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# HOW NON-PROFIT INSPECTION SERVICES CAN CORRECT FOR CREDENCE GOOD TYPE MARKET FAILURES

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## ABSTRACT

The problems associated with asymmetric information and credence goods are a common worry to consumers who require the services of technicians with expert knowledge. A study was designed to see if the concerns of consumers were justified. Specifically, the study looks at two different samples of vehicle owners and the repair costs associated with a vehicle state safety inspection. In one sample the vehicles were inspected by a non-profit, state affiliated inspection station while in the second sample the vehicles were inspected by a for-profit vehicle inspection station. The results suggest that those vehicles inspected at a for-profit inspection station had higher repair costs than those vehicles inspected by a non-profit vehicle inspection station. **JEL Classification:** D82, L15, D8

## INTRODUCTION

The issue of credence goods is a special case of asymmetric information and as such, it can lead to market failure. More specifically, credence goods deal with service goods provided by a technician with expert knowledge and the consumer's knowledge is much less than the technician's (Rasch and Waibel, 2012). There are many common examples of this. Because of this asymmetric knowledge between the technician and the consumer, there can be an incentive for the service provider to exploit the consumer, and as a result of this exploitation a market failure can arise. With respect to vehicle repairs, Schneider, (2012) estimates the welfare loss in this market at \$8.2 billion. It could be that a majority of technicians within any one particular trade are honest, but if perceptions spread among consumers that this trade group has a proclivity toward exploitation then less service will be demanded by consumers than is socially optimal (Dulleck and Kerschbamer, 2006). As a result, this market failure may even result in environmental damage as consumers decide to forgo the chance of being exploited and dispose of a product that could have been repaired for further reuse (McCollough, 2010).

There are many common examples of credence goods. As suggested above, one example would be services provided by an auto mechanic. Indeed, vehicle repairs rank first in customer complaints. However, there are many other examples which range from services provided by your local roofer or plumber or even services provided by the medical profession. Because of the consumer's reliance on the mechanic's expert knowledge, the consumers are at an information disadvantage and can, therefore, be easily exploited.

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Exploitation can take the form of overcharging for service, providing more service than is needed, or perhaps even charging for services that never took place (Darby and Karni, 1973, Webbink, 1978).

The objective of this paper is to find evidence of this type of exploitation and to find out if consumers' fears and suspicions are justified. This paper also attempts to quantify the exploitation. In addition, this paper will also show how state-affiliated agencies, acting in the role of safety inspectors without profit motives, can play an important role in correcting the market failure associated with credence goods.

The hypothesis set out in this paper is that repair costs associated with vehicle safety inspections provided by quasi-governmental agencies will be statistically less than repair costs associated with inspections provided by privately owned, for-profit service stations. The reason for this is that for-profit service stations have an incentive to provide more service than is required. For example, a for-profit service station might require brake work or perhaps a tire replacement when, in fact, these services are not really needed in order for the vehicle to pass inspection. Worse yet, the for-profit service station might require certain repair work before the vehicle can pass the safety inspection, but then never provide the service, charging the customer for work that never took place. On average, any difference in repair costs should represent the cost of the market failure.

A test was designed which compares the repair costs associated with vehicle safety inspection for residents from the state of Pennsylvania and for residents from New Jersey. In Pennsylvania, vehicle owners must have their vehicle inspected by a for profit service station, while in New Jersey the residents can choose to have their vehicle inspected by either a for-profit service station or a not for-profit vehicle inspection station. When New Jersey residents have their vehicle inspected by a non-profit, state-affiliated, vehicle inspection station, the vehicle is actually inspected by a for-profit, private firm that has been contracted to perform all state safety vehicle inspections. Safety inspectors do not work as state employees, rather they work for the firm which provides the inspections. Neither the firm nor the inspectors have a profit motive. These inspectors can only tell the vehicle owner what needs to be fixed before the vehicle can pass inspection. The inspection stations are prohibited from performing any repairs. The vehicle owner will then fix the problem at a service station of his or her choosing and then come back to the state-affiliated inspection station for an inspection sticker as proof that the vehicle passed its safety inspection.

Following this introduction, the paper gives an overview of the current literature, as well as a presentation of the significant studies conducted in this area. After the literature review, a description of the data and empirical model used in this study will be forthcoming. A discussion of the empirical results will then follow. Finally, the paper ends with a conclusion and policy discussion. Table 1, which is at the end of the paper presents the empirical results.

## **LITERATURE REVIEW**

Due to the nature of credence goods, and the fact that the expert knowledge required to perform the service is asymmetric, the services provided can often be price insensitive with low price elasticity's (Peppers and Rogers, 2006). The lower the price elasticity for the service, the easier it is for disreputable service providers to take advantage of the consumer. The literature typically cites lack of competition as the cause for price insensitivity.

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Geographic locations are a prime determinant in how competitive vehicle repairs and vehicle inspection services are. Typically, the denser the geographic location, the more competition there is and, hence, the 'switching costs' are low. In other words if it is easy for consumers to find other service providers then this makes it more difficult for service providers to overcharge.

Rasch and Waibel (2012) state that overcharging for vehicle repairs occurs more frequently in less densely populated, non-competitive locations. They find that non-competitive, low density locations just off the interstate overcharge since there is less chance of repeat business. Customers at these locations are mainly one time customers just passing through. They conclude that in more dense geographic locations where competition is higher, service providers are dependent on repeat business.

As service providers seek repeat customers, protection of their reputation can 'discipline' service providers, especially when there is a possibility of repeat business by customers (Schneider, 2012). However, Hubbard (2002, pg 466) warned that "Incentives are weaker when consumers are naive about sellers' private objectives, believe that sellers are homogeneous, or when switching costs are high." As an example of this, Hubbard (1998) finds that independently owned service stations are more likely to pass vehicles for inspection than chain store service stations, new car dealerships, and tune-up shops, because the latter work on commission whereas the independent shop is motivated by repeat business. He also finds that the more inspectors there are at a service station, the more likely a vehicle is to fail. In addition, Schneider (2012) states that higher quality service can be provided by those technicians looking for repeat business, but the prospect for repeat business must be likely.

In a follow-up study, Hubbard (2002) finds that the reputation effect does pay off. More specifically, he finds that consumers are 30 percent more likely to utilize a service station in the future if that service station had passed the vehicle for inspection in the recent past. Biehal (1983) also finds that consumers make choices with respect to auto repair services based on previous experiences with repair facilities.

However, with respect to annual state vehicle safety inspections, the desire for repeat business can actually create a moral hazard problem. For example, Hubbard (1998) found that in California private inspection facilities pass vehicles at twice the rate of state inspection facilities, except in cases when the emission repairs are covered under a warranty for late model, low mileage vehicles that are being inspected at new car dealerships. Interestingly, Hubbard also found that the inspection failure rate was even slightly lower when the service provider was located in a more competitive location, and this he attributes to 'low switching costs' and the ease in obtaining a second opinion.

Schneider (2012) finds that initial diagnostic fees are lower for possible repeat customers. This suggests that when reputation was important, the service provider charged a lower up front diagnostic fee, but Schneider (2012) found no difference in repair recommendations, repair prices or the number of legitimate repairs when the service mechanic was trying to protect his reputation. Schneider concludes that the ability of consumers to discipline service providers with the possibility of repeat business is 'fruitless'.

So, how can consumers protect themselves from unscrupulous service providers? One way is to obtain a second opinion. However, second opinions are usually expensive with respect to either money or time (perhaps both) for the consumer and the service provider, particularly when it is cheaper to provide the diagnosis and the repair service together as opposed to the repair service and diagnosis taking place separately (Emmons,

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1997). In addition, it is unclear to the consumer if a proper diagnosis was even performed. Pesendorfer and Wolinsky (2003) suggest that in competitive markets with competitive prices, efforts by the service provider to provide proper diagnosis might be sub-optimal.

Therefore, barring a second opinion it is difficult for consumers to determine if they actually were taken advantage of because who, other than the service provider, can really judge if service was required or not. With respect to vehicle repairs mandated by an annual vehicle inspection, second opinions can be costly to the consumer, particularly with respect to time. Typically consumers must leave their vehicle for half a day or more with the service provider who is giving the second opinion. Most likely, alternative transportation must be arranged. Customers then find themselves in a dilemma. If the vehicle inspection station does the repair work itself, which is usually the case in Pennsylvania, then the customer must decide to either go ahead and trust the inspector to do the repairs while the vehicle is still queued up. Or, does the customer take the vehicle in for a second opinion, requiring additional time and expense.

Another common strategy that a consumer can use is to ask for the old part back after the part was replaced. This helps to prevent fraudulent billing and overcharging for work that was not performed. But it still does not prevent ‘over-treatment’, which is providing more repairs than necessary (Dulleck and Kerschbamer, 2006)

States can help to protect consumers from fraudulent repairs by requiring licensing or certification of service providers. Unfortunately, this can increase barriers to competition which reduces competition when more competition should be encouraged. Often time consumer publications and rating agencies such as AAA membership clubs or Angie’s list allow consumers to undertake information searches to help sort out reliable service providers from the unreliable ones. However, Biehal (1983) suggests that consumers are not as proactive in their information search as they need to be. For example, from a survey of customers who recently had their vehicles repaired Biehal found that 31.7 percent of the respondents felt their bills were unreasonable and one-fourth were dissatisfied with their service. But, the level of customer dissatisfaction decreased as the amount of customer external information for auto repair services increased.

Whether or not a repair will fall into the hands of a reputable or disreputable mechanic, the consumer needs to weigh the expected benefits against the cost of a repair. The expected benefits of a repair includes both an expectation that a repair will be completed correctly as well as an expectation that the product will have its useful life extended. The more trust a consumer has in a mechanic (either because the mechanic is certified, or has an excellent “word of mouth” reputation, or has been endorsed by a rating agency) the higher the expectation that a repair will be made correctly. If this expectation is low then it is more likely that the consumer will forgo the repair in favor of choosing to replace the product (McCollough, 2010, pg 189)

## **DATA DESCRIPTION AND EMPIRICAL MODELING**

An empirical test was designed to see if the repair bills associated with vehicle state inspections are statistically different for vehicle owners who go to a non-profit, state-affiliated inspection station as opposed to those who go to a for-profit, private inspection station. Obviously, if the repair bills at the private inspection stations are statistically higher then this would suggest evidence of market failures due to asymmetric information. In other words, according to the literature, technicians with asymmetric and expert information

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regarding the repair and maintenance of a product are thought to have an incentive to cheat the customer and are in fact doing so. This then would suggest that there is role for government with respect to vehicle inspection services because the government would be able to cut back on unnecessary repair bills for the consumer by providing an initial diagnostic and inspection service as in the case of New Jersey's vehicle safety inspection program. On the other hand, if repair bills associated with vehicle inspections from a private vehicle inspection station are not statistically different from the state-affiliated vehicle inspection station, then this might suggest that there is no need for governments to be involved in the vehicle inspection business. Finally, if the repair charges associated with vehicle inspections are statistically less at private vehicle inspection stations than for the state-affiliated vehicle inspection stations, then one might conclude that the reputation effect is at work and that private inspection stations are working hard to keep customers satisfied. However, it is very troubling to think that private inspection stations could possibly be overlooking necessary and important repairs at inspection time because they are afraid of losing potential long term clients. On the other hand, it is just as unsettling to think that the state-affiliated inspectors could be overlooking necessary and important repairs which are being caught by private sector inspectors.

The data for the empirical test was taken from the 2005 BLS annual consumer expenditure survey. In this data set households are chosen at random from around the country and the head of the household keeps a bi-weekly diary on day to day expenditures. In addition, the head of household responds to a detailed monthly survey with respect to purchases that are not routine and do not occur on a daily or weekly basis. During the interview the respondents are asked to list their vehicle repair expenditures as well as annual vehicle registration fees and vehicle inspection fees. Additional information is also collected on the vehicle's make and model, age and mileage, as well as if the vehicle was purchased new or used.

Respondents to the survey from both New Jersey and Pennsylvania were chosen for the empirical test. Both New Jersey and Pennsylvania have an annual vehicle inspection program. However, the major difference between the two states is that Pennsylvania requires its residents to have their vehicle inspected once a year by a private inspection station. These privately owned service stations could be a large chain of service stations, or proprietarily owned service station, or maybe even a car dealership. In this case, the vehicle owner pays the for-profit vehicle inspection station a fee for the state inspection. If a repair is required to pass the inspection, the vehicle owner can then opt to have the inspection station do the repairs or have a different service station do the work. The car is then re-inspected, and if it passes, the vehicle gets its annual inspection sticker. Most vehicle owners simply choose to have the original inspection station perform the repairs since it more convenient and will save time.

New Jersey residents, on the other hand, can opt to have their vehicle inspected by one of many state-affiliated vehicle inspection stations located around the state or by a privately run inspection station. In the past the state of New Jersey would actually provide inspection services as an alternative to the privately run inspection stations. However, at the time the survey was conducted, New Jersey no longer provided the inspection service itself. Instead, they sub-contracted this service out to a private firm. This firm is prohibited from performing any repairs; they only provide the inspection service. Therefore, in the case of New Jersey, there is no incentive to cheat the vehicle owner at a state-affiliated inspection station by requiring unnecessary repairs. If the inspectors at the state-affiliated inspection stations find a problem with the vehicle, then the owner must go to a service

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station of his or her choice, have the problem fixed and return to the inspection station for a final inspection and inspection sticker. There is no charge to New Jersey residents who use this inspection service, but there is an inspection fee for those New Jersey residents who opt to use the inspection service of a private inspection station. Therefore, the overwhelming majority of residents in New Jersey simply have their cars inspected by the state affiliated inspection stations.

Other than New Jersey residents having the option to go to a state-affiliated inspection station, there are two other important differences between New Jersey and Pennsylvania. First, in New Jersey residents are required to have their vehicle inspected only once every 2 years as opposed to Pennsylvania where vehicles are inspected annually. Secondly, New Jersey does not mandate vehicle inspections for vehicles that are less than five years old. Only New Jersey and Pennsylvania respondents who had reported owning only one vehicle were selected for the empirical test. The reason for this is that from the data set it is impossible to determine which vehicle was being inspected for households with two or more vehicles. New Jersey respondents were also deselected from the data set if their vehicle was newer than 5 years old since, as previously stated, those vehicles are not required to have an inspection.

New Jersey residents are only required to have their vehicles inspected every other year, while in Pennsylvania the vehicle must get inspected once a year. Therefore, the only difference, for example, between a 2005 Honda CRV owned by a New Jersey resident and a 2005 Honda CRV owned by a Pennsylvania resident is that the New Jersey vehicle had not been inspected for two years while the Pennsylvania vehicle was just inspected the year before. Because of this fact one would expect that repair bills for Pennsylvania vehicles to be half the amount of repair bills for New Jersey vehicles, since Pennsylvania vehicles were just inspected the year before. To correct for this discrepancy the repair costs reported by Pennsylvania residents were doubled.

A total of 128 vehicles were selected for the empirical test. There was a difference in the number of vehicles selected by state (ie, 120 for Pennsylvania and 28 for New Jersey). The difference in vehicles by state results from the fact that vehicles 5 years old or younger do not need to be inspected in New Jersey and vehicles in Pennsylvania are inspected twice as often as those vehicles in New Jersey.

Various vehicle repair bills were cumulated and totaled for each survey respondent. The total of the repair bills per vehicle constitutes the explanatory variable. The following types of repairs were included as the explanatory variable; brake work, tire repair, tire purchases and mounting, front end alignment, wheel balancing and wheel rotation, steering or front end work, electrical system work, engine repair or replacement, exhaust system work, engine cooling system work, clutch or transmission work, motor tune-up, battery purchase and installation, and finally, other vehicle services, parts, and equipment. Survey respondents reported other types of vehicle repairs. However, these repairs were most likely not associated with passing a vehicle inspection, such as air conditioning repair, tune-up, body work, or radio repair.

The empirical test is modeled as follows.

$$C = b_1(S) + b_2(F/D) + b_3(N) + b_4(R) + b_5(MSRP) + b_6(Y) + b_7(M*A)$$

The variables are defined as follows:

C = This is the total of repair bills during the month of the vehicle owner's annual state inspection as in the case of Pennsylvania residents or during the month of the annual car registration for New Jersey residents.



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S = A value of '0' was assigned to vehicles owned by New Jersey residents and a value of '1' was assigned to vehicles owned by Pennsylvania residents.

F/D = A value of '0' was assigned to a vehicle if it was manufactured by a foreign car manufacturer such as Toyota or Volvo. A value of '1' was assigned to the vehicle if it was manufactured by a domestic car manufacturer such as Ford. These values were assigned regardless of where the vehicle was manufactured.

N = A value of '0' was assigned if the vehicle was purchased by the owner as new and a value of '1' was assigned to the vehicle if the owner purchased it as used.

R = This is a general vehicle reliability index found on the website 'autos.msn.com' for any specific make, model, and year. This rates the reliability of the vehicle's serviceable items such as the engine, transmission, brakes, steering and suspension, etc.

MSRP = This is the manufacturer's suggested retail price found on the website 'autos.msn.com' for any specific make, model, and year

Y = This represents the average number of miles driven per year.

M = This represents the total number of miles on the vehicle.

## EMPIRICAL RESULTS AND ANALYSIS

The purpose of this paper is to find empirical evidence of problems associated with asymmetric information and credence goods. Therefore, determining the factors that explain vehicle repair costs associated with state inspections is not the reason for running the empirical tests. Rather the empirical test is more narrowly focused than that, and that is to find out if the cost of vehicle repairs associated with a state inspection is statistically different depending on whether the vehicle is inspected by a private inspection station or a state-affiliated inspection station. Therefore, in this regression the explanatory variable of interest is the state variable.

Table 1 reports the regression results for the empirical model. The regression results show that the state variable is positive and significant at the 6.8 percent level. The positive coefficient of \$166.17 suggests that those vehicles inspected by privately owned service station can expect to have, on average, an additional \$166.17 in repair bills during the month of their state inspection. This amount is relevant on a bi-annual basis since, as stated above, repair bills for Pennsylvania residents were doubled to account for the fact that they are inspected twice as often as New Jersey vehicles. Since New Jersey residents are having their vehicles inspected every other year, then they can expect to save \$166.17 every time they go in for a state inspection.

The finding from the regression analysis supports the literature on credence goods and asymmetric information, meaning that service technicians with superior and expert knowledge over the customer have an incentive to cheat the customer, and they are, in fact, doing so. This 'cheating' or even the belief that vehicle owners will be cheated is what creates the market failure.

It should be pointed out that Poitras and Sutter (2002) have reported the results of a similar study which looks to see if vehicle inspections can increase vehicle repair cost. They use a dataset of 733 vehicle inspections for vehicles that were 12 years or older in 50 different states between the years of 1953 – 1967. They find that state inspections do not increase repair costs (ie, repair revenue for the inspecting facility). The difference in these results and the results reported here are most likely attributed to the time period used in both studies, the type of vehicles used in the study, and the fact that this study categorizes

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vehicles inspected into those inspected by a for-profit or a non-profit inspection facility.

The regression results also show vehicles produced by foreign manufacturers have statistically higher repair costs during the month of their state inspection at the 9.3 percent level of significance. This result suggests that repair costs associated with vehicles from foreign manufacturers is \$129.63 higher than for vehicles from domestic manufacturers. There could be a number of reasons for this result. First, it could be the case that parts cost more for vehicles from foreign manufacturers as opposed to domestic manufacturers. Second, for whatever reason, it could be that vehicles from foreign manufacturers are slightly more complicated for American mechanics to work on. Perhaps American mechanics have a good deal more experience and training with vehicles made by domestic manufacturers.

The only other variable that was statistically significant was total mileage. It was positive and significant at the 5.2 percent level. The value of the coefficient suggests that for each addition mile on the vehicle, owners can expect to pay an additional \$.002. This result should be the most intuitive of all the explanatory variables. The higher the mileage on the vehicle, the more it cost to maintain

The remaining variables all turned out to be insignificant, including the number of miles driven over the most recent year. The coefficient of determination was .229. The consumer expenditure survey data lacked one or two other relevant pieces of information which could have increased the coefficient of determination. This would be the labor rates charged per vehicle repair shop and information regarding each shop's productivity. However, as stated above, the primary focus of this paper is to find empirical evidence on the problems associated with asymmetric information and credence goods.

The data set yields socio-economic characteristics on the survey respondents. However, it is interesting to point out that each of these socio-economic characteristics was highly insignificant. Meaning that, on average, a survey respondent's race, gender, age, education level or income level was insignificant in determining how much he or she paid for vehicle repairs in the month of the state inspection. Suspicions that a vehicle owner was being taken advantage of based on his or her gender, race, age, etc. were unfounded in this empirical test.

## CONCLUSION

Credence good types of services provided by technicians that are characterized as yielding asymmetric information leave the consumers at an information disadvantage. This creates an opportunity for unscrupulous service providers to take advantage of the consumer. Indeed, from time to time one hears stories in the news media of consumers being taken advantage of. As a result, a market failure arises. An empirical test was designed and reported on in this paper to see if the consumer's fears are warranted.

The empirical test in this paper looks at vehicle owners who have had their vehicles inspected by either a for-profit inspection service station or a state affiliated, non-profit inspection station. The results from this test indicate that if your vehicle is inspected by a state-affiliated, non-profit, inspection station rather than a for-profit, inspection station, the vehicle repair bills will be less. The amount, as reported from the regression results, is \$166.17 on a bi-annual basis. This is a meaningful savings for owners who utilize the non-profit, state affiliated inspection stations. However, there are a number of factors to consider when interpreting these results. First, there is the cost of providing vehicle



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inspection services. Those vehicle owners in New Jersey do not directly pay an inspection fee whereas a direct fee is paid to the for-profit inspection station in Pennsylvania (when accumulating repair costs, the cost of the vehicle inspection fee was not included). The bi-annual savings of \$166.17 in repair bills from New Jersey residents have to be compared to the cost of running the vehicle inspection stations in New Jersey. The costs of running the state-affiliated' inspection stations are funded by the New Jersey taxpayers.

Secondly, we do not know for sure if vehicle owners in Pennsylvania are getting more thorough and higher quality inspections. Perhaps the state-affiliated inspectors from New Jersey are simply shirking their duties and passing vehicles that, in reality, do require some repair and maintenance. There is no way to tell for certain. Although it is beyond the scope of this paper, it might be possible to look at highway traffic accident data and see if there is a correlation between increased accidents and vehicles inspected by state-affiliated inspection stations. However, the literature with respect to this topic is inconclusive and shows conflicting results between vehicle safety inspections and their effectiveness at preventing accidents (For example, see Fosser 1992, White 1985, or Merrell, D., Poitras, M. & Sutter, D. 1999)

Finally, it need not be that inspections stations that simple provide diagnostic inspection services only, do not have to be state-affiliated or state operated. This type of service could just as easily be provided by the private sector, and perhaps the private sector could perform the services more efficiently than the state affiliated or state inspection station. If so, then perhaps it might just be possible that these private sector companies could run their services more efficiently than the state affiliated inspection facilities.

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**TABLE 1 – REGRESSION RESULTS FOR THE EMPIRICAL MODEL**

Variable	Coefficient	t – value
State	166.17	1.840
Foreign or domestic	129.63	1.692
Purchase new or used	29.19	.394
Reliability index	- 21.50	-1.154
MSRP	.005	1.009
Annual mileage	-.005	1.225
Total mileage	.002	1.956
R-sq	.229	

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