

Test of the Lemons Model: Comment

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In a recent article in this *Review*, Eric Bond (1982) provided an empirical test of the “lemons” model. Using the 1977 *Truck Inventory and Use (TIU) Survey*, Bond determined that there was not a significant difference between the maintenance records of pickup trucks which were purchased new and those purchased as used vehicles. He suggests several explanations for his findings. These include the counteracting institutions discussed by George Akerlof (1970), as well as the ability of consumers to obtain enough information to eliminate the buyer-seller informational asymmetry. While Bond’s conclusions are interesting, we propose to provide a finer test of the lemons model in order to determine whether these conclusions accurately reflect conditions in the market for used pickup trucks. Our model introduces two refinements to Bond’s analysis.

We believe that Bond was unable to verify the lemons model because of the lack of expenditure data in the *TIU Survey*. As he notes, the quality of a used vehicle depends “not only on the probability of maintenance but on the costliness of repairs” (p. 837). However, the relative cost of repairs cannot be captured to any significant degree in the maintenance categories of the *TIU Survey*. As shown in Table 1, the four defined maintenance categories range in average expenditure from \$100 to \$1,200. Therefore, Bond’s tests of differences in frequencies of repairs between vehicles acquired new and those acquired used are not as fine a test as necessary to verify the lemons model.¹ Not only does this test fail to capture the relative cost difference between repairs, it cannot account for vehicles that have more than one major repair during the year—perhaps the true lemon.

*Virginia Commonwealth University, Richmond, VA 23284. We thank Eric Bond, Robert Reilly, and an anonymous referee for their helpful comments.

¹We thank the referee for this interpretation.

TABLE 1—RELATIVE REPORTED MAINTENANCE COSTS FOR PICKUP TRUCKS, 1977

Brakes	\$ 100
Rear End—Differential	200
Transmission	400
Engine	1200

Source: Automotive Service Council of Virginia (1983).

Moreover, the Bond model does not capture the complete character of a lemons market. As noted by Akerlof, it is more likely that the owner of a lemon will sell his vehicle than the owner of a “creampuff.” For if a lemons market is presumed to exist, the owner of the creampuff vehicle will not be rewarded for the superior condition of his vehicle. Therefore a comparison of trucks acquired new versus trucks acquired used would identify only those vehicles for which the lemon characteristic is permanent.² One should compare trucks purchased used during a specific time period with those held during that time period, whether they had been acquired as new or used vehicles, in order to capture both the “permanent lemon” as well as the “transitory lemon.” The latter vehicle is the recently purchased used vehicle which is repaired by the new owner. In the model developed below, we test the lemons hypothesis using the *TIU Survey* data taking into account the two elements of a lemons market that should be included for a finer test of this hypothesis.

I. The Model

To reflect the essential time element and market process described by a lemons model, the *TIU Survey* data were segmented into two transaction groups.³ In the first group

²We thank Bond for this clarification.

³Bond’s analysis involved pickup trucks aged 5 years or less. We have included all pickup trucks in our analysis.

we included only pickup trucks that had been purchased used within one year of a state's survey date. These are the vehicles which would be more likely to include lemons. Our second group included pickup trucks which had been acquired either as new vehicles or used vehicles in some previous period and kept by that present owner. If there is a lemons market, this group should contain relatively more creampuffs. Excluded from both groups were vehicles that were reported to be leased, to be not in use, or to have been sold during the survey period.

Although Bond's test required that he control for vehicle age and total vehicle mileage, our test does not dictate this type of control. This is important, for to exclude some vehicles from the analysis because of their age and/or mileage characteristics precludes a full modeling of a lemons market.⁴ At any given time, the market consists of a spectrum of trucks having various age and mileage characteristics. These characteristics provide information to a prospective buyer of a used vehicle but they do not effect the buyer-seller informational asymmetry.

To capture the relative cost of the reported maintenance categories we used the cost data presented in Table 1.⁵ For example, as shown, in 1977 the average expenditure on transmission maintenance per year was four times that of the average expenditure on brake maintenance.

If the market for used vehicles is a lemons market, we would expect that the average

⁴Bond's tests require that he segment the market for used vehicles using age and mileage as a technical device. In the market, there is a segmentation of vehicles into sets that are considered by buyers and sellers to be nearly perfect substitutes. This need not correspond to a technical segmentation by age and lifetime mileage. Hence, although all trucks in Bond's sample are considered in his tests, this technical segmentation may not allow a proper test of the informational asymmetry between buyers and sellers within the same market segment.

⁵Because of obvious ambiguity, the category used to report "other maintenance" was excluded from the analysis. We would expect that this category would include maintenance types whose expenditures would be lower than the average brake repair. Inclusion of this maintenance category does not affect the results.

TABLE 2—TESTS OF THE EQUALITY OF MEAN MAINTENANCE EXPENDITURES^a

	<i>N</i>	Mean	Standard Deviation	Standard Error
Recently Transacted	2,395	\$3.18	5.42	0.11
Not Recently Transacted	10,799	2.51	4.88	0.05

^aDifferences in the means are significant at the .01 level.

yearly maintenance incurred for the four major repair categories reported in the *TIU Survey* to be significantly different between the two vehicle groups.⁶ A priori, if the lemons hypothesis is true, we would expect that the average expenditure on vehicles purchased used within our observation period to be greater than the average maintenance expenditures on vehicles in the kept group. Under the null hypothesis that the market for used vehicles is not a lemons market, there should be no difference in the mean repair expenditures between our transaction groups. Thus a test of the equality of the mean repair expenditures between these groups is performed to determine the acceptance of the null hypothesis.

The difference in the means reported in Table 2 is significant at the 1 percent level.⁷ Therefore we reject the null hypothesis, and given the ranking of the mean repair expenditures, we conclude that the market for used pickup trucks is a lemons market. Therefore arguments for the presence of Akerlof-type counteracting institutions, as well as explanations for a smaller difference in buyer-seller information, although possi-

⁶There is not a significant difference between the average age or average lifetime mileage of these two transaction groups. Therefore, our test does not merely reflect differences in repair records that one might expect to exist due to significant differences in the average age or average lifetime mileage of vehicles in the two transaction groups.

⁷A sensitivity analysis shows that the results were invariant with respect to the actual dollar amounts reported in Table 1. The analysis is dependent on the relative ranking of the reported expenditure categories.

bly correct for some used markets, may not be significant factors in this market.⁸

⁸A direct test of the impact of counteracting institutions on the market for used vehicles is provided in our earlier paper (1983).

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