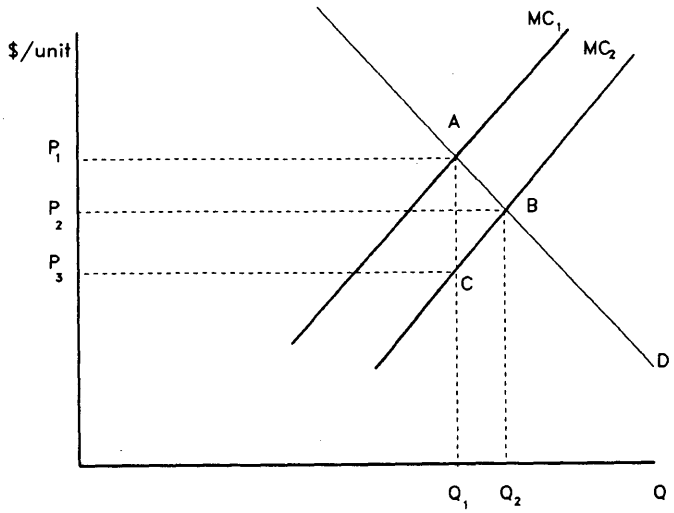


FIGURE 1 Consumer and firm gains.

both the firm and consumers benefit from the decrease in transportation cost with the distribution of benefits swaying in favor of the firm as product demand becomes more elastic.

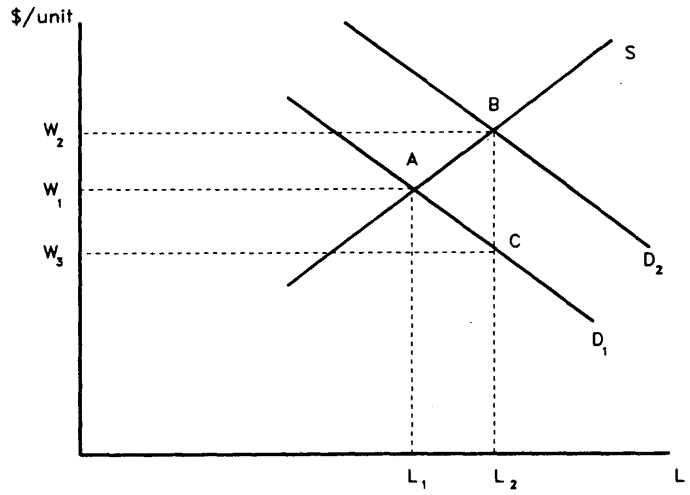
Figure 2 shows a hypothetical example in which a representative rail-using firm faces a fairly elastic factor supply curve, S. An increase in the quantity of a product demanded by consumers will require the firm to increase production. This in turn will increase the firm's demand for a factor (labor) and hence a rightward shift (D_1 to D_2) in the factor demand curve. Faced with an increase in demand for their services, resource owners will provide their labor at a higher price (wage rate). In the example, both the firm and resource owners benefit from a reduction in rail transportation cost with distribution of benefits swaying in favor of the firm, as factor supply becomes more elastic.

At the community (local economy) level, gains in income for rail-using firms, consumers, and resource owners translate to changes in output, employment, and wage levels as well as changes in returns to capital and land.

EMPIRICAL MODEL

An economic model is used to evaluate the impacts of a decrease in transportation cost on the local economy. The six-equation model is based on the traditional competitive model, which assumes that each rail-using firm within an industry is identical and follows profit-maximizing behavior in a perfectly competitive market setting. Mathematical derivations of the economic model are available from the authors on request.

The model estimates the impact of a decrease in transportation cost on changes in employment, payroll, value added, and nonlabor income at the county level. Change in employment relates to possible decreases in unemployment rates, whereas change in payroll is associated with increases in the income levels of the



Transportation Savings / unit: $W_2 - W_3$
Total Gain: W_3CABW_2
Resource Owner: W_1ABW_2
Firm Gain: W_3CAW_1

FIGURE 2 Resource owner and firm gains.

indigenous population. Change in value added takes into account possible increases in the value of the contribution to production due to labor and capital services employed in the locality. Change in nonlabor income is the difference between the change in value added and the change in payroll, and it is associated with increases in the amount of "property-type" capital services used.

Changes in employment, payroll, nonlabor income, and value added are multiplied by an income multiplier of 1.9 to capture the first-round impacts of increased spending on consumer and investment goods on the local economy. Earlier transportation studies cited by Ferguson et al. (*5*) suggest that the local portion of household expenditure may be as high as 50 percent. That translates into a community spending income multiplier of 1.9, assuming a marginal propensity to consume of 0.95. Secondly, changes in all output variables are reduced by a factor to reflect the general importance of short line rail service in the community. The factor is defined as the ratio of carloads handled by short lines to total rail carloads handled in the county.

Components of the Model

Six industries judged to be users of rail transportation are included in the model. These industries are agriculture, agricultural services, mining, construction, manufacturing, and wholesale and retail trade.

The key economic (nontransportation) parameters include share of payrolls in value added (α), elasticity of substitution (σ), price elasticity of (product) demand (η), supply elasticity of labor (ϵ_L), and supply elasticity of capital (ϵ_K) (Table 1).

Lastly, the model includes several transportation parameters, including rail input coefficients I(I), rail inbound/outbound coefficients O(I), and ratios of short line rail operating costs to Class I rail operating costs F(I) (Table 1).

Model Simulations

Two simulations are done: (*a*) the current network of local and regional railroads in Kansas and the trackage they operate and (*b*)

TABLE 1 Economic and Transportation Parameter Estimates by Industry Group

Industry	ϵ_K	ϵ_L	α	η	σ	I(I)	O(I)	F(I)
Agriculture	.1	6.9	.27	-2.8	1.01	.000	.035	0.67
Ag. Services	.1	6.9	.63	-2.8	1.01	.002	.000	0.67
Construction	.1	10.4	.53	-0.2	1.01	.002	.000	0.67
Manufacturing	.1	7.1	.56	-1.2	1.01	.009	.005	0.67
Mining	.1	10.4	.37	-0.5	1.01	.004	.001	0.67
W & R Trade	.1	4.9	.45	-1.6	1.01	.011	.001	0.67

an expanded network of local and regional railroads, operating lines with traffic density between 0.03 million and 8.0 million gross ton-km per km (0.02 million and 5.0 million gross ton-mi per mi) per year. The FRA criterion for rail line rehabilitation funds is arbitrarily used as the standard for lines that may be candidates for future short line railroad industry expansion.

Fifty-two counties have rail lines operated by local and regional railroads. Only short lines performing line-haul operations are included in the analysis. They are the Central Kansas Railroad; Garden City Western Railway; Kansas Southwestern Railway; Kyle Railways, Inc.; Northeast Kansas & Missouri Railroad; Southeast Kansas Railroad; and Southern Kansas & Oklahoma Railroad.

Eighty-one counties have light-density lines that meet the traffic criterion. This scenario also implies that not all line segments currently operated by local or regional railroads may survive into the future, because a few of the line segments may have traffic below the set minimum.

Data Sources

Data regarding employment, income (payroll), value added, and value of shipments in Kansas were obtained from the Department of Commerce publication series *County Business Patterns* (*9*) and *Census of Industries* (*10*). Employment and wage data by county and by industry were provided by the Kansas Department of Human Resources (*11*).

Elasticity estimates were obtained from the following sources: Rogstad et al. (*4*), Ferguson et al. (*5*), Eusebio et al. (*6*), Berndt and Wood (*12*), and Wohlgenant (*13*).

Class I and short line transportation coefficients by industry were calculated using the following reports: Tolliver (*14*), Emerson (*15*), the Association of American Railroads (*16*), Dooley (*17*), and the U.S. Department of Commerce (*18*).

Estimates of rail traffic tonnage and revenue by shipping and receiving point were obtained from the 1989–1991 Interstate Commerce Commission Carload Waybill Data and from marketing and management personnel of local and regional railroads in Kansas.

RESULTS

Table 2 gives frequency distributions of percent changes in county employment, payroll, nonlabor income, and value added for two scenarios: (*a*) the present network of local and regional railroads in Kansas and their existing systems of branch lines and (*b*) an expanded network of local and regional railroads operating light-density branch lines meeting the FRA traffic criterion.

The growth in economic activity for rural communities is attributed to conversion of marginally profitable lines previously operated by Class I railroads to financially viable lines operated by local and regional railroads.

The following generalizations can be made: First, a majority of the counties can expect slight to moderate (0 to 2 percent) increases in employment, payroll, nonlabor income, and value added. There are, however, some counties in which the expected increases in economic activity are substantial. These counties should be examined in greater detail when rail financial assistance programs are considered. Second, lower-paying jobs will be created as employment growth outpaces any increase in payroll for most counties. Third, increases in the value of contribution of local resources to production will largely come from capital or "property-type" services and not from labor. This is certainly true for most farming states (including Kansas) where large-scale and highly mechanized agricultural systems dominate. Lastly, even bigger economic benefits are possible if the short line railroad industry in Kansas expands operations to take over rail lines currently operated by Class I railroads that meet the predetermined traffic density criterion.

Impacts on Low- and High-Population Counties

Community impacts of local and regional railroads are compared for low- and high-population counties for both scenarios (Table 3). Results indicate that less populated counties (those with a population less than 2,500) stand to benefit more than the more populated counties (those with populations greater than 25,000). Less populated counties seem to have greater reliance on rail service than more populated counties, where other transportation options are available. Consequently, the smaller communities are the most

TABLE 2 Change in Employment, Payroll, Nonlabor Income, and Value Added: Present and Expanded Short Line Networks

Simulation/ Economic Indicator	Percent Increase			Total Counties
	0-1%	1-2%	>2%	
Present Network				
1. Employment	30	18	4	52
2. Payroll	52	0	0	52
3. Non-Labor Income	26	22	4	52
4. Value Added	32	19	1	52
Expanded Network				
1. Employment	27	39	15	81
2. Payroll	80	1	0	81
3. Non-Labor Income	26	45	10	81
4. Value Added	37	42	2	81

TABLE 3 Average Percentage Increase in Employment, Payroll, Nonlabor Income, and Value Added Comparisons

Category/ Simulation	Number of Counties	Ave. Percentage Increase			
		Employ	Payroll	Non-Labor	Value-Added
1. Population					
Present Network					
Low Pop'n	4	1.8	0.7	1.4	1.1
High Pop'n	9	0.4	0.2	0.6	0.4
Expanded Network					
Low Pop'n	7	2.0	0.7	1.4	1.2
High Pop'n	15	0.6	0.3	0.9	0.6
2. Sector					
Present Network					
Agric.	10	0.5	0.2	0.9	0.6
Non-Ag.	4	1.7	0.5	1.0	0.9
Expanded Network					
Agric.	13	0.5	0.2	0.9	0.6
Non-Ag.	7	2.2	0.7	1.3	1.1
3. Shipment					
Present Network					
LDCs	12	1.2	0.5	1.1	0.8
HDCs	3	0.4	0.2	0.6	0.5
Expanded Network					
LDCs	20	1.8	0.6	1.3	1.0
HDCs	5	0.5	0.5	1.3	1.0

positively affected by the conversion from Class I to short line railroad operations on rail branch lines.

Impacts on Agricultural and Nonagricultural Counties

Community impacts of short line railroads are compared for agricultural and nonagricultural counties for both scenarios (Table 3). Results indicate that counties that are largely agricultural (payroll share from agriculture as a percentage of total six-industry payroll greater than 75 percent) stand to benefit more from short lines than nonagricultural counties (payroll share less than 10 percent). This outcome is hardly surprising considering agriculture's historic dependence on the railroad system to deliver products to local or national markets. This dependence will likely continue with the emergence of local and regional railroad systems on lines previously operated by Class I railroads.

Diversification and Local Economic Development

The impacts of the short line railroad industry on local economic development in highly diversified counties (HDCs) are compared with the impacts in less-diversified counties (LDCs) for both scenarios (Table 3). A diversification index is calculated as the inverse of the sum of the squared value of shipment ratios for individual industries in a county. Results indicate that counties that are highly diversified (diversification index > 4.0) stand to benefit less from short lines than counties with less-diversified economies (index < 2.0).

Studies by Babcock et al. (*8*) and Wolfe (*19,20*) have reported the benefits to local and regional railroads of a diversified traffic stream to minimize the downturns and degree of dependence within individual industries. Whereas traffic diversification may be essential to the success of a local or regional railroad, its benefits do not extend as well to local economic development.

The following explanations are offered: (*a*) Short line railroads, when transporting commodities that have relatively elastic transportation demand (like grain and coal), decrease rail rates to increase rail revenue. The fact that the railroad's fortunes may be so closely linked to these commodities (and industries) may serve as an added incentive to cut rates to keep the traffic base from switching to alternative modes of transportation. As a result, railroad profits may have been passed on to rail-using firms and to the local community in the form of reduced rail rates. (*b*) Faced with a diverse traffic base from HDCs, short line railroads can exercise price discrimination between low-valued commodities, with relatively elastic transportation demand, and high-valued commodities, with relatively inelastic transportation demand (such as manufactured goods). Also, loss in traffic from one commodity or industry can be made up by traffic gains in other industries. As a result, short line railroad industry profits may have been maximized with less benefits passed on to rail-using firms and the local community.

CONCLUSIONS

The major railroads continue to downsize their rail networks. There is a need to preserve vital rail service, especially in rural areas, through the creation or expansion of local and regional railroads.

This paper provides evidence that local and regional railroads in Kansas have direct and positive economic impact on local-community income, job growth, and value-added production. Consequently, economic benefits from the establishment and continued operation of short lines need to be considered when allocating limited public resources among competing interest groups. Not only does the conversion of marginally profitable Class I lines to short lines positively affect local communities, it also avoids the alternative of rail abandonment and the adverse effects abandonment has on these communities.

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REFERENCES

1. Due, J. F., and S. D. Leever. *The Post-1984 Experience with New Railroads Formed To Take Over Lines Spun Off or Abandoned by Railroads*. Bureau of Economic and Business Research Working Paper 22, University of Illinois at Urbana-Champaign, Sept. 1992, 46 pp.
2. *Kansas Rail Plan, Update 1992*. Kansas Department of Transportation, Bureau of Rail Affairs.
3. Due, J. F. New Railroad Companies Formed To Take Over Abandoned or Spun-Off Lines. *Transportation Journal*, Vol. 24, No. 1, 1984, pp. 30–43.
4. Rogstad, B. K., et al. *Analysis of Alternative Subsidy Programs: Impact on Regional Development*. U.S. Department of Commerce, Aug. 1973, 305 pp.
5. Ferguson, A. R., et al. *Community Impacts of Abandonment of Rail Service*. U.S. Department of Commerce, Dec. 1974, 219 pp.
6. Eusebio, V. E., S. J. Rindom, and A. Abderrezak. Community Impacts of Abandonment of Rail Service in Kansas. *Kansas Business Review*, Vol. 15, No. 3, 1992, pp. 23–33.
7. *A Survey of Shipper Satisfaction with Service and Rates of Shortline and Regional Railroads*. Joint Staff Study, U.S. Department of Transportation and the Interstate Commerce Commission, Aug. 1989, 29 pp.
8. Babcock, M. W., E. R. Russell, M. Prater, and J. Morrill. *State Short Line Railroads and the Rural Economy*. Midwest Transportation Center, Ames, Iowa, 215 pp.
9. *County Business Patterns, 1987: Kansas*. U.S. Department of Commerce, Bureau of Census, 1988.
10. *1987 Census of Industries*. Kansas and Area series. U.S. Department of Commerce, Bureau of Census, 1988.
11. *Kansas Employment and Wages 1989*. Kansas Department of Human Resources, Labor Market Information Services, 64 pp.
12. Berndt, E. R., and D. O. Wood. Technologies, Prices and the Derived Demand for Energy. *The Review of Economics and Statistics*. Vol. 57, 1975, pp. 259–268.
13. Wohlgenant, M. K. Demand for Farm Output in a Complete System of Demand Functions. *American Journal of Agricultural Economics*, Vol. 71, 1989, pp. 241–252.
14. Tolliver, D. T. *The Adoption and Use of the Uniform Railroad Costing System: Ex Parte 431*. Upper Great Plains Transportation Institute Paper 55, Sept. 1983, 24 pp.
15. Emerson, M. J. *The Kansas Input-Output Model: A Study in Economic Linkages*. Bulletin 655, Agricultural Experiment Station, Kansas State University, Manhattan, 9 pp.
16. *Railroad Facts: 1991 Edition*. Association of American Railroads, Economic and Finance Department, Washington, D.C., 64 pp.
17. Dooley, F. J. *Economies of Size and Density for Short Line Railroads*. Mountain-Plains Consortium Report 91-2, April 1991, 118 pp.
18. *Standard Industrial Classification (SIC) to Standard Transportation Commodity Classification (STCC) Code Equivalence Table*. U.S. Department of Commerce, Bureau of Economic Analysis, 1991.
19. Wolfe, K. E. The Downside Risk: An Analysis of Local and Regional Railroad Service Failures. *Journal of the Transportation Research Forum*, Vol. 29, No. 1, 1988, pp. 124–137.
20. Wolfe, K. E. Financial and Demographic Conditions Associated with Local and Regional Railroad Service Failures. *Transportation Quarterly*, Vol. 43, No. 1, 1989, pp. 3–28.

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