What Drives Fraud in a Credence Goods Market?–Evidence From a Quasi Field Experiment*

Very Preliminary Version

Alexander Rasch† Christian Waibel‡

December 2011

Abstract

This paper investigates the impact of four key economic variables on an expert firm's incentive to defraud its customers in a credence goods market: reputation, the expert firm's financial situation, the level of competition as well as the firm's competence. We make use of the data collected in a nationwide quasi field experiment that looked into the reliability of car-repair shops in Germany and was conducted by the German Automobile Association over several years. We find that firms with a low concern for reputation and firms with a negative equity are more likely to overcharge while those with a high competence are less likely to overcharge. We find no support for an impact of competition on the firms' incentive to overcharge.

Keywords: Credence Goods; Fraud; Car Repair Market

JEL Classification: D82; L15

*We would like to thank Hans-Jürgen Andreß, Rudolf Kerschbamer, Michael Pfaffermayr, Matthias Sutter, Achim Wambach, and Achim Zeileis for very helpful comments and discussions.

†University of Cologne, Albertus-Magnus-Platz, 50923 Cologne, Germany. Email: rasch@wiso.uni-koeln.de. Phone: +49 (0)221 470-6067. Fax: +49 (0)221 470-5024.

‡Corresponding author. Cologne Graduate School in Management, Economics and Social Sciences, University of Cologne, Albertus-Magnus-Platz, 50923 Cologne, Germany. Email: waibel@wiso.uni-koeln.de. Phone: +49 (0)221 470-1248. Fax: +49 (0)221 470-1229.

1 Introduction

This paper analyzes the impact of the following four key economic variables on an expert's incentive to defraud his customer: reputation, financial situation, competition and competence. In markets for credence goods, customers must rely on the expert's advice as they do not know which type of the good they need (Darby and Karni, 1973). The expert's informational advantage may give rise to fraudulent behavior. More precisely, experts may charge customers for services that are not performed (overcharging) or that are performed but not necessary (overtreatment). An expert may also provide a service that is insufficient (undertreatment) (Dulleck and Kerschbamer, 2006). In this paper, we focus on the expert's incentive to overcharge. Typical examples of credence goods are cab rides in an unknown city, medical treatments, legal advice, and car repairs.

According to a joint survey by the Consumer Federation of America, the National Association of Consumer Agency Administrators, and the North American Consumer Protection Investigators, faulty repairs in the auto repair market rank first among the top ten consumer complaints in 2010. The California Department of Consumer Affairs notes that complaints related to car repairs also grew fastest during the same period. Its Bureau of Auto Repair even shut down some shops of the same chain due to overcharging and overtreatment.[1] These results are in line with earlier studies which also found that fraud related to auto repairs was among the most often observed types of fraudulent behavior.[2].

In order to analyze experts' overcharging behavior, we make use of the results from a quasi field experiment in the car repair market that is carried out on a yearly basis by Germany's and Europe's largest automobile club, *Allgemeiner Deutscher Automobil-Club e.V. (ADAC)*. We find that low reputational concerns and a negative equity increase while a high competence decreases the incentive to overcharge. We do not find any support for an influence of competition on the probability of overcharging.

A recent study conducted by Schneider (2011) is related to our paper. He analyzes data from a field experiment where he visited garages undercover in order to check whether expert reputation may alleviate the efficiency problems arising from asymmetric information. He finds both pervasive overtreatment and undertreatment but

[1] See Consumer Federation of America et al. (2011) for details.
[2] See, e.g., Titus et al. (1995)

no evidence that reputation helps reduce these problems.[3] His work is based on 40 observations. We complement his analysis by providing a richer data set and focusing on key economic indicators such as competition, the financial situation, and an expert's competence.

Dulleck et al. (2011) provide the first experimental study on credence goods. They show that neither competition nor reputation decreases the experts' incentive to overcharge. Balafoutas et al. (2011) perform a field experiment about credence goods from taxi rides in Athens, Greece. Their data reveals that if passengers have only poor information about optimal routes, they are taken on longer detours. On the other hand, asymmetric information regarding the local tariff system leads to manipulated bills. The authors also point out that higher income seems to lead to an increase in fraud.

The remainder of the paper is as follows: in the next section, we derive the hypotheses from the theoretical literature on credence goods. We then describe the data set (section 3). In section 4, we derive our results and compare them to the theoretical predictions. We check their robustness in the sixth section. The last section concludes.

2 Theoretical Predictions

We assume the car repair market to be characterized by a mass of homogeneous customers (car owners) who all either face a minor or a major problem. The problem can be fixed through a minor or major treatment[4], respectively. Customers do not know which type of treatment they require. The mass of liable experts (garages), on the other hand, is able to diagnose the treatment needed. Experts set treatment prices and incur costs for providing a treatment. The minor treatment induces costs that are lower than for the major treatment. Assuming that the customer cannot verify the treatment, experts have an incentive to overcharge customers with a minor problem by providing a minor but charging for a major treatment.

[3]He also shows that there is a positive relationship between the level of capacity available at a garage at the time of the visit and the probability of a repair recommendation. Moreover, there is a repeat-business effect for the diagnosis fee.

[4]We apply the notion of minor and major treatment used in the credence goods literature. In our setting the minor treatment corresponds to performing no treatment while the major treatment corresponds to performing a treatment.

From the literature on credence goods, we conclude the following hypothesis on the influence of our four explanatory variables on the incentive to overcharge:

Hypothesis 1. *Experts with low reputational concerns are more likely to overcharge than experts with high reputational concerns.*

Experts with a low reputational concern face many one-time interactions. They can take advantage of the informational asymmetry between the customer and themselves by overcharging the customer without loosing future business. Experts with high reputational concerns on the other hand face many repeated interactions. Dulleck et al. (2011) show that repeated interaction decreases the incentive to overcharge as experts find it optimal to forgo short-term profits from overcharging because they benefit more from higher profits due to reputation in the future. In line with these findings, Wolinsky (1993) and Park (2005) find that the need to maintain a good reputation decreases the incentive to defraud and increases efficiency.

Hypothesis 2. *An expert firm with negative equity is more likely to overcharge his customers.*

Due to limited liability, garages that face a negative equity can gamble for resurrection. In the unlikely event that overcharging is detected, the garage files bankruptcy. Due to limited liability, the garage will not bear the costs of having defrauded. On the other hand, if overcharging is not detected, the fraudulent behavior will help to overcome the garage's financial crisis.

Hypothesis 3. *A change in the degree of competition among expert firms has no effect on their incentives to overcharge.*

A monopolist maximizes his profit by maximizing the rent he can accrue from the interaction with the customer. The rent is maximized if customers expect to be treated honestly. The monopolist sets a uniform price for the minor and the major treatment in order to credibly signal that he does overcharge. In case of Bertrand (i.e., price) competition, experts set a uniform price such that the expected costs of treating equal the price. Again experts do not have an incentive to overcharge while customers now accrue the rent from the interaction (Dulleck and Kerschbamer, 2006).

Hypothesis 4. *A high-competence expert firm is less likely to overcharge than a low-competence firm.*

In order to analyze the effect of an expert firm's competence on the incentives to overcharge, consider the case with two heterogeneous firms. A low-competence firm has treatment costs of L and H for the low and the high treatment, respectively. Similarly, the high-competence type has a fixed cost advantage of Δ for any of the two treatments, i.e., costs amount to costs of $L-\Delta$ and $H-\Delta$. From Wolinsky (1993) we know that in order for experts not to defraud their customers, treatment prices involve an equal margin on the profit made with the low and the high treatment such that cheating does not pay off. Hence, the no-cheating incentive-compatibility constraint for the low-competence expert facing a customer who needs the low treatment is given by $L + e - L = (H - L)p \Leftrightarrow (H - L)p = e$ (where p is the probability that the customer accepts the high-treatment recommendation). Analogously, the no-cheating incentive-compatibility constraint for the high-competence expert firm is equal to $L+e-(L-\Delta) = (H-(L-\Delta))p \Leftrightarrow (H-L+\Delta)p = e+\Delta$. Plugging the first constraint in the second constraint gives $(H - L)p + \Delta p < e + \Delta \Leftrightarrow \Delta p < \Delta$. This means that whenever the incentive-compatibility constraint is satisfied for the low-competence expert, it is also satisfied for the high-competence firm, i.e., the latter has a lower incentive to defraud its customers.

3 Data

3.1 Sample

The data we make use of is a pooled cross-section from the ADAC's garage test in the year 2006 and 2008–2010; in 2007, there was no test.[5] Each year, the club mandates accident accessors to produce the same five faults in 75 similar cars. The faults are the following: the license plate lamp does not work, the air pressure in the spare wheel is too low, the exhaust is loose, the coolant level is low, and the front right light is displaced to the very bottom. The automobile club sends these cars off to garages across Germany and reports on each garage how many faults have been repaired and whether more repairs have been charged than there were faults repaired. Our dependent variable overcharging covers the latter case.

In order to characterize each garage, we complement the automobile club's data set on overcharging by the following key economic indicators: competition, reputation, financial situation, and competence. To measure competition, we collect the number

[5] See `http://www.adac.de/infotestrat/tests/autohaus-werkstatt/` for details.

of garages that are within a distance of ten kilometers to the address of the garage being characterized. Ten kilometers is the average distance a potential customer is willing to travel to a competitor. The data is obtained by making a request to the publicly available list of businesses sorted by branches (Gelbe Seiten, 2011).[6] We use the distance to the next interstate as a proxy for a garage's reputational concerns. Cars that broke down on the interstate are usually towed to the next garage.[7] Therefore, garages that are located close to the interstate mainly face one time interactions and have a low reputational concern. We consider garages that are located less than 1000 meters away from the interstate to be close and all others not to be close to an interstate. We obtain the distances using Google Maps Distance calculator.[8] We also complement the automobile club's data set by the garages' financial situation at the beginning of the test year. This ensures that we do not encounter any endogeneity between overcharging and the financial situation. The financial data is publicly available through the electronic federal gazette for corporate enterprises. The enterprises are required to publish basic financial information for possible shareholders. In case the balance information was not yet available, we proxied the financial data by the data from the year before. We divide the garages into those facing a negative respectively positive equity. Finally, we take the number of faults out of five detected by the garage as an competence indicator. The faults implemented are all listed on the manufacturers' check lists for inspections.

The automobile club's dataset provides information on 336 garages. Due to the fact that only corporate enterprises have to publish their financial information, we restrict our sample to the corporate enterprises. We also disregard garages that belong to the same corporate entity because these observations are not independent. Also, there is no variation in these garages' financial data. 134 observations remain.

3.2 Descriptives

The dataset contains 134 garages of which 128 did not overcharge. In accordance with Schneider (2011), we find that about 4.5% of the garages overcharged their customers (see *Table 1*). *Table 2* shows that the two groups—garages that do and do not overcharge—differ considerably in their characteristics: Garages that over-

[6] We requested "Autowerkstätten" (car repair shops).

[7] Most of the towings are conducted by the ADAC who usually tows to the next garage.

[8] See `http://www.daftlogic.com/projects-google-maps-distance-calculator.htm` for details.

	Mean	Standard Deviation	Min	Max
Overcharging	0.045	0.208	0	1
Low Reputation (= 1 if distance < 1000m)	0.224	0.418	0	1
Negative Equity (= 1 if true)	0.134	0.342	0	1
Competition	113.187	91.972	6	390
Competence (faults out of 5 found)	4.239	1.125	0	1

Table 1: Descriptives.

charge on average face half of the competitors compared to those not overcharging. Also, garages overcharging are significantly closer to the interstate (Mann-Whitney-U Test: $p < 0.01$), i.e., they have lower reputational concerns. 50% of the garages that overcharge have a negative equity while only 11.7% of those garages have that do not overcharge. Furthermore, the average competence of garages that overcharge is significantly lower than the garages that do not overcharge.

	Close to interstate*	Negative Equity***	Competition	Competence***
overcharging = 1	0.500	0.500	58.000	3.000
overcharging = 0	0.211	0.117	115.773	4.297

Table 2: Mean Comparisons Between Garages That Did and Did Not Overcharge.

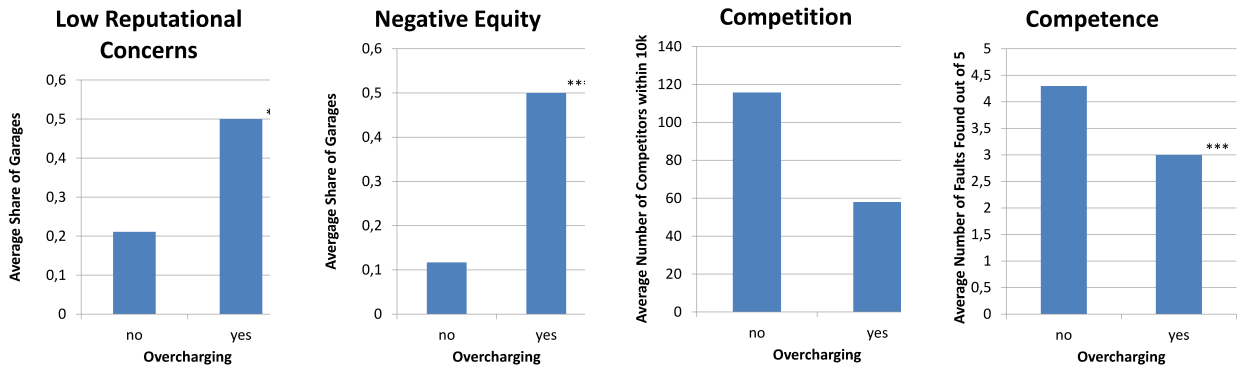

Figure 1: Mean Comparisons between Garages That Do and Do Not Overcharge

4 Results

In order to analyze the multivariate effects of reputation, financial situation, competition and competence on overcharging we perform a Firth logit regression (Firth, 1993). The Firth regression uses a penalized likelihood estimation removing the bias that occurs due to the small sample. The Firth approach also regularizes the data and thereby circumvents the perfect classification problem (Zorn, 2005). Our model is specified as follows:

$$\begin{aligned} logit(overcharging) = \beta_0 + \beta_1 low\_reputation + \beta_2 negative\_equity \\ + \beta_3 competence + \beta_4 competition + \epsilon \end{aligned} \tag{1}$$

The above model leads to the following results on a 5% significance level:

Result 1. *Low reputational concerns increase the incentive to overcharge.*

Our analysis confirms *Hypothesis 1.* The intuition is as follows: garages that have a low reputational concern, i.e., they face many one time interactions, can overcharge their customers without hazarding a loss of future earnings. Therefore, overcharging is the garages' dominant strategy as it ensures higher profits than diagnosing honestly. Consumer Federation of America et al. (2011) suggests to "only do business with auto repair shops that you know and trust or that have good reputations based on other people's experiences. If you have any doubts about the diagnosis of your cars problem, bring it to another shop for a second opinion if possible."

Result 2. *A critical financial situation, i.e., negative equity, leads to a larger incentive to overcharge.*

As a consequence, we can also confirm *Hypothesis 2.* Garages in a critical financial situation overcharge more often compared to those with a solid financial background. In case overcharging is detected, the garage does not bear the costs of defrauding because it will file bankruptcy. On the other hand, if overcharging is not detected, the fraudulent behavior will help to overcome the garages' crisis.

Result 3. *An increase in competition does not have an influence on the level of overcharging.*

In accordance with theory, we find no support for a influence of the level of competition on overcharging. The reason is that customers are only willing to pay their

Table 3: What Drives Fraud?

	Firth Logit
Low Reputational Concerns (=1 if distance<1000m)	2.431** (1.046)
Negative Equity (=1 if true)	1.810** (0.901)
Competition within 10k	-0.012 (0.008)
Competence	-0.743** (0.311)
Constant	-0.361 (1.182)
Observations	134

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

valuation of a treatment if they expect to be treated honestly. This does not depend on the market structure but holds for a monopolist as well as for a competitive market—the only difference is that in case of a competitive market the rent is accrued by the customers while the monopolist can skim the rent for himself. However, we point out that of the six garages that overcharge five shops face a competition level that is lower than the average competition level.

Result 4. *A higher competence decreases the garages' incentive to overcharge.*

This result confirms *Hypothesis 4*.

5 Robustness Checks

Our results turn out to be extremely robust against alternative models such as the linear probability model, the logit model a with regular maximum likelihood estimator, the probit and the scobit regression (see *Table 4*). The latter accounts for the skewed distribution of the overcharging variable but was not significantly different from the logit regression.

Table 4: Robustness Against Different Models

	OLS	Logit	Probit	Scobit
Low Reputational Concerns	0.089**	2.906**	1.365**	2.686**
(=1 if distance<1000m)	(0.041)	(1.239)	(0.580)	(1.123)
Negative Equity	0.110**	2.071**	0.948*	2.025**
(=1 if true)	(0.051)	(1.031)	(0.542)	(0.869)
Competition within 10k	-0.000*	-0.017*	-0.009*	-0.015*
	(0.000)	(0.010)	(0.005)	(0.008)
Competence	-0.041***	-0.876**	-0.437**	-0.818***
	(0.015)	(0.369)	(0.189)	(0.313)
Constant	0.220***	-0.247	-0.129	-14.635
	(0.073)	(1.326)	(0.758)	(2415.693)
Pseudo R-squared		0.369	0.362	
Observations	134	134	134	134

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In alternative specifications, we also controlled for yearly effects in order to ensure that the financial crisis did not effect garages' behavior. Also, we controlled for the size of the company, the type of the garage (authorized vs. independent garages), their number of employees and whether they were authorized or not. Neither of these alternative specifications had a significant influence on the probability of overcharging. We also did not find any interaction between the variables.

6 Conclusions

Making use of a quasi experiment, we analyze the impact of repair shops' reputational concerns, their financial situation, the degree of market competition, and the garages' competence on their incentive to overcharge. In accordance with theory, we find that a low reputation and a bad financial situation increase while a high competence decreases the garages' incentive to overcharge. Compared to the experimental results obtained by Dulleck et al. (2011), our effect of reputation is considerably stronger. Competition neither influences the probability of overcharging in Dulleck et al. (2011) experimental nor in our study.

To conclude, customers should avoid garages that have a low reputational concern and those in a bad financial situation. If customers are able to get a hint of the competence of the car repair shop, they should not only choose the better competence because they want their problems to be fixed but also because those garages face a lower incentive to overcharge.

References

Consumer Federation of America, National Association of Consumer Agency Administrators, North American Consumer Protection Investigators, 2011. 2010 Consumer Complaint Survey Report.

Darby, M. R., Karni, E., 1973. Free competition and the optimal amount of fraud. Journal of Law and Economics 16, 67–88.

Dulleck, U., Kerschbamer, R., 2006. On doctors, mechanics, and computer specialists: The economics of credence goods. Journal of Economic Literature XLIV, 5–42.

Dulleck, U., Kerschbamer, R., Sutter, M., 2011. The economics of credence goods: An experiment on the role of liability, verifiability, reputation, and competition. American Economic Review 101, 526–555.

Firth, D., 1993. Bias reduction of maximum likelihood estimates. Biometrika 80, 27–38.

Park, I.-U., 2005. Cheap-talk referrals of differentiated experts in repeated relationships. Rand Journal of Economics 36, 391–411.

Schneider, H.S., 2011. Agency problems and reputation in expert services: Evidence from auto repair. Journal of Industrial Economics, forthcoming.

Titus, R.M., Heinzelmann, F., Boyle, J.M., 1995. Victimization of persons by fraud. Crime & Delinquency 41, 54–72.

Wolinsky, A., 1993. Competition in a market for informed experts' services. The Rand Journal of Economics 24, 380–398.

Wolinsky, A., 1995. Competition in markets for credence goods. Journal of Institutional and Theoretical Economics 15, 117–131.

Zorn, C., 2005. A Solution to Separation in Binary Response Models. Political Analysis 13, 151–170.