

The Economic Contribution of Transport Industries to Eastern Washington

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by

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EWITS Research Reports: Background and Purpose

This report is number twenty-two in a series of research reports prepared from the Eastern Washington Intermodal Transportation Study (EWITS). The reports prepared as a part of this study provide information on the multimodal network necessary for the efficient movement of both freight and people into the next century.

EWITS is a six-year study funded jointly by the Federal government and the Washington State Department of Transportation as a part of the Intermodal Surface Transportation Efficiency Act of 1991. Dr. Ken Casavant of Washington State University is Director of the study. A state-level Steering Committee provides overall direction pertaining to the design and implementation of the project. The Steering Committee includes Jerry Lenzi, Chair, Regional Administrator (WSDOT, Eastern Region); Richard Larson (WSDOT, South Central Region); Don Senn (WSDOT, North Central Region); Charles Howard (WSDOT, Planning Manager), and Eric Berger, Executive Director, County Road Administration Board. Pat Patterson represents the Washington State Transportation Commission on the Steering Committee. An Advisory Committee with representation from a broad range of transportation interest groups also provides guidance to the study. The following are key goals and objectives for the Eastern Washington Intermodal Transportation Study:

- *Facilitate existing regional and state-wide transportation planning efforts.*
- *Forecast future freight and passenger transportation service needs for eastern Washington.*
- *Identify gaps in eastern Washington's current transportation infrastructure.*
- *Pinpoint transportation system improvement options critical to economic competitiveness and mobility within eastern Washington.*

For additional information about the Eastern Washington Intermodal Transportation Study or this Research Report, please contact Ken Casavant at the following address:

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EWITS PREVIOUS REPORTS NOW AVAILABLE

1. Gillis, William R. and Kenneth L. Casavant. "Linking Transportation System Improvements to New Business Development in Eastern Washington." EWITS Research Report Number 1. February 1994.
2. Gillis, William R. and Kenneth L. Casavant. "Lessons from Eastern Washington: State Route Mainstreets, Bypass Routes and Economic Development in Small Towns." EWITS Research Report Number 2. February 1994.
3. Gillis, William R. and Kenneth L. Casavant. "Washington State Freight Truck Origin and Destination Study: Methods, Procedures, and Data Dictionary." EWITS Research Report Number 3. December 1994.
4. Gillis, William R. and Kenneth L. Casavant. "Major Generators of Traffic on U.S. 395 North of Spokane: Including Freight Trucks and Passenger Vehicles Crossing the International Border." EWITS Research Report Number 4. January 1995.
5. Newkirk, Jonathan, Ken Eriksen, and Kenneth L. Casavant. "Transportation Characteristics of Wheat and Barley Shipments on Haul Roads To and From Elevators in Eastern Washington." EWITS Research Report Number 5. March 1995.
6. Jessup, Eric and Kenneth L. Casavant. "A Quantitative Estimate of Eastern Washington Annual Haul Road Needs for Wheat and Barley Movement." EWITS Research Report Number 6. March 1995.
7. Gillis, William R., Emily Gruss Gillis, and Kenneth L. Casavant. "Transportation Needs of Eastern Washington Fruit, Vegetable and Hay Industries." EWITS Research Report Number 7. March 1995.
8. Casavant, Kenneth L. and William R. Gillis. "Importance of U.S. 395 Corridor For Local and Regional Commerce in South Central Washington." EWITS Research Report Number 8. April 1995.

9. Gillis, William R., Eric L. Jessup, and Kenneth L. Casavant. "Movement of Freight on Washington's Highways: A Statewide Origin and Destination Study." EWITS Report Number 9, November 1995.
10. Chase, Robert A. and Kenneth L. Casavant. "Eastern Washington Transport-Oriented Input-Output Study: Technical Report." EWITS Research Report Number 10. March 1996.

EWITS Previous Working Paper Series Now Available

1. Lee, Nancy and Ken Casavant. "Grain Receipts at Columbia River Grain Terminals." EWITS Working Paper #1, March 1996.
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3. Ellis, John, Eric Jessup, and Ken Casavant. "Modeling Changes in Grain Transportation Flows in Response to Proposed Snake River Drawdowns: A Case Study for Eastern Washington." EWITS Working Paper #3, March 1996.
4. Painter, Kate and Ken Casavant. "A Comparison of Canadian versus All Truck Movements In Washington State with a Special Emphasis On Grain Truck Movements." EWITS Working Paper #4, March 1996.
5. Jessup, Eric L. and John Ellis, and Kenneth L. Casavant. "Estimating the Value of Rail Car Accessibility for Grain Shipments: A GIS Approach." EWITS Working Paper #5, April 1996.

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Executive Summary

- Recent economic performance and economic diversification in Eastern Washington challenge the common perception that the region is largely farm dependent and lagging behind the state's traditional economic engine of the Puget Sound. Since 1990, Eastern Washington has led the state in economic growth. Furthermore, this growth has become more broad-based in nonfarm related sectors.
- Regional economic growth is intrinsically connected to markets. The focus of this report is transport services, linking farm, forest and factory products to their respective markets. These services have grown as Eastern Washington's industries have become more productive. What are the economic contributions of transport services in Eastern Washington? What are the economic impacts associated with increased efficiency of the transport services and improvements of the transportation infrastructure?
- The analytical tool utilized in this analysis is the Eastern Washington Input Output Model, which provides economic information useful in assessing a wide variety of economic developments within the region. This model is more thoroughly presented in a companion EWITS report, *Eastern Washington Transport-Oriented Input-Output Study of 1992: Technical Report*.
- Transport services provide thousands of jobs and millions of labor earnings for residents of Eastern Washington. In 1992, the combined transport services employed 16,418 workers with labor earnings totaling \$508.8 million. Average annual earnings per transport services worker were \$30,990, substantially above the Eastern Washington average of \$25,293 in 1992.
- In 1992, total operating revenues of Eastern Washington transport services amounted to \$1.2 billion, or nearly four percent of the total Eastern Washington regional output of \$33.5 billion. Trucking is the dominant mode of transport in the region with \$631.6 million in revenues, followed by railroad transport at \$205.6 million, the U.S. Postal Service with \$136.4 million, and air transport with \$84.1 million in revenues. Other transport services sectors include local & suburban transport with \$68.7 million in revenues; transport services, including travel agents and tour operators, shipping agents and freight forwarders, and packing and crating at \$59.2 million; pipelines with \$10.0 million; and water transport at \$9.6 million.
- Virtually every industrial sector depends, in varying degrees, upon transport services. Three out of every ten dollars of transport services sales are made to other industries within the region. In 1992, Regional manufacturers made the largest combined purchase of transport services totaling \$102.3 million. Trade--wholesale and retail--purchased \$50.0 million in regional transport services. Trucking was the preferred mode of transport for the majority of manufacturers

and wholesalers/retailers. For agricultural production, regional transport services of \$27.5 million were divided among the modes of trucking, rail, and waterborne.

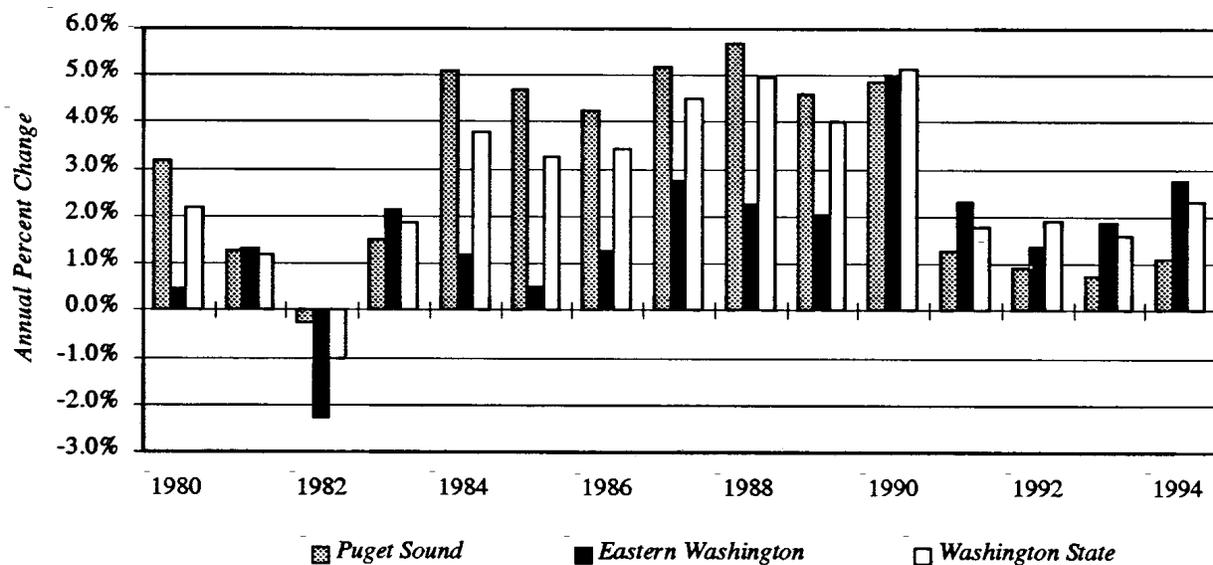
- Transport services also serve as markets for regional industries in purchasing various inputs for running their operations. Non-labor inputs for transport services totaled \$156.5 million in 1992.
- Transport services are important export sectors in the Eastern Washington economy. Transport services earn export revenues by: (1) shipping regionally produced products to out-of-region customers, (2) providing non-resident passenger services, and (3) providing transshipment services.
- In 1992, the export of Eastern Washington transport services amounted to \$641.7 million--over half of total sales. Nearly three out of every five-transport service jobs in Eastern Washington are tied directly to the regional export base. The majority of these exports were to serve markets located within the rest of the United States, including Western Washington. Other export markets served by transport services were foreign countries and the Federal government.
- Various economic multipliers for the transport services sectors were derived from the Eastern Washington Input-Output Model. These multipliers measure the impacts of a given external change on total regional economic activity.
- Transport services wield significant influence on the regional economy. In 1992, the total economic impact of transport services on Eastern Washington was \$1.11 billion in sales of transport services, 17,355 jobs, and \$458.6 million in labor earnings. Highway construction activity related to state transportation outlays and exports generates another 834 total (direct and indirect) jobs with labor earnings of \$23.0 million.
- The indirect economic effects of transport services are heavily concentrated in services and trade. Nearly 60 percent of the total indirect output effects of transport services are in these two sectors.

Introduction: Overview of the Eastern Washington Economy

Eastern Washington: Leading the State in Economic Growth

The Eastern Washington economy is often characterized as agriculturally dependent, lagging behind the more dynamic manufacturing and international trade-based Puget Sound economy. While this view had some validity in the past, an increase in non-farm employment has been evident over the past two decades¹. In recent years, Eastern Washington has led the state in economic growth, outperforming the state's traditional economic engine of Puget Sound (Figure 1).

Figure 1: Economic Performance of Eastern Washington, Puget Sound and Washington State, 1980-1994 (Annual Percent Change in Total Employment)



Prior to 1990, most of the growth in Washington State was concentrated in the Puget Sound region. Since then, Eastern Washington has outperformed the state and Puget Sound region with an average annual employment growth rate of 2.7 percent.

Underlying this recent trend is a vigorous array of broad-based economic growth within the region (Table 1). Outside of agricultural production and manufacturing, employment has increased in most major industry groups within Eastern Washington between 1990 and 1994.

¹ In 1970, nearly 16 percent of Eastern Washington's total industrial labor earnings was farm-related (i.e., farming, agricultural services, and food processing) compared to a statewide average of 5.8 percent. By 1994, this ratio had declined to 11.7 percent compared with 3.9 percent for the state.

Table 1--Employment Growth Rates in Eastern Washington and Washington State, 1990-1994 (in percent change)

Major Industry Group, By Place of Work	Eastern Washington	Washington State
Total employment	8.5%	7.8%
Wage and salary	8.7%	6.6%
Proprietors	8.0%	13.7%
Farm	-3.7%	-4.8%
Nonfarm	8.4%	15.2%
Farm	-21.5%	-4.7%
Nonfarm	11.9%	8.2%
Private	12.4%	8.5%
Manufacturing	-9.4%	-7.6%
Public utilities & communications	2.1%	2.5%
Transportation	3.6%	6.8%
Wholesale trade	7.5%	9.7%
Retail trade	13.5%	10.4%
Services	23.5%	16.1%
Construction	21.7%	9.9%
Other Private	9.7%	6.5%
Government & government enterprises	10.0%	6.6%

Source: U.S. Bureau of Economic Analysis

Notes: Other private includes agricultural services, forestry fisheries; mining; and finance, insurance, & real estate; employment numbers include both wage & salaried workers and proprietors.

Economic Growth is Connected to Markets

Within any region, economic growth is tied to the regional firms' ability to sell its products and services to outside markets. Those markets may be within other parts of the state (e.g., western Washington), in other states, or in foreign countries². In any thriving export-oriented sector, a number of comparative advantages will be observed in action, such as a cost advantage in producing the good or service, a unique resource for the production of the good or service, a unique marketing location, or a transportation advantage.

Within Eastern Washington, the economic or export base is composed of a number of goods producing and services producing industries. Although agriculture production

² Regional economic theory holds that selling a product or a service to a non-local customer brings income into the area, enabling the local area to expand. These "exports" occur either as a movement of a good, service, or capital to the purchaser or the movement of a purchaser to a good or service. Firms that sell their product or service outside the area are part of the local economic base (some even call it the export base); whereas those businesses that sell to local customers, such as other businesses or households, are called non-basic businesses. Generally, agriculture, forestry, mining, and manufacturing are classified as export industries (Shaffer, 1989).

and processing continue to play dominant export roles within the Eastern Washington economy, there are other industries which are important regional exporters, including primary metal (specifically, primary aluminum), mining, chemicals, and engineering and management services (Table 2).

Table 2--Economic Specialization in Eastern Washington, 1994

Sector	Location Quotient ³	Share of State Production ⁴	Exports as Share of Total ⁵
Farm	3.995	75.3%	75.0%
Primary metal industries	2.879	54.3%	65.3%
Agricultural services	2.331	43.9%	57.1%
Railroad transportation	2.028	38.2%	50.7%
Food & kindred products	1.789	33.7%	44.1%
Mining	1.655	31.2%	39.6%
Pipelines, except natural gas	1.441	27.2%	30.6%
Chemicals & allied products	1.401	26.4%	28.6%
Engineering & management services	1.372	25.9%	27.1%
Electric, gas, and sanitary services	1.256	23.7%	20.4%
Machinery, except electrical	1.247	23.5%	19.8%
Trucking & warehousing	1.243	23.4%	19.5%
State & local government	1.190	22.4%	16.0%
Educational services	1.149	21.7%	13.0%
Automotive dealers & service stations	1.132	21.3%	11.7%

Source: U.S. Bureau of Economic Analysis; author's calculations

Transport Services-A Driving Force Behind Regional Economic Growth

The fifteen industries listed in Table 2 are ranked in terms of economic specialization⁶. Three of these sectors are transport services: railroads, pipelines, and trucking, ranked fourth, seventh, and twelfth, respectively. These rankings underscore the critical importance of transportation in efficiently moving commodities produced in (or moving

³ Sectors are ordered based on rankings of the location quotient. A location quotient is an indirect measure of exports, and hence gauges economic specialization. It also serves as a proxy for economic base.

⁴ Share of state production is estimated based on labor earnings.

⁵ Exports as a share of total is an estimate of the proportion of total production used for exports based on the following formula:

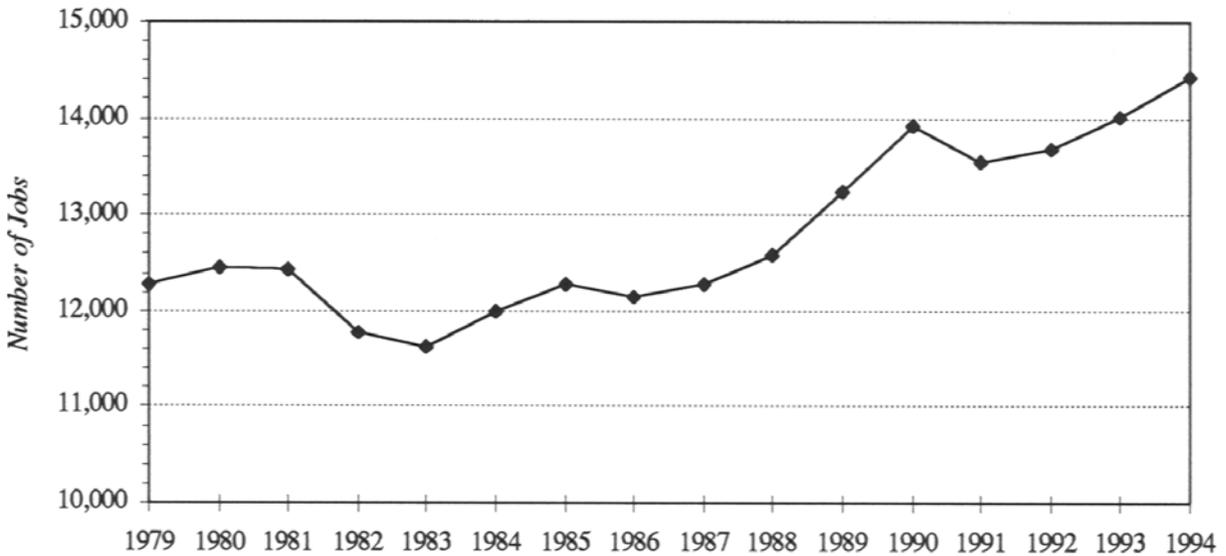
$$\% \text{ Total} = (1 - 1/LQ) \times 100$$

where LQ = location quotient.

⁶ An indirect measure of economic specialization, called location quotients, was used to determine the economic base of Eastern Washington. In this case, location quotients compare the share of total labor earnings in a particular industrial grouping within Eastern Washington with the share it represents in Washington State. The quotient for any industry or sector is determined by dividing its share of Eastern Washington labor earnings by its share of state labor earnings. The underlying assumption of this measure is that a region that is highly specialized in a given sector is exporting a portion of that good or service.

through) Eastern Washington to their respective markets. They also illustrate that the flow of goods is dependent upon an integrated transportation network of highways, railroads, pipelines, airports, ports and waterways.

Figure 2: Total Employment In Transportation Services, Eastern Washington, 1979-1994



Note: Total employment includes both wage & salaried workers and proprietors in private sector transport services. Transport services do not include employment from U.S. Postal Service. Source: U.S. Bureau of Economic Analysis.

As Eastern Washington's economy has diversified, employment in transportation services has risen dramatically (Figure 2). During the last fifteen years, total employment within transportation services⁷ has had an average annual growth rate of 1.2 percent. In 1994, transportation services accounted for 14,430 jobs, or 2.3 percent of total employment (638,366 workers & proprietors) in Eastern Washington. Steady growth is expected to be the norm for the foreseeable future.

⁷ Although covered elsewhere in this report, transportation services here do not include public-owned enterprises such as the U.S. Postal Service and municipal transits.

Purpose of Report

Eastern Washington's existing transportation network of rails, highways, pipelines, waterways, and air routes represents the lifeline that connects its farms, forests and factories with their respective markets. Maintaining and improving this transportation system bolsters economic development within Eastern Washington.

The purpose of this report is to describe the recent economic contribution of transport industries to Eastern Washington. Essentially, the role of transport is supportive, facilitating commerce both within and outside the region. What other roles do transport services play within the regional economy? Can we view transportation services in the same manner as traditional export or basic industries? How much of the existing export base within Eastern Washington is transported by regional industries? Finally, what are the economic impacts associated with the maintenance and expansion of the transportation infrastructure? Do improved transportation services (i.e., by mode) result in additional economic benefits to the region?

Outline of Report

This report is intended for policy-makers and non-technical readers wishing to increase their understanding of the economic role played by transportation services in the regional economy. The report is divided into three parts. The first part describes the various roles of transport services within the regional economy. The second part of the report presents an economic impact analysis of transportation services and highway construction, which represents a proxy for improving transportation infrastructure. This section uses results from the Eastern Washington Input-Output Model for 1992. The third part presents an impact assessment, addressing topics such as how regional transport services are affected by expansion of an export industry and the impact of regional transportation expansion on other industries within the region.

Methodology

The input-output model is used in this report to provide a quantitative picture of purchases and sales among businesses, households, and government agencies in an economy. This model supplies a wide variety of economic information useful in analyzing different types of economic development within a region. The input-output table is comprehensive in scope, providing a detailed set of accounts on all conventionally defined economic activities within the region. The input-output model explicitly captures the growth effects triggered and sustained by export-oriented industries within the region through the use of economic multipliers. This model is more thoroughly presented in a companion report, *Eastern Washington Transport-Oriented Input-Output Study of 1992: Technical Report*.

Transport Industries in the Eastern Washington Economy

Transportation: The Means of Market Orientation

The efficient transport of commodities produced and moving through Eastern Washington to their markets is critical to the region's economic well being. If a region were lacking in transport services locally, exporters of products would have to supply transport services from outside the region. Resident transport services serve as the primary facilitators if regional economic growth is ultimately connected to export markets.

Transport services do more than serve to connect regional industries with their export markets. They provide transshipment services by facilitating the movement of goods that are "just passing through" (i.e., goods produced outside the region to purchasers also located outside the region). In addition, regional transport services are provided between producers and customers located within the region. Finally, Eastern Washington industries purchase various inputs from outside suppliers, including purchases from transport sectors elsewhere. This portion of transport services is imported⁸. In sum, transport services are exported, imported, and used locally.

Transportation Jobs and Earnings in Eastern Washington

Eastern Washington has historically enjoyed an efficient multimodal transport system. An extensive system of highways, rails, waterways, and air travel has satisfied the transportation needs of Eastern Washington's businesses and industries. In addition, this transportation system has directly provided thousands of jobs and millions in labor earnings for residents of Eastern Washington. In 1992, combined transport services employed 16,418 workers with labor earnings of \$508.8 million (Table 3). These transport services totals represent 2.8 percent of total regional employment and 3.4 percent of total labor earnings in Eastern Washington.

⁸ The accounting convention of input-output analysis specifies that the flows of goods and services be measured in producers' prices. In order to assure that the revenue received by a producer equals outlays by purchasers, transport and distribution (wholesale and retail trade) services are treated as a purchaser's expense. This accounting convention can be succinctly put as the "purchaser pays the freight." However, this rule is often inconsistent with actual market transactions since goods are frequently sold by producers on a delivered cost basis. In this case, purchasers of goods often do not know the amount paid for freight.

Table 3--Jobs and Earnings of Transport Services in Eastern Washington, 1992

Sector	Labor Earnings (\$ millions)	Wage & Salary Employment	Total Employment
Railroad Transport	105.8	1,438	1,438
Local Transport	33.2	1,510	1,650
Trucking & Warehousing	202.8	6,629	8,335
U.S. Postal Service	108.7	2,711	2,711
Water Transport	1.3	78	83
Air Transport	29.5	992	1,009
Pipeline	1.0	21	21
Transport Services	26.5	1,099	1,171
Total	508.8	14,478	16,418

Sources: U.S. Bureau of Economic Analysis; U.S. Postal Service; and Washington State Employment Security Department

Average annual earnings per transport services worker of \$30,990 were significantly higher than the Eastern Washington average wage of \$25,293 in 1992. Railroad workers have the distinction of being the highest paid workers in the entire Eastern Washington region, with average annual earnings of \$73,574, while water transport workers are near the bottom among all sectors with average earnings of \$15,663 in 1992. In addition, there are 1,220 workers employed within the Eastern Washington highway construction sector with average annual earnings of \$35,656, for a total of \$43.5 million in this sector in 1992.

Transport Services as Markets for Regional Industries

In addition to the purchase of labor, transport services purchase other inputs (e.g., metals, machinery, services) for running their operations. Regional purchases by transport services for required non-labor inputs totaled \$156.5 million in 1992 (Table 4). Transport services sectors in Eastern Washington are, in general, net importers of required inputs. Of the total \$478.2 million in non-labor inputs, \$321.7 million are purchased outside the region. For instance, transport services are a significant purchaser of refined petroleum products, most of which is produced in Western Washington.

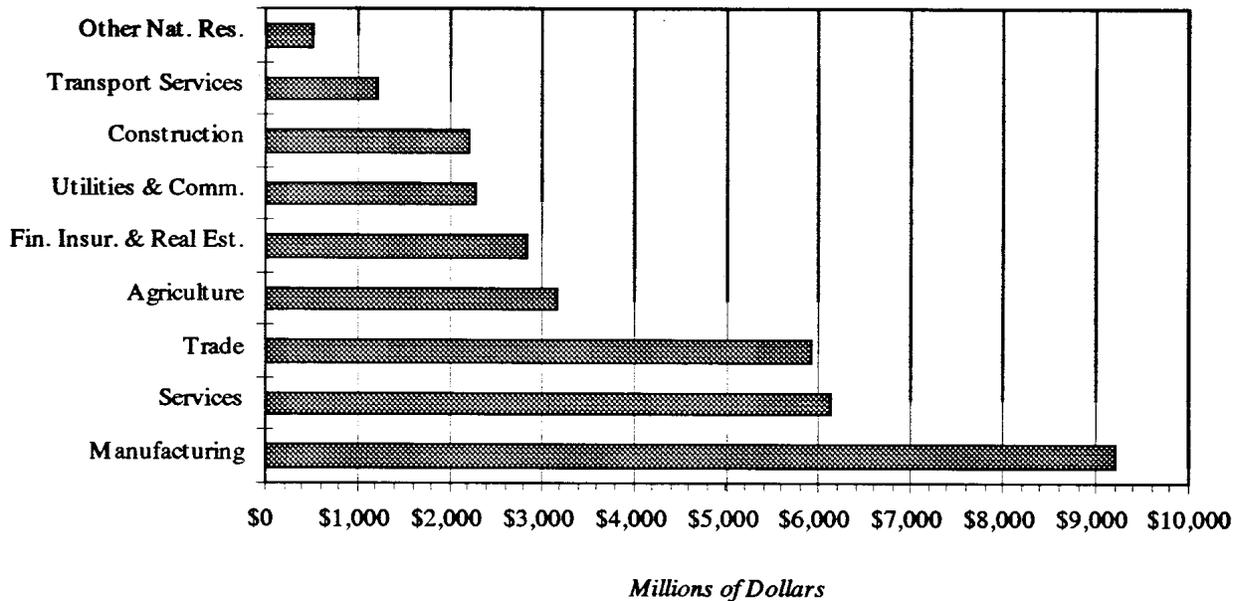
Table 4--Purchases by Transport Services in Eastern Washington, 1992

Major Industry Group	Purchases (millions \$)
Transportation services	\$47.7
Services	\$40.9
Trade	\$23.6
Finance, insurance & real estate	\$16.6
Manufacturing	\$13.4
Utilities	\$9.3
Construction	\$3.4
Mining	\$1.1
Agriculture	\$0.5
Forestry	\$0.0
Total, In-region purchases	\$156.5
Total Imports	\$321.7

Distribution of Transport Charges in Eastern Washington

The Eastern Washington Transport-Oriented Input-Output Model for 1992 provides a detailed quantitative picture of the Eastern Washington economy, including the linkages between the transport services sectors and other sectors. Results of this model provide insight into the workings of the regional economy, particularly the supportive relationship of transportation with other sectors. Total 1992 operating revenues of Eastern Washington transport services amounted to \$1,205.2 million (Figure 3).

Figure 3: Total Output by Major Economic Sector in Eastern Washington



Transport services' output represents 3.6 percent of the total Eastern Washington regional output of \$33.5 billion. Trucking is the dominant mode of transport in the region with \$631.6 million in total operating revenues (both interindustry sales and final sales), followed by railroad transport (\$205.6 million), the U.S. Postal Service (\$136.4 million), and air transport (\$84.1 million) (Table 5). Interindustry sales make up 23% of total transport services sales. Thirty percent of final sales are made to resident consumers, state and local governments, or capital goods sectors in Eastern Washington. Sixty percent of transport services' final sales are due to the exporting of goods and services to customers located outside the region (i.e., Federal government; other states, including Western Washington; and foreign countries). Given the rule that "the purchaser pays the freight charge," these sales of regional transport services are considered export income.

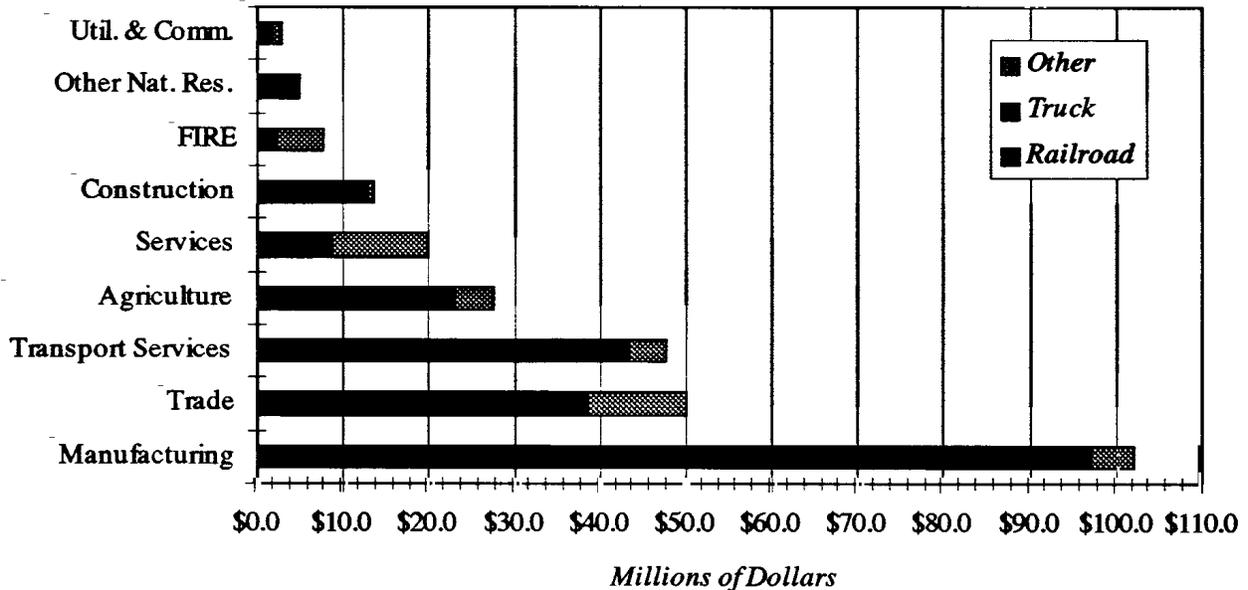
Table 5--Sales of Eastern Washington Transport Services to Interindustry and Final Demand Markets, 1992 (millions of dollars)

Sector	Inter- industry Sales	Final Sales						Total, Final Demand
		PCE	EWA S&L	EWA GPI	Federal Gov't	Exports U.S.	Exports Foreign	
Railroad Transport	44.3	8.6	0.5	1.9	1.9	136.4	12.0	161.3
Local Transport	5.5	45.6	10.5	0.0	0.1	6.8	0.2	63.2
Trucking	187.9	128.1	2.4	4.0	9.0	253.2	47.0	443.7
US Post Service	22.9	49.3	3.8	0.0	2.0	53.5	4.9	113.5
Water Transport	7.0	0.2	0.0	0.0	0.0	2.0	0.4	2.6
Air Transport	3.7	22.6	0.6	0.1	0.8	50.1	6.2	80.4
Pipeline	0.8	2.0	0.0	0.0	0.3	6.5	0.4	9.2
Transport Services	4.0	6.9	0.3	0.0	0.0	45.6	2.4	55.2
Total	276.1	263.3	18.1	6.0	14.1	554.1	73.5	929.1

Notes: Interindustry sales refer to purchases by other industries within the region; PCE or personal consumption expenditures are sales to consumers residing in Eastern Washington; EWA S&L are sales to state & local governments in Eastern Washington; EWA GPI refers to sales for gross private investment or fixed capital formation in Eastern Washington; Exports-U.S. are sales to rest-of-the-U.S. including western Washington.

Virtually every industrial sector in Eastern Washington depends, in varying degrees, upon transport services (Figure 4). These "inter-industry sales" are made in the process of regional production of goods and services. Regional manufacturing industries made the largest purchases of transport services totaling \$102.3 million in 1992. The leading purchasers of transport services among the manufacturing sectors in Eastern Washington are the logging, aluminum, sawmill, and canning & preserving industries. The majority of these manufacturers' purchases are for trucking, except for the aluminum industry, which relies on rail transport for the majority of its transport purchases. Wholesale and retail trade purchased \$50.0 million in regional transport services. Trucking was again the dominant transport mode, followed by the U.S. Postal Service. Agriculture purchased \$27.5 million in regional transport services, including trucking, railroad, and water transport.

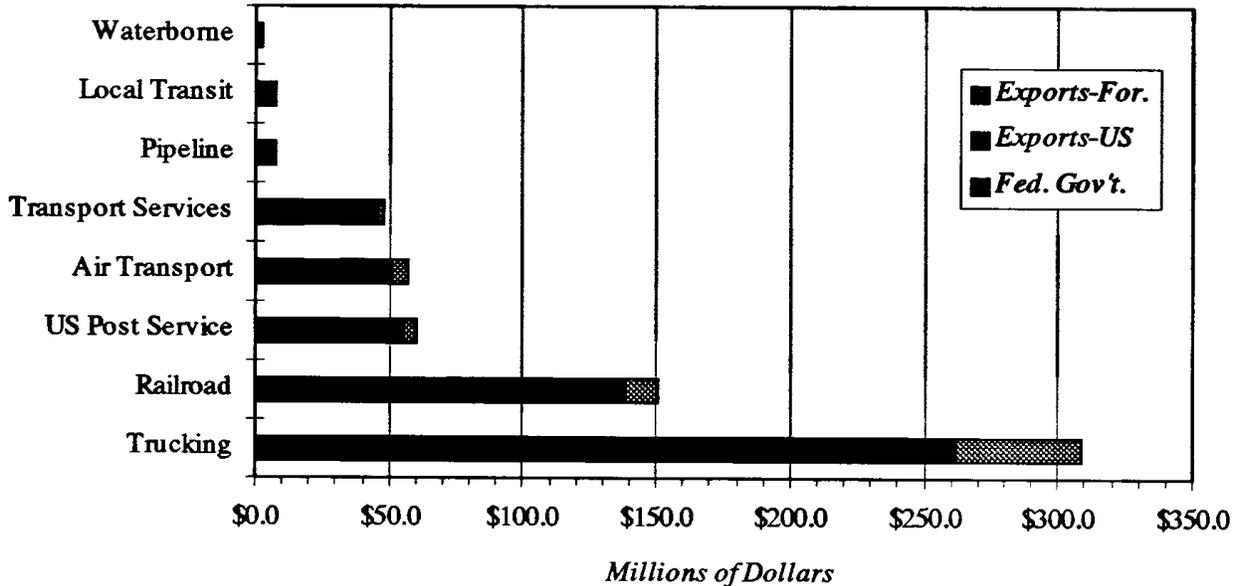
Figure 4: Purchases of Transport Services by Major Industry Groups in Eastern Washington, 1992



The Role of Transport Services in Eastern Washington Exports

Transport services represent important export sectors in the Eastern Washington economy. Eastern Washington transport services earn export revenues by shipping Eastern Washington products to out-of-region customers, as the purchaser pays the freight. They also bring in export revenues to the state by providing non-resident passenger services, and through transshipments. The export of Eastern Washington transport services (consisting of sales to rest-of-the-U.S., sales to foreign customers, and sales to the Federal government) amounted to \$641.7 million, over half of 1992 total sales (Table 5). Transport services operating revenues associated with exports to the rest-of-the U.S. (including Western Washington) are estimated to be \$554.1 million, while those related to foreign exports are \$73.5 million, and those to the federal government amount to \$14.1 million. The leading exporters of transport services in Eastern Washington by mode are trucking, \$309.2 million; rail, \$150.3 million; and air, \$57.1 million (Figure 5).

Figure 5: Value of Exports by Transport Services in Eastern Washington, 1992



The export of transport services accounted for 4.4 percent of the total value of Eastern Washington exports in 1992, which was two-thirds of the statewide total. Transport services accounted for 3.0 percent of Eastern Washington's total exports to foreign countries, and 5.6 percent of exports to the rest of the U.S. (including western Washington). These export-oriented industries generate substantial transport revenues for commodity carriers and for the arrangers of shipments (e.g., freight forwarders, shipping agents). Cargo activities associated with the transshipments of commodities are quite visible in the ports and rail yards of this region. Spokane is also a regional airline hub (with some international flights) for both passenger and air freight services.

Due to the supportive role played by transport services within the regional economy, exports of the transport sectors are at least partly dependent upon the exports of other sectors in the regional economy. As the export market expands in a particular sector (for example, field and seed crops), purchases for regional transport services will presumably increase. Table 6 ranks the top fifteen export sectors in Eastern Washington with their respective transport services purchases. Note that the trucking and warehousing category ranks twelfth among all sectors in the Eastern Washington economy⁹. This is due largely to the significant role played by trucking in providing transshipments services for goods that are merely passing through the region. Washington with their respective transport services purchases.

⁹ There are 58 sectors within the Eastern Washington Input - Output model. A sector simply refers to a group of firms engaged in the same general type of business.

Table 6--Leading Export Sectors in Eastern Washington & Demand for Transport Services, 1992 (in millions of dollars)

Sector	Federal Government	Exports- Rest of U.S.	Exports- Foreign	Total Exports	Level of Transport Services
Finance, Insurance & Real Estate	1.0	1,290.1	9.0	1,300.1	7.6
Wholesale Trade	14.1	953.0	285.2	1,252.3	10.5
Business Services	800.0	268.8	75.7	1,144.5	4.6
Aluminum	0.0	898.9	193.2	1,092.1	20.1
Canning & Preserving	22.9	846.0	172.0	1,040.9	8.9
Vegetables & Fruit	0.0	682.4	181.0	863.4	11.6
Field & Seed Crops	0.0	116.4	494.1	610.5	12.1
Industrial Chemicals	195.0	185.2	217.8	598.0	3.9
Meat Products	6.9	567.1	22.3	596.3	2.2
Other Services	22.1	398.3	30.2	450.6	8.3
Sawmills	0.0	281.8	71.1	352.9	10.1
Trucking & Warehousing	9.0	253.2	47.0	309.2	39.7
Industrial Machinery	7.6	216.8	63.0	287.4	1.0
Other Primary Metals	0.6	231.0	35.0	266.6	4.0
Pulp & Paper Mills	1.5	127.8	60.2	189.5	2.8

Economic Impact Analysis of Transport Industries

Input-Output Table-A Springboard for Economic Impact Analysis

Policymakers, local officials, and analysts are often faced with the need to estimate impacts of economic changes, such as plant openings, closings or expansions. An economic tool often used to assist in this task of economic impact estimation is the "multiplier." These multipliers are derived from the input-output table. The most common and useful application of an input-output table lies in economic impact analysis.

The Role of Economic Multipliers in Economic Impact Analysis

Multipliers essentially measure the impact of a given external change--new investment, expansion of exports, or influx of dollars from the Federal government--on total regional economic activity through the spending and re-spending of new dollars within the regional economy. The multiplier measures the linkages and interactions between the regions export sectors and other businesses and households within the region. If a certain sector has no linkages, e.g., no local purchases of labor, suppliers, materials, etc., then there is no multiplier effect.

The multiplier concept can be best explained through an example. Suppose Eastern Washington's fruits and vegetables sector increases export sales by \$10.0 million. Given an output (sales) multiplier of 1.94 for this sector, total business sales throughout the region are expected to increase by a total of \$19.4 million as a result of the original \$10.0 million increase in fruit and vegetable exports. The initial \$10.0 million is called the direct impact, associated with the effects of increased demand in fruit and vegetable

exports. The additional \$9.4 million are termed the indirect and induced impacts. The indirect impact refers to the production-related changes in those regional industries linked with the fruits and vegetables sector. The induced effects refer to the increased regional household spending patterns caused by increased household income generated from the direct and indirect effects. The cycle of spending and re-spending in response to the original increase in exports is also known as the "ripple" effect.

There are a number of different kinds of multipliers, each measuring a different type of economic impact. Output (sales) multipliers measure the total change in regional sales generated by an initial change in export sales. Employment multipliers measure the total change in regional employment generated by an initial change in employment in an export sector. Income multipliers measure the total change in regional income (e.g., labor earnings) generated by an initial change in income from an export sector.

1992 Eastern Washington Multipliers for Transport Services

Multipliers for the Eastern Washington transport services and highway construction are reported in Table 7. These multipliers include output (or sales) multipliers, total employment multipliers (including both wage & salaried workers and proprietors), labor earnings or income multipliers, and value added multipliers. The labor income and value added multipliers are stated in terms of dollar of income per dollar of output. Use of these multipliers will be illustrated in the next section.

Table 7--Economic Multipliers for Eastern Washington Transport Services

Industry	Output (per \$ output)	Total Employment (per job)	Labor Income (per \$ output)	Value Added (per \$ output)
Railroad Transportation	1.763	2.647	0.757	1.049
Local & Suburban Transit	1.706	1.615	0.783	1.367
Motor Freight & Warehousing	1.649	2.077	0.608	1.105
U.S. Postal Service	1.987	1.755	1.102	1.513
Water Transportation	1.229	1.757	0.269	0.598
Air Transportation	1.739	2.140	0.621	0.977
Pipelines	1.378	7.976	0.412	1.318
Transportation Services	1.777	1.690	0.725	1.080
Highway Construction	1.702	2.508	0.590	1.039

Analytical Examples of Impact Assessment

Multipliers can assess the regional economic impacts of a number of various transport-oriented issues. The total economic impacts of transport services in Eastern Washington can be estimated through the use of economic multipliers. The economic impact of a single sector, such as highway construction, can be measured. For example, the impact of changes in the regional highway construction budgets on the regional economy can be estimated. Multipliers can be used to trace the impacts of changes in other export industries on regional transport services. If export sales in field and seed crops increase in Eastern Washington, regional transport services are affected.

Total Economic Impact of Transport Services in Eastern Washington

Transport services wield a significant economic impact on the economy of Eastern Washington. The total direct and indirect impact of transport services in 1992 was \$1.11 billion in output (sales), 17,355 jobs, and \$458.6 million in labor earnings (Table 8). The implied employment multiplier for transport services in total is equal to the total direct plus indirect impact on jobs (17,355) divided by the direct impact on jobs (8,240), or 2.1. This translates to an additional 1.1 supporting jobs in the regional economy for every transport services job in Eastern Washington.

For regional highway construction activity related to state transportation outlays and exports, a total of 834 jobs with labor earnings of \$23.0 million are generated within Eastern Washington (Table 8). The implied employment multiplier for highway construction in total is 2.4 (834/345), meaning that for every highway construction job in Eastern Washington, there are an additional 1.4 supporting jobs in the regional economy.

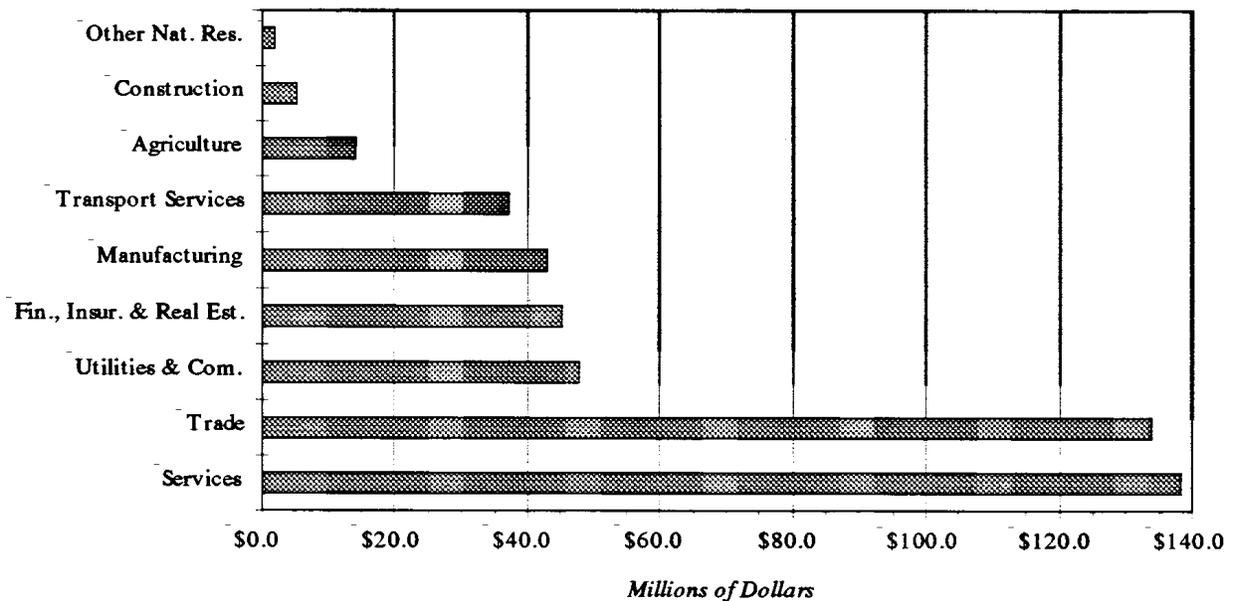
Table 8--Economic Impact of Transport Services on Eastern Washington, 1992

Eastern Washington Input-Output Sector	Direct Impact: Output (\$ millions)	Direct Impact: Jobs	Direct Impact: Earnings (\$ millions)	Total (Dir. + Ind.) Impact: Output (\$ millions)	Total (Dir. + Ind.) Impact: Jobs	Total (Dir. + Ind.) Impact: Earnings (\$ millions)
Railroad Transport	152.2	1,065	78.3	268.4	3,250	124.0
Local Transit	7.1	171	3.4	12.1	269	5.4
Trucking & Warehouse	313.2	4,133	100.6	516.5	8,181	182.3
U.S. Postal Service	60.4	1,200	48.1	120.0	2,369	71.9
Water Transport	2.4	21	0.3	2.9	31	0.5
Air Transport	57.2	696	20.1	99.5	1,511	36.4
Pipeline	7.2	15	0.7	9.9	58	1.7
Transport Services	48.0	949	21.5	85.3	1,686	36.4
Total, Transport	647.7	8,240	273.0	1,114.6	17,355	458.6
Highway Construction	40.0	345	12.3	68.1	834	23.0

Figure 6 illustrates the impact of the transport services sector on the output of sectors with indirect ties to transport services. Nearly 60 percent of the total indirect output

effects of transport services are in the sectors of services and trade. A total of 9,115 indirect jobs are in other services, other retail trade, health services, eating & drinking places, and transport services.

Figure 6: Indirect Output Impacts of Transport Services on the Eastern Washington Economy, 1992



Transport Services and Highway Construction Impact Analysis Examples

What occurs within regional transport services when there is an expansion within an export sector? Which transport services are most impacted? For illustrative purposes consider (1) the expansion of the regional fruit & vegetable processing sector, and (2) the increase of exports in field and seed crops.

In this first example, a new frozen vegetable processing plant is being sited in Eastern Washington. This new facility will have an annual production value of \$75 million. The direct and total impact¹⁰ of this new facility is shown in Table 9. For this new food processing facility, transport services sectors would expand in total output by \$2.1 million and hire 30 additional workers with \$0.8 million in additional labor earnings.

¹⁰ Although appropriate, the construction of this facility is not considered.

Table 9--New Food Processing Plant - Impact on Eastern Washington Economy

	Impact
Direct Impact	
Output, food processing (\$ million)	75
Total employment, food processing (jobs)	71
Labor income, food processing (\$ million)	16
Total Impact	
Output (\$ million)	159
Total employment (jobs)	2,61
Labor income (\$ million)	53

Another example presents estimates of the impact on the regional economy from an increase in exports of field and seed crops (Table 10). Suppose field and seed crops experience an increase in exports valued at \$350 million due to a bumper wheat crop¹¹. For this dramatic increase in field and seed crop exports, the transport services sectors would expand in total output by \$8.6 million and hire 113 additional workers with \$3.4 million in additional labor earnings.

Table 10--Field & Seed Exports: Impact on Eastern Washington Economy

	Impact
Direct Impact	
Field & seed crop export increase (\$ million)	350
Field & seed crop total employment	2,612
Field & seed crop labor income (\$ million)	91.6
Total Impact	
Output (\$ million)	563.5
Total employment	6,115
Labor income (\$ million)	168.2

A final example presents estimates of the impact on the regional economy from an increase in highway construction expenditures of \$ 100 million (Table 11). The result of this increase would be 2,086 jobs with labor earnings of \$57.4 million. The improved transportation infrastructure has an indirect impact on transport services.

¹¹ Eastern Washington wheat farmers expect a record harvest in 1996, valued at \$875 million, up from an average of \$530 over the past several years.

Table 11--Highway Construction Impacts on Eastern Washington Economy

	Impact
Direct Impact	
Highway construction output (\$ million)	100
Highway construction total employment	863
Highway construction labor income (\$ million)	33.2
Total Impact	
Output (\$ million)	170.2
Total employment	2,086
Labor income (\$ million)	57.4

These services will increase their output by \$3.7 million and hire an additional 51 workers with labor earnings of \$1.4 million.

Summary and Conclusions

The transportation network of highways, railroads, waterways, and air routes is an economic lifeline for industries in Eastern Washington. The transport services associated with connecting farm, forest, and factory with their respective markets contribute \$1.2 billion to the regional economy in total output (operating revenues) and 16,418 jobs with \$509 million in labor earnings.

Transport services provide a critical supporting role in connecting regional industries with their export markets. A significant portion of regional transport services has developed to support these export markets. Regional transport industries perform an additional export-oriented function by providing transshipment services (i.e., facilitating the movement of goods that are "just passing through"). In total, about three-fifths of Eastern Washington's transport services are export-oriented.

Transport services wield a significant economic impact on the economy of Eastern Washington. The total direct and indirect impact of transport services in 1992 was \$1.11 billion in output (sales), 17,355 jobs, and \$458.6 million in labor earnings. Economic ties to transport services are dispersed among many regional businesses and residents. The majority of the total indirect economic activity associated with transport services are found in the retail trade and service sectors.

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