ESSAYS IN CREDENCE GOOD MARKETS

A Proposal for Doctoral Dissertation

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by

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Contents

1 Introduction

> Experts get things wrong all the time. The effects of such errors range from mild embarrassment to wasted time and money; in rarer cases, they can result in death, and even lead to international catastrophe. And yet experts regularly ask citizens to trust expert judgement and to have confidence not only that mistakes will be rare, but that the experts will identify those mistakes and learn from them.
>
> Tom Nichols, *The Death of Expertise*

> Knowledge is Power
>
> Sir Francis Bacon, 1597

The universally acknowledged adage was stated by Sir Francis Bacon at the dawn of the seventeenth century, during what we now call the Age of Enlightenment. However, irrespective of the wisdom Sir Francis Bacon might have had, he could not have fathomed the magnitude of relevance the proverb holds now, four centuries later. We live in what we have colloquially termed as The Information Age, with the development of Information and Communication Technology in the twentieth century and the rapid spread of the internet which has connected each individual with the rest of the world, transcending all geographical constraints.

It is no coincidence then, with the role of information in our economic life, that Information Economics has become one of the forefront sub-disciplines in modern economic theory. Despite the large attention the field has garnered from economists, the rapidly changing landscape of technical innovations and rise of electronic commerce and various platforms demand consistent analysis of the various sub-disciplines that have opened under the framework of Information Economics

1.1 Information in Markets of Expert Services

> Water, Water everywhere., nor any drop to drink
>
> -Samuel Taylor Coleridge, *The Rime of the Ancient Mariner*, 1834

The information Age is plagued not by a scarcity of information, but rather too much it. While conventional economic theory with perfectly rational agents would be expected to have computational capabilities to use all available information dispersed in the world to make an economic decision, in reality the bindings of rationality pose several problems for the individual decision maker to possess the information required to make the optimal decision. The increase in information stock paradoxically has increased the value of information, as

it requires even more effort to get the relevant information out of irrelevant, non-credible information. (Rose, 1999)

With the aforementioned context in mind, an analysis of the nature of information asymmetries in the markets for expert services is an important step to map out the nature of modern information asymmetry as a whole. This is because:-

1. Expert Services such as those of Physicians, Scientists, Lawyers, Mechanics, Electricians etc. depend on the knowledge of the expert to solve problems which the average consumer requires. For the average consumer to obtain the information to treat her own problem would be prohibitively costly.

2. However, one can assume that the relevant information is publicly accessible, through which the consumer can educate herself on the nature of the problem.

3. However, the probability of the average consumer actually possessing all information to diagnose and treat her problems is low in reality, regardless of her beliefs.

4. It is therefore that expert services become important. However, the information gap between the expert and the consumer on the nature of the problem and its treatment possibilities means that the expert might have incentives to conduct in fraudulent behaviour.

5. Therefore, amidst the possibilities of being deceived by an expert, relevant information on not only the market, but also on technical information of the expertise might have a role in preventing such outcomes.

1.2 Expert Services as Credence Goods

The markets for expert services such as medical care, financial and legal services, repair services such as mechanics, plumbers or electricians share certain similarities on the basis of their information characteristics.On the basis of information characteristics, Nelson(1970) classified *ordinary* , *search* and *experience goods*. Darby and Karni(1973) added *credence goods* to this list. Information pertaining to search goods could be ascertained *ex ante* via a costly search process, while experience goods provide information only *ex post*. Credence goods sometimes known as *post-experience* goods are those on which information cannot be ascertained even *ex post*.

The expert seller who diagnoses the treatment and given economies of scope, provides treatment can offer verifiable or non verifiable information, where the difference in pertains to the implications. The former results in an experience good while the latter a credence good. The difference between the two are significant with experience goods resulting in credible evaluations and innovations such as pre-purchase trials as product differentiation processes. Conversely, the uncertainty remaining even after trials in credence goods and problems with respect to credibility of reputational information (even when non strategic) adds further asymmetry and results in larger inefficiencies and agency problems.

It is then useful to sketch briefly how this problem sits in the literature, and analyse the various implications this special type of information asymmetry results in, particularly since it has varied treatments in standard neoclassical analysis, principal agent theories, game theory, industrial organization and other applied fields such as health economics.

1.3 Literature Review

The standard theory of agency considers a Principal(uninformed) and Agent(informed) who maximize their independent utility functions, where because of the possibilities of diverse interests, the principal usually draws up a contract so that the agents dont cheat. The literature suggests that since outcome is the only source of information to the principal, the payment is a function of this outcome.

The literature in Health economics was among the first to notice such agency problems in the physician-patient relationship.Mooney and Ryan(1993) point out that there is a sort of reversal in the nature of agency in such a market since here it is the principal(consumer) who provides information to the agent(seller) who then takes an action, compared to the seller(agent) providing all the information that the buyer(principal) needs.
There is a consensus among various health economists that implies the patient not only cares for treatment outcomes, but with the treatment process McGuire et al,(1988);Mooney(1991),Mooney and Lange(1991). Other health economists suggest the inclusion of utility from information which reduces uncertainty, or just knowledge[(Lubs and Falk,1977);(McGuire and Henderson, 1988)]. Culyer(1988) identifies three factors leading to agency problems in the physician-patient market:-

- *Misinterpretation and Misinformation*: The physician in interpreting the patient might respond poorly out of misconception of the consumers interests, and also with own incentives to maximize his pay-off.
- *Capability*: The physician lacks skill or information on effectiveness.
- *Overclaiming*: The physician claims expertise when he doesnt.

The literature of Credence goods is scarce, with Dulleck and Kerschbamer(2006) being the only survey article published as to my knowledge. Their article does express these concerns, citing a handful of papers which have worked towards this class of goods since the introduction by Darby and Karni(1973). This section will first sketch the theoretical undertakings in the literature and then provide a few empirical studies which shed light on the validity of predictions generated by the various theoretical undertakings.

1.3.1 Theoretical Results

Some of the classic questions handled by the literature of credence goods are to examine the conditions in which experts have incentive to exploit the information asymmetry, the analysis of various type of fraud behaviours, and finally the mechanisms and institutions to deal with such behaviour.
The special feature of the credence good markets is that though the success or failure of the overall treatment are observable, the extent of the service needed and performed are not, and hence provides incentives to the expert to conduct in opportunistic behaviour, resulting in deception or fraud. The experts inability to provide efficient treatment as well as the moral hazard resulting from the inability of the consumer to monitor the expert are other sources of information asymmetry in such markets.
Dulleck and Kerschbamer(2006) then elucidate the types of fraud that exist:-

- Under-treatment When a consumer requires complex sophisticated treatment which is expensive but receives a simple treatment, which is inexpensive.
- Over-treatment This is explained as when the consumer requires a simple treatment but receives an expensive one.
- Overcharging Consumer requires and or receives inexpensive treatment but is charged for expensive one.

The predictions of the theoretical literature in the credence good literature are very sensitive to initial conditions as most of the differences in the literature stem from different assumptions. These assumptions are whether the consumers verify the type of treatment post transaction so that the experts must provide treatment even if it is the inefficient costly one, though they also identify equilibria where these markets operate efficiently competitive markets, same price for all treatments, experts division of labour etc., and also a wide range of outcomes which ranges from undertreatment, overtreatment, and overcharging. [(Wolinsky, 1993); (Emons, 1997); (Dulleck and Kerschbamer,2006) ;(Alger and Salanie, 2006)]

Darby and Karni(1973) presented how market conditions and reputational concerns drive fraud in the market. Pesendorfer and Wolinsky(2003) study how second opinions can lead for sellers to put in costly diagnostic effort. Alger and

Salanie(2006) study conditions under which sellers tend to lie about true diagnosis which prevents right treatment from a competing seller and undermining specialization as well as the validity of second opinions. The elements of any theoretical study would then need to take these studies into view, and a role for search efforts, search costs, diagnostic efforts, consumer heterogeneity and so on have been recognized. The definitions which characterizes credence goods also differ in the assumptions, where different analytical methods to achieve the assumption of consumers non observation of utility can be used to see the problem differently.

Wolinsky(1993) provides a justification that consumers punishing behaviour would deter the experts from cheating through the threat of second opinions[1]

1.3.2 Empirical Results

Empirical observations from different markets confirm the pattern of agency problems. Such markets are in financial services (Ellison and Chevalier, 1999), physicians (McGuire T. , 2000), pharmacists (Iizuka, 2007), Real Estate (Levitt, 2008).

The study on the auto-repair market by Schneider(2012) grants insight into the three conditions posed by Dulleck and Kerschbamer(2006) for the verifiability, liability through prevalence of over treatment than overcharging and through under-treatment respectively. The low effort corresponds to under treatment, which the seller might resort to when the effort is unobservable, or legally cant be challenged. Similarly, the reputation-al concerns and repeat customers as well as certified sellers are shown to bear no statistically significant outcomes, which raises conjectures and hypotheses that expert incompetence can be a possible explanation. Schneider(2012) raises other empirical results of experience of experts not leading to better outcomes which warrant a theoretical analysis of the interaction processes in experts incentives and skills, and mechanisms which would provide reliable reputation guidelines(from top ranked consumers, third parties) where public posting serves as a guideline to make the reputation claims reliable. The importance of correct feedbacks are extremely crucial to such markets, where consumers report their experience, rather than ratings and judgements.

Iizuka(2007) considers the case for the prescription drug market in Japan, and outlines another problem that exists in expert markets, of the seller not only providing information for outcome, but rather providing the treatment itself, which raises a financial incentive of mark-up on treatment service. For example, a doctor providing facilities of dispensing tests and medicines which are prescribed, which is a common trend in many countries. This incentive

[1]However, empirical results such as Schneider(2012) have shown that second opinions are usually not borne out and there is a degree of commitment since second opinions can be prohibitively expensive)

might accentuate the Supplier-Induced-Demand found in the Health Economics literature . The author also finds evidence that the mark-up on treatment does influence physicians decisions, with physicians prescribing high cost, high mark-up drugs compared to available lower cost generics(the patients being unaware of the different lower cost choices). Finally, results bear that physicians dont act purely on their own incentives, and are responsive to out of pocket expenses by consumers, unless an insurer is there. It becomes interesting here that pharmaceutical companies do play a role in the choice of drug prescribed by the physician.

Emons(1997) cited a swiss study where an average person was three times more likely to receive a surgical intervention than a physician or a member of her family while Wolinsky(1993) refers to a survey which estimated that half of auto repairs are unnecessary.

These markets dont suffer from market failure despite the inefficiencies because there are enough good experts(in fact more so than the poor ones) so that the market is an inefficient one and not failed. (Schneider, 2012)

Dulleck and Kerschbamer(2011) in a large scale experimental study for 936 people find that liability is crucial to the market where as verifiability and reputation have at best a minor effect. Liability implies that the seller is needed to provide a sufficient standard of quality posed by institutional or regulatory norms, and if not, or if caught is responsible for it legally. Verifiability similarly implies that overcharging is ruled out, that is the seller can only charge for the service provided. The authors find that in their study, seller competition drives down prices.

1.4 Literature Gaps

Dulleck and Kerschbamers(2006) attempt to generalize the credence good literatures piecemeal models into cases differing on a few key assumptions and identify the efficient outcome is a step which organizes the small but dispersed nature of articles. However, in their attempt to do so, they rely on some extremely strong assumptions as well as miss out on a few key aspects.

First, the literature has largely ignored the role of experts ability[2], that is, they assume that the experts diagnose problems perfectly, which also undermines the moral hazard of the experts. (the mechanism depending on the number of good experts)

Secondly, reputation effects are different for experience goods as compared to credence goods, for where quality and quantity cant be observed post trans-

[2]Pesendorfer and Wolinsky(2003) attempted to account for experts choice of effort in diagnosis from the threat of consumers obtaining second opinions.

action, reputation may fail to create efficiency in the market. Indeed, Wolinsky(1993) finds that reputational concerns can limit efficiency. However the kind of reputation understood in these models whether in experience or credence goods case hasnt considered how reputations form on the internet through opinions(subjective beliefs about treatment), which lead to herd behaviour or conformity. The mixed effect of reputation on agency in credence good markets has been found by Dulleck, Kerschbamer, and Sutter(2011)

The review yielded the observation of only two studies Pesendorfer and Wolinsky(2003) and Dulleck and Kerschbamer(2005) which has explicitly paid attention to problems of effort and ability, while the rest are primarily devoted to financial incentives which lead to over-treatment behavior.

1.5 Aim and Scope of Analysis

The literature on markets for credence goods is scarce and dispersed, and has been noted by Dulleck and Kerschbamer(2006) who have provided the only survey paper for the literature as to my knowledge. However, the prevalence of such markets in an economy, apart from the complications arising due to the informational problems, widespread consumer scepticism and changing nature of the markets from innovations such as the internet which provides a reservoir of information at significantly less search costs means that there is a scope for rigorous analysis, building upon the themes the literature has discussed.

The aim of hence my dissertation project is to incorporate these concerns and provide a theoretical analysis of some empirical studies since the survey paper which surprisingly is at odds with many predictions of the theoretical literature, as mentioned above. Because credence goods have various levels at which information problems occur, that is, in search, market structure, bargaining and persuasion, post-transaction reputation and feedback, my dissertation seeks to address these issues for the levels of analysis, and then provide a systematic account of each flowing to the other. The project aims to cover most aspects of credence good markets, building upon the gaps and provide valuable contribution to the literature for further analysis. The following section provides the outline for the dissertation project.

1.6 Dissertation Outline

The outline of the proposal attempts to extensively analyze most aspects for the market of expert services. The three chapters of the dissertation would examine different levels of analysis, to expose all aspects. The first chapter would study the interaction and game between the expert and the consumer. The second chapter examines the reputation concerns for experts and its effect on economic behaviour while the third chapter would look at credence goods in low income

and income inequality settings through locational choices of experts in rich and poor neighbourhoods.

2 Chapter 1 - Decoding Deception in Markets for Expert Services

2.1 Introduction

One of the most important theoretical questions in credence good markets is to determine the conditions when experts engage in fraudulent behaviour, and the ways they do so. The Pre-Requisite of such analysis then necessarily implies that given an opportunity, through violations of the Homogeneity, Liability and Verifiability assumptions, the expert would always cheat (Dulleck and Kerschbamer,2006).

There is widespread consensus and evidence that deception is prevalent in markets for expert services whether they are experience or credence goods. However, there is debate as to what causes deceptive behaviour in experts, and how they engage in it. Though the theoretical predictions of the literature vary considerably on the assumptions which lead to fraud, almost all of them tinker with the same set of assumptions and frame of reference.

However, asking a few simple questions and looking at the empirical literature quickly shows the scope for further theoretical analysis, which should be consistent with empirical results, as well as answers the questions which would be laid out in the sections below.

First, some theoretical predictions in the literature would be examined against recent empirical results, which would be followed by a critique of the literature where identified gaps would be put forward as questions for analysis. The last section will sketch out the proposed methodology of analysing and answering the questions.

2.2 Empirical Evaluation of Theoretical Predictions

The genesis of fraudulent behaviour in most of theoretical literature of expert services lies on the reliance of consumers on experts for not only the diagnosis but the treatment of the said problem (given sufficient economies of scope). The dual role of diagnosing as well as seller of services leads to agency problems, where the seller can then exploit incentives of the information asymmetry to engage in fraudulent behaviour(Dulleck and Kerschbamer,2006).

In their survey article, Dulleck and Kerschbamer(2006) identify three general assumptions that of *Consumer Homogeneity*, *Liability* (minimum standards of treatment), and *Verifiability* (observation of experts action) for market efficiency. The violation of these assumptions gives rise to three types of fraud: - *Overcharging* (From violation of Verifiability - the expert charges for services

which are not provided.), *Undertreatment*(From violation of Liability - providing less than efficient treatment) and *Overtreatment*(Second best strategy when overcharging is not possible.)

Outcomes dont reflect the quality and quantity of treatment, A few examples would illustrate this point A simple fix on a car would make it run again, but the consumer might be charged for expensive parts. Another example might be a taxi-driver driving the tourist through longer routes and a medical practitioner leading a consumer to expensive tests and treatments. (well documented in the Health Economics literature as Supplier induced demand).

A few empirical studies in the past few years have examined these predictions through survey and experimental methods, which are as follows: -

- Expert Characteristics
  - In a large scale experimental study, Dulleck and Kerschbamer(2011) found that even in absence of liability constraints, more than a quarter of experts displayed non-fraudulent behaviour.
  - Effort and Competence - Dulleck and Kerschbamer (2011) found that the dominant factor for poor quality treatment in their experiment was lack of effort in diagnosis.
- Consumer Characteristics
  - Heterogeneity - Consumer heterogeneity relates to the ability of the consumer to monitor the sellers action, Ryan(1992) indicates from within the medical literature that patients are not homogeneous and doctors treat different patients differently. Other treatments in literature identify importance of consumer heterogeneity in types and expert capacity (Fong, 2005).
- Role of Market Factors
  - Dulleck and Kerschbamer(2011) find that neither controlling for competition, reputation, prices reduced deceptive behaviour, a finding also observed by Schneider(2012)
- Nature of Fraud
  - Dominance of Under-treatment
  - Negligible Overcharging - Dulleck and Kerschbamer (2011) found that violation of the verifiability assumption in their experiment had negligible importance, that is, minimum overcharging.
  - Exaggerated importance of Over-treatment

2.3 Discussion and Literature Gaps

Though the empirical results discussed in the previous section provide enough evidence of widespread deception in expert services market, one of the most striking observations is why such a significant number of experts dont act opportunistically when given the chance as expressed in results of of Dulleck and Kerschbamer (2011) and Schneider(2012) which reveal that more than twenty-five percent and sixty-five percent of experts respectively, do not engage in any deceptive behaviour, even in the absence of liability constraints for the former. That implies that if deception is the dominant strategy given that the expert is not constrained by verifiability or liability assumptions, and though there is widespread scepticism among consumers on being deceived, then how do these markets not only exist but thrive?

2.3.1 An Alternative Framework?

The primary mechanisms which Dulleck and Kerschbamer (2006) suggest in preventing fraudulent behaviour are expert certification, competitive forces, price signals and reputation considerations. However, in their follow-up experiment, they find that none of these factors are important in limiting deception (Dulleck and Kerschbamer,2011). They found that observed price differences among various quality provisions were negligible, with flat and inelastic pricing structures. The authors claimed that the contradictory nature of the theoretical and empirical results imply the need for a deeper look into the behavioral relevance of the theories.

The failure of theoretical predictions in explaining empirical results implies that either the theoretical literature has ignored some important explanatory mechanisms or exaggerated other mechanisms which prove to be not so important. An examination of the assumptions hitherto applied are also necessary to reveal the mechanisms at work.

The different parameters identified and examined are as follows :-

Expert Characteristics

Preferences The presence of significant honest experts as validated by the empirical studies leads us to the question whether experts engaging in fraudulent behaviour could be exaggerated in the theory, and secondly, how much of deceptive and inefficient levels of treatment are borne out of financial incentives, as compared to other sources of deceptive behaviour?

A behavioural explanation of expert honesty stems from the claim that experts are not only motivated by their pure selfish interests. Indeed, the health

economics literature has documented that in physicians do care about the patient interests, and the utilities are to a certain extent inter-dependent[3][Evans(1984);Culyer(1988)].

Effort and Competence Most of the seminal papers out-rightly neglect the role of experts competence and effort incentives, which lead to agency issues resulting in a possibility of fraudulent behaviour. [Dulleck and Kerschbamer (2006); Emons (1997); Wolinsky (1993)]. In fact, Dulleck and Kerschbamer claim in the paper, notwithstanding the importance of the two effects, that the two effects are not specific to credence good markets.

When experts' effort and competence are included in analysis, a review of definitions of various deceptive behaviours become imperative, as well as possibilities of other deceptive behaviours.

When an expert's knowledge is binding such that he lacks the ability to effectively treat the consumer's problem, and given that the consumer lacks the information to gauge expert competence, two sources of deception may arise from another type of deception, which is *Overclaiming* behaviour of the expert who despite the lack of skills to provide optimal diagnosis and treatment, proceeds out of self-interest. This can lead to two different deceptive behaviours:-

- *Undertreatment* - The expert might proceed with the diagnosis and treatment despite lacking the skills to do so resulting in poor treatment, which can either fail to solve the problem, which is verifiable to the consumer, or provide less than optimal treatment which though works, leads to problems post transaction(and liability becomes important)

- *Overtreatment* - The expert on account of lacking the skill to diagnose and treat the problem efficiently, resorts to the most drastic solution of overtreating depending on the amount of effort it takes in overtreatment. For example, a psychiatrist unable to diagnose a patient might prescribe highly potent drugs whcih are unwarranted. This reason might explain why overtreatment would occur in cases of fixed prices and public sector.

The credence good literature treats Undertreatment and Overtreatment as two distinct kinds of deception, however once we look into the behavioral genesis of the two, it becomes apparent that the two might be closely interrelated. Dulleck and Kerschbamer discount the importance of undertreatment on account of its observable nature, and liability protection. This is a general trend in the theoretical literature of credence good markets where overtreatment is to state

[3]However, while this explanation might be suitable for markets such as medical care, the experts honesty and pro-social behaviour doesnt fit with markets such as those of other specialists and mechanics which are not weighed down by ethical considerations as such. Taking preferences to be partially aligned is a more realistic assumption, as in Crawford and Sobel(1982)

casually, the more *sinister* of the two deceptions.

However, the empirical results have universally found that though both undertreatment and overtreatment are significant, the former is significantly more common than the latter.[(Schneider,2012);(Dulleck and Kerschbamer,2011);(Das et al.,2006)]

This might imply that undertreatment might be preferred over overtreatment because overtreatment can be costly, and the expert only uses it as a last resort, and even though poor liability regulations might explain why undertreatment is pervasive, it doesn't explain undertreatment under the assumption of honest expert.

Consumer Characteristics

Preferences Though consumer preferences no doubt depend on outcome and prices, in credence markets where prices are assumed to be fixed, and the provision of quality due to the nature of the good cannot be ascertained, the consumer might still derive utility through a proxy of quality which she can observe. Since outcomes of treatment don't reflect deception per se, other observable factors as well as consumer's verification of the process(even though probabilistic) can provide utility in the form of reduced uncertainty. This depends on the actual information the consumer credibly decodes, to subjective beliefs on them.

The point that treatment works that the outcome is right but poor treatment means that problems develop later on, especially in durable goods. The nature of warranties for repair services as such then arise post say the warranty period. That is why It is taken in my analysis that the Consumer not only wants treatment outcome, but the process and information gathered as well. The expert wants the treatment outcome too, since we are talking about partially aligned objectives. But the expert cannot promise process, or can have an aversion towards it.

This can be interpreted as *consumer skepticism* in so far as the consumer requires information on the quality and quantity of service provision to verify the nature of treatment.[4]

The utility from the process of interaction with the consumer hence can be formalized as the information the consumer directly gets from the expert on the nature of the treatment, which may or may not be interpreted correctly.[5]

[4]Here information transmission from expert seller serves not as a direct utility, but as a form of indirect utility as the consumer might not directly care about the information *per se* but only for its use in verifiability

[5]It is to be mentioned that the indirect utility of information as verifiability is different from the treatment of verification assumption by Dulleck and Kerschbamer(2006) where verification

Heterogeneity Homogeneity assumption in a market is never true in practice and so the theoretical literature follows in the seminal papers treating consumer heterogeneity either in forms of valuations and willingness to pay, incomes, probability of requirement of a major or minor treatment etc.

However, as far as I am aware, the literature has missed out on heterogeneity on the basis of the utility derived from expert's provision of information to the consumer, such that while some consumers only care for the outcome of the treatment given prices and other observable factors(which would from now would be referred to as *naive consumers*), other consumers might also require information on the nature of the treatment and provision, either due to curiosity, scepticism, plain lack of knowledge or to reduce uncertainty through some verifiability on the treatment.[6] (These consumers would be referred to as *sophisticated consumers*)

Sophisticated consumers are hence intrinsically *skeptical*, with differing assumptions on expert's knowledge of the consumer's type. The heterogeneity among consumers on account of skepticism serves as a method to differentiate consumers on account of their own expertise on the information sought in the expert market, which would serve the purpose of verifiability, with an additional effect of reducing the effort of doctor in conveying information.

Market Characteristics

Time and Capacity Constraints Often, an expert in credence good markets especially when is the market is saturated with a low proportion of experts might suffer from time and capacity constraints. Well define capacity constraint as finite time which an expert might allocate to all consumers, which when fixed is the same for all consumers.

$$t = T/N$$

When the expert goes beyond his capacity, and allocates time equally, the time per consumer decreases.

However, when t is endogenous, the expert can allocate time differently depending on the type of the consumer.

in their model excludes effort, ability and instead means observation of expert's action whereas here it implies information on the diagnosis and treatment presented to the consumer directly by the expert, and hence is not limited to *overcharging* as in their study

[6]This assumption is different than the one considered by Fong(2005) where consumers differ on the valuation of treatment such that information explicitly is valuable. The more realistic assumption would be that derived utility from information is a by-product of the interaction, since the consumer doesn't go to an expert to get educated

We will assume that within t the consumer has to put three types of effort which require time, i.e. diagnosis, transmission and treatment. We assume that treatment times to be same across all experts, such that competent experts are assumed to diagnose as well as transmit information in a lesser time.

$$t = e_d + e_c$$

The expert can hence choose to be vague or precise in his communication of information after diagnosis, where being vague would require lesser time.

2.4 Research Questions and Proposed Methodology

The hypothesis or the question of my first paper is to verify that whether deceptive behaviours exist in credence good markets when the experts are honest and not motivated by financial interests? And to test the conditions under which such behaviours might arise depending on assumptions on consumers and experts types and capacity constraints.

The chapter also seeks to ask the question that what can be perceived as deception in a market is strategic or non-strategic motivations of the expert.

The theoretical framework which would be used in light of the research questions, aforementioned assumptions and which would capture all the interested parameters discussed above would be through a modification of the information transmission model presented in the seminal work by Crawford and Sobel (1982).

The justification of modelling credence goods as a game of strategic information transmission is the empirical result which shows lesser relevance of market level characteristics such as competitive forces and price vectors in explaining the mechanisms of fraud. In fact since the informational problems span the markets, competition doesnt mean that fraud behaviour is diluted, which is intuitive since consulting other experts might be costly, and empirical and experimental results demonstrate the pooled nature of prices and negligible price differences.

In light of the importance of the behavioural parameters in the questions, which comes from modelling the actual process of interaction, where the expert can manipulate the information transmission from his private information of the state. The large literature since Crawford and Sobels seminal work runs parallel to the nature of such problems, but very few of them have been applied in the case of credence goods, which would require modifications in the original set-up, such that even the framework would be a new one, and possibly an addition to the cheap talk literature as well. Before elucidating the departure of the proposed model from the Crawford and Sobel model, a justification of using the communication approach as opposed to the standard game approach as used in Dulleck and Kerschbamer(2006) must be discussed.

As the proposed analysis aims to take the empirical results as a starting point for analysis, the broad consensus established is that the role of market factors such as pricing strategies and competition might be overstated. Hence, price setting in the analysis would be exogenously determined, an intuitive assumption in the context of credence good markets. The general analysis in Dulleck and Kerschbamer(2006) analyses a market from a single expert and seller to multiple of both. However, the study of deception in credence markets might be better served through a focused analysis of each dimension separately, especially when intrinsic unobservable factors such as experts effort and ability matter.

The proposed framework departs from the CS analysis in two major ways. First, in light of nature of credence good markets, where the consumer is severely limited in not only the stock but accumulation of information, the framework would use a bounded rationality model for both the consumers and the experts. The assumption of bounded rationality allows for important factors such as errors, interpretation and most importantly in the information gap between the expert and consumer, and the possibility of information transmission in light of the information gap. Lipman (2009) has proposed such a model to study the vagueness of language, which might be optimal despite being Pareto dominated by the precise message. This information transmission I have termed as the *Ockham Razor* effect, and will be a key component in the analysis.

The second departure from the CS model is in the nature of relationship between the experts and consumers preferences. While the intuition behind the CS analysis is that experts with biases on the nature of treatment would send biased message to the expectation of the rational receiver, resulting in no information revelation. In my proposed analysis, the receiver cannot ascertain whether the expert is biased, and more importantly, recognizes the interdependent utility between the two (the benchmark model would consider perfect alignment of interests). Information revelation in the CS framework arises from strategically general partitions over the state, resulting in partial revelation (perfectly aligned interests would result in full information revelation in the CS model), the hypothesis of equivocation can arise even in presence of non-strategic and aligned interests of the expert and the consumer.

The assumption of bounded rationality also allows the type of heterogeneity of experts and consumers warranted in the analysis, that is through information providing indirect utility. The heterogeneity would have significance in the next chapters discussion on reputational effects as well.

In context of signalling games as in the costless signalling game of CS framework, Noise corresponds to distortions in the message signal which changes the informational content of the message on decoding by receiver. In the standard communication model of Shannon(1948), there are various sources of noise in the signal, which can either be a deliberate strategy of the sender with respect

to incentives, or an unintended non-strategic outcome from poor encoding, decoding, or signal loss over a distance.[7]

The information transmission literature in economics applies noisy messages as deliberate strategies of the self-interested seller, as developed in the CS framework. However, in the credence goods framework, where we can assume the assumption of bounded rationality, we can expand the sources of noise in the message in addition to strategic action of the expert to reveal important mechanisms at work in the interaction process.

2.4.1 Sources of Noise

The expert can either deliberately alter the message to manipulate the information with regards to his strategic interests. This is the type of noise discussed in CS framework. However, there are other sources of noise which can arise from both strategic and non strategic interests. If the expert is incompetent, he may either misdiagnose the state and send the wrong signal.

The consumer similarly can also induce noise into the signal sent by the expert, in misunderstanding the information sent by the expert on account of limited rationality.

One important source of noise in the signal comes in the transmission process itself, which is the encoding-decoding process, which though might be necessary, in the context of credence good markets can have powerful effects. The intuition is that even if the expert perfectly captures the signal and is honest, distortion can arise because the complexity of the information signal wont do any benefit to the consumer, and hence the expert would have to put effort and time in converting the complex signal into a simple one, which can be decoded by the consumer. However, in the process of encoding, the complex nature of the information becomes noisy when translated into the simple signal. It will be assumed that the simple signal can be informative as the complex signal, but for which the expert would have to put more time and effort. This type of noise induction is what well term *Ockham Razor* effect.

The use of noise in signalling theory makes intuitive sense in the analysis of credence goods where excess noise in the signal can be perceived as deception, even when the expert and consumers preferences are aligned and also when the expert is non-strategic.

Pitchik and Schotter (1987) present the expert consumer game, where the experts randomize in reporting truthfully or not, and consumers randomize between acceptance of a major treatment recommendation in a game of Strategic

[7]It is to be noted that there exist multiple methods of introduction of noise to a signal, as deemed necessary by the analysis

information transmission applied in context of credence goods. However, the framework discussed above can account for not only deception through honest or dishonest behavior, but what can be perceived as deception even when the expert might be honest and capable.
The Expert can be vague or equivocal when he doesnt put effort in translating the signal. Indeed, since the market has nave consumers who only care about the outcome of the treatment at a fixed price, the seller might discount the the role of information transmission and might not be very precise in explaining the nature of treatment, which he might consider as superfluous.

Here the types of both expert and consumer become important, where it can be assumed the difference between the competent and incompetent expert lies in the time and effort put in decoding and transmitting the signal. Likewise for the consumers, the sophisticated consumers dislike vague information, which even though sufficient for outcome, reduces verifiability where as the nave consumer might prefer vague over the precise nature of information.Depending on the difference of information between expert and consumer, the expert has to put more effort for the nave consumer to interpret the state

2.5 Further Exploration

Learning dynamics, intermediaries and feedbacks from consumers into a dialogue other dimensions flexible nature of signalling model vast literature to work upon deception and identity.

3 Chapter 2 : Reputation in Markets for Expert Services

3.1 Introduction

One of the important theoretical results of limiting incentives for fraudulent behaviour in markets with asymmetric information are the reputational concerns of experts.(Shapiro,1983)

Generally, it is predicted that reputational concerns for experts would improve market outcomes and efficiency through provision of honest, high quality service to the consumer which would result in loyalty as well as externalities through information sharing, providing incentives to the expert in expectation of a larger consumer base, whereas from the consumers perspective, reduced uncertainty and decreased search costs and low risk of deception for a highly reputed seller.[(Kreps and Wilson,1982), Shapiro (1983), Klein and Leffler(1981)]

Credence goods however pose interesting challenges to the applicability of reputation mechanisms in increasing market efficiency. Unlike experience goods, the quality of treatment received cannot be ascertained even post transaction, and hence evaluation of the service received cannot be credible.

However, this doesnt mean that reputation effects are not important in credence good markets. In a market where the product characteristics are not ex ante observable, the only recourse for a consumer lies in undergoing a search process by trial and error, or finding the expert on the basis of the public information presented by previous consumers, either through physical networks or the internet.

The following sections cover the theoretical and empirical results from the literature, discussion and gaps, and finally the questions and proposed methodology to be conducted in the project.

3.2 Literature Review

The seminal papers on reputation claim that reputation effects reduce the market inefficiency, where sellers build up reputation when consumers cannot observe product quality prior to purchase. (Kreps and Wilson,1982), Shapiro (1983), Klein and Leffler (1981). The literature computes equilibria where sellers provide high quality at a mark up.

Within the literature, there are primarily two ways in which reputation effects increase efficiency. First, the consumer evaluations provide information to other future customers, which helps them avoid an overtly fraudulent expert, and second that the experts then have an incentive to provide quality service

to maintain credibility and increase consumer base. The following intuition and effectiveness of reputation falls under question in credence good markets, because unlike experience goods, the consumers evaluation of the treatment is imperfect, as the consumers cannot perfectly verify the quality of the treatment.

Wolinsky (1993) was the first study of reputation effects in credence good markets. In the study, Wolinsky claims that the weight of reputation in guiding the consumer depends negatively on search costs. In the model with multiple experts, the threat of a second opinion i.e. selecting a different expert in subsequent periods prevents overcharging behaviour from the first expert.

Ely and Valimaki(2003) start with Kreps and Wilsons(1982) model to show that in absence of liability constraints, reputation effects might lead to decreased efficiency and increased fraudulent behaviour.(Given that treatments are observable). They argue that reputational concerned experts would want to separate themselves from deceiving ones, and would in consequence undertreat new consumers given sufficient consumers with major treatments in previous periods.

Much of the focus of reputation concerns in credence goods literature has been on the private histories of individual consumers. This implies the assumption of identification of experts by the consumers, and building of a history or memory in repeated interactions(Dulleck and Kerschbamer,2011).

Dulleck and Kerschbamer (2011) find that and find that reputation building only benefits the sellers, with its effect being not in increased efficiency and welfare but in increasing the volume of trade in the market, which does not induce any behavioural effects, which they imply that an opportunity to build up reputation can deteriorate rather than improve consumers welfare providing a false sense of credibility.

3.3 Research Questions and Proposed Methodology

With the basic framework for the expert-consumer interaction drawn in the previous analysis, it will be first considered as to how reputation effects enter in that framework, after which other mechanisms of reputation effects would be considered.

The analysis of reputation effects means adding the concepts of evaluation and pre-interaction information into the framework. The consumer can be affected by reputation effects in two ways:-

- The consumer has only the private information of his previous interactions with the expert.

- The consumer has the public information which affects skepticism and bias before the interaction process.

The second approach is based on the fact that people observe actions of other people who precede them in sequence, or gather them in a public platform.

The difference between the two types of reputation effects in the framework of previous analysis is that while in the private history framework, the skepticism of the consumer might change on the basis of previous encounter with the expert, for example, if the previous encounters are believed by the consumer to be positive, the consumer would not require information(or be skeptic) in the next encounter turning him from a sophisticated to a nave consumer.[8]

The literature on reputation in information economics as a whole has focused on the private reputation effect, but after the emergence of the internet as a medium to access information, the importance of the private mechanism is costly, and decreased search costs has led to the primacy of the second mechanism, for which there are a very few studies, and to my knowledge none applied to the credence good framework.

In the case of the public reputation mechanism, the consumer gathers information from a large public network or a platform, say the internet. Such a reputation mechanism is different from the private history approach, as first, the consumer now has to evaluate public information (which is also imperfectly evaluated in line with the credence good assumption). Depending on whether the consumer chooses a negatively reputed expert, would have pre-interaction biases and *induced skepticism*, and even in the case for a highly reputed expert, might take public opinion with a grain of salt, and still be skeptic or in the case of the nave consumer, might discount the need for verifiability. This presents an interesting study through a comparison of private and public reputation mechanisms.

The public reputation mechanism also introduces the agency problem of the platform, which can serve as an outlet for expert advertising, or might distort information suiting its own objectives. The expert might have incentives in managing his reputation and depending on the popularity of the platform, provide services aimed at observable aspects of the treatment process, which can mask the the actual parameters required for efficient evaluation. The public reputation mechanism also has strategic vested interests of an expert's competitors especially in the neighbourhood

Successful evaluation for the expert depends upon treatment outcomes, the information transmitted and dissolution of skepticism. However, the expert can

[8] As we have assumed that monitoring or skepticism requires effort for all consumers, and hence when the credibility of expert is established, the consumer has no utility from being a skeptic

especially for the nave consumers, portray credibility through alternate mechanisms which dont reflect his deception incentives. For example, the expert might offer price discounts to gain a favourable evaluation from a consumer, while still over-treating the consumer to result in a profit.

Reputations play a central role in credence good markets, and there exist three mechanisms to study reputation and provide a comparative analysis, that is of the private history reputation, public history reputation, and Network based reputation. The following questions are then analyze: -

The reputation effects in private mechanism on deceptive behaviour and to determine the conditions when reputation effects can improve or reduce consumer utility. Another question in a different vein to study how the three different kinds of deceptive behaviour of falsification, hidden, and equivocation by the expert affects consumers evaluation and expert credibility. Incorporating time and capacity constraints leads to the question of whether the uncertainty and disciplinary benefits from reputation is offset by time and capacity constraint for a popular expert.

The second question from the same framework but with the pre-market characteristics of evaluation or bias from public source and how do platform characteristics such as proportion of sophisticated to nave consumers can influence bias and ultimately deception and consumer welfare.

Dulleck and Kerschbamer(2011) also suggest that it is an open question that first in the condition of private information, repeated interactions reputation, and the second is the public information condition, and effect on reputation effects. Indeed with opening up of internet, the latter becomes easier from crowd-sourcing, or versus a network.

To complete the picture of reputation effects, a second approach to the reputation effect problem is one which is intermediate of the two extremes of information of private experiences and those obtained from public information such as the internet. The role of networks within and across a neighbourhood and how a network structure affects information sharing among consumers and conditions under which information cascading and herding occurs.

According to my knowledge, reputational effects in networks under the assumption of credence goods has not been attempted in the literature. The proposed methodology would again use a modification of the Strategic Information Transmission literature with application of networks. There are two studies which apply such an approach which would serve as the foundation of the analysis[(Hagenbach and Koesler, 2009);(Galeotti, Ghiglino, and Squintani, 2013)]

4 Chapter 3: Credence Good markets in Low Income Countries

4.1 Introduction

The literature on markets for expert services on both theoretical and empirical fronts has predominantly applied a framework in the context of already developed countries. There is no such literature to my current knowledge which has studied credence goods explicitly in context of income and income inequality, as characterized by developing countries.

In context of credence good markets, developing countries differ from developing ones in shortage of actually skilled experts with a presence of many incompetent experts and even quacks, stemming from institutional and regulatory weaknesses, such that the value of certification is not enough to ascertain credibility. Poor expert to consumer ratio, capacity constraints through infrastructure, and large roles social norms and identities play complicate the nature of credence goods in developing countries.

The large scale presence of public sector spanning across almost all of the markets offer different agency problems with differing nature of incentives. For example, though the presence of public sector offsets deception arising from financial incentives, the agency issues which are brought by poor legal structure and job security in public markets, as well as overburdened highly saturated markets with long waiting lines often make the private sector (which under a lax regulatory regime can be more likely to engage in fraudulent behavior)a relevant option, despite the higher prices(as public goods are often subsidised).The presence of public provision of credence goods raises an interesting comparison with the private sector provision,and has not been attempted as far as I am aware.

As an illustration, Das et al., (2006) in their study make a conjecture that risk averse consumers sometimes have incentives to benefit from overtreatment in developing countries, especially in public services a phenomenon captured as Consumer-induced-demand rather the suppliers induced demand widely acknowledged in the Health Economics literature.(Das et al., 2006)

This chapter is motivated by the hypothesis that different outcomes exist for rich and poor neighbourhoods, determined not through the consumer attributes, but by the choice of competent and incompetent experts alike to provide services in locations that benefit them the most.

4.2 Research Questions and Proposed Methodology

Das et al.,(2006) give a picture of how such markets work in developing countries, which are characterized with dominantly the public sector, weaker institutions

and regulations, poor expert to consumer ratio, and larger implications of social effects in determining the probability of getting deceived. They claim that health markets in low-income countries suffer from not only poor infrastructure and access to said services, but a bottleneck in the form of poor quality care despite considerable investments in infrastructure and access in previous decades. This poor quality provision in low income countries arises from low competence and inadequate effort levels of doctors, with less capable doctors on average putting lower effort than their capable counterparts, as revealed in their survey

Why are poor neighbourhoods characterized by poor quality provision? Theoretical justifications might include that rich consumers are more educated, and hence provide better monitoring than their poor counterparts. Other justifications arise in the form of infrastructure differences, high willingness to pay for higher quality services by the rich and so on. However an overlooked cause in the form of how properties of poor neighbourhoods might influence the type of experts providing services, and given the type, the effort put in the provision.

The analysis will look at the problem in context of firstly, the single experts choice of choosing a rich or a poor neighbourhood to work through an endogenous model of experts location choice in rich and poor neighbourhoods , depending on ability. The analysis then expands to multiple experts of varying types, which allows us to bring in expert competition as a factor for location choice.

The role of public versus private experts would be studied in the framework of location choice, and how changes in neighbourhood such as increased inequality, ratio of experts to consumers would be studied, and the conditions resulting in market equilibrium will be examined with thy hypothesis of incompetent experts in poor neighborhoods and competent ones in rich.

4.3 Further Exploration

The role of Identities and social norms are important in developing countries, especially when expert markets which are can be position of status also such as doctors or lawyers, intersect with identity parameters. Identity can then assume the role of credibility and trust, with a hypothesis that discriminatory effects might be more prevalent in developing than developed countries.

5 The Way Forward

Each of the three chapters discussed could be considered the subgames of an extended game which is that of the entire process which starts with the consumer's search process, matching, bargaining and negotiation, evaluation and similarly for the expert in matching and persuasion.

There is much to be discussed in the context of credence goods, simply because the nature of the problem is so prevalent and important, covering under its assumptions markets of healthcare and most professional services.

The role of intermediaries, especially of the platform kind of two sided matching such as those provided by the firm Yelp! have gained prominence in recent years. Information intermediaries occupy an important role in arbitraging between the expert and the consumer, but with own strategies, especially of those who fly-by-night strategies of duping consumers and exiting the market, especially when there are large numbers operating in the market.

Finally, a distinction between data, information and knowledge is imperative where the consumer might confuse one for the other. Information access might be costless, especially available on the internet, however, consumers treat information as knowledge and end up self diagnosing themselves often to disastrous results. The confirmation bias leading to overconfidence in the knowledge the consumer doesn't have, and instead has bits of information, and ends up not following the advice of an expert, who has undergone theoretical and practical training for years, and doesn't possess information, but knowledge.

All these are planned for further research.

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