A Comparison of Canadian Versus All Truck Movements In Washington State With a Special Emphasis on Grain Truck Movements

EWITS Working Paper Number 4
March 1996

by

Kate Painter
Department of Agricultural Economics

and

Ken Casavant, EWITS Project Director
Washington State University
Department of Agricultural Economics
103 Hulbert Hall
Pullman, WA 99164-6210

EWITS Research Reports:
Background and Purpose

This report is the fourth in a series of Working Papers (current topics related to the mission of the Eastern Washington Intermodal Transportation Study (EWITS)) to accompany EWITS reports providing 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, Regional Administrator (WSDOT, Eastern Region); Richard Larson (WSDOT, South Central Region); Don Senn (WSDOT, North Central Region); Charles Howard (WSDOT, Planning Manager), and Jay Weber (Douglas County Commissioner). 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 Working Paper, please contact Ken Casavant at the following address:

Ken Casavant, Project Director
Department of Agricultural Economics
Washington State University
Pullman, WA 99164-6210
(509) 335-1608

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Department of Transportation or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

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. 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.

11. Chase, Robert A. Kenneth L. Casavant. "The Economic Contribution of Transport Industries to Eastern Washington." EWITS Report Number 11. April 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.

2. Lenzi, Jerry, Eric Jessup, and Ken Casavant. "Prospective Estimates for Road Impacts in Eastern Washington from a Drawdown of the Lower Snake River." EWITS Working Paper #2, March 1996.

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.

Table of Contents

List of Tables

Introduction

Providing for the efficient intermodal movement of freight and goods is a primary responsibility of state departments of transportation, metropolitan planning organizations (MPOs), and many local governments. A critical element of intermodal movement is truck transportation. Indeed, it is difficult to find any commodity or product that has not traveled by truck at some point in its journey from production to consumption.

The road system is the means by which trucks provide an efficient and effective delivery service; roads provide access from production areas to local, national, and international markets. This is true for foreign products moving into the United States as well as U.S. products reaching their foreign customers.

Each truck passage over the roadway has a small but identifiable impact, in part consuming the roadway. The amount of this consumption or deterioration is directly related to the weight of the vehicle, along with many other physical and environmental factors. The impact of this weight on the roadway depends on total vehicle weight, axle weight, tire pressure, and tire type, among others. However, weight of the cargo payload can serve as a preliminary indication of road usage associated with any movement unless these other variables change systematically from region to region, road to road, or by type of movement.

Considerable interest and concern has been expressed about the implications of the North American Free Trade Agreement (NAFTA) and new transportation policies in Canada on road usage in this country. These policies have resulted in an increase in both grain and general freight shipments into the U.S. Such increased movements will and do have the related effect of increasing the deterioration of highways in Washington and other states.

Objectives and Approach

The overall purpose of this preliminary study was to examine the profile of Canadian trucks in Washington and compare it with the profile of all trucks operating in the state of Washington. The northeast counties of Washington were a primary focus of the study as they represent the expected location of Canadian grain shipments into the state.

This review uses a database developed in a statewide freight truck origin and destination (O&D) study conducted in late 1993 and early 1994. This Washington study was the first in the United States to collect statewide freight truck O&D data through direct personal interviews of truck drivers. A total of 30,000 truck drivers were interviewed, providing Washington with an extensive database on statewide freight and goods movement. Information was collected on time-of-day movements, vehicle configuration, trucking company location, cargo, origin and intended destination, cargo type, vehicle and cargo weight, use of intermodal facilities, the specific route traveled, and trip frequency per week. Interviews were divided equally among summer, fall, winter, and spring. In agricultural and forestry regions like northeastern Washington, seasonal differences in truck movements are expected to be substantial.

Weight of Payload

The trucks interviewed during the origin and destination survey provided information on two characteristics of special importance to this review. These are the payload weight on the vehicle and the carrier base, which indicates whether the firm is located in Canada, Washington, or other states/counties. Since vehicle configuration in the data set does not vary noticeably between Canadian and other trucks, payload is a reasonable first approximation of axle load and road impact.

It is quickly evident that Canadian trucks usually carry heavier loads than the average truck moving through the state of Washington (Table 1). Canadian trucks are up to 9 percent heavier in the winter and overall are 4.4 percent heavier throughout the year: 36,453 pounds for domestic vehicles versus 38,053 pounds for Canadian-based vehicles. It is also apparent that, when spring arrives, payloads are at their peak. Canadian trucks have slightly lighter loads relative to the state average during this season. Summer loads are lightest, followed by fall and winter, a trend found in all trucks in the Washington survey and in Canadian trucks.

The five northeastern counties in Washington are of special interest to this study. These include Okanogan, Ferry, Stevens, and Pend Oreille counties, which border Canada, as well as Spokane County, which receive substantial Canadian traffic entering from the east on I-90. Data for these counties were collected at Deer Park on 395 for southbound traffic, Plymouth Port of Entry on 395 for traffic heading north, and Spokane Port of Entry on I-90 for westbound traffic.

In this northeastern region, payloads for the Canadian trucks are even heavier relative to the total truck population than they were for the statewide sample (11.3 percent heavier versus 4.4 percent heavier for the state). Canadian-based trucks in the northeast region averaged 43,451 pounds per payload, compared to 39,037 pounds for all trucks (Table 2). Spring is of special interest as roads are most vulnerable to damage during this season. Canadian loads are 44 percent heavier during this time. Only in the winter were the loads comparable for Canadian trucks relative to all trucks. It should be noted that since the average for all trucks includes the Canadian vehicles, a comparison of Canadian trucks to non-Canadian-based vehicles would indicate an even larger disparity.

The average payload for grain truckers throughout the state was 52,393 lbs., while in the northeast region the payload was approximately 6 percent lower at 49,189 lbs. (Table 3). The traditional weight restrictions on rural roads in the spring season appear to have a noticeable effect since spring payloads were 20 percent lighter than the average for the year. Too few Canadian-based trucks in the northeastern counties were carrying grain products to make a comparison with Canadian trucks statewide.

Table 1--Comparison of Average Payload (lbs.), by Season for All Trucks and for Canadian Trucks, 1993-1994 Survey

Season	All Trucks	Canadian Trucks	% Difference
Fall	34,571	36,849	+6.59
Winter	35,401	38,426	+8.55
Spring	40,850	40,165	-1.71
Summer	34,090	36,516	+7.12
Average	36,453	38,053	+4.39

Table 2--Comparison of Average Payload (lbs.) by Season for All Trucks and for Canadian Trucks in the Five Northeastern Counties of Washington, 1993-1994 Survey

Season	All Trucks	Canadian Trucks	% Difference
Fall	36,895	41,650	+12.89
Winter	37,008	36,439	- 1.54
Spring	37,271	53,669	+44.00
Summer	44,113	46,192	+ 4.71
Average	39,037	43,451	+11.31

Further examination of grain-carrying trucks versus all trucks in the state reveals that grain truck payloads are 40 to 60 percent greater than all trucks and are about 44 percent heavier on the average, except in spring, when road restrictions constrain the payload (Table 4). In the northeast region this difference still exists but is substantially smaller at 26 percent. While heavy loads have important efficiency implications, they also have road damage implications. While grain trucks are lightest in the spring, their average payload is still slightly higher than that for all trucks, which are at their peak in spring. In the northeastern five counties, average payloads for grain trucks average 26 percent greater than for all trucks for fall and winter. No observations were obtained for grain truck movements in this region during spring and summer.

In summary, Canadian trucks carry 4.4 percent heavier payloads than all trucks do in Washington and, in the five northeast counties, they are over 11 percent heavier. Grain payloads average about 44 percent more than all truck payloads in Washington and 26 percent heavier in the northeast region. Grain truck payloads decrease by over 20 percent statewide in the spring, probably in response to road conditions and seasonal weight restrictions.

Incidence of Loaded Trucks

Truck traffic, whether from Canada or other locations, will obviously have a different impact on the roadway if it is not carrying a payload. The previous section detailed the average payload for those trucks that were not empty. If the vehicle was empty, it was excluded from the calculations. Overall, trucks were empty about 30 percent of the time during the survey (Table 5). While the percentage of empty trucks remained constant at 28 percent during fall, winter, and summer, during spring this percentage rose to 34 percent. There is a concurrent increase in total truck numbers in the spring season statewide. However, in the northeast region, the lowest traffic volume occurred in the spring (Table 6). This relationship held for Canadian-based trucks as well.

Table 3--Comparison of Average Payload (lbs.) for Grain Trucks, in Washington State and in the Five Northeastern Washington Counties, 1993-1994 Survey

Season	All Grain Trucks	NE Washington	% Difference
Fall	52,491	51,000	- 2.84
Winter	52,425	44,660	-14.81
Spring	41,000	-	-
Summer	54,200	-	-
Average	52,393	49,189	- 6.12

Table 4--Comparison of Average Payloads (lbs.), All Trucks versus Grain Trucks in Washington State and in the Five Northeastern Washington Counties, 1993-1994 Survey

Season	All Trucks	All Grain Trucks	% Difference	All NE Trucks	NE Grain Trucks	% Difference
Fall	34,571	52,491	+51.84	36,895	51,000	+38.23
Winter	35,401	52,425	+48.09	37,008	44,660	+20.68
Spring	40,850	41,000	+ .37	37,271	-	-
Summer	34,090	54,200	+59.00	44,113	-	-
Average	36,453	52,393	+43.73	39,037	49,189	+26.01

Table 5--Total number of Trucks and Number of Empty Trucks Operating in Washington, 1993-1994 Survey

Season	# of Trucks	# of Empty Trucks	% Empty
Fall	6,622	1,831	28
Winter	6,191	1,730	28
Spring	7,283	2,486	34
Summer	5,464	1,520	28
Average	25,560	7,577	30

The average percent of empty trucks in the five northeastern counties is slightly lower than the state as a whole at 24 percent. The highest incidence of empty trucks, about 28 percent, occurred during the spring season as it did statewide. Thus, little difference is evident between the northeastern region and the total state in terms of incidence of loaded trucks.

There is a substantial difference in percentage of loaded trucks between all trucks and Canadian-based trucks (Table 7). Canadian trucks operating in this state are loaded over 81 percent of the time, in contrast to 70 percent of all trucks. The same seasonal pattern is evident for Canadian trucks as for all trucks: the incidence of empty trucks is fairly constant throughout the year at 14 to 15 percent, then rises to 23 percent in spring. Canadian-based trucks operating in the northeast counties are also loaded far more often at 89 percent than the state as a whole at 83 percent (Table 8).

In summary, the northeast region has a higher percentage of loaded trucks at 76 percent than the state overall at 70 percent. Canadian trucks are more often loaded than all trucks in both the overall state at 89 percent and the northeast region at 83 percent.

Table 6--Number of Trucks Operating in Five Northeastern Counties and Incidence of Empty Trucks, 1993-1994 Washington Survey

Season	# of Trucks	# of Empty Trucks	% Empty
Fall	624	146	23
Winter	694	140	20
Spring	481	133	28
Summer	673	181	27
Average	2,472	600	24

Table 7--Number of Canadian-Based Trucks and Incidence of Empty Canadian-Based Trucks Operating in Washington State, 1993-1994 Survey

Season	# of Canadian Trucks	# of Empty Canadian Trucks	% Empty
Fall	544	76	14
Winter	507	78	15
Spring	619	140	23
Summer	548	79	14
Average	2,218	373	17

Table 8--Number of Canadian-Based Trucks and Incidences of Empty Canadian-Based Trucks Operating in the Five Northeastern Counties, 1993-1994 Survey

Season	# of Canadian Trucks	# of Empty Canadian Trucks	% Empty
Fall	15	2	13
Winter	27	2	7
Spring	15	2	13
Summer	23	3	13
Average	80	9	11

Final Thoughts

The statewide origin and destination study resulted in an extensive database detailing the characteristics of truck movements throughout the state. Examination of these data reveals that trucks in the northeast region carry heavier payloads and are less likely to be empty than the overall state average. Grain payloads are significantly higher (44 percent) than other trucks in the state (26 percent in the northeastern five counties). Canadian-based trucks are 4.4 percent heavier than the overall state average and 11 percent heavier than the northeastern region average. Furthermore, Canadian-based trucks are less likely to be empty than U.S. vehicles. These results indicate the increased pressure being put on the highway system by Canadian trucks and by those trucks carrying grain, especially in the northeast region of Washington.