

# **The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2003**



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## Executive Summary

Changes to the transportation system or transportation policies have the potential to affect travel-time and related costs. The purpose of this paper is to provide estimated values of travel-time for vehicles driving on Oregon roads.

User costs associated with travel are typically grouped into three primary types: travel-time costs, vehicle operating costs, and safety costs. Only one of the three primary transportation user cost categories is presented here: costs associated with travel-time.

Some travel-time estimates include vehicle operating costs as a component of the time value estimate. This paper considers costs associated with time as separate from vehicle operating costs. Costs associated with travel-time include on-the-job time: employers' cost of employees traveling; and personal time: the opportunity cost of time spent traveling – time that could be spent doing something else.

The United States Department of Transportation (USDOT), the Oregon Department of Transportation (ODOT), and local governments have used a number of different estimates of the value of travel-time. Differences among these estimates exist because the value of travel-time depends on the:

- type of vehicle
- vehicle occupancy
- purpose of the trip
- costs included or excluded when building the estimates
- underlying assumptions regarding input data
- availability of detailed data

The value of one hour of vehicle travel-time is estimated for three vehicle categories using Oregon wage data. The estimates are presented in Table 1. When using these estimates to make regulatory or investment decisions, a range of estimates of the value of travel-time should be used for sensitivity analyses. USDOT guidelines for plausible ranges are presented at the end of this paper.

**Table 1. Estimated Value of One Hour of Travel-Time  
by Vehicle Class, Oregon 2003**

<b>Vehicle Class</b>	<b>Average Value</b>
Automobiles	\$15.31
Light Trucks	\$19.53
Heavy Trucks	\$30.43

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# The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2003

## Introduction

Changes to the transportation system or transportation policies have the potential to affect travel-time and related costs. The purpose of this paper is to provide estimates of the value of travel-time for vehicles driving in Oregon. This paper is an updated version of a paper written in 2001.<sup>1</sup>

User costs associated with travel are typically grouped into three primary types: travel-time costs, vehicle operating costs, and safety costs.<sup>2</sup> Only one of the three primary transportation user cost categories is presented here: costs associated with travel-time.

Some travel-time estimates include vehicle operating costs as a component of the time value estimate. This paper considers costs associated with time as separate from vehicle operating costs.

Costs associated with travel-time fall within one of two categories, on-the-job or off-the-job (personal). Costs associated with on-the-job travel-time include employers' costs such as wages and fringe benefits and in some instances the time value of the average payload. For driving outside of work hours, travel-time costs include the opportunity cost of peoples' time spent driving – time that could be spent doing something else.

Some analyses using value of travel-time estimates may be sensitive to the magnitude of the values. The United States Department of Transportation (USDOT) guidelines suggest using a range of plausible values to test the sensitivity of economic evaluations and conclusions. Plausible ranges identified by the USDOT for values of travel-time per person hour are included in this paper.

## Variation in Estimates

National estimates of the value of travel-time vary from under \$10 per hour to over \$100 per hour. Studies within the Oregon Department of Transportation (ODOT) have used a variety of estimates for the value of travel-time as well. Such differences exist because estimates of the value of travel-time depend on the:

- type of vehicle
- vehicle occupancy
- trip purpose

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<sup>1</sup> “*The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon, 2000*” Policy Section, Transportation Development Division, Oregon Department of Transportation, November 2001.

<sup>2</sup> In addition, there are also agency costs, capital improvement costs, and external costs associated with use of the transportation system. External costs borne by users and non-users alike include: air, water, and noise pollution, land use, property value, and aesthetic impacts.

- costs included and excluded when building the estimates
- availability of detailed data
- underlying assumptions

Detail on underlying assumptions, sources, and calculations used for the estimates of the 2003 hourly value of time for vehicles in Oregon are provided in the text and footnotes of this document.

## **Oregon Value of Travel-Time Estimates**

Oregon wage data is used in conjunction with national trend data to build value of travel-time estimates for three vehicle categories. The methodology used in this paper is based on work done by the Federal Highway Administration in the Highway Economic Requirements System (HERS).<sup>3</sup> The estimates are followed by a discussion of the sensitivity of the estimates to different variables and the use of ranges of values as recommended by USDOT.

### **Wages & Total Compensation**

The value of travel-time is conventionally based on either wages or total compensation.<sup>4</sup> The value of on-the-job time is a reflection of the total cost of the employee's time to the employer and so is a function of total compensation. Valuation of off-the-job (personal) time reflects the opportunity cost of time spent traveling vs. time that could be spent doing something else and is typically expressed as a fraction of wages exclusive of benefits.<sup>5</sup>

Wage information used in these estimates comes from the Oregon Employment Department.<sup>6</sup> Benefits for auto drivers are estimated to be 28.4 percent of total compensation, compared to 35.7 percent of total compensation for light and heavy truck drivers.<sup>7</sup> The estimated average value of total compensation in Oregon for a single person in 2003 (by vehicle type) is listed on line 3 of Table 2.

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<sup>3</sup> "Highway Economic Requirements System - State Version, Technical Report" U.S. Department of Transportation, Federal Highway Administration, 2002.

<sup>4</sup> Total compensation includes wages, fringe benefits (insurance, vacation, holidays, sick leave, other paid leave, etc.) and legally required benefits (unemployment insurance, Social Security, workers' compensation, etc.).

<sup>5</sup> The fractional values are the result of literature surveys conducted for HERS.

<sup>6</sup> The statewide average wage used for autos was taken from "Oregon Covered Employment and Wages" for the first and second quarters of 2003, provided by Oregon Employment Department's OLMIS web site [Hhttp://www.qualityinfo.org/olmisj/CEPH](http://www.qualityinfo.org/olmisj/CEPH). Truck driver wages come from "Oregon Wage Information, 2003," which provides wages by occupation, also from the Oregon Employment Department.

<sup>7</sup> Total compensation, annual wages and salaries, and benefits used are averages of values for the four quarters of 2003, identified for two national worker categories: all civilian workers and transportation and material moving blue-collar occupations, from the "National Compensation Survey - Compensation Cost Trends", Bureau of Labor Statistics, 2003, [Hhttp://www.bls.gov/ncs/ect/home.htm](http://www.bls.gov/ncs/ect/home.htm).

## On-the-Job Trips

On-the-job trips represent travel for work and do not include commute trips. In order to estimate the weighted value of travel-time for on-the-job trips by vehicle type, a number of other variables must be determined. These include the average number of occupants in the vehicles, freight inventory value for trucks, and the proportion of travel miles spent on-the-job. The sections below discuss each of these variables in turn.

**Table 2. Details of Estimated Value of One Hour of Travel-Time by Vehicle Class, Oregon 2003**

#	Category	Vehicle Class <sup>8</sup>		
		Automobiles	Light Trucks	Heavy Trucks
1	2003 Oregon Average Wage	\$16.25	\$12.16	\$16.38
2	2003 Value of Fringe Benefits	\$6.44	\$6.76	\$9.11
3	Total Compensation	\$22.69	\$18.92	\$25.49
<b>On-the-Job Trips</b>				
4	Average Vehicle Occupancy	1.22	1.03	1.12
5	2003 Cost of Employees	\$27.60	\$19.53	\$28.55
6	2003 Freight Inventory Value	\$0.00	\$0.00	\$1.88
7	Total "On-the-Job" Value	\$27.60	\$19.53	\$30.43
8	Miles "On-the-Job" %	9.9%	100.0%	100.0%
9	Weighted Value	\$2.72	\$19.53	\$30.43
<b>Off-the-Job Trips</b>				
10	Average Vehicle Occupancy	1.58	N/A	N/A
11	Total "Off-the-Job" Value	\$13.96	\$0.00	\$0.00
12	Miles "Off-the-Job" %	90.1%	0.0%	0.0%
13	Weighted Value	\$12.58	\$0.00	\$0.00
14	<b>Total Weighted Average</b>	<b>\$15.31</b>	<b>\$19.53</b>	<b>\$30.43</b>

Note: Table values are rounded to two decimal places, but calculated values are not. As a result, calculations made by the reader will differ slightly from some values in the table.

<sup>8</sup> Vehicle classes in this report vary from FHWA vehicle classifications. FHWA identifies light trucks as two-axle, four-tire vehicles other than passenger cars. In this report private passenger trucks fall into the automobile category and light trucks include: single-unit two-axle four-tire trucks (in commercial use), other single-unit trucks, and single trailer trucks with four axles or less.

### ***Vehicle Occupancy***

In order to include all relevant employee time associated with on-the-job travel, it is necessary to know how many people occupy the vehicle during these trips. Average vehicle occupancy for on-the-job auto trips is estimated to be 1.22 persons.<sup>9</sup>

Average vehicle occupancy for the light truck category is estimated using a combination of local and national data. HERS documentation identifies an average occupancy of 1.05 persons for six-tire vehicles, which include pick-up-and-delivery vehicles that sometimes carry a helper, while heavier single-unit trucks were assumed to have only one occupant. The weighted average vehicle occupancy for light trucks (at 1.03 persons) was determined by taking the proportion of average daily traffic on the state highway system in 2002 for these vehicle categories and multiplying by the appropriate occupancy number. HERS assumes average vehicle occupancy of 1.12 persons for four and five axle combination trucks.<sup>10</sup> This same average vehicle occupancy has been assigned to our heavy truck category.

Oregon-specific vehicle occupancy data is not available, but there is no reason to expect Oregon to be very different from the nation as a whole. Line 4 of Table 2 lists on-the-job vehicle occupancy rates. Employee compensation for 2003 was multiplied by average vehicle occupancy to compute total per-vehicle cost to employers for one hour of work travel-time. Line 5 of Table 2 presents the 2003 cost of employees per vehicle.

### ***Freight Inventory Value***

The freight inventory value represents the time value of the average payload (i.e. the interest costs of cargo). Freight inventory values are based on HERS documentation and exclude costs for spoilage and/or depreciation. For heavy trucks, the freight inventory value per hour of travel-time is estimated to be \$1.88.<sup>11</sup> HERS assumes inventory values for vehicles other than heavy trucks are negligible. This same assumption has been applied to these estimates.

### ***Total On-the-Job Value***

Total on-the-job value is the sum of cost of the employees and freight inventory value for each vehicle category and is shown on Line 7 of Table 2.

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<sup>9</sup> “The 2001 National Household Travel Survey (NHTS)”, U.S. Department of Transportation, Bureau of Transportation Statistics, 2003, Hhttp://www.bts.gov/programs/national\_household\_travel\_survey/H.

<sup>10</sup> This average vehicle occupancy number is set based on Robin Hertz’ analysis of the frequency of the use of two driver teams in crash involved trucks: “ Sleeper Berth Use as a Risk Factor for Tractor Driver Fatality”, 31<sup>st</sup> Annual Proceedings, American Association for Automotive Medicine, September 1987, pp.215-227.

<sup>11</sup> “Guidebook for Assessing the Social and Economic Effects of Transportation Projects”, National Cooperative Highway Research Program (NCHRP) Report 456. *Table 2.1 Value of One Hour of Travel Time* identifies an updated HERS estimate of combination truck inventory values at \$1.78 per hour (year 2000 dollars). This estimate uses the implicit price deflator for US GDP to adjust the value to 2003 dollars.



### ***Miles On-the-Job***

It is estimated that on-the-job trips represent approximately 9.9 percent of miles driven in autos. Components in determining this number include the proportion of registered autos that are in fleets (except rental vehicles) – in other words those used 100 percent for work-related travel, and for non-fleet autos the work-related proportion of total miles of travel.<sup>12</sup> Miles on-the-job are assumed to be 100 percent for both the light and heavy truck categories.

### **Off-the-Job Trips**

Off-the-job trips include recreation, shopping, commuting, and other personal travel. Because light and heavy trucks are allocated on-the-job travel 100 percent of the time, autos are the only vehicle type for which off-the-job valuation assumptions have been determined.

### ***Vehicle Occupancy***

The *2001 Household Travel Survey* identifies average personal vehicle occupancies for a number of trip purposes. The estimated average auto vehicle occupancy for off-the-job trips, approximately 1.58 persons, is the average vehicle occupancy for all trips except work-related.<sup>13</sup>

### ***Total Off-the-Job Value***

The time spent on these non-work trips is not without value simply because people are not getting paid for their time. HERS assumes the value of off-the-job travel-time for auto drivers is 60 percent of the average wage rate exclusive of benefits. The value of auto passenger travel-time is estimated to be 45 percent of the average wage rate. Thus, the hourly value of travel-time for off-the-job auto trips in Oregon is estimated to be \$9.75 for drivers and \$7.31 for passengers. Applying the average occupancy figure of approximately 1.58 persons (a driver and an average of 0.58 passengers) to the average hourly values for off-the-job travel-time and summing gives a total off-the-job travel-time value for autos of \$13.96, as shown on line 11 of Table 2.

### ***Miles Off-the-Job***

As mentioned previously, 9.9 percent of miles traveled in autos are work-related. The remaining 90.1 percent of miles traveled represent off-the-job trips (line 12 of Table 2).

### **Total Weighted Average**

The values of travel-time for on-the-job and off-the-job travel are weighted by each trip type's share of miles traveled (on lines 9 and 13 of Table 2). The total weighted average

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<sup>12</sup> Sources include: FHWA State Motor-Vehicle Registrations 2001; "Automotive Fleet / 2002", Bobit Publishing; "The 2001 National Household Travel Survey (NHTS)", U.S. Department of Transportation, Bureau of Transportation Statistics, 2003,

[Hhttp://www.bts.gov/programs/national\\_household\\_travel\\_survey/H](http://www.bts.gov/programs/national_household_travel_survey/H).

<sup>13</sup> "The 2001 National Household Travel Survey (NHTS)", U.S. Department of Transportation, Bureau of Transportation Statistics, 2003, [Hhttp://www.bts.gov/programs/national\\_household\\_travel\\_survey/H](http://www.bts.gov/programs/national_household_travel_survey/H).

value of all travel-time is the sum of these two weighted values and is presented on line 14 of Table 2. These estimates represent the total statewide average values of travel-time for Oregon vehicles in three vehicle classes.

### Sensitivity to Underlying Assumptions

Changing the underlying assumptions used to build value of travel-time estimates will affect the resulting values. Table 3 presents effects of changing some of these underlying assumptions. For example, the estimated value of travel-time for commuters who drive to work alone, drive more miles on-the-job or drive fewer miles on-the-job are different than what is presented in Table 2.

**Table 3. Effect of Changing Underlying Assumptions of Value of Travel-Time Estimates**

<b>Category</b>	<b>Automobiles</b>	<b>Light Trucks</b>	<b>Heavy Trucks</b>
2003 Estimates	\$15.31	\$19.53	\$30.43
Occupancy Rate of 1.0	\$14.82	\$18.92	\$27.37
Miles On-the-Job Doubled	\$16.65	N/A	N/A
Miles On-the-Job Cut in Half	\$14.63	N/A	N/A
Value of Benefits Excluded	\$14.53	\$12.55	\$20.23
Drop Wage 10%	\$13.78	\$17.58	\$27.57
Increase Wage 10%	\$16.84	\$21.49	\$33.28

Removing benefits from the total compensation calculation reduces the heavy truck estimate from \$30.43 to \$20.23. Increasing the assumed wage for light truck drivers by ten percent increases the estimate from \$19.53 to \$21.49. Doubling the assumed miles on-the-job for autos increases the estimate from \$15.31 to \$16.65. These examples illustrate how estimates may vary because of the unique data being applied.

### Plausible Ranges

The value of travel-time may also vary due to differing purposes of travel, conditions under which it occurs, and possible alternative uses of time. Because of this, the U.S. Department of Transportation (USDOT) released departmental guidelines<sup>14</sup> describing the use of plausible ranges for travel-time savings estimates. The USDOT ranges are presented in Table 4.<sup>15</sup> The guidelines suggest those using the value of travel-time estimates to conduct economic evaluations test the sensitivity of their analyses and conclusions to such ranges of uncertainty.

<sup>14</sup> U.S. Department of Transportation, “The Value of Saving Travel Time: Departmental Guidance for Conducting Economic Evaluations,” Office of the Secretary of Transportation, April 1997.

<sup>15</sup> The subsequent February 2003 updates for “The Value of Saving Travel Time: Departmental Guidance for Conducting Economic Evaluations,” made no changes to this table originally published in 1997.

**Table 4. Plausible Ranges for Values of Travel-Time Savings per Person Hour as Percentage of Average Wage Rate**

Category	Surface Modes*	Truck Drivers
Local Travel		
Personal	35-60%	--
Business	80-120%	100%
Intercity Travel		
Personal	60-90%	--
Business	80-120%	100%

\* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time should be valued at 100% of the wage rate when actions affect only those elements of transit time.

For example, if the average wage for a region were \$17 per hour, USDOT would calculate the plausible range of values for local travel to be \$5.95 - \$10.20 per person hour for personal trips and \$13.60 - \$20.40 for business trips.

## Conclusion

Time spent traveling is valuable. Estimates of the value of travel-time are needed to make informed investment and policy decisions affecting highway users. Estimates of the value of travel-time may vary in magnitude because of the data and assumptions used to construct them. Even when quality data is available, uncertainty exists. This is best addressed by using a range of values to test how sensitive predicted outcomes are to the estimates used.