VALUE OF TIME FOR COMMERCIAL VEHICLE OPERATORS IN MINNESOTA

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Abstract

The spring load restriction policy of Minnesota has been in effect for over 50 years with no consideration given to the cost that it imposes on the freight industry. A cost-benefit study was recently commissioned to examine the policy's necessity. The cost-benefit analysis required a precise estimate of the value of time for commercial vehicle operators in Minnesota.

An estimate was not available from previous studies, or from previous data. The necessary revealed preference (RP) information does not exist, and relevance of previous studies was questioned based on the differences in geographic location and the age of data used to construct the estimates. A sample was constructed from several trucking industry sources to conduct a survey. Interviews were conducted using an adaptive stated preference (ASP) survey to derive an estimate to the nearest dollar.

A tobit model was fit to the data from the interviews to derive the estimate for value of time. A mean of $49.42 was found, with a 95% confidence interval from $40.45 to $58.39. Variation in the distribution of values is largely undetermined, with the exception of fleet operation, whether it is a for-hire truck fleet, or a private truck fleet.

The current state of the art in using stated preference (SP) methods to evaluate the value of time uses a fee structure in exchange for time savings, in most cases a toll. It has been shown that SP methods typically underestimate the true value of time. The use of a fee structure fails to account for those subjects that avoid paying additional fees for a public good that they may feel they pay for in the form of taxes. The fine structure included in this

analysis accounts for these subjects and provides a greater estimate for value of time compared to previous studies.

1. Introduction

This study on the value of time for commercial vehicle operators in Minnesota is part of a larger investigation analyzing the cost-benefit of the spring load restriction policy in Minnesota. The spring load restriction policy, also known as seasonal load restrictions or SLR, was enacted in Minnesota in 1937 (Minnesota Statute 169.87) to protect the large public investment in roadway facilities. In cold regions, pavement strength varies with seasonal change. The spring thaw introduces a saturated condition in the soil under the pavement; under this condition the load bearing capacity of the roadway is reduced and heavy trucks driving on this roadway can cause additional damage.

The SLR policy seeks to reduce this damage and extend the life of pavements by restricting the weights of commercial vehicles during the spring season. The restrictions impose costs on commercial vehicle operators while benefiting society by extending the pavement life. The aim of the large scale study is to quantify these costs and benefits in economic terms.

One part of the study must quantify the cost of maintaining the roadways to a suitable level. The changes in these costs with the imposition of SLR represent the benefit to the road building and maintaining agency by extending the useful life of the road.

A related part of the study, the cost to commercial operators has been given little attention in research despite the transportation industry in the United States accounting for 3.1 percent of the Gross Domestic Product in 1997, with trucking alone accounting for 1.2 percent of the GDP (U.S. Department of Commerce, Bureau of Economic Analysis, 2001). When the trucking industry is viewed in terms of commodity flows, its share of the transportation industry increases greatly to 71.7 percent of the value hauled in 1997, 69.4 percent of the tonnage, and 38.5 percent of the ton-kilometers (U.S. Department of Transportation, Bureau of Transportation Statistics and U.S. Department of Commerce, Census Bureau, 1999). Any cost imposed on trucking greatly impacts the entire economy.

The cost of SLR on commercial vehicle operators is assumed to be the consequence of alternate behavior resulting from the imposition of the restrictions. This alternate behavior can be summarized as any of the following options: shift the seasonal timing of shipments, reduce load size per vehicle, change vehicle type, or change routes. All these behaviors add costs to the operation of commercial vehicles.

The first part of quantifying the cost of the SLR policy to the freight industry is determining the additional distance and time. This requires a precise freight demand model to examine changes in flows between the period in which SLR is in place and the rest of the year. The change, additional kilometers driven and additional time taken, will then need to be analyzed to determine the total social cost on the industry.

A cost per kilometer or value of time is needed to perform the analysis on the change in freight flows in order to determine the actual cost. In order to obtain a meaningful estimate of the value of time for commercial vehicle operators in Minnesota new research needed to be undertaken. The body of this paper illustrates how this analysis was done, outlines the theory supporting it, and provides an estimate to be used in the cost benefit analysis.

This paper is organized in four sections. The second section provides an overview of the theory that was used as a building block for the analysis. It details the methodology used in the interview and surveying process. The third section presents the results of the interviews. The fourth section explains the variation in results. Finally, the conclusion will provide a summary of the findings, their relation to the cost-benefit study, and a discussion of further analysis.

2. Methodology

The value of time for vehicles has been evaluated for over 40 years, since it was noted to be an important part of economic analysis in transport planning (Bruzelius, 1979). Haning and McFarland (1963) published one of the first reports estimating the value of time for commercial vehicles. They evaluated time savings through the net operating profit approach. This approach makes the assumption that business oriented travel time saved is used for productive purposes, whereas personal travel time saved may be used for productive purposes or leisure activity. Thus commercial vehicle value of time should be greater even when no cargo is being carried. Their methodology fixed most vehicle and labor costs so that with improved speeds, a vehicle will be able to travel farther in the same time and contribute more profit. The difference was the value of time savings.

Adkins, Ward, and McFarland (1967) used a cost savings model to estimate the value of time for commercial vehicles, which is "based on a reduction of those costs that are not variable with miles of operation." They also reviewed two additional methods of estimation: the cost-of-time method in which the value of time is "derived by determining the cost of providing time savings" for a specific project, and the willingness to pay method in which "individuals are faced with a decision between time savings and other benefits." A summary of some of the past results is provided in Table 1, adapted from Kawamura (1999). The Consumer Price Index was used to adjust the figures to reflect 2003 prices.

Several papers have used willingness to pay methods in Europe over the last decade (Bergkvist, 2000) (Nerhagen, 2001) (Wynter, 1995). They used revealed preference and stated preference methods to derive choice data. Revealed preference (RP) refers to preferences observed in actual market situations. Stated preference (SP) refers to preferences recorded in hypothetical situations. Economists typically are reluctant to rely on stated consumer preference compared with observing actual consumer behavior, but in many situations the choice for researchers is to take consumers at their word or do nothing (Louviere, Hensher, and Swait, 2000).

In the case of this cost-benefit analysis of SLR, we have very little available market choice data in instances where we could derive proper demand equations and estimate a value of time. We are limited to the use of SP methods, from which one can apply econometric models to estimate the value of time from the stated choices of commercial truckers.

SP methods have several benefits over RP methods. Louviere, et al. (2000) state how SP surveys can be designed to control for outside influences whereas data from RP methods sometimes cannot satisfy model assumptions, thus observed relationships cannot provide reliable and valid inferences. SP data are often less expensive to collect. SP methods are used widely in marketing studies to explain preference for items that are not in the actual marketplace. SP can introduce variability in explanatory variables to estimate preference where little variation exists in the marketplace.

A sample of commercial vehicle operators is necessary to conduct an analysis on their value of time. The sample of the population for this analysis was constructed from many sources: Minnesota Department of Transportation (Mn/DOT) Freight Facilities Database, Mn/DOT filed insurance list, Mn/DOT overweight permit list, Minnesota Trucking Association (MTA) board of directors, and firms identified by an independent survey of city and county engineers throughout the state. The Freight Facilities Database consists of 7,968 origins and destinations for freight flows in the State of Minnesota. Initially, the sample consisted of 1,766 of these entries, and all 34 MTA board members, for a total of 1,800. The sample was added to as additional sources became available, and included all new information from the other two Mn/DOT lists and the city and county engineer results to bring the total sample to 2,523.

A survey was initially constructed and mailed to the sample to gather general information on the companies, the effects of SLR on their operations, and their willingness to participate in an interview. The long form survey consisted of 19 questions, a short form of 7 of those same questions was also sent to test the difference in response rates. It was expected that the long form would have a smaller response rate than the shorter survey. They were mailed out over the spring of 2003. An interview was chosen for the SP component rather than telephone and mailed methods because the interviewer can be available for clarifying and follow-up questions, allowing the subject to gain a clearer grasp of the scenarios presented and their trade-offs (Kawamura, 1999).

The hoped for response rate for the survey was about 10 percent, of which 50 percent were expected to be willing to be interviewed. Of those who were willing to be interviewed, it was anticipated that about 50 percent could actually be scheduled and carried out, which would have yielded a final interview sample size of about 50 companies. This would minimize interview costs while providing a statistically significant sample. The response rate exceeded expectations as shown in the final column of Table 2.

Of the 441 good responses from the mailed survey, 50.9 percent were willing to be interviewed. It was decided for the freight demand modeling component of the cost-benefit analysis of SLR that four counties would be modeled and the results extrapolated for the final analysis. Four Minnesota counties: Olmsted, Lyon, St. Louis, and Clay, were chosen based on available data and geographic location. These four counties are located at different extremes in the state and represent a different mix of commodity flows representative of their respective locations. To remain consistent, the interviews were to be conducted in these same counties. Only 40 candidates were willing to be interviewed from these four counties, so the sample area was increased to include neighboring counties. A pilot study was conducted in Hennepin County because of its close proximity to the University of Minnesota and to include some metropolitan data. In all, interviews were conducted in twelve different counties during July and August of 2003 (see Figure 1).

The SP experiment used stated choice as the framework. Several options are available in designing a SP survey. Preferences can be reported as rankings, or choices between two or more options, or as ratings of each individual option. Stated choice was chosen for this experiment because ranking and rating of alternatives seems to be an unusual activity in transportation (Kawamura, 1999). Also, discrete choice data has been shown to be less sensitive to bias when compared with other methods such as rating and ranking (Wynter, 1995). The options are described by attributes set to particular levels. "It is usual, because it provides useful data, to choose attribute levels such that alternatives do not dominate each other, i.e. are not better in all respects. Instead, trade-offs are built into the experiment, where respondents are given more of one good (or less of a bad) in return for less of another good (or more of a bad)" (Fowkes, 2001).

The chosen design for our analysis employed adaptive stated preference (ASP) methodology. ASP surveys differ from conventional SP surveys in four major ways: options presented in subsequent games depend on the answers recorded in previous games, fewer alternatives and attributes are presented in individual games, the subject is often presented with more games, it is possible to obtain estimates of parameters at the individual level (Richardson, 2002). The last reason is the most important reason this methodology was chosen, value of time is estimated at the disaggregate level.

Our design of the commercial vehicle survey included the often utilized permit schemes of Mn/DOT and several municipalities as an attribute, in addition to time per truckload, total truck loads, and the expected value of the fine. The adaptive technique presented one no cost option and one cost option in exchange for time or truck load savings. There were five scenarios, each with six games: one trading a reduction in time per truck load for a single use permit, one trading a reduction in total truck loads for a single use permit, one trading a reduction in total truck loads for a seasonal permit, one trading a reduction in time per truck load for an expected value of fine, and one trading a reduction in total truck loads for an expected value of fine.

The interviews were conducted in person and the survey was administered on a laptop computer. A computer program running through a Microsoft Access database was used to alter values in the separate presentations. The computer program used bisection techniques to focus on each subject’s maximum willingness to pay. It started at a midpoint of an appropriate range and increased or decreased the cost attribute by half depending on the alternative chosen by the subject. This process continued until a reasonable amount of precision was reached; in this case we were looking for values to the nearest $1 or $2. A reasonable starting point should be two to three times the final mean (Richardson, 2002). The average values in previous studies indicated that the starting point should be around $50, instead $40 was chosen for its meaningful integer values when bisected up to the 4th iteration. This makes the range of possible values of time from $1.25 up to $77.75 for the six iterations. The full range is $0 to $80, but these values represent the limits to which infinite iterations would be bound.

The range was tested for validity in the pilot study, along with the language of the instructions, SP and interview questions, as well as SP format and database functionality. The average value given was $19.74, the minimum was $0, the maximum was $45.00, and the average of the maximums was $33.33. These values confirmed that the chosen anchor and maximum points were sufficient, and all bugs in the operation of the database and all misinterpretations of instructions were eliminated prior to travel to the four study areas.

Extraction of value of time estimates from SP data can be obtained with two different methods, switching point analysis and statistical analysis. Switching point analysis estimates the value of time from the level of trade-off where the choices switch from the cost option to the free option (Kawamura, 1999). An example would be a traveler who chooses to pay a toll for a given amount of time savings on all options up to $5, but then chooses the alternate route without a toll for all tolls presented over $5. The switching point for this individual is $5, and this would be an estimate of that traveler's value of time.

The logit model has been widely used to estimate the value of time from discrete choice data. It assumes that the error terms are Gumbel distributed. Using the logit model for aggregate estimation yields utility coefficients that reflect average behavior. If the objective of the analysis is to measure differences in coefficient values across individuals, aggregate estimation is contradictory (Kawamura, 1999). Various suggestions have been presented to handle this problem including introducing socioeconomic variables, relaxing assumptions, or segmenting the data. Fowkes (2001) suggests fitting individual models for each respondent. Further analysis can be conducted by aggregating the fitted disaggregate models.

In cases of truncated data, data that has lower and/or upper limiting values, there may be a number of responses that take on the limiting value. In this situation, logit analysis would be inappropriate. Probit analysis would provide a suitable model of the probability of responses taking on the limiting value, and regression analysis would be appropriate for the non-limited values. James Tobin (1958) proposed a model that is a hybrid of these two techniques for cases of truncated data.

3. Results

Presentation one measured the preference for saving truck loads for a particular shipment versus time per truck load for that same shipment. The mean final value of truck loads and time per truckload were near the midpoint of the analysis, thus no clear indication of preference for time savings or truckload savings was indicated. For the logit analysis, the estimates from the two scenarios of truck load savings and time per truck load savings will be based on the product of the two, the total time savings.

The results of the switching point analysis yielded an overall mean of $24.10 (see Table 3). The values presented are descriptive statistics based on the greatest value of the non-free alternative that the respondent chose in the ASP survey.

The second presentation, time savings in exchange for a single use permit, has the greatest switching point mean of $36.70. The lowest mean corresponds to the seasonal permit scenario, followed closely by the fine scenarios. The mean of all the presentations for all 50 survey participants is $24.10. This is in line with the past studies' estimates of the value of time (see Table 1).

Typically in value of time analysis, the mean of the switching points is referred to as the estimate of the value of time. Most SP surveys have a similar structure as was used in presentation two where time is saved as a result of paying a fee, in most cases a toll, but in this case, a single use permit. Brownstone et al. (2003) have noted that SP studies generally yield lower values than RP studies. Avoidance of paying additional fees for a public good that people believe they already pay enough for in the form of taxes may be the reason behind this underestimate. Some respondents noted that they would not purchase permits, but were more willing to pay fines to save time. Using only permits to estimate value of time would not capture this group of respondents' actual willingness to pay. The maximum switching points for each respondent would take into account those who are unwilling to pay additional fees, but still have a willingness to pay in other scenarios. The mean of those maximum switching points is $46.78 (see Table 3). The use of this value is likely to represent a varied samples' maximum willingness to pay and therefore more accurately estimate the value of time.

One problem that was encountered in this analysis is that some cases were bounded by the survey instrument's computer program that adaptively adjusted the values of the fines and permits based on previous answers. The program was bounded at $0 so that no one would receive payment for time savings. The expectation was that no individual value of time would exceed $78.75 per hour throughout the experiment; this was confirmed during the pilot study. However, eight subjects reached the maximum willingness to pay during at least one presentation. Two options are available when working with bounded data: either throw out the bounded cases due to the fact that they violate the homogeneity assumption for the data, or use all the data with a model that accounts for limited cases. A tobit model accounts for limited cases; this model will be fit to the data in a later section.

The estimate for value of time with the bounded cases eliminated reduced the previous estimate by $4.06 to $42.72 (see Table 4). The two lower bounded cases and the eight upper bounded cases were eliminated, leaving 40 for the analysis.

The results for the logit model when analyzed at the extreme disaggregate level of each presentation for each subject are equivalent to the switching point analysis.

Choice = a + ?(Cost Difference) + ?(Time Difference) (1)

If the data are aggregated to the individual level, the results are roughly equivalent to the mean over presentations for the switching point analysis as shown in Table 5. One difference is that the mean goes up by eliminating the bounding cases, whereas the mean goes down in the switching point analysis. These results should not be given much consideration because only three out of 40 individuals had significant coefficients for time and cost at the 95 percent confidence interval. This is consistent with previous research (Lam & Small, 2001) (Louviere et. al., 2000). Aggregating the data at the presentation level will result in large differences in value of time estimates (see Table 6). Logit analysis must be done at the disaggregate level, and in this case the results are equivalent to those presented in the switching point analysis section.

The main problem with the previous analysis is the limited cases. The tobit model can be fitted to truncated data without eliminating cases. It provides additional information, and thus will provide a better estimate of the value of time in this analysis. The tobit model used in this analysis uses the maximum switching point as the dependent variable with a constant as the independent variable and an upper limit of $78.75. The estimate for the independent variable parameter is $49.42 using all 50 cases. The estimate is statistically significant with a *t*-statistic of 11.07.

The best result from these data to be used as an estimate of the commercial vehicle operator's value of time is $49.42. It accounts for people's aversion to paying for something that they feel they have already paid for by including fine scenarios and choosing the maximum from all presentations. It also uses all data collected in the derivation of the estimate.

A check for this estimate of value of time would be to take the stated cost per kilometer reported by the subjects and multiply that by a reasonable estimate of kilometers per hour. The average stated cost per kilometer for the subjects is $0.65. From the interviews, 80 kilometers per hour was considered a reasonable expectation for the speed of trucks. The product comes out to be $52.36, which is in line with the estimate from the tobit analysis.

4. Variation

One aim of this study was to not only provide an accurate estimate for commercial vehicle operator's value of time in Minnesota, but also to account for the variation in value of time. The distribution of recorded values of time is a very flat distribution with variance exceeding the mean exponentially. The mailed survey recorded many operational and economic details of each firm so that they could be used in further analysis as independent variables to test for a statistically significant relationship.

Kawamura (1999) showed that the value of time varies at a significant level based on the operation of the trucking firm, whether it is has a private or for-hire truck fleet. Using the tobit model, we test this hypothesis. The indicator variable for firms with private fleets was significant at the 90 percent level. The results are consistent with Kawamura's findings that firms with private fleets have a considerably lower value of time (see Table 7).

The freight facility database has records organized by facility type (see Table 8). We test the hypothesis that for-hire fleets have a higher value of time, and our results are consistent with previous results. Three facility types are significant at the 90 percent level, with two more being almost significant.

Most variables, especially continuous variables, failed to account for the variation in value of time estimates across individuals. This is consistent with the literature; only Kawamura's (1999) study has postulated and provided evidence for an explanatory variable or variables.

5. Conclusion

The value of time for commercial vehicle operators needed to be determined in order to conduct a cost-benefit study of the spring load restriction policy in Minnesota. SLR policies have been in place for over 50 years across the globe, and little research has been done on the cost that the policy places on the users.

Stated preference methods were determined to be the best choice to conduct the analysis on value of time. A population sample was extracted from several Minnesota Department of Transportation sources, the Minnesota Trucking Association, and the results of a city/county engineer survey. The final survey design presented 30 games of two alternatives to subjects. One alternative provided time savings for a cost, while the other provided no time savings for zero cost. Each game was adapted based on the previous game, to zero in on a precise value of time.

Five sets of games were used to estimate the value of time with different time saving scenarios. Two used single use permits in exchange for either truck load savings or time savings per truck load. One scenario used seasonal permits for truck load savings, and two scenarios used fines instead of single use permits. The five different scenarios accommodated each subject’s preference for either fines or permits. The maximum value over all presentations more accurately represents the subject’s maximum willingness to pay.

The games were bounded by ‘reasonable’ estimates of the value of time, and during the course of the analysis several subjects reached the upper limit of the survey. The best model for truncated data of this type is the tobit model. The model provided an estimate for the average commercial vehicle value of time in Minnesota of $49.42. This result is very similar to the median of the maximum of presentations of $48.75 using switching point analysis with bounded cases eliminated. Comparisons between for-hire firms and those with private fleets indicated that for-hire firms have a considerably higher value of time.

The primary limitation in the analysis of the value of time is the lack of RP data, which led to the use of SP methods. In the absence of economic data derived from observed behavior, researchers are left with taking consumers at their word. It has been shown that SP methods routinely underestimate value of time, but most of the underestimate should be accounted for by using many different scenarios and taking the maximum of the presentations as the maximum willingness to pay for each subject.

The truncation of the data provided some limitations in the modeling that could be done in order to extract the estimate for the value of time. The truncation could account for the data not following the expected log-normal distribution.

The small sample size limited the number of variables that could be used to explain the variance in value of time. The budget and time horizon for the study limited the sample size when interviews were used to conduct the analysis, but it was felt that the quality of the data from interviews overcame this limitation.

Previous SP surveys estimate the value of time using trade-offs that involve fee scenarios, which many respondents in this analysis indicated an aversion to. Considering the maximum of fines versus fees provides a new way of looking at the question. Further research is needed to corroborate SP estimates with existing RP data. Little RP value of time data exist in the field of commercial trucking, but the analysis should be done where both sets of data are obtainable.

Future freight value of time analysis using the ASP technique should increase the upper bound to eliminate the truncation problem that was encountered. A reasonable upper limit would be $160; this would still possess all the attractive properties that $80 had for meaningful integer values when bisected repeatedly.

The pavement impacts and resulting damage during the spring period under regular loading represent the cost to the public agency of not having a SLR policy. This is equivalent to the maximum benefit to that same agency by having a SLR policy in place.

The additional time for road users as a result of compliance with the SLR policy is an indication of the cost to those road users. In order to quantify that additional time, a proper estimate for the value of time is necessary. The estimate for commercial vehicle value of time in Minnesota will be used following the estimation of the additional time required for 100 percent compliance. This result is equivalent to the maximum cost to road users. The actual cost-benefit for the policy falls between these maximum values depending upon the actual level of compliance.

Tables and Figures

Table 1 Summary of Previous Value of Time Studies

Authors	Year of Publication	Focus	Location	Adjusted to 2003	Average
Haning and McFarland	1963	Truck Operators		$19.57 to $25.42	$22.50
Waters et al.	1995	Truck Operators		$6.86 to $38.92	$22.89
Kawamura	1998	Truck Operators		$30.14	$30.14
Brownstone et al.	2002	Autombiles	San Diego, CA	$30.58	$30.58
Small and Yan	2001	Autombiles	California	$21.36	$21.36
Adkins et al.	1967	Cargo Vehicles		$25.81	$25.81
				Overall Average	$25.55
				Standard Deviation	$4.01

Table 2 Response Rates for Mailed Survey

	Count	Total Returned	Return Rate	Bad Addresses	Bad Address Rate	Actual Responses	Actual Response Rate	Actual Response Rate (Adjusted)
				Response Rate By Survey Group				
MTA February 2003 - Pre SLR, Long Form	34	12	35.3%	0	0.0%	12	35.3%	35.3%
FF March 3 2003 - Pre SLR, Long Form	165	45	27.3%	27	16.4%	18	10.9%	13.0%
FF March 3 2003 - Pre SLR, Short Form	200	76	38.0%	31	15.5%	45	22.5%	26.6%
FF March 6 2003 - Pre SLR, Long Form	51	24	47.1%	12	23.5%	12	23.5%	30.8%
FF March 6 2003 - Pre SLR, Short Form	50	27	54.0%	4	8.0%	23	46.0%	50.0%
FF March 10 2003 - Pre SLR, Long Form	50	24	48.0%	6	12.0%	18	36.0%	40.9%
FF March 10 2003 - Pre SLR, Short Form	50	23	46.0%	11	22.0%	12	24.0%	30.8%
FF March 21 2003 - SLR, Long Form	300	79	26.3%	39	13.0%	40	13.3%	15.3%
FF March 21 2003 - SLR, Short Form	300	103	34.3%	51	17.0%	52	17.3%	20.9%
Mn/DOT April 4 2003 - SLR, Long Form	459	104	22.7%	53	11.5%	51	11.1%	12.6%
FF May 23 2003 - Post SLR, Long Form	300	98	32.7%	56	18.7%	42	14.0%	17.2%
FF May 23 2003 - Post SLR, Short Form	300	96	32.0%	39	13.0%	57	19.0%	21.8%
CC June 5 2003 - Post SLR, Long Form	264	77	29.2%	18	6.8%	59	22.3%	24.0%
	2523	788	31.2%	347	13.8%	441	17.5%	20.3%

Note: MTA refers to Minnesota Trucking Association as the mailing list source, FF refers to the Mn/DOT Freight Facilities database as the source, Mn/DOT refers to the filed insurance and overweight permit lists as the source, and CC refers to the city/county engineer surveys as the source. The dates listed represent the date mailed. Total returned consists of all surveys returned, regardless of reason. Bad addresses are surveys that were returned to sender. Actual responses are the difference of total returned and bad addresses. The actual response rate uses the mailed count as the denominator, and adjusted uses the mailed count less the bad addresses.

Table 3 Switching Point Analysis

	P1: Trucks	P1: Time (min.)	P2: Permit, Time Savings Per Truck Load ($)	P3: Permit, Total Truck Load Savings ($)	P4: Seasonal Permit, Total Truck Load Savings ($)	P4/40: Seasonal Adjusted to Single Savings ($)	P5: Fine, Time Savings Per Truck Load ($)	P6: Fine, Total Truck Load Savings ($)	Mean ($)	Max P ($)
Mean	5.82	176.61	36.70	30.23	653.41	16.34	19.50	17.35	24.10	46.78
Median	5.00	176.00	38.75	13.75	300.00	7.50	3.75	1.88	10.00	48.75
Mode	4.00	120.00	0.00	0.00	0.00	0.00	0.00	0.00		
Max	8.00	240.00	78.75	78.75	3,150.00	78.75	78.75	78.75		
Min	4.00	120.00	0.00	0.00	0.00	0.00	0.00	0.00		
Standard Deviation	1.85	55.44	28.10	30.34	857.82	21.45	27.86	25.88	27.98	27.07

Notes:

- *P refers to presentation*
- *P2 is a scenario where there is a trade-off between an hour of time savings for each truck with a single use permit versus no time savings for zero cost.*
- *P3 is a scenario where there is a trade-off between a savings of one truck load with a single use permit versus no truck load savings for zero cost.*
- *P4 is a scenario where there is a trade-off of having to run fewer truck loads over the SLR period for the cost of a seasonal permit, or more truck loads for the same amount of product for zero cost.*
- *P4/40 adjusts the 40 hours of time savings to one hour.*
- *P5 is similar to the second presentation except in this case, fines are used instead of single use permits.*
- *P6 is the same as P3, except that fines were used in the place of single use permits. The second set of data presented in this table averages the two single use permit scenarios and the two fine scenarios.*

Table 4 Switching Point Analysis - Bounded Cases Eliminated

	P1: Trucks	P1: Time (min.)	P2: Permit, Time Savings Per Truck Load ($)	P3: Permit, Total Truck Load Savings ($)	P4: Seasonal Permit, Total Truck Load Savings ($)	P4/40: Seasonal Adjusted to Single Savings ($)	P5: Fine, Time Savings Per Truck Load ($)	P6: Fine, Total Truck Load Savings ($)	Mean ($)	Max P ($)
Mean	5.50	184.09	$34.81	$26.44	$605.88	$15.15	$15.44	$13.56	$21.22	$42.72
Median	4.50	192.00	$36.25	$10.63	$325.00	$8.13	$2.50	$1.88	$10.00	$48.75
Mode	4.00	240.00	$5.00	$0.00	$0.00	$0.00	$0.00	$0.00		
Max	8.00	240.00	$77.50	$77.50	$2,800.00	$70.00	$70.00	$70.00		
Min	4.00	120.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		
lard Devi	1.76	54.93	$25.85	$26.89	$792.75	$19.82	$23.31	$20.00	$24.67	$24.12

Notes:

- *P refers to presentation*

- *P2 is a scenario where there is a trade-off between an hour of time savings for each truck with a single use permit versus no time savings for zero cost.*
- *P3 is a scenario where there is a trade-off between a savings of one truck load with a single use permit versus no truck load savings for zero cost.*
- *P4 is a scenario where there is a trade-off of having to run fewer truck loads over the SLR period for the cost of a seasonal permit, or more truck loads for the same amount of product for zero cost.*
- *P4/40 adjusts the 40 hours of time savings to one hour.*
- *P5 is similar to the second presentation except in this case, fines are used instead of single use permits.*
- *P6 is the same as P3, except that fines were used in the place of single use permits. The second set of data presented in this table averages the two single use permit scenarios and the two fine scenarios.*

Table 5 Logit Results - Individual

	All Cases ($)	Bounded Cases Eliminated ($)
Mean	24.92	26.58
Median	14.70	14.80
Mode		
Max	85.33	85.33
Min	0.46	1.89
Standard Deviation	23.60	24.19

Table 6 Logit Results - By Presentation - Bounded Cases Eliminated

Presentation	totaldtime	dmoney	dT/dC	VOT ($)	Significant
2	1	0.0106	93.9	93.92	
3	1	0.0116	86.3	86.34	
4	1	-0.0002	-115.7	115.74	
5	1	0.0177	56.5	56.48	*
6	1	0.0148	67.7	67.69	
Mean				84.04	
Median				86.34	
Mode					
Max				115.74	
Min				56.48	
Standard Deviation				23.10	

Table 7 Tobit Model - Private vs. For-Hire

	Estimate	Standard Error	t-statistic	P-value	95% Confidence Interval	
Constant	59.5962	6.715904	8.87	0	46.10009	73.09232
Private	-17.23666	8.641082	-1.99	0.052	-34.60156	0.1282455

Table 8 Tobit Model - By Freight Facility Type

	Estimate	Standard Error	t-statistic	P-value	95% Confidence Interval	
Constant	78.09	16.04	4.87	0	45.77	110.42
Ag Chem	-56.43	21.98	-2.57	0.014	-100.72	-12.13
Grain	-34.80	20.03	-1.74	0.089	-75.18	5.57
Manufacturing	-34.34	20.65	-1.66	0.103	-75.97	7.28
For-Hire Trucking	-19.79	16.82	-1.18	0.246	-53.68	14.11
Waste	-50.59	30.57	-1.65	0.105	-112.21	11.02
Wholesale	-54.52	18.81	-2.9	0.006	-92.44	-16.60

Note: Ag Chem refers to Agriculture Chemical Distribution Centers

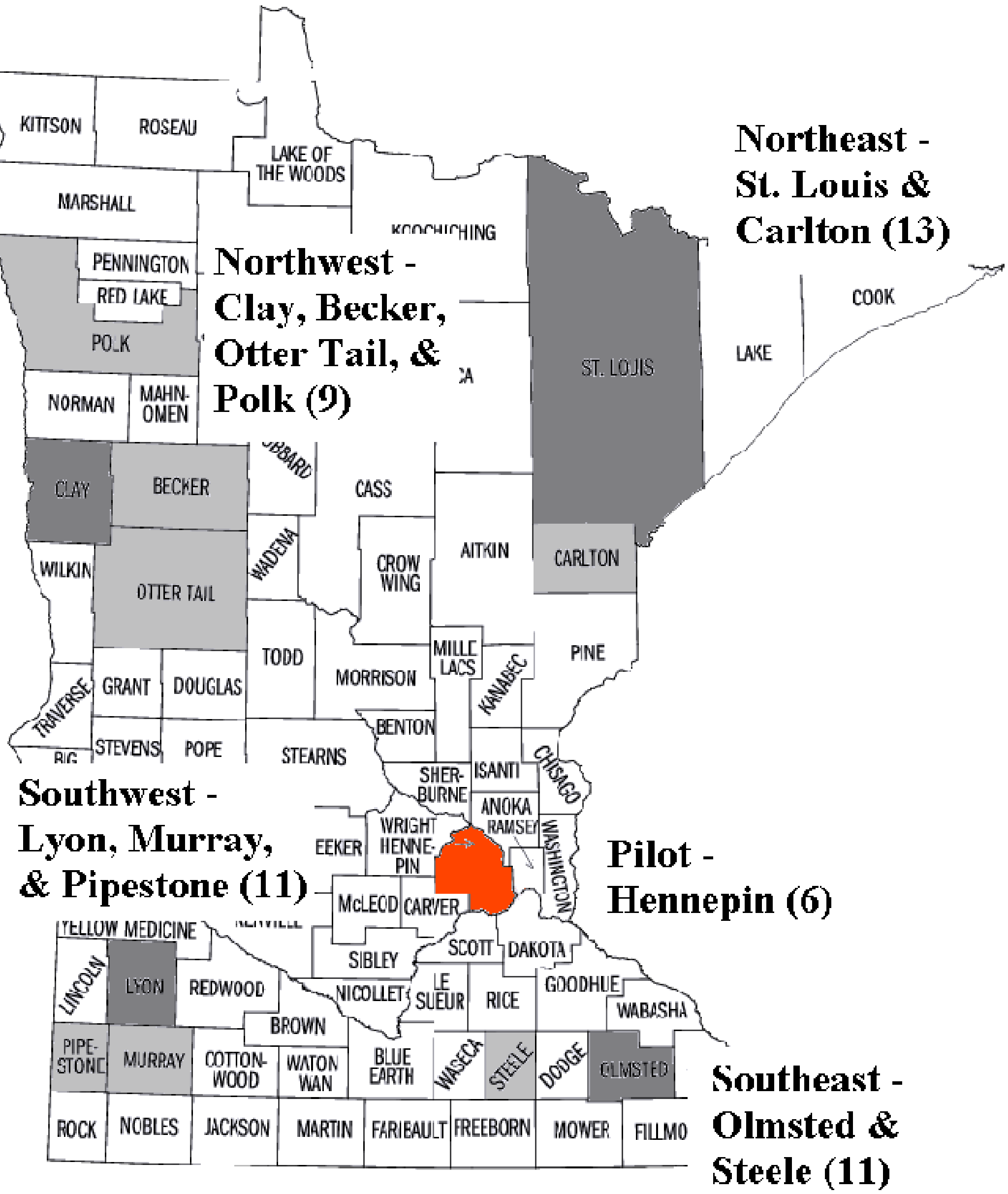

Figure 1 Interview Locations

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