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NATIONAL INCOME AND EMPLOYMENT IMPACTS OF RAILROAD BRANCH LINE ABANDONMENT: CONCEPTUALIZATION AND ESTIMATION

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NATIONAL INCOME AND EMPLOYMENT IMPACTS OF RAILROAD BRANCH LINE ABANDONMENT: CONCEPTUALIZATION AND ESTIMATION*

By

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PREFACE

This study seeks to contribute to the development of procedures which provide useful information to decision-makers and affected people regarding the national income and employment impacts of railroad branch line abandonment. The general conceptual framework developed in this study is not unique to a specific problem or geographic region but rather the framework is intended to have universal application for the kinds of problems addressed here. Of course, the specific empirical estimates contained herein are unique to the case study under analysis.

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graduate assistants in the Department of Agricultural Economics, Michigan State University.

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I. Introduction

State and federal subsidization of railroad branch lines has evolved in the wake of impending large scale abandonment of unprofitable light density branch lines. In Michigan, the possibility of the abandonment of approximately 1,000 miles of branch line trackage[1] has called into question the importance of branch line service to local communities and the state. Currently, the federal government and state or local governments share subsidy cost for branch line service continuation along these branch lines. Currently, under the terms of the Railroad Revitalization and Regulatory Reform Act of 1976 (RRRR), the federal share amounts to 90 percent of the subsidy cost. This will decrease to 80 percent in 1978 and 70 percent in 1979 and 1980. Beyond 1980, the federal contribution is scheduled to cease and any subsidy costs must be borne by state governments and/or local authorities.[2]

Subsidy decisions by public decision-makers are based on analyses which seek to illuminate the short-run "benefits" and "costs" associated with maintaining rail service. A decision to subsidize a branch line reflects an explicit judgment by decision-makers that adverse consequences of a rail abandonment justify the cost of subsidization. As state governments tend toward comprehensive, multimodal transportation planning, the importance of

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[1]See Michael Patrick and Bernie Ferres, "Railroad Reorganization in Michigan," Michigan Farm Economics, Michigan State University, No. 401, July 1976.

[2]Ibid.

providing information which sheds light on the consequences of public expenditures in transportation services is becoming more apparent. This report seeks to contribute to the development of analytic procedures which will enable decision-makers and affected people to more effectively evaluate the impacts of alterations in the transportation system. To this end, the analysis focuses on selected "consequences" of branch line abandonment. These consequences are measured in terms of performance variables that are deemed important objectives of transportation investments. Judgments as to the "goodness" or "badness" of these consequences involve the assignment of values to these variables. These judgments are made by decision-makers in the ultimate abandonment decision.

The specific objectives of this study are:

1. To suggest a conceptual approach for providing useful information on the consequences of abandonment expressed in terms of performance variables.
2. To establish a theoretical framework within which two performance variables--national income and employment impacts--can be conceptualized.
3. To use the conceptual framework to make empirical estimates of national income and employment impacts of four connecting branch lines in Michigan. In addition, some of the data problems and limitations associated with empirical estimation will be identified.

This paper is intended to contribute primarily to the development of an analytic base upon which more complete empirical applications can be made in the future. Another CRMPA publication on this subject is "Community Evaluation of Railroad Branch Lines: Principles and Procedures," by Marc A. Johnson (April 1975). While Professor Johnson focused mostly on market investment criteria, this study deals with the nonmarket or governmental investment decision.

II. Performance Variables and Abandonment Impacts: A Conceptual Approach

When rail firms seek to abandon a branch line, this can be seen as a process of disinvestment in response to projected capital losses resulting from continued operations.[3] Public decision-makers evaluate the welfare implications of these market disinvestments when they pass judgment on an abandonment petition. The provision of information which illuminates the consequences of abandonment is therefore useful to those who make the ultimate evaluations. These consequences can be measured in terms of performance variables which are impacts deemed important criteria of public investments. Performance variables can include monetary impacts such as changes in the level of local, state, or national income, or nonmonetary impacts such as changes in the level of pollution, energy consumption, or employment. The distributional implications of these impacts can involve transfers among individuals, groups, or geographical boundaries as well as transfers through time. This study focuses on two such variables:

1. Changes in the level of national income associated with different logistical configurations of transportation services. These changes can arise due to increased or decreased resources required to meet the demand for transportation services and resultant changes in output and employment.

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[3]Marc A. Johnson has described the market-related decision process on the part of the firm to disinvest in a particular rail segment in "Community Evaluation of Railroad Branch Lines: Principles and Procedures," Center for Rural Manpower and Public Affairs, Report No. 38, April 1975.

2. The distribution of local employment impacts for occupational groups and geographical areas. These impacts are measured according to the local reemployment opportunities for workers laid off due to abandonment.

III. Conceptualization of Performance Variables

A. National Income Impacts

For the purpose of gauging changes in the level of national income as a result of branch line abandonment, a conceptual framework which links transportation services and production in the economy is useful. This model is designed to provide a framework within which national income consequences of branch line abandonment can be conceived. The linkage of the transportation and product markets enables the analyst to identify the relationships between transportation services and resource allocations in the national economy.

The Market for Transportation Services

The demand for transportation services arises out of a need to move goods and services from given origins to given destinations. Because of the many modes by which transport services are performed, economists have argued that it is virtually impossible to portray a "transportation industry."[4] This stems from the fact that the "output unit" of transportation services is not homogeneous among modes or even among commodities.[5] Thus, specification of a transportation industry suffers from the problem of aggregation, common to

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[4]See George W. Wilson, "On the Output Unit in Transportation," Land Economics XXXV, No. 3, August 1959, pp. 266-276.

[5]Ibid., pp. 267-268.

all efforts at establishing common indexes. Similarly, costs of operation are very difficult to isolate with respect to the elusive output units. While these characteristics of transportation make demand and supply estimations difficult, they should not obscure the issue that transportation costs are significant to decision-makers in spatial economies characterized by nonzero transfer costs. Thus, in order to examine relationships between transportation and economic activity, it is imperative that an aggregate conception of a transportation industry be devised.

By the same token, effects of changes in the transportation industry on production activities cannot be isolated without a certain degree of modal disaggregation of the transport industry. This is so because changes in the logistical configurations of commodity movements must be understood in order to predict the overall effects on production.

Many commodities do not move by a single mode. Transport alternatives facing many shippers can include rail, truck, barge, or pipeline for some commodities. Often a single "journey" (defined as total mileage between origin and destination as perceived by the shipper) will include several modes. For example, 55 percent of the goods shipped into and out of the northwestern Lower Peninsula of Michigan on the rail line (Chessie System) from Manistee to Petosky must be either loaded or picked up at public sidings located a mile or more from the shipper's plant.

The market for transportation services, then, is characterized by the various price and quantity relationships of numerous modal alternatives for the purpose of moving commodities from specific origins to specific destinations within specific time periods.

The following section will present a price-quantity analysis of modal shares of total transportation services by shippers of a commodity between two locations.

Transportation Services Market-Modal Shares

Because of the multimodal nature of many freight movements, it is useful to divide the total journey[6] into modal segments. The range of viable modal alternatives available to the shipper will determine the dimensions of the analysis. This formulation will focus on only two dimensions--rail and truck. Thus, it is implied that water and pipeline alternatives are not perceived as viable by the shippers.

This analysis is carried out in the short run where the abandonment of a branch line represents the reduction of a fixed amount of available rail transport services offered at a regulated price. Hence, in this discussion, no supply function, in the classical sense, is expressed for the rail industry.[7] Prices for trucking services are likewise regulated. However, in this case, supply is assumed to be infinitely elastic at the regulated price. Thus, it is assumed that truckers are in a period of rapid expansion where acquisition prices fall below the value of additional durable assets.

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[6] Total journey is defined to be a measure of the movement (in ton-miles) of a commodity from a given origin to a given destination.

[7] Experience in empirical supply estimation of freight supply functions has not been encouraging, largely due to researchers' inability to correctly specify the supply function. Rail operations, especially, are characterized by high fixed costs and the maintenance of a large stock of durable assets. These conditions, coupled with differentials between acquisition prices and salvage values of these assets, lead to supply responses to changes in output prices which are "irreversible" (see Clark Edwards, Resource Fixity, Credit Availability and Agricultural Organization, unpublished Ph.D. Thesis, Michigan State University, 1958, esp. pp. 13-31 and pp. 87-110; Alan E. Baquet, A Theory of Investment and Disinvestment Including Optimal Lives, Maintenance and Usage Rates for Durables, unpublished Ph.D. Thesis, Michigan State University, 1977; and Glenn L. Johnson and C. Leroy Quance, The Overproduction Trap in U.S. Agriculture, Johns Hopkins University Press, 1972). This may help to explain results such as negative price elasticities found by H. Binishay and G. Whitaker, Jr., "Demand and Supply in Freight Transportation," Journal of Industrial Economics, 14, 1966, pp. 243-262. Friedlaender (Chapter 3) has also pointed out the difficulty in assigning costs "on any reasonable basis to sales (output) units."

In the short run, traffic is assumed to flow according to the regulated price of transport and the quantity demanded for each mode. It has been argued that regulatory formulas, based on the "value-of-service" principle rather than the "cost-of-service" principle, tend to cause a misallocation of traffic away from the least costly mode.[8] Cost of service pricing is beginning to gain acceptance in some parts of the industry,[9] however, the inability to isolate costs associated with given movements still hinders the establishment of a cost-based rate structure.[10]

While regulated rates do not represent actual resource costs, they are the basis for shippers' decisions on quantity of modal services demanded. Figure 1 displays graphically demand functions for modal shares of movement of a commodity between two location. Functionally, these relationships are expressed as:

$$Q^D_{TR} = f\ (P_{TR},\ Ser_{TR},\ P_R);$$

$$Q^D_R = f\ (P_R,\ Ser_R,\ P_{TR});$$

where:

Q^D_{TR}, Q^D_R = quantity (ton-miles) of truck and rail service demanded per unit of time;

P_{TR}, P_R = effective truck and rail rate facing the shipper;

Ser_{TR}, Ser_R = service variables associated with truck or rail transport; from a shipper's point of view, these are primarily inventory costs resulting from time in transit and size of shipment.

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[8]Meyer et al., p. 145.

[9]Charles E. Olson and Terence A. Brown, "The Output Unit in Transportation Revisited," Land Economics, Volume 19, pp. 280-281.

[10]Wilson, p. 268; see also Edwards.

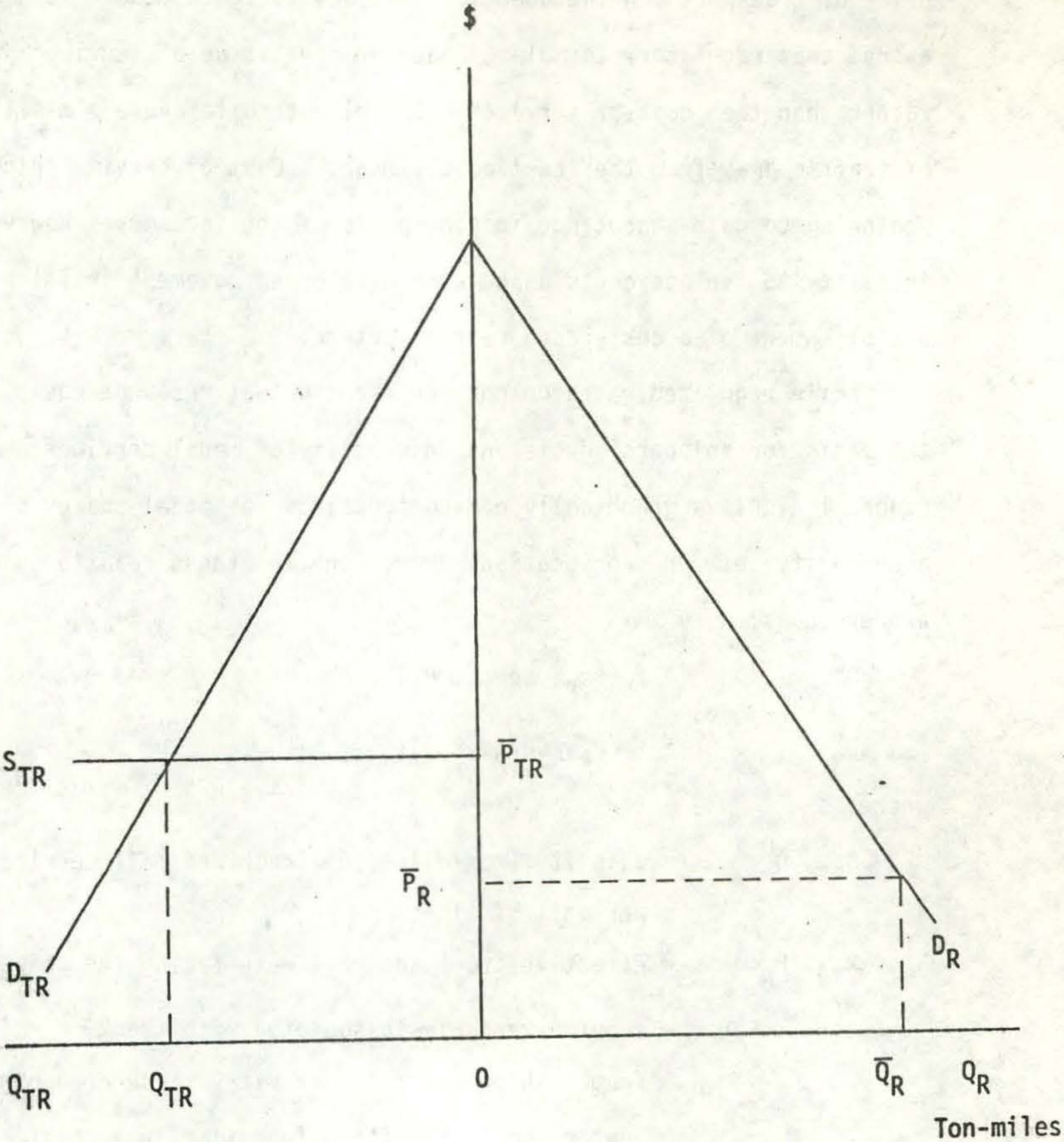

Figure 1. Demand for Modal Shares - Truck and Rail- for a Single Commodity Between Two Locations

Estimations of the demand for transport have been attempted with varying degrees of success.[11] Important variables noted in past studies include transport rates (P_{TR}, P_R) and service variables (Ser_{TR}, Ser_R). Prices of competing modes were found to be statistically significant by Miklius et al.[12] Benishay and Whitaker point out, however, that because of rate regulation, interpretation of cross-price elasticities is unclear, especially if an unregulated carrier is competing with a regulated one.[13] Furthermore, studies have shown that regulation limits rate competition in the transport industries so that service differentials constitute by far the more fertile ground for intermode competition.[14] Nevertheless, it is felt that since the viewpoint is that of the shippers, the availability of viable alternatives will change the effective rate which shippers must pay for those alternative modes. Thus, where a rail branch line is discounted, the fixed supply of rail services ($\bar{Q}_R$) decreases and the effective equilibrium rail rate ($\bar{P}_R$) increases, which in turn, shifts the demand for truck services (Q^D_{TR}).

The total quantity of commodity traffic between the two locations is equal to Q_{TR} at price $\bar{P}_{TR}$ plus $\bar{Q}_R$ at price $\bar{P}_R$. Total transport cost per unit (ton-mile) to the shippers is equal to $(\bar{P}_{TR}\, Q_{TR} + \bar{P}_R\, \bar{Q}_R)/(Q_{TR} + \bar{Q}_R)$. Figure 2 shows total quantity of traffic flow (Q_T) and unit cost to shippers (P_T), where $Q_T = Q_{TR} + \bar{Q}_R$, and $(P_T = \bar{P}_{TR}\, Q_{TR} + \bar{P}_R\, \bar{Q}_R)/(Q_{TR} + \bar{Q}_R)$.

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[11] Most notably, H. Benishay and G. Whitaker, Jr., "Demand and Supply in Freight Transportation," Journal of Industrial Economics, 14, 1966, pp. 243-262, and W. Miklius et al., "Estimation of Demand for Transportation of Agricultural Commodities," American Journal of Agric. Economics, Vol. 58, No. 2, May 1976, pp. 217-223, Johnson, AJAE.

[12] Miklius et al., pp. 220-221.

[13] Benishay and Whitaker, p. 249.

[14] Friedlaender, p. 59.

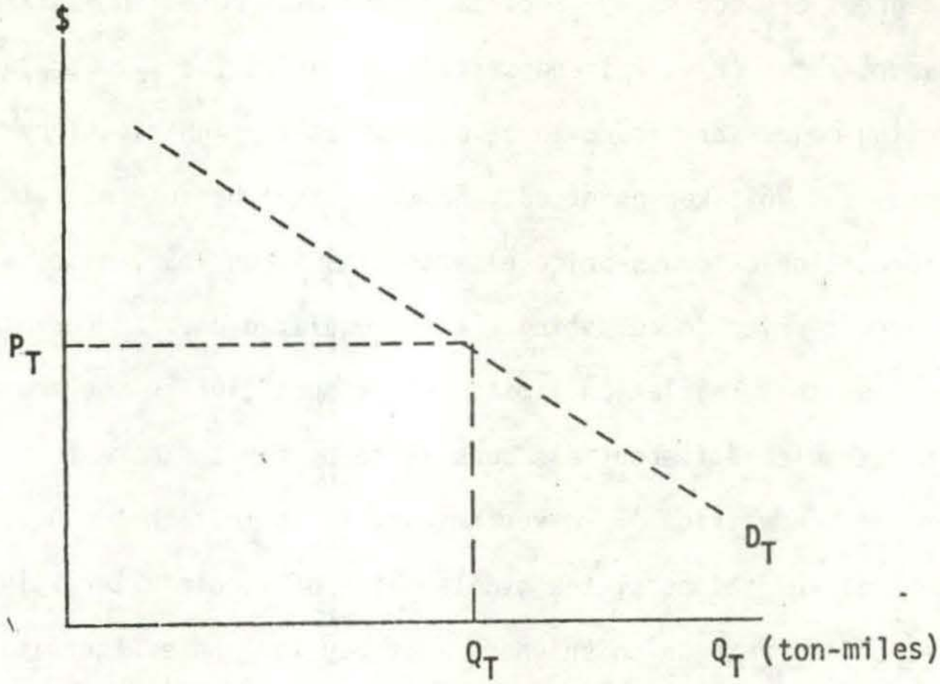

Figure 2. Total Quantity of Traffic Flow and Unit Cost to Shippers

Product Market

As the demand for transportation is a derived demand for the movement of commodities, relationships between supply and demand conditions for the commodities at the origin and destination are crucial to an understanding of transportation and economic activity. In this connection, a spatial equilibrium model of trade between two locations is enlightening. Figure 3 shows a two-region spatial equilibrium model in a competitive environment. Because the equilibrium price for the commodity is lower in Region A (P_{AE}) than the equilibrium price in Region B (P_{BE}), opportunities for trade exist between the two regions. An excess supply curve for Region A (ES_A) can be constructed, based on the difference between S_A and D_A at prices above P_{AE}. Similarly, an excess demand curve for Region B (ED_B) can be constructed based

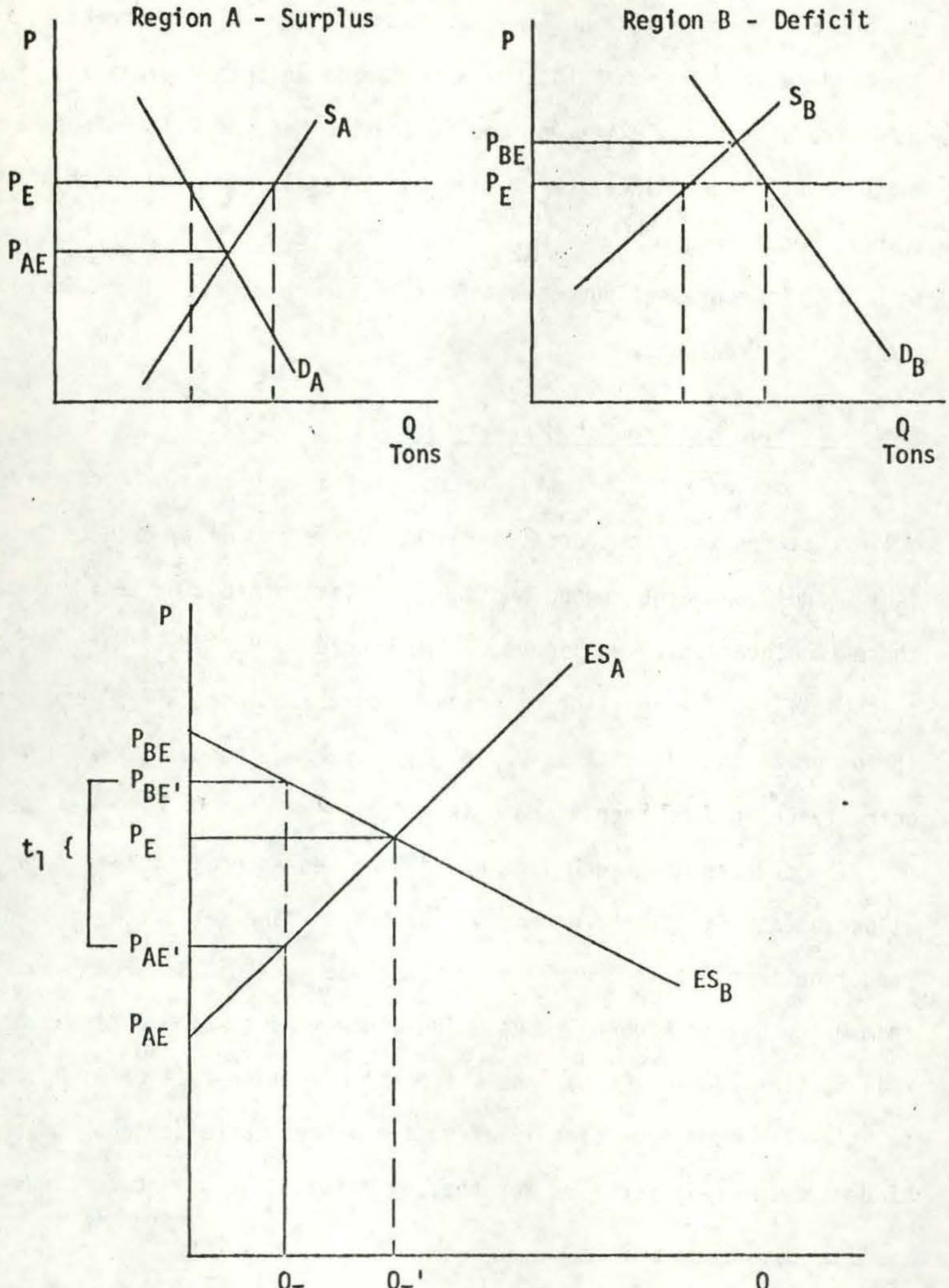

Figure 3. Two Region Spatial Equilibrium Model*

*Source: William Tomek and Kenneth Robinson, "Agricultural Product Prices," Ithaca: Cornell University Press, 1972, p. 153.

on differences between D_B and S_B at the same prices. The intersection of ED_B and ES_A is at P_E in the lower graph. If there were no transfer costs, Q_T would be traded from A to B with the price in both regions P_E. However, where transfer costs exist, prices in the two regions will move toward one another until they differ by exactly the transfer cost.[15] In this case, transfer costs equal $P_{BE}' - P_{AE}' = t_1$ and Q_T tons of product moves from A to B. For the present purposes, the transfer cost, t_1, is considered to be the cost of transport.

Transportation and Product Markets Linked

The cost of transport (t_1) in the spatial equilibrium model provides a link between the transportation market for a commodity between two locations (say A and B) and the demand and supply relationships for that commodity in those two locations, see Figure 4. In Figure 4, $P_T = t_1$. With the price of transport, P_T, the equilibrium price of purchase in B is P_{BE}' and the equilibrium price of sale in A is P_{AE}', the difference being $P_T = t_1$. The quantity shipped between A and B is $0Q_T$.

The effects of branch line abandonment on economic activity can now be illustrated. First, the withdrawal of branch line services represents a reduction in the fixed supply of rail services. This is shown by a movement from $\bar{Q}_R$ to $\bar{Q}_R'$ in Figure 5. Assuming a downward sloping demand function for rail service ($dQ_R^D/dP_R < 0$), the shippers' effective rail rate, $\bar{P}_R$, has risen to $\bar{P}_R'$. The magnitude of this effective price change depends on the elasticity of demand for rail services for the commodity. The demand for truck transport

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[15] Raymond Bressler, Jr. and Richard King, Markets, Prices, and Interregional Trade, New York: John Wiley and Sons, 1970, p. 89.

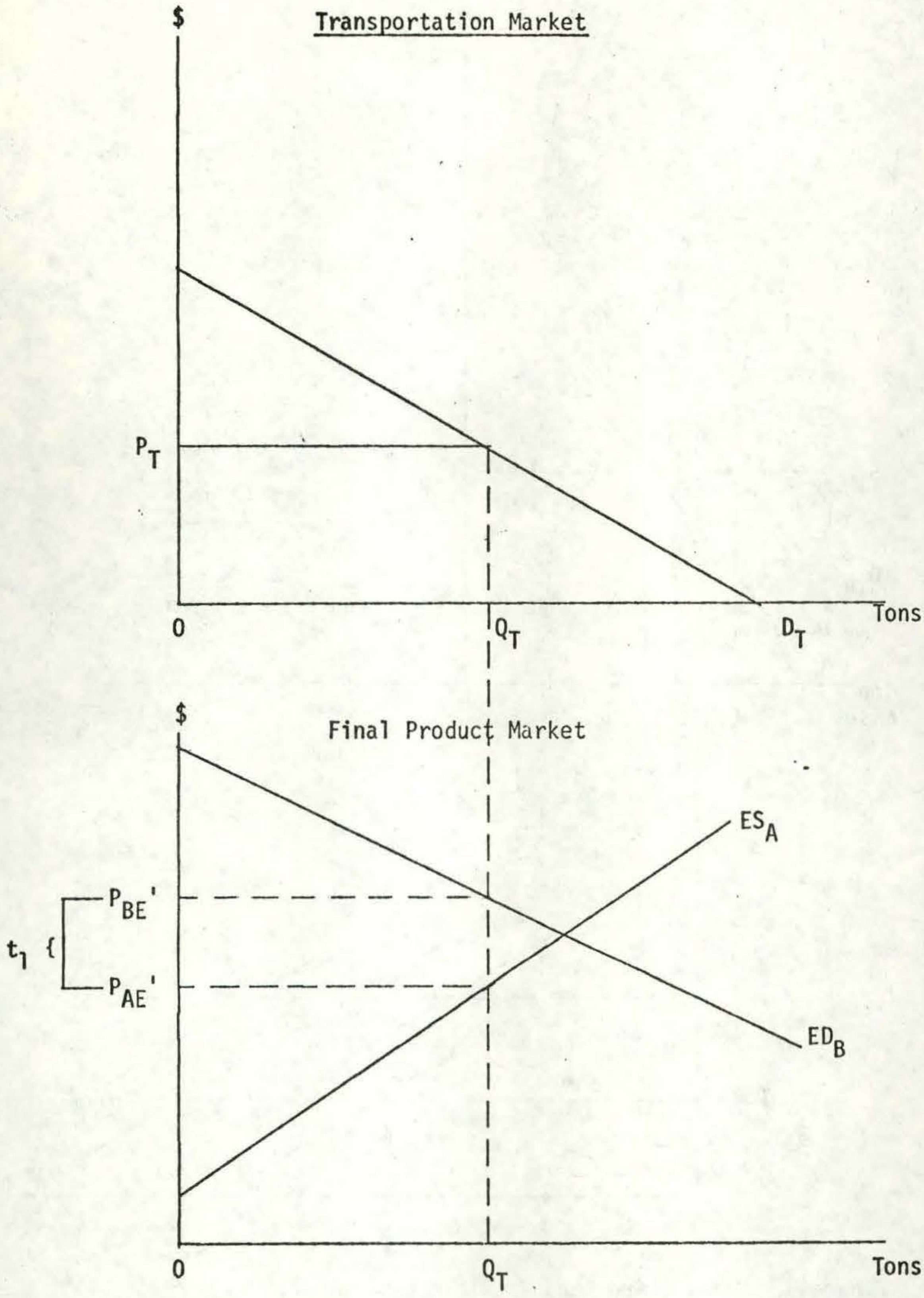

Figure 4. Transportation and Product Markets

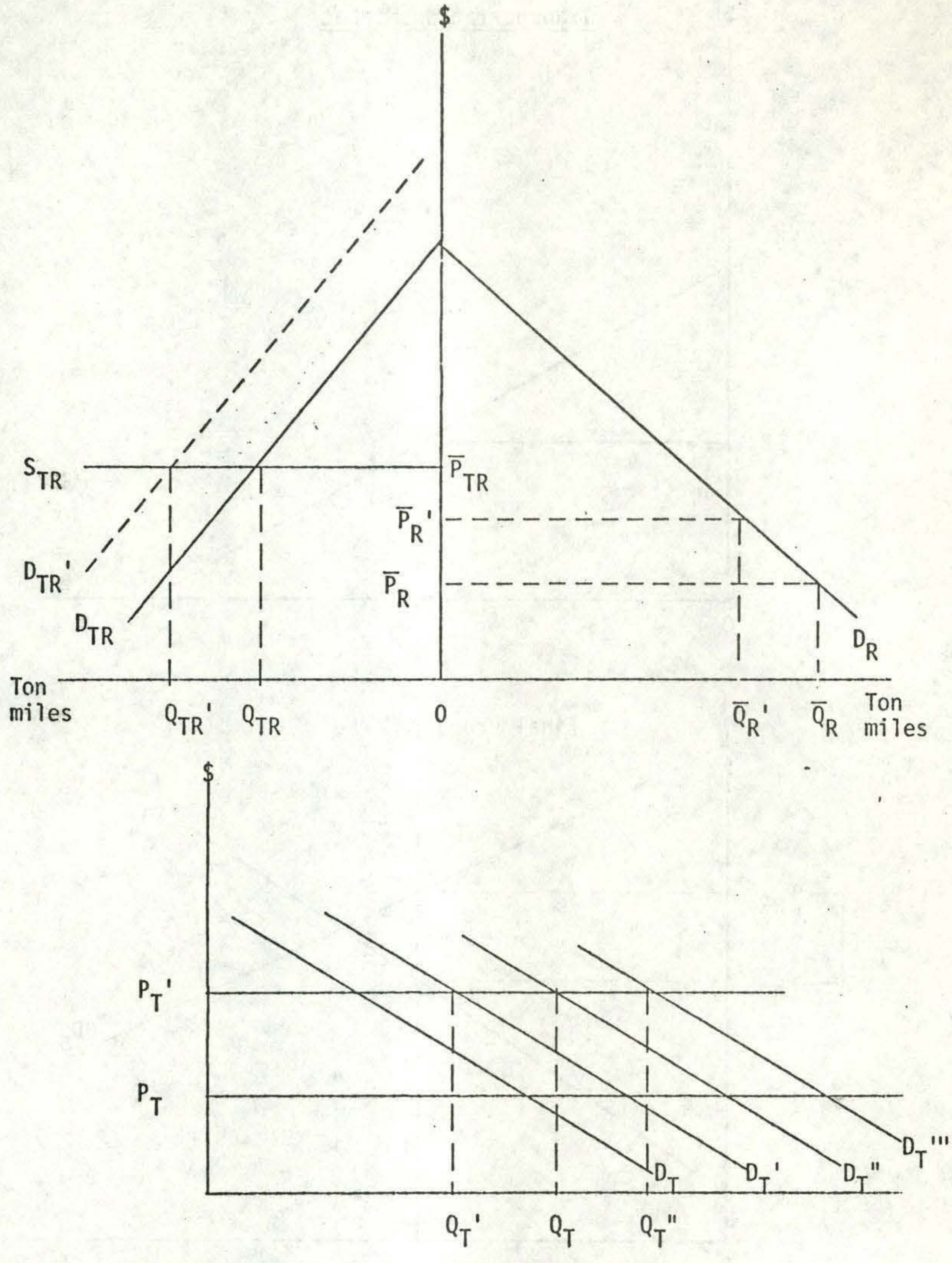

Figure 5. Modal Shares and Total Transport Services Market

is a function, in part, of the effective rate for rail transport, that is, $\bar{P}_R$ is a "demand for shifter" for trucks. The shift in demand is shown in Figure 5 as the change from D_{TR} to D_{TR}'. The direction of the shift would be expected to be positive because truck and rail are considered to be substitutes.[16] The magnitude of this shift, of course, would depend on the magnitude of the cross-price elasticity between effective rail price and demand for truck.

Since truck supply is assumed to be perfectly elastic at the regulated price, expansion of truck services are adequate to accommodate the increased demand at the regulated price. If supply is assumed to have an upward slope, then expansion occurs only in the wake of increased prices. In this short-run analysis, trucking prices are held constant and trucking firms are believed to be expanding at the regulated price. Thus, Q_{TR} is increased to Q_{TR}' in Figure 5.

Furthermore, the final magnitude of the quantity change in the truck market will depend on the magnitude of the demand elasticity for truck service. Changes in the level of truck and rail service will then depend on the relative magnitudes of the aforementioned elasticities. In Figure 5, these changes are shown to be $Q_{TR}' - Q_{TR}$ for truck and $\bar{Q}_R - \bar{Q}_R'$ for rail. The short-run effective price change will also depend on the above elasticities. The effective price change for rail is $\bar{P}_R - P_R$, as shown in Figure 5.

Since $Q_T = Q_{TR} + Q_R$ and $P_T = (P_{TR}\, Q_{TR} + P_R\, Q_R)/(Q_{TR} + Q_R)$, it can be seen that the shifts in $\bar{Q}_R$ and D_{TR} will have an effect on the price and quantity relations in the total transportation market. In Figure 5, if the

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[16] Miklius _et al._, found that cross elasticities for rail and truck for cherries and apple shipments were positive, pp. 220-221.

decrease in $\bar{Q}_R'$ is not completely offset by a corresponding increase in D_{TR} and a resultant increase in D_T to D_T', total quantity shipped is reduced from Q_T to Q_T' at a total price of P_T'. If the decrease in $\bar{Q}_R$ is just offset by an increase in D_{TR} (D_T''), then Q_T remains constant at a total price of P_T'. If this decrease in $\bar{Q}_R$ is more than offset by an increase in D_{TR} (D_T'''), the total quantity shipped actually increases to Q_T''. Total transport price and quantity changes therefore hinge largely on the cross-elasticity of demand between effective rail price and truck demand.

A consideration of the role transport cost plays in the final product market will complete this analysis. As shown earlier, $P_T = P_{BE}' - P_{AE} - = t$ (see Figure 3). With a reduction in rail services ($\bar{Q}_R - \bar{Q}_R'$ in Figure 5), the magnitude of a resultant increase in D_T will depend primarily on the cross-elasticity between effective rail rates and the demand for truck. Assume, for purposes of exposition, that D_T does not increase by a large enough quantity to offset the reduction in supply in Figure 6. Quantity shipped is reduced to Q_T' at unit transport price of P_T'. In the product market, the differential between P_{BE}' and P_{AE}' is enlarged to P_{BE}'' and P_{AE}''. New transport cost is t_2 which is equal to P_T'. Reduction in quantity shipped between A and B in the product market corresponds exactly to the reduction of quantity shipped in the transport market.

The interactive linkage between the transport and product markets can be further illustrated by examining the relationships between the elasticity of demand for the product at Location B (E_{PB}) and the elasticity of demand for transportation (E_T).[17]

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[17] Friedlaender, pp. 52-53 (footnote). A full explanation of this relationship is given in the Appendix.

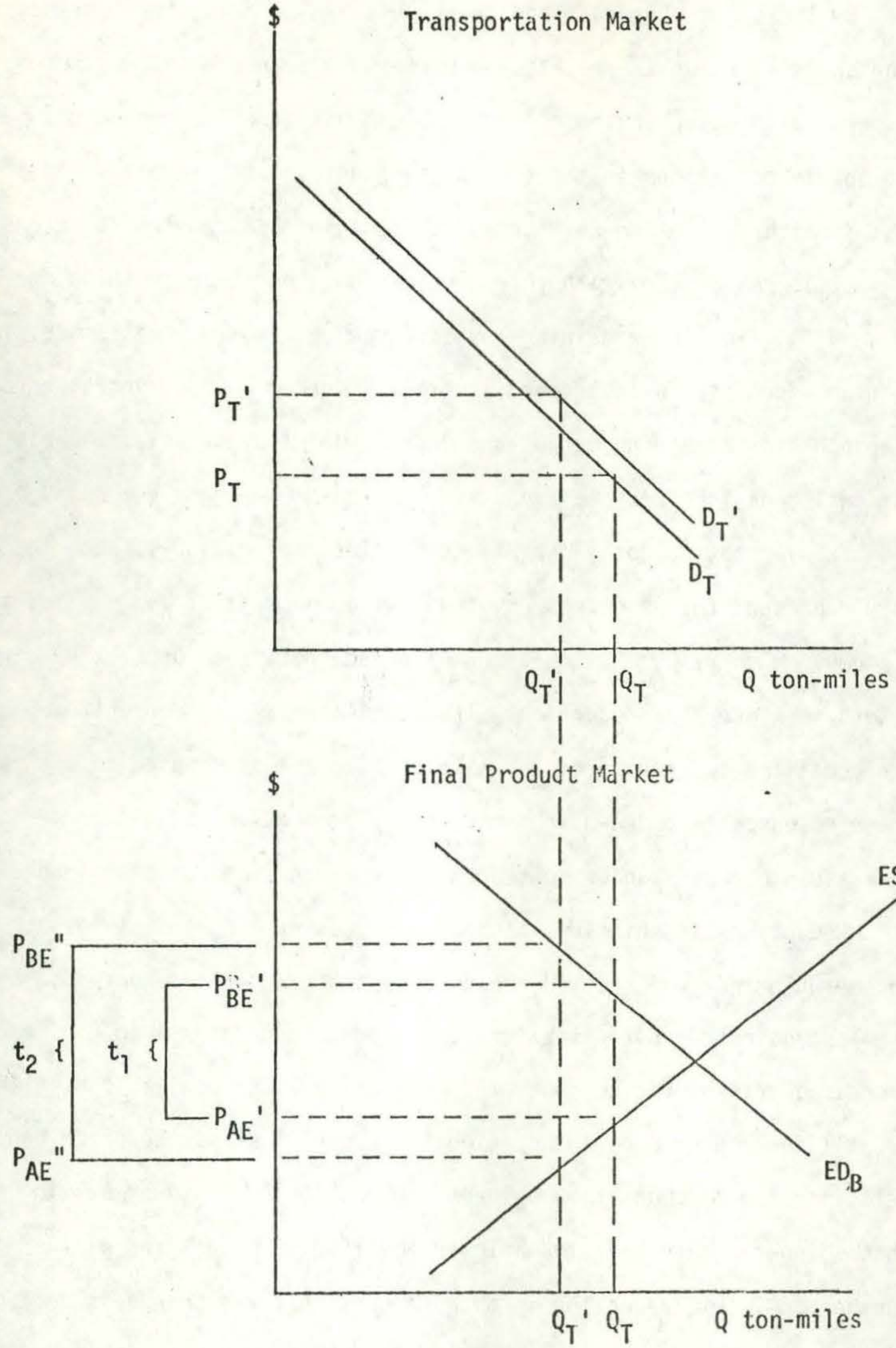

Figure 6. Transport and Product Markets

By linking the product and transportation markets, the previous formulation sheds light on the relationships between transportation services and resource allocation in the economy. The model suggests that a change in the supply conditions in the transport industry can bring about an increased cost for transportation services of commodities between two locations ($t_2 - t_1$). Associated with this cost can be a decrease in shipping volume ($Q_T - Q_T'$). For the remaining levels of output, however, the model indicates that an added cost of transport is still incurred. Thus, increased cost of transport for remaining output and decreased output provides the basis for estimating national income impacts.

Transportation costs can affect the level of national income because they represent the resources devoted to the movement of commodities in the economy. When resources are being diverted from other uses, they can represent a loss in aggregate production. If, because of an abandonment, more resources are committed to transportation with abandonment as opposed to without and those resources are drawn from previously productive uses, then avoided increases in costs can be considered a net change in national income.

Reductions in shipping volume can represent a potential loss to national income when they reflect a decrease in output and the resources devoted to the lost output do not enter into other productive uses. In Figure 6, the increased transportation cost, t_2, reflects a lower equilibirum selling price (P_{AE}'') for the product in Location A. Figure 7 shows the price and output relations for a competitive shipper in Location A. A lower selling price for that shipper's output yields a lower equilibrium output for his/her product. Furthermore, this reduction in output means that the change in demand for transportation services, D_T', is not enough to compensate for the reduced

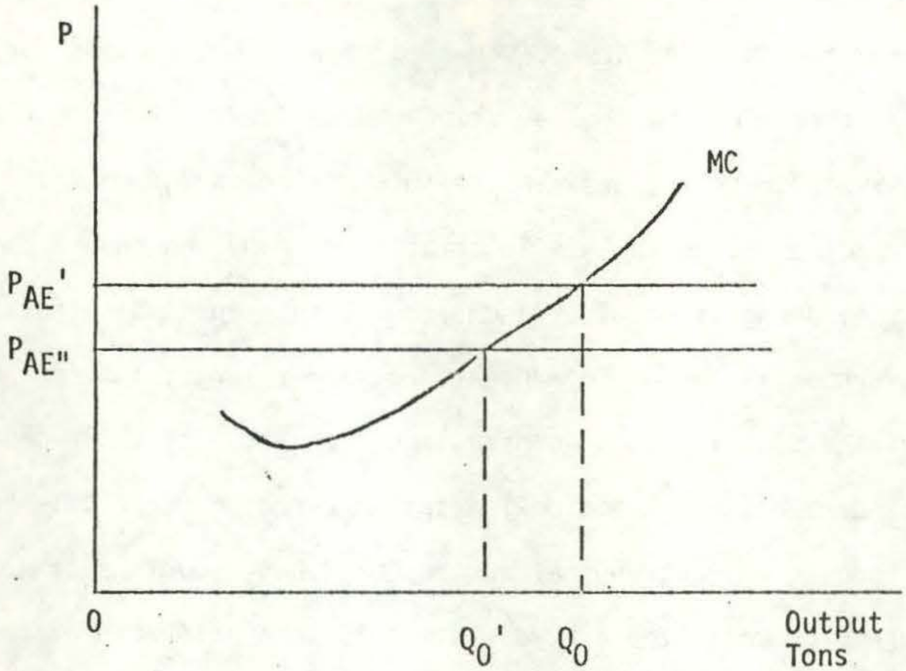

Figure 7. Price and Output Relations for a Competitive Shipper

supply (Figure 6). In other words, an increase in truck demand, as a result of $(dQ_{TR}/dP_R) \cdot (P_R/Q_{TR})$, will not make up for the decrease in $\bar{Q}_R$ to $\bar{Q}_R'$, so that Q_T is in fact reduced to Q_T'.

Returning to Figure 7, the possible reduction in output, Q_0' Q_0, represents a reduction in national income if resources devoted to Q_0' Q_0 remain idle or underemployed after abandonment.

Potential losses to national income associated with a branch line abandonment are exhibited in Figures 6 and 7. The transport cost component is that portion of $P_T'CAP_T$ (Figure 6) which is drawn from previously productive uses. The shipping volume component is that portion of $Q_0'BDQ_0$ (Figure 7) which leaves previously employed resources idle or unemployed.

B. Local Employment Impacts

Probable increased levels of unemployment among residents of communities receiving branch line service can be a major consideration for subsidies when the threat of branch line abandonment is evident. Informed public decisions in these matters require information on the distribution of employment impacts. Based on this information, groups can have a better idea where they stand vis-a-vis branch line abandonment and voice the reaction to the governmental body. Government decision-makers can also have a better idea of the distributional consequences (impacts) of their decisions regarding abandonment. Informational displays can help serve this purpose. This study focuses on geographical and occupational groupings of workers faced with unemployment. The analysis attempts to clarify the distribution of employment impacts in these areas for five occupational groups. Implications for indirect impacts in these areas are also drawn from the analysis. The goal is to provide an informational display to decision-makers who are concerned with how public investments such as rail subsidies might interact with employment conditions.

IV. Empirical Application

A. Overview

This chapter employs the previous conceptual framework to estimate dollar national income and the distribution of local employment impacts of abandonment. The estimation is made for a series of four connecting branch line segments in the northwest portion of Michigan's Lower Peninsula. Each of these segments currently have abandonment applications pending before the

ICC.[18] At present, they are all operated by the Chesapeake and Ohio (C&O) Railroad, part of the Chessie system (see Figure 8). Specifically, they are:

1.	Northport Branch	(Rennies-Northport)	27.66 miles
2.	Elk Rapids Branch	(Williamsburg-Elk Rapids)	8.82 miles
3.	Petosky Branch	(Traverse City-Bay View)	75.92 miles
4.	Traverse City Branch	(Manistee-Traverse City)	63.92 miles

For national income consequences, the four branches are grouped and considered as a single line. Local employment impacts, however, will correspond to the southern portion (Manistee Labor Market Area), central portion (Traverse City-Leelanau-Kalkaska Labor Market Area), and northern portion [Petosky (Emmet-Charlevoix) Labor Market Area].

B. Data Sources

An attempt is made to utilize available data to implement the conceptual framework. These data were obtained from a shipper survey conducted in Michigan and an unemployment study conducted for the Michigan Department of Labor to estimate national income impacts associated with transport cost and output changes. The shipper survey was conducted in 1976 by the Upper Great Lakes Regional Commission, Department of Commerce, State of Michigan. The survey provided the data on sales volume (output) reduction and employment impacts. The unemployment study sought to analyze the extent and magnitude of structural unemployment in Michigan. Its results concerning the proportion of people who become reemployed in certain industries within specified periods of time were used to adjust original employment impact figures to

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[18] Michigan Department of State Highways and Transportation, Michigan Rail Plan, Annual Update, August 1977, V-45.

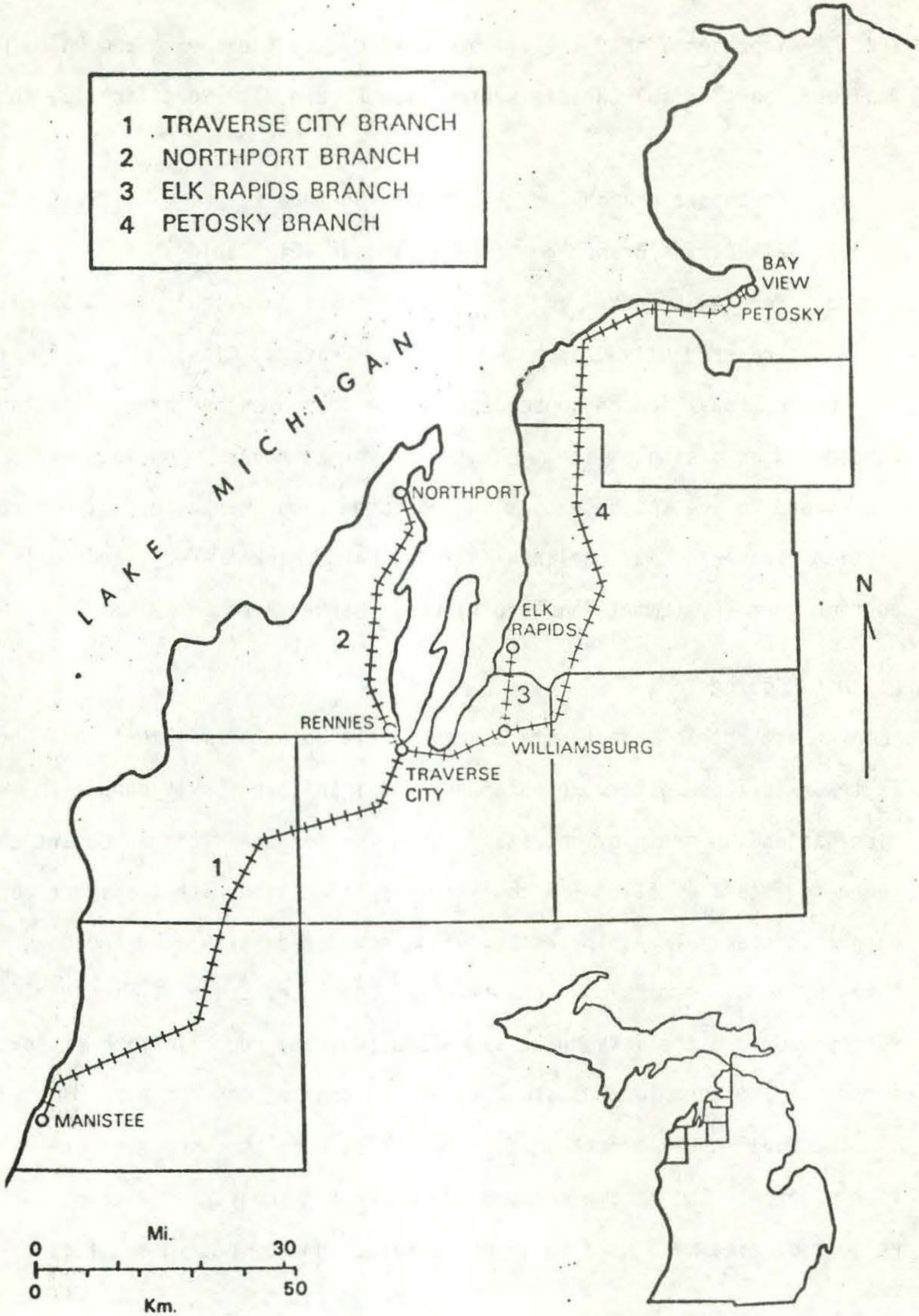

Figure 8. Four Branch Rail Lines in Northwest Lower Peninsula of Michigan

more accurately approximate the number of "idle" human resources resulting from railroad abandonment in a year's time. Transport cost increase was determined using the Interstate Commerce Commission publications, "Railroad Carload Cost Scales" (1974) and "Cost of Transporting Freight by Class I and Class I Motor Common Carriers of General Commodities" (1974-75). Highway maintenance cost adjustments for truck cost were taken from Friedlaender (1969).

It should be noted that employment loss estimates from the shipper survey and ensuing income loss estimates are probably overestimated since respondants may feel that heavier impact estimates would contribute to a positive subsidy decision. Therefore, the employment loss estimates from the shipper survey should be interpreted as an upper bound to actual employment impacts.

The time period for estimated impacts in this study is very short--15 weeks. These estimates are made with the intention of providing a basis upon which more complete analyses covering longer time periods can be carried out. It is recognized that economic adjustments occur regularly over wide geographical bounds and longer periods of time. These adjustments necessarily diminish the magnitudes of net impacts to the nation. More complete data will, in the future, make possible analyses which can illuminate the magnitude and character of these adjustments in a dynamic setting. Hopefully, the methodology presented here can be used in those expanded settings.

Analysis of local employment impacts involved consultations with labor market analysts in Lansing and Traverse City. Publications used were the Michigan Employment Security Commission's (MESC) "Annual Planning Report--Fiscal Year 1978--Michigan Balance of State Prime Sponsor--Volume I" and

MESC Form 3221, "Civilian Labor Force and Employment Estimates" (1970-76). Information on "still active" files of registered job seekers by occupation was taken from MESC files in Traverse City. Occupational distributions in the analysis were taken from the state occupational matrix. An occupational matrix for the northern portion of the Lower Peninsula is available but the state matrix is felt to be more reliable.

C. Impacts Associated with Transport Cost

If abandonment of branch lines results in the use of alternate routes and modes of transport, the difference in costs with and without the branch line can represent a gain or loss to the nation's income. Reduced volume of traffic as a result of output reductions entail decreased transport costs. Therefore, impacts associated with transport cost should be based on remaining traffic after output reduction. This information can be derived from shipper response to the question, "If discontinuance of present service would affect. . .sales volume, please estimate the percent change as compared to present level." Reduction in transport volume is assumed to be proportional to a reduction in sales. These responses are shown in Table 1. In Figure 6, $P_T - P_T' = t_2 - t_1$ is the increased unit cost which shippers must incur as a result of an abandonment (under the stated assumptions about the relative elasticities in the transport and product markets). As mentioned above, the demand for truck and rail transport is a function of modal rates, service variables, and effective rates of competing modes. If rates in the transport industries perfectly reflected resource costs, then rate differentials facing shippers, times the remaining quantity shipped, would

Table 1. Sales Volume Reduction - Northport, Elk Rapids, Petosky, and Traverse City Branch Lines (by Shipper)

Location	Commodity Shipped	Approx. Gross Sales (Dollars)	Percent Sales Reduction	Am't Sales Reduction (Dollars)
Traverse City	Lumber	1,500,000	25	375,000
Traverse City	Lumber	1,500,000	25	375,000
Alden	Lumber	875,000	10	87,500
Mancelona	Lumber	1,250,000	30	375,000
Bellaire	Lumber	1,500,000	20	300,000
Kaleva	Lumber	875,000	50	437,500
Wealthy	Beer & ale	4,500,000	5	225,000
East Jordan	Beer & ale	1,750,000	6	105,000
Elk Rapids	Beer & ale	2,500,000	10	250,000
Elk Rapids	Beer & ale	875,000	10	87,500
Suttons Bay	Cherries	60,000	25	15,000
Traverse City	Foundry prod.	7,000,000	10	700,000
Traverse City	Cut stone	125,000	10	12,500
Petosky	Bottled gas	250,000	20	50,000
Petosky	Bottled gas	375,000	15	375,000
Kaleva	Bottled gas	375,000	25	93,750
Traverse City	Plastics	18,000,000	15	2,700,000
Bellaire	Nondurables	125,000	25	31,250
Charlevoix	Sporting goods	1,500,000	80	1,200,000
East Jordan	Bottled gas	1,250,000	10	125,000
Bay View	Furniture	3,000,000	5	150,000
Williamsburg	Unknown	125,000	20	25,000
Traverse City	Lumber	375,000	15	56,250
Petosky	Lumber	125,000	20	25,000
Kaleva	Lumber	2,700,000	100	2,700,000
Traverse City	Unknown	4,000,000	10	400,000
Total				10,957,500

Source: Shipper Survey, Northwest Regional Commission, Michigan Department of Commerce, 1976.

be an appropriate basis for calculating efficiency costs associated with transport investment decisions.[19]

There are several reasons why rates are not valid indicators of efficiency costs. First, rail rates are "regulated so that they will earn a rate of return which is reasonable and no more."[20] In fact, the railroad rate structure "constitutes a most elaborate system of price discrimination,"[21] based on a "value of service" principle in pricing. The problems of resource allocation and pricing have been discussed by transport and public investment economists.[22] (There is generally a concensus that rates based on value of service rather than cost of service promote an inefficient allocation of national resources.)

Second, the degree and nature of intermode competition will have an effect on the effective rates and resultant rates and resultant deviation from true resource costs. The importance of cross-elasticities of demand noted above exhibits the fact that <u>actual</u> levels of demand depend less on resource utilization and more on actual rates.

Finally, expenditures for highway maintenance are resource costs and are generally not reflected in truck rates, and therefore, the demand for transportation services.[23] Truck user charges contribute to these costs[24]

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[19]R.H. Haveman, <u>The Economic Performance of Public Investments</u>, Baltimore: Johns Hopkins Press, 1972, p. 38.

[20]Otto Eckstein, "Survey of Public Expenditure Criteria," in: <u>Public Finances: Needs, Sources, and Utilization</u>, Princeton: Princeton University Press, 1961, p. 16.

[21]Meyer <u>et al</u>., p. 178.

[22]For example, Pigou, Meyer <u>et al</u>., Friedlaender.

[23]Johnson, p. 57; Friedlaender, p. 37.

[24]Johnson, p. 57.

expenditures for highways provide benefits for cars and buses as well as trucks[25] but the large expenditures on highways has far outpaced increases in highway travel.[26]

Differences in transport costs to the shippers, i.e., rates, are important because they determine the levels of actual commodity flows. Thus, in Figure 6, $t_2 - t_1$ represents pecuniary costs to shippers. Inasmuch as the t_1 and t_2 do not reflect the cost of resources consumed in the movement of the actual commodity flows, their difference cannot be considered a national income impact. As mentioned before, a movement is afoot in the industry to derive rate structures to reflect costs. Until this movement becomes a general rule for all transportation modes, however, an alternative to rate differentials should be used as bases for transport cost differentials.

Resource costs associated with modal alternatives can include line-haul, switching (for rail), and various terminal expenses. In this analysis, comparisons of terminal costs of truck and rail have been found to be exceedingly difficult, owing to the diversity in reported statistics by the ICC. For example, truck terminal costs are broken down by platform, billing and collecting, and pick-up and delivery costs. There is no breakdown of terminal costs for rail. Further research on actual cost differentials would be invaluable to transportation planners. For purposes of this study, line-haul cost differentials are considered the one category of costs which are comparable using current ICC statistics.

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[25]Meyer et al., p. 65.

[26]Ibid.

The introduction of a branch line abandonment brings about a change in the supply conditions of transportation services. The analysis of changes brought on by this event necessitates a consideration of alternative logistical configurations which will most likely occur.[27] A shipper will shift use of modal combinations in accordance with his/her type of commodity, inventory costs, and access to other modes. These will vary with perishability of the commodity, storage facilities, and physical location. Some shippers may have previously been using transshipment methods, either picking up or delivering goods at a public rail siding. For them the choice is to continue the transshipment at a farther rail siding or shift entirely to truck. Other shippers who have private sidings must decide whether to begin transshipment operations or convert entirely to truck.

With information on the cost structure of firms, trends in commodity movements and relative costs by differ logistical configurations, a portrayal of probable firm response to abandonment could be made. In the absence of such detailed information, the assumption is made here that shippers, whether currently at a private or public siding, will transship to the closest adjacent rail siding. This is not an unreasonable assumption for some commodities. For example, lumber dealers receive shipments that have come by rail on one leg of the journey from point of origin. Access to a rail line is essential to receive "distressed"[28] shipments of lumber. On the other hand, perishables such as cherries may not be transshipped even

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[27]This was carried in the New York State Rail Plan.

[28]Shipments at a railyard which have not yet been sold.

for long distance shipments. Distance from alternative rail sidings is a crucial factor in these cases. If shippers are currently using public sidings and abandonment forces the utilization of another siding which is not significantly farther, the added cost may not be large enough to push them to total truck usage.[29]

Assuming then that shippers transship to the nearest rail siding, additional truck line-haul costs to that siding constitute additional resource costs of transport. These costs are calculated on the basis of ICC variable line-haul costs, adjusted for a highway maintenance factor[30] (due to increased truck usage of roads). These calculations require the following assumptions:

1. The cost of rail beyond the truck-rail interchange is the same as before.
2. There are no increased costs of congestion at the public siding which firms now use.
3. The firms, in fact, use the public siding indicated.
4. Transportation facilities at point of origin or destination don't change.
5. These added transport costs draw resources away from other uses.
6. The supply of truck services is infinitely elastic. This may or may not be true depending on resource fixities in the truck industry. In the area under study, truck operations appear to be expanding so supply may indeed be highly elastic.

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[29] Examination of these "threshold costs" in rail-truck conversion is a fertile avenue for future research.

[30] Friedlaender, p. 39.

Additional transport cost due to increased truck mileage is calculated for flows of commodities for each shipper. Table 2 gives sample calculations for additional transport cost for shippers who currently use public siding (Case I) or those who are at private sidings (Case II).[31]

As the emphasis is on resource costs, impacts are based on variable line-haul operating costs of truck. An adjustment is made for increased wear on highways and the associated maintenance.

For the sample firm using a public siding, the additional annual resource cost is found to be $31.38. For the sample firm currently using a public siding, additional annual resource cost is $1,929.73. For all firms on the four branch lines under study, additional annual resource costs are $66,417.25. For a 15-week impact period, additional resource cost is $19,194.59.

D. Impacts Associated with Output Reduction

As mentioned above, output reduction represents a decrease in national income if the resources devoted to that reduction remain idle or underemployed after abandonment. Three broad categories of resources in the production process are land, capital, and labor. Land and capital resources often represent durable assets. Losses in rents derived from the use of these assets can be considered a loss only inasmuch as they cannot be transferred to other uses. This does not negate the fact that the current owners of those assets may incur losses in rents due to the difference in acquisition and salvage values. Labor resources can similarly be viewed in the production

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[31] Other cases could be identified whereby shippers convert completely from private siding rail to truck exclusively or public siding rail to truck exclusively. A comparison of these costs would involve knowledge of terminal and interchange operations along the entire journey from origin to destination and would complicate the analysis enormously. Yet, this is vital information for long-range, multi-modal transportation planning.

Table 2. Additional Annual Resource Costs Resulting From Abandonment - Sample Data Summary

Shipper Location	Current Station	Tons Shipped T_{ij}	Current Distance to Siding (Miles) CD_j	Location of Alternate Siding	Alternate Distance (Miles) AD_j	Distance Differential (Miles) DD_j	Truck Line-Haul Cost (Adjusted) (Cents per Ten-Mile)[a]	Additional Resource Cost (Dollars) AC_{ij}
Case I: Current Use of Public Siding								
Bear Lake	Norwalk	89.0	5.0	Manistee	10.51	5.51	6.3998	31.38
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
Case II: Currently on Private Siding								
Suttons Bay	Suttons Bay	1,900.0	0.0	Traverse City	15.87	15.87	6.3998	1,929.73
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	
$\sum_{j=1}^{n} \sum_{i=1}^{n} AC_{ij}$								66,417.25

[a]CTR composed of: 1) variable line haul cost (cents per ten mile) 6.2998
2) incremental highway maintenance . . . . 0.1000.
Line haul cost from "Cost of Transporting Freight," ICC Statement 120.2c1-75, p. 7.
Incremental share for highway maintenance from Friedlaender (1969), p. 39 (5-tm load).

process. Since an explicit objective of many public investments is to maintain and increase levels of employment, employment impacts are singled out here as the most significant component of $Q_0' Q_0$ in Figure 7 and, therefore, worthy of estimation. In this study, changes in employment of human resources are the object of national income impacts resulting from changes in output. The extent to which people losing their jobs are permanently rendered idle or are willing to pay for the continuation of rail service guides the following estimation procedure for employment and resultant national income impacts.

Employment Impacts

The basic employment impacts are taken from shipper response to the survey question, "If discontinuance of present rail service would affect jobs...please estimate the percentage change as compared to present level." Responses to that question are shown in Table 3, which shows the breakdown of these impacts by industry and occupation. Table 3 shows that manufacturing industries are most affected, followed by wholesale and retail trade. Operatives and laborers suffer the highest immediate job impacts (137), with clerical and sale workers also losing large numbers of jobs (89), followed by craftsmen (66); professional, technical, and managerial workers (53); and service workers (31).

National income impacts are concerned with those laid-off workers who remain unemployed for an extended period of time, i.e., those "human resources" who will remain unemployed without subsidization. Thus, the basic employment loss should be adjusted to reflect the reemployment opportunities for affected workers. An examination of the process and success of job search requires

Table 3. Overall Distribution of Employment Impacts by Industry and Occupation - Northport, Elk Rapids, Petosky, and Traverse City Branch Lines

	Occupational Group[a]					
Industry	PTM[b]	C&S[c]	Cr[d]	O&L[e]	S[f]	Total
Manufacturing	31	29	52	110	7	229
Trade	22	60	12	26	24	144
Construction	-	-	2	-	-	2
Warehousing	-	-	-	1	-	1
Total	53	89	66	137	31	376

Source: Shipper Survey, Northwest Regional Commission, Michigan Department of Commerce, 1976; Michigan Employment Security Commission - state occupational matrix.

[a]Groupings and proportions taken from Michigan occupational matrix (Michigan Employment Security Commission).

[b]Professional, technical, and managerial.

[c]Clerical and sales.

[d]Craftsmen.

[e]Operatives and laborers.

[f]Service workers.

assumptions about the relevant labor market area and the time allowed for labor adjustments to occur.

Labor market analyses[32] suggest that personal factors, such as age, sex, and educational levels, weight heavily on reemployment chances for laid-off workers.[33] Most case studies[34] stress the importance of mobility of labor in finding alternative employment. Hence, the emphasis is on identifying the portion of laid-off workers who are relatively less mobile and less likely to be reemployed.

Current studies on unemployment have tried to identify the extent to which structural unemployment exists.[35] Unemployment insurance statistics have been the prime means by which this problem has been examined. Dauffenback et al. developed a stock-flow model of the unemployment insurance (UI) system whereby movement into and out of the UI system in Michigan was analyzed.[36] Dauffenback et al. suggest that structural unemployment is primarily indicated by the length of unemployment. "Long-term unemployment, generally in the form

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[32]For example, Bureau of Labor Statistics, "Impact on Workers and Communities of a Plant Shutdown in a Depressed Area," Bulletin No. 1264 (1960); and James L. Stern, "Consequences of Plant Shutdown."

[33]Bureau of Labor Statistics, p. 62.

[34]Ibid., Richard D. Wilcock and Walter H. Frank, Unwanted Workers: Permanent Layoffs and Long-term Unemployment, New York: Free Press of Glencoe, Illinois, 1963; John W. Dorsey, "The Mack Case: A Study in Unemployment," in: Otto Eckstein (ed.), Studies in the Economics of Income Maintenance, Washington, D.C.: Brookings Institutions, 1967.

[35]R.C. Dauffenback, J.M. Matilla and C.L. Klisz, "An Evaluation of the Source and Magnitude of Structural Unemployment in the State of Michigan." A report to the Michigan Department of Labor, submitted by the Department of Economics, Wayne State University, February 1977. Structural unemployment is defined to be a type which is insensitive to the general level of business activity. This, as opposed to frictional, which is of a short-term native and cyclical, which charges with the business cycle (1).

[36]Ibid.

of 15 weeks or more, is considered by many students of unemployment to be a useful proxy..."[37]

The stock-flow model developed by Dauffenback et al. yields a measure of the proportion of people in selected industries who leave the unemployment insurance system and presumably find jobs within a 15-week period. This proportion, referred to as a "job-flow rate" (JFR_i, where i = industry), is a useful indicator of reemployment possibilities associated with laid-off workers in these industries. Operationally, the JFR_i is used to adjust downward the basic employment impact estimate. Thus, (JFR_i) x (Basic $Estimate_i$) = the number of workers who are likely to be reemployed within 15 weeks and should be subtracted from a base impact figure. The results of this adjustment are shown in Table 4.

The limitations of this adjustment are suggested by the assumptions which it requires. These are:

1. The JFR is calculated from Form ES 203, compiled by the Michigan Employment Security Commission, based on a one percent sample. Such a small sampling raises questions regarding the actual representativeness of the data.
2. The JFR is calculated from statewide data (the only available). Urban areas, such as the Detroit area, can bias the results away from the more rural area which is the subject of this inquiry.[38]
3. The JFR is calculated for largely aggregated industries such as "manufacturing durables." Fluctuations within these categories cannot be captured.

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[37]Ibid., p. 15.

[38]This may not be a difficulty where industries are tied closely to a resource base in an area not found in others. Fruit packing could be an example in the northwest Lower Peninsula

Table 4. Overall Job Flow Rate Adjustments - Employment Impact - Northport, Elk Rapids, Petosky, and Traverse City Branch Lines

Industry (i)	(1) Basic Estimate	(2) JFR (i)[a]	(3) Reemployed in 15 Weeks	(4) Adjusted Estimate[c]
Manufacturing	229	.348	80	149
Trade	144	.245	36	108
Construction	2	.369	1	1
Warehousing	1	NA[b]	0	1
Total	376		117	259

Source: Shipper Survey, Northwest Regional Commission, Michigan Department of Commerce, 1976.

[a]R. Dauffenback et al., "Evaluation of the Source and Magnitude of Unemployment in Michigan" (Michigan Department of Labor, 1977).

[b]With only one job loss, JFR is inapplicable.

[c]Adjusted estimate = $(\text{Basic estimate}_i) - [(\text{Basic estimate}_i) \cdot (\text{JFR}_i)]$.

4. The adjustment period is considered 15 weeks. A more complete analysis considers reemployment opportunities over a longer period of time.[39]

5. Finally, the relevant labor market area is considered to be the state. How far will workers seek other opportunities? If the workers who are likely to be reemployed are the most mobile, as the evidence suggests, then statewide data may not be far off when considering national income impacts. Local job opportunities for certain occupations may be limited which would suggest that area impacts will be more severe. This is taken up in the distributional account.

National Income Impacts

Income impact resulting from employment loss should reflect the willingness of payment to laid-off workers to reflect net national income loss. By considering that not all workers will stay unemployed it becomes necessary to divide income losses into two parts: (1) losses to workers who, without subsidization, will become chronically unemployed; and (2) losses to reemployed workers.

For workers who lose their jobs permanently, that is they become completely idle, their full income is a measure of their "willingness to pay." These are the workers who correspond to the net employment impact in Table 4 (Column 4). Average yearly earnings from County Business Patterns, 1974, are used as the basis for wage loss per worker in the appropriate industry group.

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[39] JFR_i could be calculated for 26 weeks, using Dauffenback's stock flow model. Time limitations did not permit that calculation with this study but differences in 26-and 15-week JFR_is would be useful information and a 26-week JFR_i would provide a more accurate protrayal of the reemployment process.

Since this analysis focuses on a 15-week period of impact, income losses should reflect losses incurred during that time. Average yearly earnings are therefore multiplied by .289 (15/52) to arrive at the relevant income loss per worker in the appropriate industry group for the first 15 weeks after abandonment.

For workers who are reemployed (corresponding to Column 3, Table 4), losses in real wage items can lead to a willingness to pay which reflects a change in their welfare. Case studies of laid-off workers generally show that most workers who lose their jobs due to plant closure accept lower salaries and suffer loss of real wage items such as seniority and fringe benefits at previous jobs.[40] The magnitude of these losses depends on the breakdown of laid-off workers by age, sex, mobility, educational, and skill level. Without this kind of detailed information, an estimation of income losses is made based on previous case studies. Two such studies concerned the closure of a Midwest jar factory[41] and the closure of a truck assembly plant in New Jersey.[42] They showed that workers reemployed within a six-month period incurred earning losses of 32 percent[43] and 30 percent.[44] These did not include real wage items such as seniority and added commuting costs. These case studies provide limited evidence that workers who are laid off have higher unemployment rates than the general population and receive lower real earnings in their new jobs. Based on this evidence, a conservative

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[40] Bureau of Labor Statistics, p. 62; Stern, p. 3; Dorsey, p. 203.

[41] Bureau of Labor Statistics.

[42] Dorsey.

[43] Ibid., p. 203.

[44] Bureau of Labor Statistics, p. 62.

estimate of a 30 percent reduction in current earnings is made as the willingness to pay of reemployed workers. This figure too is multiplied by .289 to reflect the 15-week impact period. These real income impacts are added to the income impacts to unemployed workers for a total national income loss figure. This is the labor component of the output loss impact which totals about \$828,000 thousand for a 15-week period and is given in Table 5.

Beyond this 15-week period, as more workers may be gradually reemployed, cumulative impact estimates could be calculated over time. The vital information for carrying out such an analysis is the availability of a JFR type statistic that represents the dynamic reemployment effects over time. Unfortunately, the nature of the long-run reemployment adjustment process is not known; therefore, the results presented here are based on the best available statistic (i.e., 15-week JFR) and are confined to a 15-week impact period. As analyses of unemployment insurance statistics progresses, more complete analyses covering broader periods of time could be made with this methodology. In addition, as these impacts can be calculated over time and costs of maintenance and rehabilitation can be calculated over time, the present value of the "project" of subsidizing and upgrading a rail line can be calculated according to the formula,

$$PV_i = \sum_{t=1}^{N} \frac{I_t - C_t}{(1+r)t} ;$$

where:

PV = present value of project i;

I_t = avoided adverse impacts from project in time t;

C_t = cost of project in time period t;

r = appropriate discount rate.

Table 5. National Income Loss Estimates--15 Week Impact Periods

Industry	No. of Workers	Average Income Loss Dollars	Total Income Loss Dollars
Long-Term Unemployed (15 Weeks)			
Manufacturing	149	2,893.27	431,097.23
Trade	108	2,690.78	290,604.24
Construction	1	3,591.10	3,591.10
Warehousing	1	3,719.76	3,719.76
Reemployed Within 15 Weeks[a]			
Manufacturing	80	867.11	69,368.80
Trade	36	807.23	29,060.28
Construction	1	1,077.33	1,077.33
Total:	360		828,518.74

Source: Employment loss from Upper Great Lakes Regional Commission, 1975. Income loss from County Business Patterns, U.S. Department of Commerce.

[a]Real income losses to reemployed workers assumed to be 30 percent of average salary.

Utilizing this formulation rehabilitation and maintenance projects for different lines might be compared using the "internal rate of return" criteria. The internal rate of return is the discount rate, r; such that,

$$PV_i = \sum_{t=1}^{N} \frac{I_t - C_t}{(1+r)t} = 0.$$

That is, where avoided impacts (transport cost plus income loss) are considered a "return" of investing in a rail line, the internal rate of return indicates the discount rate under which the project "breaks even." Where these impacts are important criteria for project evaluation, projects can be ranked in order of the value of the internal rate of return.[45]

This study presents the avoided impacts for a 15-week period (or "t_1") for what could be considered a project to rehabilitate the four branch lines in question.

E. Local Employment Impact

The dimensions of employment impact examined here are geographical and occupational. The area affected by the abandonment of the C&O line running from Manistee to Bay View is divided into three sub-areas which correspond to labor market areas (LMA) delineated by MESC. These are: Manistee LMA, Traverse City-Leelenau-Kalkaska LMA, and Petosky (Emmet-Charlevoix) LMA (see Figure 9). Industries affected by abandonment are classified according to Standard Industrial Classification (SIC). These industries are further broken down by five occupations according to the State of Michigan occupational matrix. They are: (1) professional, technical, and managerial (PTM); (2) clerical and sales (C&S); (3) craftsmen (Cr); (4) operatives and laborers

[45]See J. Price Gittinger, Economic Analysis of Agricultural Projects, Baltimore: The Johns Hopkins University Press, 1972, for a more complete discussion.

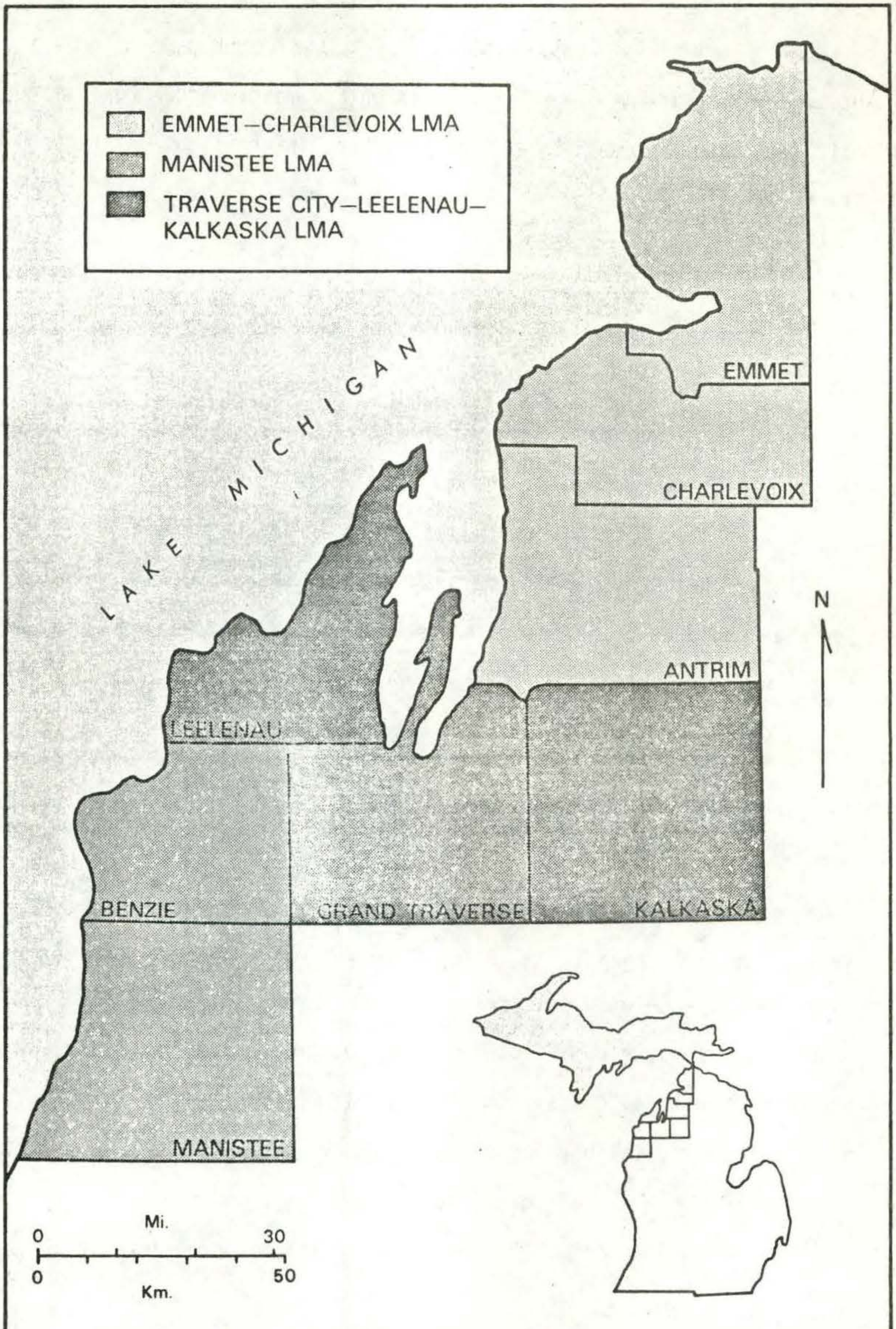

Figure 9. Labor Market Areas in Northwest Lower Peninsula of Michigan

(O&L); and (5) service workers (S). In this way, occupational impacts can be derived from industrial estimates on the shipper survey. Table 6 gives the occupational and industry breakdown of employment impacts by LMA. Manufacturing (MFG) and retail and wholesale trade (T) are the two broad industrial groups most seriously affected. In terms of absolute magnitudes, most job losses will go to operatives and laborers, followed by clerical and sales workers; craftsmen; professional, technical, and managerial people; and finally, service workers.

Occupational Distribution Analysis

In order to gain a better understanding of the distribution of employment impacts, an analysis of labor market conditions in three areas affected by the abandonment is carried out. For each area, employment impacts are broken down by occupational grouping. Persons laid off because of abandonment are thrust into a pool of unemployed people with whom they compete for job openings. Annual average job openings can be projected for each LMA using "Civilian Labor Force and Employment Estimates" (MESC) and the state occupational matrix.[45] Unemployment conditions for certain occupations may be severe in an affected area before abandonment so that after abandonment these conditions may be worsened due to the additional job seekers.

Indications of unemployment conditions in an area can be obtained by examining local employment security "active files" which show the number of people who have registered with the Employment Security Commission and are actively seeking work. To the extent that not all people register with MESC, these files are an understatement of the "competition" affected workers have

[45]See Appendix for methodology.

Table 6. Employment Impacts - Occupation and Industry Breakdown - by LMA

Industry	PTM	C&S	Cr	O&L	S	Total
			Manistee LMA			
Trade	11	30	6	13	12	72
		Grand Traverse - Leelenau - Kalkaska LMA				
Manufacturing	22	21	37	78	5	163
Trade	10	28	6	12	11	68
Sub-total	32	49	43	90	16	231
		Petosky - (Emmet-Charlevoix) LMA				
Manufacturing	9	8	15	31	2	65
Trade	1	2	0	1	1	5
Warehousing	0	0	0	1	0	1
Construction	0	0	2	0	0	2
Sub-total	10	10	17	34	3	73
Total	53	89	66	137	31	367

Sources: Employment impact from Upper Great Lakes Commission Survey, Michigan Department of Commerce, 1976. Occupational matrix from Michigan Employment Security Commission.

to contend with. Table 7 gives the background information on employment impacts, projected annual average openings, and the "still active" file for occupational groups in the three affected areas. This informational display can be useful when we see that, for example, in the Traverse City-Leelenau-Kalkaska LMA there are currently 637 operatives and laborers seeking work with only 202 annual average openings projected for the next year. The addition of 90 more job seekers in that labor market, along with other new entries indicates a severe impact on operatives and laborers in that area. On the other hand, things look less gloomy for professional, technical, and managerial workers in the Petosky-Emmet-Charlevoix region where 257 average openings are projected and abandonment will add seven job seekers to the "still active" pool of 166.

Table 7 also contains a "seeker/opening ratio" which is one indicator of the severity of unemployment problems for certain occupations. A seeker/opening ratio of less than one indicates favorable reemployment prospects for impacted workers.[46] Table 8 presents a distributional impact matrix which gives the with and without abandonment seeker/opening ratio in each area. This can be examined to see which occupational groups would incur the severest impacts because of already unfavorable employment prospects. Occupationally, the matrix shows that heaviest impacts will fall on craftsmen in Manistee County area where there are already over seven times as many job seekers as projected openings. On the other hand, professional and technical workers in the Emmet-Charlevoix County area have brighter employment prospects as the

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[46] However, a seeker/opening ratio of less than one over a long time period in an area of high unemployment can be indicative of "structural imbalances in the local labor market. See Konstant and Wingeard, "Analysis and Use of Job Vacancy Statistics: Part I and II," Monthly Labor Review, August 1968 and September 1968.

Table 7. Background Information - Distributional Employment Impacts - Occupational Group and Labor Market Area (LMA)

	Occupational Group					
	Total	PTM	C&S	Cr	O&L	S
			Manistee LMA			
Employment Impact	72	11	30	6	13	12
Projected Annual Average Openings '77*	291	61	99	28	55	48
"Still Active" File**	909	77	155	201	133	158
Without Abandonment Seeker/ Opening Ratio		1.26	1.57	7.18	2.42	3.29
With Abandonment Seeker/ Opening Ratio		1.44	1.87	7.39	2.65	3.54
			Traverse City - Leelenau - Kalkaska LMA			
Employment Impact	231	32	49	43	90	16
Projected Annual Average Openings '77*	1,541	392	494	152	202	301
"Still Active" File**	3,765	467	721	899	637	679
Without Abandonment Seeker/ Opening Ratio		1.19	1.46	5.91	3.15	2.26
With Abandonment Seeker/ Opening Ratio		1.27	1.56	6.20	3.60	2.31

(continued)

	Total	PTM	C&S	Cr	O&L	S
			Occupational Group			
			Petosky (Emmet-Charlevoix) LMA			
Employment Impact	73	10	10	17	33	3
Projected Annual Average Openings '77*	923	257	285	84	105	192
"Still Active" File**	11,070	166	219	250	169	282
Without Abandonment Seeker/ Opening Ratio		.65	.76	2.98	1.61	1.47
With Abandonment Seeker/ Opening Ratio		.68	.80	3.18	1.90	1.48

*Data Source: MESC Form 3221, "Civilian Labor Force and Employment Estimates" (1970-1976).

**As of July 31, 1977, MESC, Traverse City.

Table 8. Distributional Impact Matrix With and Without Abandonment Job Seeker - Job Opening Ratio[a] by Occupation and LMA

Labor Market Area	Occupational Group										Overall Average	
	PTM		C&S		Cr		O&L		S			
	w/out	with	w/out	with	w/out	with	w/out	with	w/out	with	w/out	with
Grand Traverse-Leelenau-Kalkaska	1.19	1.27	1.46	1.56	5.91	6.20	3.15	3.60	2.26	2.31	2.73	2.99
Manistee	1.44	1.26	1.57	1.87	7.18	7.39	2.42	2.65	3.29	3.54	3.18	3.34
Petosky (Emmet-Charlevoix)	.65	.86	.76	.80	2.98	3.18	1.61	1.90	1.47	1.48	1.50	1.58
Overall Average	1.09	1.06	1.26	1.41	5.36	5.57	2.39	2.62	2.34	2.44	2.47	2.64

[a]Left figure in each cell is "without abandonment" job seeker/job opening ratio. Right figure is "with abandonment" job seeker/job opening ratio.

number of projected openings exceed registered job seekers with and without abandonment. Overall, in terms of reemployment opportunities, craftsmen will suffer the most, followed by operatives and laborers; service workers; clerical and sales people; and professional, technical, and managerial workers.

Geographically, Manistee County has the worst seeker/opening ratios of 3.18 and 3.34, followed by Grand Traverse-Leelenau-Kalkaska and Emmet-Charlevoix. One would expect that abandonment will result in people being added in an already large pool of unemployed workers which indicates a significant magnitude of immobility and that indirect impacts on these commodities would be more severe.

Decision-makers concerned with employment problems may find the above analysis useful in identifying the extent of local workers' immobilities. In this formulation, the effects of a rail abandonment in local communities have come into clearer view as these immobilities have surfaced with respect to areas and occupations.

V. Summary and Conclusions

The objectives of this report have been to suggest a conceptual approach for providing useful information on selected consequences (impacts) of branch line abandonment, present a theoretical framework within which "performance variables" (reflecting these impacts) can be conceived, and empirically estimate and display these performance variables. The conceptual approach is based on the notion that the welfare implications of railroad abandonment are evaluated by public decision-makers when considering branch line abandonment petitions or public subsidies. Decision-makers, therefore, need information on the consequences of a branch line abandonment to which they can assign values in making the ultimate abandonment decision. These consequences can be measured in terms of performance variables which reflect important criteria of public investments. Two performance variables are examined in this study: (1) changes in the level of national income (dollars); and (2) the distribution of local employment impacts.

A conceptual framework for the identification of national income impacts was developed. It showed that changes in resource cost for transport services and changes in output were the two important components of national income impacts of branch line subsidies. Development of an informational display of the distribution of employment impacts provides a useful framework to be used in evaluating the distribution of local employment consequences.

Empirical estimates of national income impacts for a 15-week period were carried out using data from a shipper survey conducted by the Upper Great Lakes Regional Commission, Michigan Department of Commerce, and Interstate Commerce Commission publications. Resource costs devoted to transportation were calculated on the basis of additional line-haul costs for truck movement to an alternate rail siding. This amounted to about $19 thousand per 15 weeks for the four branch lines. National income impacts associated with changes in output were based on employment impacts. These were adjusted to reflect the reemployment opportunities and real income reductions of laid-off workers. Reemployment opportunities required downward adjustment of the basic impact figure. Real income reductions required estimates of income loss for workers who would be reemployed plus income loss to permanantly unemployed workers. National income loss associated with output reduction for the four branch lines was estimated for the first 15 weeks following abandonment to be about $828 thousand. Total national income loss for 15 weeks was estimated to be about $847 thousand.

It should be borne in mind that the employment loss estimates as obtained from the shipper survey and the ensuing national income loss estimates have an explicit upward bias and should be interpreted as an upper bound.

The major emphasis of the report was on developing a methodology which could be used as a basis for estimating impacts and adjustments over time. Accordingly, a short time period of 15 weeks was used as an example of how impacts may be estimated for an initial impact period. This methodology can be expanded to include broader time periods and consider the economic adjustments and cumulative impacts which occur in a dynamic environment.

The distribution of local employment consequences were analyzed by focusing on the trends in the unemployment situation for occupations and selected labor market areas (LMAs) along the four branch lines. An informational display showed that laid-off craftsmen in the Manistee LMA will have the most difficult time finding reemployment locally if abandonment should occur. Operatives and laborers in the Traverse City-Leelenau-Kalkaska LMA will also be added to an already large pool of unemployed. In the three LMAs, in terms of reemployment opportunities, craftsmen will suffer the most, followed by operatives and laborers; service workers; clerical and sales people; and professional, technical, and managerial workers. Geographically, Manistee LMA contains the least reemployment opportunities for laid-off workers so that indirect impacts are likely to be more severe in that area than the other two.

Abandonment and subsidy decisions involve value judgments regarding the consequences of branch line service termination. The provision of informational displays, as illustrated in this report, are designed to enable interested parties and decision-makers to see the magnitudes and distribution of national income and employment impacts. Relative values of these consequences can be assigned by decision-makers and affected people so that the decision of whether or not to abandon a certain branch line is made with a more complete view of these particular consequences.

VI. Appendix

The Relationships Between Elasticities in the Transport and the Product Markets

The interactive linkage between the transport and product markets can be illustrated by examining the relationships between the elasticity of demand for the product at Location B (E_{PB}) and the elasticity of demand for transportation (E_T).[47] If it is assumed that a reduction in output is reflected proportionally in transport demand,[48] the following relationships can be identified:

Let f = transport cost as a percentage of product price at B,

r = percentage increase in transport costs;

so that:

$$r = \frac{t_2 - t_1}{t_1} ; \qquad (1)$$

and:

$$f = \frac{t_i}{P_B}, \quad (i = 1,2). \qquad (2)$$

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[47] Friedlaender, pp. 52-53 (footnote).

[48] Ibid.

The percentage change in product price at Location B will be:

$$\frac{P_{BE}'' - P_{BE}'}{P_{BE}'} = (f)\ (r). \qquad (3)$$

The percentage in change in freight volume is then given by:

$$\frac{Q_T - Q_T'}{Q_T} = (E_{PB})\ [(f)\ (r)]. \qquad (4)$$

Elasticity of demand for transport is:

$$E_T = \frac{Q_T - Q_T'}{Q_T} \div \frac{P_T' - P_T}{P_T}. \qquad (5)$$

Substituting (4) in the numerator and (1) in the denominator, we have:

$$E_T = \frac{(E_{PB})\ [(f)\ (r)]}{r}, \text{ or} \qquad (6)$$

$$E_T = E_{PB}\ (f).$$

Equation (6) shows that the elasticity of demand for freight traffic is a function of the elasticity of demand for the product to be shipped at the point of destination as well as the transport cost proportion of the destination price. Thus, the change in transportation price and quantity shipped as a result of an abandonment will be jointly determined in two markets by relative demand and supply elasticities and cross elasticities within the transportation market as well as the demand elasticity in the product market at the point of destination.

In the context of the demand and supply formulation, changes in transport cost and output can be found with the following variables: (1) the percentage change in transportation cost to shippers (r); (2) the percentage of final product price which is transport cost (f); and (3) elasticity of demand for the product at the destination (E_{PB}). The benefit associated with resources devoted to transportation is the change in transport cost, or $t_2 - t_1$. When E_{PB} is known, the percent change in output (assumed to be proportional to the change in transport demand) can be calculated with equation (4):

$$\frac{Q_T - Q_T'}{Q_T} = E_{PB} [(f) (r)].$$

When E_{PB} is unknown and E_T is known, E_{PB} can be derived from equation (6):

$$E_T = E_{PB} (f).$$

The change in output $Q_T - Q_T'$ can be simply calculated once equation (4) is derived. Thus, given these required variables, changes in transport cost $(t_1 - t_2)$ and resultant changes in output $(Q_T - Q_T')$ can be calculated. These quantities represent efficiency benefits when they entail a reduction in national income because of the diversion of resources from previously productive uses or they leave immobile resources "stranded" with unused productive capacity.

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