

**The Value of Travel-Time: Estimates of the Hourly Value of
Time for Vehicles in Oregon 2009**



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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 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 people's time spent driving – 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 a number of elements:

- 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 and household income data: automobiles (including passenger trucks), light trucks (delivery vehicles), and heavy trucks. 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 2009

Vehicle Class	Average Value
Automobiles	\$21.80
Light Trucks	\$23.37
Heavy Trucks	\$31.68

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The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2009

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 2008.¹

User costs associated with travel are typically grouped into three primary types: travel-time costs, vehicle operating costs, and safety costs.² 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 a number of elements:

- Type of vehicle
- Vehicle occupancy
- Trip purpose

¹ “*The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2007*” Long Range Planning Unit, Oregon Department of Transportation, June 2008.

² 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

Details on underlying assumptions, sources, and calculations used for the estimates of the 2009 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 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).³ 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. 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.⁴ 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”.⁵

Wage information used in these estimates comes from the Oregon Employment Department⁶ and the U.S. Census Bureau⁷. The estimated average value of total compensation in Oregon for a single person in 2009 (by vehicle type) is listed on line 3 of Table 2. The estimated value of off-the-job (personal) time is listed on line 4.

³ “Highway Economic Requirements System - State Version, Technical Report” U.S. Department of Transportation, Federal Highway Administration, August 2005.

⁴ 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.).

⁵ The U.S. Department of Transportation Memorandum: *Departmental Guidance for Valuation of Travel Time in Economic Analysis*, April 9, 1997 (identified as a resource for HERS-ST values of travel time) uses household income divided by 2000 (hours) to represent “wages” for all travelers regardless of their age, employment status, or relationship to other travelers. The fraction of the “wage” used to value personal time is currently 50%, applied equally to drivers and passengers.

⁶ The statewide average wage used for autos was taken from Oregon Covered Employment data for all four quarters of 2009, provided by Oregon Employment Department staff. Truck driver wages come from “Oregon Wage Information, 2009,” which provides wages by occupation, also from the Oregon Employment Department.

⁷ Median household income for Oregon in 2009 came from the US Census Bureau Oregon Quick Facts, <http://quickfacts.census.gov/qfd/states/41000.html>

**Table 2. Details of Estimated Value of One Hour of Travel-Time
by Vehicle Class, Oregon 2009**

#	Category	Vehicle Class		
		Auto	Light Trucks	Heavy Trucks
1	2009 Oregon Average Wage	\$19.59	\$15.20	\$18.49
2	2009 Value of Fringe Benefits	\$8.51	\$7.46	\$9.07
3	Total "On-the-Job" Compensation	\$28.09	\$22.66	\$27.56
4	"Off-the-Job" Compensation	\$12.08	N/A	N/A
On-the-Job Trips				
5	Average Vehicle Occupancy	1.22	1.03	1.12
6	2009 Cost of Employees	\$34.41	\$23.37	\$30.87
7	2009 Freight Inventory value	\$0.00	\$0.00	\$0.81
8	Total "On-the-Job" Value	\$34.41	\$23.37	\$31.68
9	Miles "On-the-Job" %	9.0%	100.0%	100.0%
10	Weighted Value	\$3.10	\$23.37	\$31.68
Off-the-Job trips				
11	Average Vehicle Occupancy	1.70	N/A	N/A
12	Total "Off-the-Job" Value	\$20.55	\$0.00	\$0.00
13	Miles "Off-the-Job" %	91.0%	0.0%	0.0%
14	Weighted Value	\$18.70	\$0.00	\$0.00
15	Total Weighted Average	\$21.80	\$23.37	\$31.68

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.

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 following discuss each of these variables in turn.

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. 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. Average vehicle occupancy for on-the-job auto trips is estimated to be 1.22 persons.⁸

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. Using the proportion of average daily traffic on the state highway system in 2009 for each of the light truck categories, weighted average vehicle occupancy for light trucks in Oregon is estimated at 1.03 persons.

HERS assumes average vehicle occupancy of 1.12 persons for four and five axle combination trucks.⁹ This same average vehicle occupancy has been assigned to our heavy truck category.

Line 5 of Table 2 lists on-the-job vehicle occupancy rates. Employee compensation for 2009 was multiplied by average vehicle occupancy to compute total per-vehicle cost to employers for one hour of work travel-time. Line 6 of Table 2 presents the 2009 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-ST 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 \$0.81.¹⁰ 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 8 of Table 2.

Miles On-the-Job

It is estimated that on-the-job trips represent approximately 9.0 percent of miles driven in autos. There are two components in determining this number. The first is the proportion of registered autos that are in fleets (except rental vehicles) – in other words those used 100 percent for work-related travel. The second component is the work-related proportion of total miles of travel for

⁸ “The 2009 National Household Travel Survey (NHTS)”, U.S. Department of Transportation, Federal Highway Administration, <http://nhts.ornl.gov/>. Average vehicle occupancy for "on-the-job" trips is a VMT weighted estimate based on the "return to work", "attend business meeting/trip", and "other work related" categories of travel.

⁹ This average vehicle occupancy number is 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”, 31st Annual Proceedings, American Association for Automotive Medicine, September 1987, pp.215-227.

¹⁰ *HERS-ST Technical Report*, August 2005, Page 5-51 identifies a \$0.60 hourly value of the average payload (ignoring costs for spoilage or depreciation over time). This is a 1993 estimate inflated to 1995 dollars using the GDP deflator. This analysis has used the same deflator series to inflate to 2009 dollars. This is a methodological change to bring these estimates more in line with HERS-ST. As a result the inventory value is lower than in previous reports.

non-fleet autos.¹¹ 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 *2009 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 1.70 persons, is the average vehicle occupancy for all trips not work-related.¹²

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. The USDOT and HERS by extension estimate the value of off-the-job (personal) travel-time as a fraction of household income based “wages”. This is done to represent all travelers regardless of their age, employment status, or relationship to other travelers. The fraction of the “wage” used to value personal time is currently 50%, applied equally to drivers and passengers. Applying the average occupancy figure of approximately 1.7 persons to the estimated hourly compensation for off-the-job travel-time gives a total off-the-job travel-time value for autos of \$20.55, as shown on line 12 of Table 2.

Miles Off-the-Job

As mentioned previously, 9.0 percent of miles traveled in autos are work-related. The remaining 91.0 percent of miles traveled represent off-the-job trips (line 13 of Table 2).

¹¹ Sources include: “Highway Statistics 2009”, State Motor-Vehicle Registrations 2009 Table MV-1, FHWA, <http://www.fhwa.dot.gov/policyinformation/statistics/2009/mv1.cfm>; Automotive Fleet Fact Book 2009, Bobit Publishing Co. <http://www.automotive-fleet.com/statistics/>; “The 2009 National Household Travel Survey (NHTS)”, U.S. Department of Transportation, Federal Highway Administration, <http://nhts.ornl.gov/>

¹² “The 2009 National Household Travel Survey (NHTS)”, U.S. Department of Transportation, Federal Highway Administration, <http://nhts.ornl.gov/>. Average vehicle occupancy for "off-the-job" trips is a VMT weighted estimate based on all travel categories except: "return to work", "attend business meeting/trip", and "other work related".

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 10 and 14 of Table 2). The total weighted average value of all travel-time is the sum of these two weighted values and is presented on line 15 of Table 2. These estimates represent the total statewide average values of travel-time for Oregon vehicles in the 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 a person driving an auto alone would be \$13.53 rather than the 2009 auto estimate of \$21.80 per hour.

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

Category	Auto	Light Trucks	Heavy Trucks
2009 Estimates	\$21.80	\$23.37	\$31.68
Occupancy Rate of 1.0	\$13.53	\$22.66	\$28.37
Miles On-the-Job Doubled	\$23.05	N/A	N/A
Miles On-the-Job Cut in Half	\$21.18	N/A	N/A
Value of Benefits Excluded	\$20.86	\$15.68	\$21.52
Drop "Wages" 10%	\$19.72	\$21.80	\$29.61
Increase "Wages" 10%	\$23.89	\$24.94	\$33.75

Doubling the assumed miles on-the-job for autos increases the value of travel time estimate from \$21.80 to \$23.05. Removing benefits from the total compensation calculation reduces the heavy truck estimate from \$31.68 to \$21.52. Increasing the assumed wage for light truck drivers by ten percent increases the value of travel time estimate from \$23.37 to \$24.94. These examples illustrate how estimates may vary because of the unique data or assumptions 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 guidelines¹³ describing the use of plausible ranges for travel-time savings estimates. The USDOT ranges are presented in Table 4.¹⁴ For example, if the average wage for a region were \$20 per hour, USDOT would calculate the

¹³ 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.

¹⁴ 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.

plausible range of values for local travel to be \$7.00 - \$12.00 per person hour for personal trips and \$16.00 - \$24.00 for business trips.

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.

These guidelines suggest that analysts test the sensitivity of their analyses and conclusions. 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.

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. This update, like previous reports, provides an estimate of the value of travel time in Oregon for three vehicle categories: automobiles (including passenger trucks), light trucks (delivery vehicles), and heavy trucks. It illustrates how the final value is sensitive to (and changes with) underlying assumptions regarding the share of miles traveled for work vs. non-work purposes, total number of people in the vehicle, and changes in wages. By providing regular updates and keeping values current, planning and project impact analysis is improved.