

**The Value of Travel-Time: Estimates of the Hourly Value of  
Time for Vehicles in Oregon 2013**



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## Executive Summary

Time is a valuable and limited resource for individuals and businesses. Transportation investments and policy can affect how we use time. Estimates of the value of travel-time are needed to make informed investment and policy decisions affecting highway users.

National estimates of the value of travel-time vary from under \$10 per hour to over \$100 per hour. Such differences exist because estimates of the value of travel-time depend on a number of components:

- Type of vehicle
- Vehicle occupancy
- Trip purpose
- 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 2013 hourly value of travel-time for vehicles in Oregon are provided in the text and footnotes of this document.

This update, like previous reports, provides an estimate of the value of travel-time in Oregon for three vehicle categories: automobiles/light trucks, delivery/medium trucks, 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. personal 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.

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 2013**

<b>Vehicle Class</b>	<b>Average Value</b>
Auto/Light Truck	\$25.78
Delivery/Med. Trucks	\$22.12
Heavy Trucks	\$31.32

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# **The Value of Travel-Time: Estimates of the Hourly Value of Time for Vehicles in Oregon 2013**

## **Introduction**

Time is a valuable and limited resource for individuals and businesses. Transportation investments and policy can affect how we use time. Estimates of the value of travel-time are needed to make informed investment and policy decisions affecting highway users.

Travel-time is one of three primary types of user costs associated with travel. The other two are vehicle operating costs and safety costs.<sup>1</sup> 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-clock/business time or personal time. Costs associated with business 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 (i.e., personal time), travel-time costs reflect the fact that how we spend our time is important and affects our happiness. In economic terms it is the opportunity cost of people's time spent driving – time that could be spent doing something else.

This update, like previous reports, provides an estimate of the value of travel-time in Oregon for three vehicle categories: automobiles/light trucks, delivery/medium trucks, 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. personal 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 are improved.

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. Such differences exist because estimates of the value of travel-time depend on a number of elements:

- Type of vehicle
- Vehicle occupancy

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<sup>1</sup> In addition to user costs, 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.

- Trip purpose
- 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 2013 hourly value of travel-time for vehicles in Oregon are provided in the remainder 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 USDOT in the Highway Economic Requirements System (HERS) and Revised Departmental Guidance on Valuation of Travel Time.<sup>2</sup>

## **Household Income & Total Compensation**

The value of travel-time is conventionally based on either household income or total compensation. The value of on-the-clock business time is a reflection of the total cost of the employee's time to the employer and so is a function of total compensation.<sup>3</sup> Value of 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 household income.<sup>4</sup> Household income and compensation information used in these estimates comes from the U.S. Department of Labor<sup>5</sup> and the U.S. Census Bureau<sup>6</sup>.

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<sup>2</sup> "Highway Economic Requirements System - State Version, Technical Report" U.S. Department of Transportation, Federal Highway Administration, August 2005; *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2014 Update)*," U.S. Department of Transportation, July 9, 2014.

<sup>3</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>4</sup> *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2014 Update)*, uses annual median household income divided by 2080 (hours) to represent person hour personal trip values for all travelers regardless of their age, employment status, or relationship to other travelers. The fraction of the hourly median household income used to value personal time is currently 50% for local trips and 70% for intercity trips, applied equally to drivers and passengers.

<sup>5</sup> Median hourly wages used for autos was taken from *Occupational Employment and Wage Estimates*, Bureau of Labor Statistics, U.S. Department of Labor, May 2013, and utilizes the median hourly wage for category 00-0000 All Occupations in Oregon. Truck driver median hourly wages come from the same source, but different occupational categories (53-3033 Light Truck or Delivery Services Drivers in Oregon. and 53-3032 Heavy and Tractor-Trailer Truck Drivers in Oregon). Fringe benefit estimates are derived from the wage to fringe benefit relationships for appropriate occupational categories taken from the *Employer Costs for Employee Compensation Historical Listing March 2004 – June 2014* published by the Bureau of Labor Statistics.

<sup>6</sup> Median household income for Oregon in 2013 came from the U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplements average of 2012 and 2013 estimates.

## **On-the-Clock Business Trips**

On-the-clock/business trips represent travel for work and do not include commute trips. In order to estimate the weighted value of travel-time for on-the-clock trips by vehicle category, 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-clock. The sections that follow discuss each of these variables in turn.

### ***Vehicle Occupancy***

In order to include all relevant employee time associated with on-the-clock 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-clock auto trips is estimated to be 1.22 persons.<sup>7</sup>

Average vehicle occupancy for the delivery and medium weight 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 single-unit trucks were assumed to have only one occupant. Using the proportion of average daily traffic on the state highway system in 2013 for each of the delivery and medium weight truck categories, the weighted average vehicle occupancy for trucks in this category in Oregon is estimated at 1.03 persons.

HERS assumes average vehicle occupancy of 1.12 persons for four and five axle combination trucks.<sup>8</sup> This same average vehicle occupancy has been assigned to Oregon's heavy truck category.

Line 7 of Table 2 lists on-the-clock business vehicle occupancy rates. Employee compensation for 2013 was multiplied by average vehicle occupancy to compute total per-vehicle cost to employers for one hour of work travel-time. Line 8 of Table 2 presents the 2013 cost of employees per vehicle.

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<sup>7</sup> "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-clock business trips is a VMT weighted estimate based on the "return to work", "attend business meeting/trip", and "other work related" categories of travel.

<sup>8</sup> 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", 31<sup>st</sup> Annual Proceedings, American Association for Automotive Medicine, September 1987, pp.215-227.

**Table 2. Details of Estimated Value of One Hour of Travel-Time  
by Vehicle Class, Oregon 2013**

#	Category	Vehicle Class		
		Auto/Light Truck	Delivery/Med. Trucks	Heavy Trucks
1	2013 Oregon Median Hourly Wage	\$17.24	\$14.24	\$18.07
2	2013 Value of Fringe Benefits	\$7.71	\$7.19	\$9.13
3	Total Hourly "On-the-Clock" Compensation	\$24.95	\$21.43	\$27.20
4	2013 Oregon Hourly Median Household Income	\$26.16	N/A	N/A
5	Hourly Value Personal Local Travel	\$13.08	N/A	N/A
6	Hourly Value Personal Intercity Travel	\$18.31	N/A	N/A
<b>"On-the-Clock" Business Trips</b>				
7	Average Vehicle Occupancy	1.22	1.03	1.12
8	2013 Cost of Employees per Vehicle	\$30.55	\$22.12	\$30.46
9	2013 Freight Inventory Value	\$0.00	\$0.00	\$0.86
10	Total "On-the-Clock" Value per Vehicle	\$30.55	\$22.12	\$31.32
11	% Miles "On-the-Clock"	10.9%	100.0%	100.0%
12	Weighted Value	\$3.33	\$22.12	\$31.32
<b>Personal Trips</b>				
12	Average Vehicle Occupancy	1.70	N/A	N/A
13	Total Personal Value Local Trips	\$22.25	\$0.00	\$0.00
14	% Miles Personal Local Trips	59.6%	\$0.00	\$0.00
15	Total Personal Value Intercity Trips	\$31.15	\$0.00	\$0.00
16	% Miles Personal Intercity Trips	29.5%	0.0%	0.0%
17	Weighted Value	\$22.45	\$0.00	\$0.00
18	<b>Total Weighted Average</b>	<b>\$25.78</b>	<b>\$22.12</b>	<b>\$31.32</b>

Note: A number of key variables have been adjusted to reflect updated guidance (for example, using median rather than average wages). As a result, these estimates should not be used with previous years' estimates. In addition, the table values are rounded to two decimal places, but calculated values are not. So calculations made by the reader may differ slightly from some values in the table.

### ***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 \$0.86.<sup>9</sup> HERS assumes inventory values for vehicles other than heavy trucks are negligible. This same assumption has been applied to these estimates.

<sup>9</sup> *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 2013 dollars.

### ***Total On-the-Clock Value per Vehicle***

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 10 of Table 2.

### ***Miles On-the-Clock***

It is estimated that on-the-clock trips represent approximately 10.9 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 non-fleet autos.<sup>10</sup> Miles on-the-job are assumed to be 100 percent for both the delivery/medium and heavy truck categories.

### **Personal Trips**

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

### ***Vehicle Occupancy***

The 2009 National Household Travel Survey identifies average personal vehicle occupancies for a number of trip purposes. The estimated auto vehicle occupancy for personal trips, approximately 1.70 persons, is the weighted average vehicle occupancy for all trips not work-related.<sup>11</sup>

### ***Total Personal Trip Values (Local and Intercity Trips)***

The time spent on these non-work trips is not without value simply because people are not getting paid for their time. Personal travel-time costs reflect the fact that how we spend our time is important and affects our happiness. The USDOT estimates the value of person hour personal travel-time as a fraction of hourly household income.<sup>12</sup> This is done to represent all travelers regardless of their age, employment status, or relationship to other travelers.

The fraction of the household income used to value personal time per person hour varies depending on whether travel is local or intercity. This is based on the assumption that the value

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<sup>10</sup> Sources include: FHWA State Motor-Vehicle Registrations 2012; <http://www.fhwa.dot.gov/policyinformation/statistics/2012/mv1.cfm> ; Fleet data 1/1/13 from Automotive Fleet Fact Book (annual issues), Bobit Publishing Co <http://www.automotive-fleet.com/statistics/> ; 2009 National Household Travel Survey, U.S. Department of Transportation, Bureau of Transportation Statistics.

<sup>11</sup> "The 2009 National Household Travel Survey (NHTS)", U.S. Department of Transportation, Federal Highway Administration, <http://nhts.ornl.gov/>. Average vehicle occupancy for personal trips is a vehicle miles traveled weighted estimate based on all travel categories *except*: "return to work", "attend business meeting/trip", and "other work related".

<sup>12</sup> U.S. Department of Transportation, *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2014 Update)*, July 9, 2014 identifies the use of median household income to derive the value of personal travel for surface vehicles (regardless of employment or age). The data source for 2013 Oregon Median Household Income was the U.S. Census Bureau Current Population Survey Annual Social and Economic Supplements, average of 2012 and 2013 estimates.

of travel-time rises with distance (because the constraint on time and so choices is greater with longer distance journeys). For local personal trips, the value of travel-time is estimated at 50 percent of hourly median household income, for intercity personal trips 70 percent. The proportion is applied equally to drivers and passengers.

Applying the average occupancy figure of approximately 1.7 persons to the estimated hourly value for personal local travel per person hour gives a total personal local travel-time value for autos/light trucks of \$22.25 as shown on line 13 of Table 2. Applying the occupancy rate to the hourly value for personal intercity travel gives a total value per vehicle for personal intercity trips of \$31.15 as shown on line 15 of Table 2.

***Miles Personal Trips (Local and Intercity)***

As mentioned previously, 10.9 percent of miles traveled in autos/light trucks are work-related. The remaining 89.1 percent of miles traveled represent personal trips. U.S.DOT ratios<sup>13</sup> were used to estimate the proportion of personal travel that is local vs. intercity, these values are provided on lines 14 and 16 of Table 2.

**Weighted Values and Total Weighted Average**

The values of travel-time for on-the-clock and personal travel are weighted by each trip type’s share of miles traveled (on lines 11, 14, and 16 of Table 2) to determine the weighted values by trip purpose for vehicles. These are summed to create the total weighted average value of travel-time by vehicle category, presented on line 18 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.

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

<b>Category</b>	<b>Auto/Light Truck</b>	<b>Delivery/Med. Trucks</b>	<b>Heavy Trucks</b>
2013 Estimates	\$25.78	\$22.12	\$31.32
Occupancy Rate of 1.0	\$15.94	\$21.48	\$28.06
% Miles On-the-Clock Doubled	\$26.36	N/A	N/A
% Miles On-the-Clock Cut in Half	\$25.48	N/A	N/A
Value of Benefits Excluded	\$24.74	\$14.67	\$21.10
Drop Median Hourly Wage 10%	\$25.54	\$20.61	\$28.44
Increase Median Hourly Wage 20%	\$26.23	\$25.01	\$34.51

<sup>13</sup> U.S. Department of Transportation, *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2014 Update)*, July 9, 2014 distributes local travel by surface mode 95.4% to personal travel and 4.6% to business; intercity travel by surface mode as 78.6% to personal and 21.4% to business. Using these ratios and our assumption of 10.9% of auto travel to business use, one can solve for local vs. intercity distributions. The results are shown in Table 2.

Doubling the assumed miles on-the-clock for auto/light trucks increases the value of travel-time estimate from \$25.78 to \$26.36. Removing benefits from the total compensation calculation reduces the heavy truck estimate from \$31.32 to \$21.10. Increasing the assumed wage for delivery/medium truck drivers by 20 percent increases the value of travel-time estimate from \$22.12 to \$25.01. These examples illustrate how estimates may vary because of the unique data or assumptions being applied.

## Plausible Ranges

Even when quality data is available, uncertainty exists. So, like other travel behavior parameters, the estimated values of travel-time provided in this report are subject to uncertainty. Because of this, the U.S. Department of Transportation (USDOT) released departmental guidelines<sup>14</sup> describing the use of plausible ranges for its travel-time estimates. The USDOT ranges are presented in Table 4. For example, if the average wage for a region were \$20 per hour, USDOT would calculate the 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 Total Earnings**

<b>Category</b>	<b>Percentage of Total Hourly Earnings</b>
Local Travel	
Personal	35-60%
Business	80-120%
Intercity Travel	
Personal	60-90%
Business	80-120%

The guidelines suggest that analysts test the sensitivity of their analyses and conclusions to potential errors in estimation. This is best addressed by using a range of values to test how sensitive predicted outcomes are to the estimates used.<sup>15</sup>

## Conclusion

The estimated values of travel-time for vehicles in Oregon in this report are intended to assist analysts and policy makers by providing region specific guidance for valuing delays and time savings.<sup>16</sup> Efforts have been made to create well reasoned estimates derived from public and regularly updated data sources. In order to create standardized values, a number of factors

<sup>14</sup> U.S. Department of Transportation, *The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2014 Update)*, July 9, 2014.

<sup>15</sup> Applying the plausible ranges to the hourly values of travel provided on lines 3, 5, and 6 of Table 2 and then multiplying the values by vehicle occupancy and distribution of travel by trip type and summing by vehicle type will provide ranges for such a test.

<sup>16</sup> These estimates are not intended to represent the long term changes in business operations or capital costs due to recurring congestion and related delay.

representing the complexity and broad variance in the way individuals value time have had to be simplified. Many of those factors do not have readily available sources for estimates nor agreed upon methodologies, and using them as a basis for local estimates adds significant uncertainty.

The estimated values of travel-time in this report should be used for Oregon specific transportation policy, planning, and investment decisions. The USDOT may request reliance on national figures for analyses provided for national competitions; such as TIGER grants.