

DEPRECIATION OF LIGHT DUTY ROAD VEHICLES: EVIDENCE FROM THE CANADIAN RED BOOK

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1. INTRODUCTION

The Full Cost Investigation has revealed the importance of the financial costs of vehicles in the estimations of the total cost of the transportation system in Canada. Among the components of vehicle financial costs is the drop in value that a vehicle experiences over time, or its annual depreciation, which could be as costly to owners as fuel is. However, while total fuel expenses are relatively easier to assess through the national fuel sales, depreciation represents a cost that is very difficult to assess at the national level. The Full Cost Investigation attempted the estimation of depreciation of light road vehicles in Canada. This is important because it allows for a comparison of the full financial and social impacts of transportation. Depreciation costs may influence the choice of type of vehicle on the roads, which together form vehicle fleet, which in turn generates social costs such as air pollution.

This paper focuses on depreciation estimates for the entire fleet of light duty road vehicles, the difference between price paid and resale value of vehicles. More specifically, this is about annual depreciation, the drop in the value of a light duty vehicle over a one-year period.

Carriers and commercial vehicles operators keep depreciation records of commercial vehicles, mostly heavy vehicles, for accounting purposes. However, the depreciation of private vehicles, most of them light duty vehicles, is not documented on a regular basis with the

¹ Views expressed do not necessarily reflect those of Transport Canada.

same accounting rigour. In addition, this task is difficult due to the large size of the light duty vehicles fleet.

This paper is organized as follows: section 2 presents the description of the methodology; section 3 shows the results of the annual depreciation costs for the light duty vehicles fleet in Canada; section 4 compares the average depreciation costs of the entire fleet to the average depreciation costs of the four most popular vehicles by type of vehicle, by province and by vehicle age; section 5 concludes.

2. METHODOLOGY

The task of estimating depreciation is challenging due to the lack of records and the large size of the light duty road vehicles fleet. Results come from a unique dataset of the annual depreciation of millions of private vehicles recently built at Transport Canada to fill this information gap.

A dataset with the resale value of vehicles was built into electronic format from printed records from the Canadian Red Book. It was subsequently matched to an additional dataset that includes the vehicle registration records obtained from decoding the Vehicle Identification Number (VIN).

Within the context of estimating the financial and social impacts of transportation in Canada, Transport Canada estimated the financial costs of owning and operating a number of light duty road vehicles. First, the depreciation cost had been estimated based on the Canadian Red Book only for a reduced sample of the four most popular make and models per vehicle type, per province, and per vehicle age. This was done for the base years 2000 and 2006.

Second, the sample for the year 2006 was expanded to include all of the vehicle make and models listed on the Canadian Red Book. The dataset created includes the estimated resale value of each of the vehicles on the Canadian Red Book printed editions from January 2006 and January 2007. The printed editions were scanned and

converted to Excel format. The dataset contains the relevant following fields for each resale value:

- make and model,
- model year,
- factory price,
- resale value (wholesale and average),
- other details (number of doors, transmission type, detailed model description).

Third, for each record in the dataset the estimated depreciation was calculated as the difference between January 2006 and January 2007.

Finally, each record in the dataset was matched to another dataset that contains the number of vehicles registered with corresponding characteristics such as the province of registration, make and models and model year taken from the registration lists that had been decoded by Transport Canada in 2009 using the Vehicle Identification Number (VIN) decoder named Polk.

The next section discusses the results of the expanded sample for the depreciation of light duty vehicles in the base year 2006 in Canada.

3. ANNUAL DEPRECIATION COSTS OF THE ENTIRE LIGHT DUTY ROAD VEHICLE FLEET

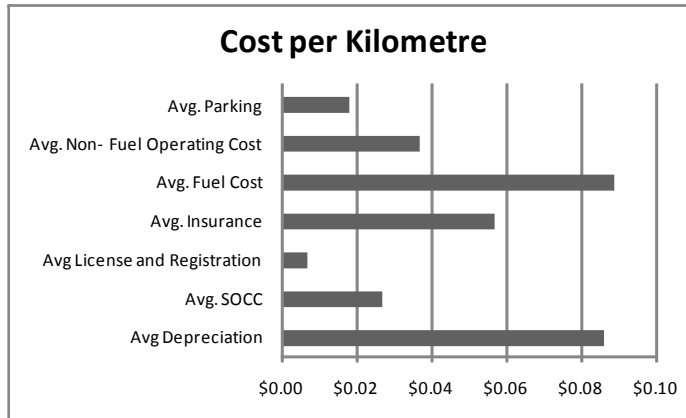
The depreciation of a vehicle is the reduction in its resale value, i.e., the difference between the value estimated at the beginning of the year and the value estimated at the beginning of the following year. For example, in January 2006 a Lincoln 2004 was worth close to \$30,000; one year later in January 2007, the same vehicle was worth about \$22,000. In the example, the annual depreciation cost is estimated at \$8,000.

Depreciation ends to be the largest estimated fixed cost and it only compares to fuel cost in terms of importance within the cost structure of light duty road vehicles. Fixed costs do not vary with usage, while variable costs do. For example, licence fees are fixed costs since the annual payment does not vary with mileage, while fuel costs are

variable costs because the more a vehicle travels the higher the fuel expense. Depreciation is a cost of owning and operating a vehicle that could be considered fixed and also variable to some extent. The resale value of vehicles drops somewhat regardless of usage. However, the depreciation cost is also affected by mileage.

Fuel and depreciation are the two largest cost components. The following chart shows the cost structure of light duty road vehicles:

Chart 1. Cost per Kilometre of Light Duty Road Vehicles. Year 2006



Source: Ray Barton and Associates, 2009.

Note: Social Opportunity Cost of Capital (SOCC)

Chart 1 above includes: parking, non-fuel operating costs, fuel, insurance, licence and registration, social opportunity cost of capital (SOCC)², and depreciation. Fuel expenses are monthly cash expenses affected by the fuel price, which influences the amount of travel directly. Depreciation and SOCC are capital expenses; linked to a one-time decision concerning the replacement of the vehicle in the longer term.

² The social opportunity cost of capital is the interest that the funds used in the vehicle purchase would have earned elsewhere in the economy had the funds being used somewhere else.

Table 1. Annual Depreciation By Type of Vehicle Year 2006

Type of vehicle	Number of vehicles	Average Annual Depreciation	Average Price	Average Annual Depreciation Percentage of Price
Car	4,997,497	\$ 2,385	\$ 24,376	10%
SUV*	1,289,339	\$ 3,988	\$ 34,903	11%
Van	1,245,575	\$ 3,246	\$ 30,222	11%
Pickups	962,177	\$ 2,844	\$ 23,937	12%
Total/ Average	8,494,588	\$ 2,806	\$ 26,781	10%

Source: Canadian Red Book and Vehicle Registration dataset

Table 2. Annual Depreciation By Province Year 2006

Province	Number of vehicles	Average Annual Depreciation	Average Price	Average Annual Depreciation Percentage of Price
NF	130,654	\$ 2,590	\$ 23,588	11%
PE	26,291	\$ 2,607	\$ 24,349	11%
NS	249,748	\$ 2,694	\$ 24,705	11%
NB	207,303	\$ 2,672	\$ 24,744	11%
QC	2,141,654	\$ 2,493	\$ 24,335	10%
ON	3,359,086	\$ 2,872	\$ 27,966	10%
MB	269,560	\$ 2,822	\$ 26,479	11%
SK	230,020	\$ 2,943	\$ 26,790	11%
AB	941,143	\$ 3,125	\$ 28,317	11%
BC	921,966	\$ 3,024	\$ 28,212	11%
YK	7,094	\$ 2,868	\$ 25,619	11%
NT	8,911	\$ 3,213	\$ 27,324	12%
Total/ Average	8,494,588	\$ 2,806	\$ 26,781	10%

Source: Canadian Red Book and Vehicle Registration dataset

Depreciation does not seem to change much by type of vehicle, or by province, the annual depreciation is about ten percent of the purchase price of the vehicle. Cars seem to depreciate slower than larger vehicles such as SUVs³, vans, or pickups. In the provinces of Ontario and Quebec vehicles tend to depreciate slower than in the rest of Canada.

In the first year depreciation is higher than average at about 15 percent of the purchase price of the vehicle, it drops to about ten percent per year thereafter.

**Table 3. Annual Depreciation By Vehicle Model Year
Light Duty Vehicles. Model Years 2000 to 2006. Year 2006**

Model Year	Number of vehicles	Average Annual Depreciation	Average Price	Average Annual Depreciation Percentage of Price
2006	597,876	\$4,371	\$28,823	15%
2005	1,371,944	\$2,477	\$27,277	9%
2004	1,247,893	\$2,918	\$28,631	10%
2003	1,439,561	\$2,704	\$27,329	10%
2002	1,375,715	\$2,894	\$25,999	11%
2001	1,186,149	\$2,586	\$25,478	10%
2000	1,275,450	\$2,544	\$24,920	10%
Total/ Average	8,494,588	\$2,806	\$26,781	10%

Source: Canadian Red Book and Vehicle Registration dataset

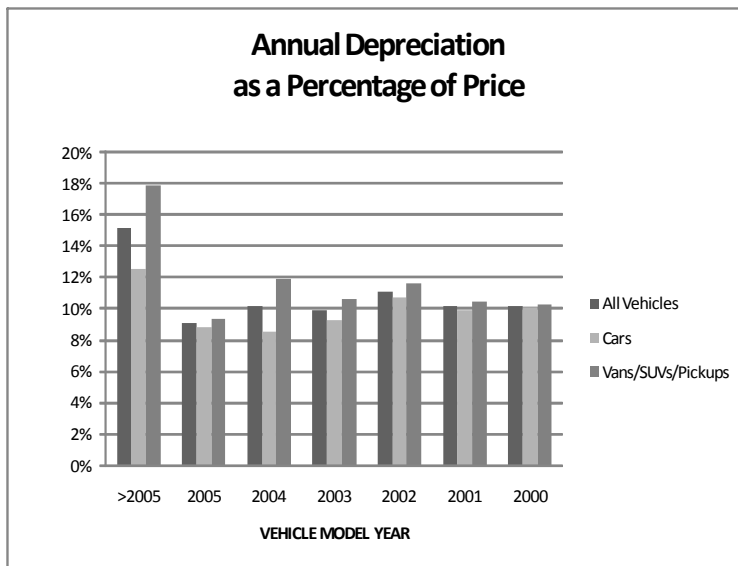
Other things equal, vehicles with lower depreciation and relatively high pollution potential imply that at a lower private cost, vehicles pollute relatively more. After the first year or two the largest share of private financial cost, which is the depreciation cost, cannot be reversed. After the first or second year it is likely that pollution

³ SUV stands for Sport Utility Vehicle

impacts are higher while the private cost of replacing a vehicle is also high.

In addition, compared to cars, in average larger vehicles such as vans, SUVs and pickups seem to experience higher annual depreciation cost in the first four years of vehicle life, and especially in the first year. The following chart compares the depreciation patterns of various vehicle types through the vehicle life. Vans, SUVs and pickups also tend to have lower fuel efficiency, and more kilometres per year.

Chart 2. Annual Depreciation as a Percentage of Prices, Model Years 2000 to 2006. Year 2006



The dataset that produced the results described above is the expanded sample that includes all of the make and models in the Canadian Red Book for the base year 2006. Initially, a reduced dataset that was easier to build had been developed with the depreciation of only the four most popular vehicles per vehicle type, per province, and per

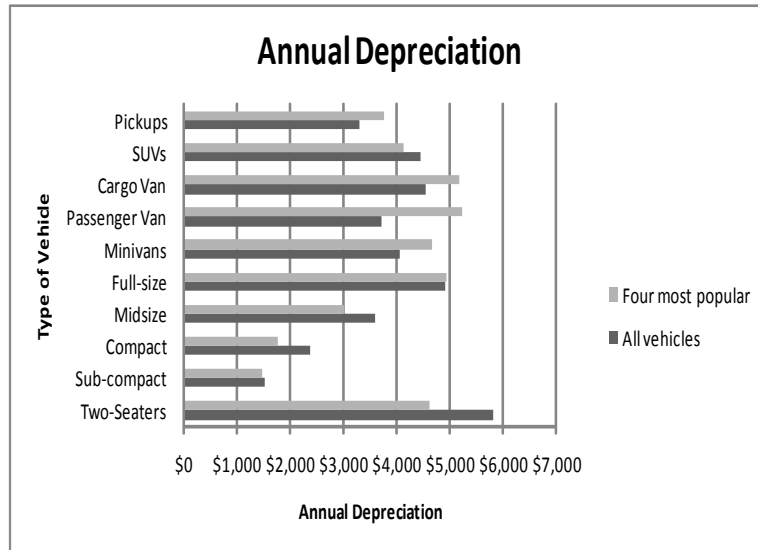
vehicle age. The next section presents the depreciation costs of the reduced sample.

4. ANNUAL DEPRECIATION COSTS OF THE FOUR MOST POPULAR MODELS

This section explores the depreciation patterns of the vehicles that are most popular compared to all of the vehicles.

Chart 3 below presents annual average depreciation costs for the four most popular vehicle models by vehicle type (lighter shade) compared to average depreciation for all vehicles in the fleet (darker shade).

Chart 3. Annual Depreciation of the Four Most Popular Vehicles by Type of Vehicle.



The four most popular cars tend to depreciate slower than all other cars. One of the explanations to this may be that car models that depreciate slower are chosen more often. By contrast, the four most

popular pickups and vans depreciate faster than all of the other pickups and vans. The lower resale value of popular vans and pickups may have to do with specialized features that are attractive to specific groups of consumers. For example, vans are a favourite family vehicle. Rather than a specific model, it is the features in the vehicle that are attractive to buyers; therefore the link between a specific model and a purchase decision is less strong in vans or pickups than it is in cars. However, SUVs tend to behave such as cars, with the depreciation of the four most popular vehicles is slower than in the all-vehicle sample.

5. CONCLUSIONS

Overall, vehicles value drops about 10 percent of purchase price each year. Cars tend to depreciate slower than larger vehicles such as vans and pickups. Vehicles value drops at a faster rate of about 15 percent of the purchase price in the first year, and then drops slower at about 10 percent each year. Most vehicles drop about 90 percent in value after seven years. Annual depreciation is slightly slower in Ontario and Quebec, but similar in all provinces.

The four most popular cars depreciate slower than the average car, indicating a possible link between purchase decisions and expected depreciation costs of particular make or models. However, in the case of vans and pickups, it is the four most popular models depreciate faster than other vans and pickups. This counterintuitive result may be explained due to the special features in these types of vehicles. Special features may tend to influence purchase decisions of vans and pickups rather than a particular make and model.

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