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BUILDING TRUST BY QUALIFICATION IN A MARKET FOR EXPERT SERVICES

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Building Trust by Qualification in a Market for Expert Services

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Abstract

Markets for credence goods are classified by experts alone being able to identify consumers' problems and determine appropriate services for solution. Examining a market where experts have to invest in costly diagnosis to correctly identify problems and consumers being able to visit multiple experts for diagnosis, we introduce heterogeneously qualified experts. We assume that high skilled experts can identify problems with some probability even with low effort, e.g. due to education or experience. In a laboratory experiment we show that, against our theoretical predictions, this does not lead to a drop in experts' willingness for high diagnostic effort. However, consumers generally distrust experts' diagnosis effort as they buy less often after their first recommendation than it would be optimal and show frequently other non-optimal behavior patterns, e.g. receiving recommendations but do not buy service. Our results indicate that, at some level, introducing higher qualified experts increases the quality of diagnosis, as well as consumers' trust resulting in more and quicker service purchases.

Keywords: credence goods; expert market; second opinions; diagnostic effort; qualification; laboratory experiment

JEL: C70; C91; D40

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1 Introduction

Credence good markets are classified by information asymmetries between experts and consumers. Examples in everyday life are, for example, visiting a doctor or a car mechanic, taking a cab in a foreign city, as well as financial services and home improvement contracts. In all cases, consumers are uncertain about which service they need to solve their problem as they lack the appropriate knowledge. Consumers are neither able to identify *ex ante* the best solution for their problem nor potentially *ex post* which service actually solved it. In contrast, experts are not only able to identify consumers' individual issues but can determine and carry out the needed services.

In the credence goods literature, experts are mainly assumed of being homogeneous. However in reality they differ in multiple dimensions, for example in their degree of qualification with the general intuition that by better qualifying experts market outcome will be enhanced. When consumers are not perfectly able to determine whether an expert is high or low skilled, high skilled experts might become unwilling to invest in costly diagnosis anymore leading to a Market for Lemons (Akerlof 1970). Consider a consumer visiting a car mechanic, as her car does not operate appropriately. The mechanic will diagnose the vehicle and report to the consumer. However, she does not know whether the diagnosis is correct, whether the car mechanic has invested the needed effort in the diagnosis nor whether he is in general high or low skilled. Being afraid of getting outwitted she might always act like the mechanic is low skilled and, therefore, her willingness to pay for diagnosis is reduced. According to Pesendorfer and Wolinsky (2003), this incentive problem might be solved by a consumer being able to visit multiple experts to confirm or contradict the opinion of a formerly visited expert. If she receives identical diagnosis, she can likely rely on the correctness of both recommendations. As she would only be willing to buy a service based on a truthful diagnosis, this might act as an incentive for experts to invest more effort in diagnosis depending on a consumer's propensity to search for matching opinions.

In this paper we extend the model of Pesendorfer and Wolinsky (2003) and investigate how experts' costly investments in diagnosis and consumers' reactions are influenced by introducing heterogeneously qualified experts. It is assumed that consumers are neither able to observe effort choices nor

an individual expert's qualification. We contribute to the existing literature by examining experts' willingness to invest in costly diagnosis and consumers' reaction in more detail, as former research mainly assumed homogeneous experts. If, for example, credence goods markets would react to an introduction of qualified but unidentifiable experts like a Market for Lemons, qualification programs would be useless until unambiguous signaling of experts' skills becomes feasible. Moreover, we test Pesendorfer's and Wolinsky's (2003) fixed price equilibrium, as well as our theoretical extension experimentally in the laboratory. To our best knowledge, there is no other controlled laboratory experiment which tests for experts' willingness to invest in costly diagnosis in a market for credence goods. In the model, consumers can contact multiple experts for diagnosis which enables them to verify recommendations. We expand the framework by introducing two different qualification levels for experts by distinguishing between high skilled and low skilled experts with the former ones having the ability to identify consumers' problems correctly with some probability even with low diagnostic effort. We examine how an increase in high skilled experts' qualification affects market outcomes by keeping the share of high and low skilled experts in the market constant. Consequently, we investigate the effect of an increasing degree in heterogeneity regarding the likelihood of making a correct diagnosis with low effort.

Our experimental results show that experts are more willing to invest in high diagnostic effort than our theory predicts. This leads to higher qualities in diagnosis, i.e. higher likelihoods for consumers to receive a correct diagnosis, with increasing qualification of high skilled experts. With the increase in qualification, consumers are more willing to trust experts advice and buy more often after their first recommendation, therefore, refrain from letting their recommendations verified by other experts. This should lead to an increase in welfare as transaction costs are reduced by less visited experts.

The remainder of this paper is structured as follows. Section two gives an overview about the relevant literature. Section three introduces our theoretical framework. Section four describes our experimental design. Section five shows our hypotheses. Section six presents and discusses our results and section seven concludes.

2 Literature Review

The term credence goods has been introduced by Darby and Karni (1973) in addition to search and experience goods. "Generally speaking, credence goods have the characteristic that though consumers can observe the utility they derive from the good ex post, they cannot judge whether the type or quality they have received is the ex ante needed one." (Dulleck et al., 2011, 526). In the literature, it is usually assumed that consumers are homogeneous and have only vague information about their problem at hand but know that they suffer from either a minor or a serious problem with a commonly known probability and need either a cheap or an expensive treatment (Angelova and Regner 2013; Bonroy et al. 2013; Dulleck and Kerschbamer 2006, 2009; Dulleck et al. 2011; Emons 2001; Mimra et al. 2013, 2014, 2016; Pesendorfer and Wolinsky 1998, 2003; Roe and Sheldon 2007; Wolinsky 1993).

Most of the credence goods literature assumes that experts can determine consumers' problems at no costs and with no effort. This does not represent real life circumstances as diagnosis is actually costly for experts, i.e. at least time consuming. Additionally, experts have to choose how much effort they are willing to invest in their diagnosis. Is an expert just interested in presenting a plausible story or is he really concerned for the consumer and therefore willing to invest much effort in order to make more precise diagnosis? According to the credence goods character, consumers are not able to determine experts' effort level without irrational costs (Emons 2001; Feser and Runst 2015). This might make experts to underinvest in diagnosis to maximize their own utility. This would, as a consequence, lead to inferior service recommendations rather based on guesses than real diagnosis. Dulleck and Kerschbamer (2009) show in a model with costly and not observable diagnosis effort where experts compete with discounters that the former undertreat consumers in order to avoid free-riding behavior. Moreover, Bonroy et al. (2013) find that risk averse experts are less likely to invest in costly diagnosis. In contrast, Pesendorfer and Wolinsky (2003) show that with fixed prices and consumers being able to receive multiple opinions, second best outcome can be realized with high probabilities of correct diagnosis, i.e. experts mainly investing high effort. Due to consumers' ability to search for matching opinions, which would indicate a correct recommendation, they

can discipline experts in order to invest more effort in diagnosis.

By acquiring information, it appears crucial whether consumers are able to consult more than one expert for diagnosis. Wolinsky (1993) shows that the costs for visiting multiple experts are decisive but this can lead to an overall welfare increase. This is in line with the results of Mimra et al. (2016), showing that the rate of overtreatment decreases significantly with the possibility of second opinions. Here, absolute market efficiency increases depending on additional search costs. Nevertheless, in their experiment the willingness to search for second opinions was significantly lower than theory had predicted. Mimra et al. (2016) attribute this to consumers might have thought that honest expert types were prevailing in the market, or due to consumers' risk aversion. It seems, therefore, that already the threat of second opinions lead experts to less fraudulent behavior. However, Pesendorfer and Wolinsky (1998, 2003) show theoretically that the possibility for multiple opinions, in a market where experts decide on their effort for diagnosis, this does not lead to Pareto optimal outcomes due to incentive incompatibility.

In sum, it remains uncertain how multiple opinions and the possibility to search for matching recommendations will actually affect consumer and expert behavior in a market for credence goods. Moreover, in the literature there are, to our best knowledge, no investigations how the introduction of different qualified experts affect the outcome in a market for credence goods. Since individuals vary in many dimension, they also do in their degree of qualification. Even in a narrow field of expert services, e.g. medicine, car repair or energy consultation, the variation in skills is omnipresent. While it is plausible that experts per se can clearly be identified by consumers due to diploma or certifications, whether an expert is high or low skilled compared to his colleagues cannot be determined clearly. Consequently, it is important to investigate how varying degrees of qualification affect market outcomes.

3 Theoretical Framework

Our theoretical model builds closely on Pesendorfer and Wolinsky (2003). We apply their model to the case of heterogeneously qualified experts. Moreover, in order to test our results experimentally, we adapt it to a limited number of players and finite periods.

We assume a finite number of N experts and M identical consumers in the market. In general, consumers need some service for a problem which can be identified and treated by experts. However, an expert needs to exert effort for correct diagnosis. We assume consumers are unable to observe experts' actual effort level, as well as their degree of qualification and experts do not know a consumer's history, i.e. whether she has consulted other experts before her visit.

The range of possible services to treat a consumer's problem is determined by $b \in [0, 1]$. Consumers only receive a positive payoff from a service matching their actual type $i \in [0, 1]$. We assume a consumer's utility from service is given by

$$U(a, t) = \begin{cases} V & \text{if } b = i \\ 0 & \text{if } b \neq i \end{cases} \quad (1)$$

with $V > 0$. Since consumers do not know about their actual type i , they need to consult one or more experts. Each expert offers a contract (d, p) to prospective consumers with d as the potential diagnosis costs and p the potential costs of a purchase of service. Experts provide diagnosis by recommending a service to consumers conditional on their effort choice. In return, consumers decide whether they are willing to accept the recommendation which would automatically lead to the performance of the recommended service. Consumers can consult up to N experts but have to bear transaction costs s for each consulted expert besides costs d for diagnosis. Notice, however, that we assume transaction costs to only incur if a principal actually receives a diagnosis from an expert but becoming aware of a potential contract, i.e. (d, p) , is free.

In contrast to Pesendorfer and Wolinsky (2003), we assume experts with varying degrees of qualification which affect their ability for correct diagnosis. For simplification, we assume experts can be of two types only, i.e. being either high or low skilled denoted by $q_t \in \{0, 1\}$, where $q_h = 1$ stands for high skilled and $q_l = 0$ stands for low skilled. Notice that by introducing heterogeneous experts in the market, there are two elementary factors which could affect market outcome:

(1) Firstly, there is the magnitude of how much high skilled and low skilled experts differ in their degree of qualification, i.e. how much high skilled

experts are better in diagnosis. For our model, we assume to diagnose a consumer experts need to decide on their effort level $e \in \{0, 1\}$ with $e = 1$ denotes high effort and $e = 0$ denotes low effort. High effort always leads to correct recommendations, regardless of the individual level of qualification. In contrast, low effort always leads to a wrong recommendation if an expert is low skilled. However, high skilled experts are expected to make a correct diagnosis by low effort with probability $y \in (0, 1)$. Consequently, the variable y defines the magnitude of the difference in qualification. All experts have to bear costs $c > 0$ for high effort. For simplification, we assume that low effort, as well as all services performed are free. Moreover, experts do not decide over their recommendation strategy: if an expert chooses high effort, his recommendation is always correct, i.e. he recommends a service $b = i$.

(2) Secondly, there is the share of high skilled and low skilled experts in the market. We assume a share $a \in [0, 1]$ of high skilled experts and a share $1 - a$ of low skilled experts.

The game consists of a finite number $K \geq 1$ of periods. From a consumer's perspective, the course of each period is structured in the following manner:

1. One of the N experts is randomly chosen and offers a contract (d, p) .
2. The consumer decides on one of the following actions: (i) accept the contract and get diagnosed by this expert; (ii) visit another expert; (iii) buy the service from any expert whose diagnosis has been received previously; (iv) leave the market without purchase and/or diagnosis. Decisions (iii) and (iv) end the period.
3. If the contract is accepted, the consumer pays the diagnosis costs d to the expert and has to bear transactions costs $s > 0$.
4. The expert chooses his diagnostic effort $e \in \{0, 1\}$. We denote the probability of an expert for high diagnostic effort depending on his type q_t by $x_q \in [0, 1]$.
5. The consumer receives the recommendation conditionally on expert's effort choice and has to decide how to proceed further.

In sum, a consumer's expected utility is determined by how many experts she consults for diagnosis, the offered contracts by experts and whether a

potentially bought service matches her actual type i . We assume consumers have an initial endowment $\theta > 0$ from which they have to pay for consultations and purchase. Additionally, this determines their outside option if they decide to leave the market without purchase and/or consultation. Suppose a consumer contacted n experts who offered corresponding contracts (d, p) , her expected utility is given by

$$U(a, s, t) = \begin{cases} \theta + V - p - \sum_{i=1}^n d_i - ns & \text{if } a = i \\ \theta - p - \sum_{i=1}^n d_i - ns & \text{if } a \neq i \\ \theta - \sum_{i=1}^n d_i - ns & \text{no purchase} \end{cases} \quad (2)$$

In contrast, an expert's profit function, depends on how many consumers consult him, his effort choices and wheather some consumers are buying his service, all conditional on the offered contract (d, p) . An expert's expected payoff who is contacted by m consumers with $r \leq m$ consumers buying his service, is given by

$$\pi(c, e) = \begin{cases} m(d - ec) + rp & \text{r consumers buy service} \\ m(d - ec) & \text{any consumer buys service} \\ 0 & \text{not consulted} \end{cases} \quad (3)$$

Experts cannot observe consumers' history, i.e. if and how many other experts they have visited before. Consequently, they maximize their expected profit by choosing their contract offer (d, p) , as well as their effort level $e \in \{0, 1\}$ conditional on their belief B of principals' searching strategies. The consumers, in contrast, condition their searching behavior on experts' probability $x_q \in [0, 1]$ to chose high diagnostic effort, the share of high skilled experts in the market a , the qualification degree of high skilled experts y , and the offered contracts (d, p) .

3.1 Optimal Search and Diagnostic Effort

According to the symmetry assumption, identically qualified experts choose the same strategy profile (d_q, p_q, ϵ_q) with ϵ_q being denoted as the probability for high diagnostic effort x , conditional on the offered contract (d, p) and the individual qualification $q_t \in \{0, 1\}$.

In return, consumers have to decide whether they are willing to enter the market in the first place. If they decide to participate, consumers will adapt a stopping rule according to experts' expected effort choice and the market composition, i.e. how many high skilled experts are in the market and how much they are qualified. Recall that a is the share of high skilled experts in the market, then, sampling a random expert will give a consumer a correct recommendation with

$$z = x_h a + (1 - a)x_l + (1 - x_h)ay, \quad (4)$$

where $x_h, x_l \in [0, 1]$ determine the probabilities that an expert with high or low qualification chooses high effort.

Let f be the probability for a consumer to stop after her first recommendation. Additionally, with probability $1 - f$ she searches for two matching opinions. If she decides to stop and purchase after her first recommendation, her expected payoff is given by

$$U(z|f = 1) = zV - p - (s + d) + \theta. \quad (5)$$

Since a randomly sampled expert makes a correct recommendation with probability z , the expected duration for a correct diagnosis is given by $1/z$. Consequently, the expected duration for two matching recommendations is $2/z$. The underlying search and diagnosis costs for matching diagnosis are, therefore, $2(s + d)/x$. The expected utility for a consumer, in this case, is given by

$$U(z|f = 0) = V - p - 2\frac{s + d}{z} + \theta. \quad (6)$$

For a consumer to enter the market, the expected value of (5) or (6) need to be positive.

Lemma 1: *A consumer's best response to (d_q, p_q, x_q) will always be one of the following strategies: (i) quit without any action; (ii) get one diagnosis and purchase its service; (iii) get diagnosis until two recommendations match and buy the service from one of the two experts with matching recommendations.*

Proof of Lemma 1: *see Appendix A*

□

As outlined by the proof of Lemma 1, welfare maximization requires consumers either to stop after their first recommendation with purchasing or to search until two recommendations match and then purchase. Additionally, in order to search for matching opinions, the number of experts N in the market must at least correspond to the expected search duration for receiving matching opinions.

In contrast, experts have to decide how much effort they are willing to invest in diagnosis. To determine their best response, they have to build a belief about a consumer's search history. Let B be an expert's belief about the probability that a consumer has not been diagnosed by another expert, conditional on this consumer letting her be diagnosed by this expert, i.e. accepting his contract (d_q, p_q) . If an expert is consulted and decides for high diagnostic effort, he will automatically provide a correct diagnosis and get an expected payoff given by

$$\pi(f, B|e = 1) = d_q + p_q f B + (1 - f B) \frac{p_q}{2} - c \quad (7)$$

with fB being the probability that a consumer has not contacted another expert before and stops after the first recommendation and $(1 - fB)$ being the probability that a consumer is searching for matching opinions. We assume that in the latter case, a consumer purchases with probability $1/2$ from an expert as she has no preferences regarding the sampling order.

In contrast, if a consulted experts invest low effort for diagnosis by not incurring the costs c , whether the recommendation is correct depends on his qualification. In this case, his expected profit is given by

$$\pi(f, q_t, B|e = 0) = d_q + p_q f B + q_t y (1 - f B) \frac{p_q}{2}. \quad (8)$$

With low effort, an expert will only sell his service to a consumer if she is either on her first visit and stops afterwards or with probability $y/2$ if a consumer searches for matching recommendations and the expert is high skilled. For a pure best response, experts choose high effort, i.e. $x_q = 1$,

when (7) is greater than (8). In case of indifference, i.e. (7)=(8), any $x_q \in [0, 1]$ is optimal. Notice that by introducing different degrees of qualification, high skilled experts' incentive for high diagnostic effort decreased.

3.2 Equilibria with Fixed Prices

We assume prices to be fixed, i.e. all experts have to offer identical contracts (d, p) . According to Pesendorfer and Wolinsky (2003), (d, p, z, f) is a fixed price equilibrium if consumers' choices for f are optimal given (d, p, z) and if experts' effort decisions $x_q \in [0, 1]$ are optimal given (d, p, f) and their belief B about consumers' histories. Accordingly, we define an equilibrium as perfectly non-degenerate if all experts choose high diagnostic effort with positive probability, i.e. $x_h, x_l > 0$. In a degenerate equilibrium, all experts always opt for low diagnostic effort, i.e. $x_h, x_l = 0$. Furthermore, there might be partly non-degenerate equilibria with only a low skilled experts choosing high effort.

For being a fixed price equilibrium, B needs to be consistent according to f and z which is fulfilled if it equals the inverse of the expected duration of search as outlined by Pesendorfer and Wolinsky (2003). As mentioned before, the expected duration of search depends on consumers' applied strategy. With probability f , a consumer stops after her first diagnosis and buys in which case the duration is one period. In contrast, with probability $1 - f$, a consumer searches for matching opinions resulting in a duration of $2/z$. Consequently, the expected duration of search S for consumers is given by

$$S = f + (1 - f) \frac{2}{x_h a + (1 - a)x_l + (1 - x_h)ay}. \quad (9)$$

As experts are sampled in a random order, it follows that

Lemma 2: *Experts' beliefs are consistent with (d, p, z, f) if and only if*

$$B = \frac{x_h a + (1 - a)x_l + (1 - x_h)ay}{f(x_h a + (1 - a)x_l + (1 - x_h)ay) + 2(1 - f)}. \quad (10)$$

Proof of Lemma 2: *see Appendix A*

□

For a non-degenerate equilibrium of any kind, experts need to get an expected payoff from high effort at least equal to low effort, given by

$$d + fBp + (1 - fB)\frac{p}{2} - c \geq d + fBp + q_t y(1 - fB)\frac{p}{2}. \quad (11)$$

For a non-degenerate equilibrium it is, therefore, necessary that $p \geq \frac{2c}{(1-y)(1-fB)}$. Notice that the less often consumers are willing to search for matching recommendations and/or when experts are higher qualified, the greater needs to be experts' markup, i.e. the difference of high effort costs c and service price p , in order to attract them for high effort choices. In the following analysis, we assume that the condition for p is fulfilled.

If consumers would always buy after their first recommendation, i.e. $f = 1$, (11) would not hold, since in this case $fB = 1$ and $1 - fB = 0$. Consequently, for a non-degenerate equilibrium consumers need to weakly prefer searching for matching opinions, i.e. $f < 1$. This will only be the case, if their expected payoff from (6) is at least equal to their payoff from (5), which results in

$$V - p - 2\frac{s+d}{z} + \theta \geq zV - p - (s+d) + \theta. \quad (12)$$

Three market conditions for a non-degenerate equilibrium follow from (12)¹: (i) z need to lie within a specific interval, i.e. $z \in [\underline{z}, \bar{z}]$; (ii) the costs for diagnosis and the transaction costs may not exceed a specific threshold $s + d < \frac{Vz(1-z)}{2-z}$; (iii) the transaction costs on its own may not be greater than $\bar{s} \equiv V(3 - 2\sqrt{2})$. Moreover, the principal will only search for matching recommendations, if $N \geq \frac{2}{z}$. Finally, to be willing to choose $f < 1$, consumers need to get a positive expected utility searching for matching opinions at all by

$$V - p - 2\frac{s+d}{z} > 0. \quad (13)$$

If experts would always provide correct diagnosis by high effort, consumers would never search for matching recommendations and, therefore, (11) would not hold. If all experts would always choose low effort, this would be a degenerate equilibrium by definition. For $0 < x_q < 1$, (11) must hold with equality, making experts indifferent between high and low effort choice.

¹For detailed calculations see Appendix B

$$d + fBp + (1 - fB)\frac{p}{2} - c = d + fBp + q_t y(1 - fB)\frac{p}{2}. \quad (14)$$

Solving (14) for f by substituting B we can determine f^* making experts indifferent between high and low effort.

$$f_t^* = \frac{1 - \frac{2c}{p(1-q_t y)}}{1 + \frac{c(z-2)}{p(1-q_t y)}}. \quad (15)$$

However, since experts differ in their degree of qualification, i.e. $q_t \in \{0, 1\}$, and consequently have a different expected utility from choosing low effort, consumers are not able to choose a uniform f making all experts indifferent. As noticed before, (15) shows that for making high skilled experts indifferent between high and low effort consumers need to search for matching opinions more often, since $\frac{df_t^*}{dq} < 0$. Consumers will choose f according to what yields them the highest expected payoff. Experts will react to consumers' choice depending on their degree of qualification, i.e. $q_t y$, and the fixed ratio of the price for service p and the costs for high effort c .

Lemma 3: *Depending on the fixed price ratio $2c/p$ there exist three types of non-degenerate equilibria with the profile (d, p, z, f) , i.e. if $N \geq \frac{2}{z}$, $s + d < \bar{s} = \frac{Vz(1-z)}{2-z}$, and $V - p - 2\frac{s+d}{z} > 0$: (i) With $p = 2c$, consumers decide for $f = f_l^* = 0$, resulting in an partial non-degenerate equilibrium with low-skilled experts choosing x_l^* ; (ii) with $p > 2c$, consumers will choose the partial non-degenerate equilibrium with $f = f_l^*$ as long as low skilled experts can perfectly adapt their effort level by x_l^* that $z \in \{z, \bar{z}\}$; (iii) $p > 2c$, if low skilled experts are not able to adapt their effort level that $z \in \{z, \bar{z}\}$, consumers will opt for the perfectly non-degenerate equilibrium by choosing $f = f_h^*$, resulting in $x_l = 1$ and either $x_h \in [\underline{x}_h, \bar{x}_h]$ or $x_h \in \{\underline{x}_h, \bar{x}_h\}$.*

Proof of Lemma 3: It is important to emphasize that in order to establish a mixed strategy equilibrium experts need to choose their effort level in accordance to make consumers indifferent between buying after one recommendation and searching for matching opinions. As mentioned before, this requires that the probability for getting a correct diagnosis by sampling a random expert, i.e. z , takes one of the two determined values $z = x_h a + (1 - a)x_l + (1 - x_h)ay \in \{z, \bar{z}\}$. If, for example, all high skilled

experts choose only low effort when $f > f_h^*$, low skilled experts in the market will balance the downshift in x_h by increasing their own effort level. In contrast, high skilled experts will, as well, adapt their effort choice in equilibrium when all low skilled experts choose only high effort. Consequently, we can define the threshold values for x_t in reaction to a chosen f and x_{-t} by $x_t^* \in [\underline{x}_t, \overline{x}_t]$. Only if x_t^* takes this values, or rather lies within the defined interval, a non-degenerate equilibrium is possible. This adaptation will always take place as long as market composition is not too one-sided, i.e. the values for a and y do not exceed a critical threshold. We can determine the threshold values by

$$\underline{x}_l^*, \overline{x}_l^* = \frac{\frac{V+d+s}{2V} - ay \pm \sqrt{(\frac{V+d+s}{2V})^2 - \frac{2(s+d)}{V}}}{1-a}, \quad (16)$$

and

$$\underline{x}_h^*, \overline{x}_h^* = 1 + \frac{1 - \frac{V+d+s}{2V} \pm \sqrt{(\frac{V+d+s}{2V})^2 - \frac{2(s+d)}{V}}}{a(y-1)}. \quad (17)$$

Note that x_t can only take values between 0 and 1. Consequently, if x_t^* falls below or exceeds this interval, an adaptation of z to the equilibrium interval $z \in [\underline{z}, \overline{z}]$ becomes impossible.

Combining former arguments, we can define five distinct scenarios according to market composition.

(i)

$$p < 2c \rightarrow \begin{cases} x_h, x_l = 0 \end{cases} \quad (18)$$

(ii)

$$2c = p < 2c/(1-y) \rightarrow \begin{cases} x_l \in [\underline{x}_l, \overline{x}_l], x_h = 0 & \text{if } f = f_l^* = 0 > f_h^* \\ x_h, x_l = 0 & \text{if } f > 0 \end{cases} \quad (19)$$

(iii)

$$2c < p < 2c/(1-y) \rightarrow \begin{cases} x_l \in \{\underline{x}_l, \overline{x}_l\}, x_h = 0 & \text{if } f = f_l^* > f_h^* \\ x_h, x_l = 0 & \text{if } f > f_l^* \end{cases} \quad (20)$$

(iv)

$$2c < p = 2c/(1-y) \rightarrow \begin{cases} x_h \in [\underline{x}_h, \overline{x}_h], x_l = 1 & \text{if } f = f_h^* = 0 < f_l^* \\ x_l \in \{\underline{x}_l, \overline{x}_l\}, x_h = 0 & \text{if } f = f_l^* > f_h^* \\ x_h, x_l = 0 & \text{if } f > f_h^*, f_l^* \end{cases} \quad (21)$$

(v)

$$p > 2c/(1-y) \rightarrow \begin{cases} x_h, x_l = 1 & \text{if } f < f_h^*, f_l^* \\ x_h \in \{\underline{x}_h, \overline{x}_h\}, x_l = 1 & \text{if } f = f_h^* < f_l^* \\ x_l \in \{\underline{x}_l, \overline{x}_l\}, x_h = 0 & \text{if } f = f_l^* > f_h^* \\ x_h, x_l = 0 & \text{if } f > f_h^*, f_l^* \end{cases} \quad (22)$$

In the following, we assume that the previously defined market conditions for non-degenerate equilibria are fulfilled.

Scenario (i)

In scenario (i), there is no possibility for a non-degenerate equilibrium of any kind, since the fixed price for service is too low in comparison to high effort costs that even consumers searching for matching opinions all the time cannot make experts willing to choose high effort, regardless of their qualification. If the prerequisites for a non-degenerate equilibrium are not fulfilled, there will be a degenerate fixed price equilibrium in which all experts always choose low effort and consumers leave for their outside option.

Scenario (ii)

In scenario (ii), consumers will make low skilled experts indifferent between high and low effort by always searching for matching opinions, i.e. $f = f_l^* = 0$. In this case, any solution for x_l^* within the defined interval $z \in [\underline{x}_l, \overline{x}_l]$ is feasible. Since $f > 0$ would lead to all experts choosing low

effort, consumers strictly prefer to search for matching opinions as long as they get a positive payoff from it. However, due to the determined price ratio for service and high effort costs, high skilled experts can never made to choose high effort which makes scenario (ii) a partial non-degenerate equilibrium.

Scenario (iii)

In scenario (iii), there is a great difference between low skilled and high skilled experts in their ability for diagnosis, i.e. y is relatively large. This implies that even while consumers can make low skilled experts indifferent between high and low effort, there is no possibility to achieve a perfect non-degenerate equilibrium as high skilled experts will never choose high effort. For consumers choosing a mixed strategy, i.e. $f = f_l^* \in]0, 1[$, (12) must hold with equality. Therefore, x_l^* can take only the extreme values of the determined interval $\{x_l^*, \overline{x_l^*}\}$. With a positive expected utility from market entry, consumers will opt for $f = f_l^*$ leading to a partial non-degenerate equilibrium with low skilled experts choosing x_l^* corresponding to f and high skilled experts choosing $x_h = 0$.

Scenario (iv)

In scenario (iv), the difference in qualification between high and low skilled experts is less extreme than in scenario (iii). Consumers can choose between two potential equilibria by either choosing $f = f_h^* = 0$ or $f = f_l^*$. In the former case, consumers search for matching opinions all the time, making high skilled experts indifferent between high and low effort and low skilled experts strictly preferring high effort. In the latter case, consumers opt for sometimes buying after their first recommendation making high skilled experts always choosing low effort. In contrast, low skilled experts become indifferent between high and low effort which results in the same outcome as in scenario (iii). However, since experts will adapt their effort level to balance z , there is no difference in expected profits for consumers between both equilibria. Since searching is costly, consumers will opt for the equilibrium with less search costs. This results in consumers always choosing the partial non-degenerate equilibrium as long as experts are perfectly able to adapt their effort level by x_t^* . However, if market composition does not allow for perfect adaptation, consumers prefer any kind of non-degenerate

equilibrium as long as they get a positive expected utility.

Scenario (v)

In scenario (v), consumers are in general confronted with the same equilibria choices as in scenario (iv). However, with the $p > 2c/(1 - y)$ it is no longer necessary to choose $f = f_h^* = 0$ for making high skilled experts indifferent between high and low effort. Again, consumers will either opt for a partial non-degenerate equilibrium with $f = f_l^*$ leading to $x_h = 0$ and a x_l^* , or consumers will choose the perfect non-degenerate equilibrium with $x_l = 1$ and a x_h^* .

□

4 Experimental Design

Our experimental design builds on our theoretical model. In each session we introduce one or two independent markets for expert services comprising eight subjects each. Subjects are randomly assigned to the role of an expert or a consumer with $N = 4$ consumers and $M = 4$ experts. The roles remain constant throughout all ten periods of the game. Payoffs are denominated in ECU, accumulated over periods and paid at the end of the experiment, where ECU 1 converts to EUR 0.70. The payoff structure of the game is common knowledge to all participants by outlining it in the instructions ¹.

Consumers have in each period a problem which is determined by a value between 0 and 1 with two decimal spots, e.g. 0.12. Consumers get never directly informed about the actual value of their problem at any time. There is a share $a = 0.5$ of experts being high skilled and $1 - a = 0.5$ being low skilled. For each consumer who is on a visit for diagnosis, an expert receives a lump-sum fee of $d = 2$. Each expert has to decide in advance for each consumer whether he wants to invest high or low effort in diagnosis. When choosing high effort, experts have to bear costs of $c = 1$ while low effort is expected to be free. If opting for high effort, this automatically leads to a correct recommendation. A correct recommendations implies that a signal is send to the consumer with the exact same value as her problem in the

¹The complete instruction can be found in the appendix.

actual round, i.e. a consumer with problem 0.12 then automatically receives the signal 0.12. If choosing low effort, low skilled experts will automatically send a false recommendation but high skilled experts have some probability of correctly identifying consumers' problem even with low effort depending on treatment condition. A false recommendation leads to a random but definitively incorrect signal between 0 and 1 which is also automatically send to a consumer.² Besides diagnosis, experts can provide services to solve consumer problems which are automatically based on their former diagnosis, as we assume that an expert can only provide a service he formerly has recommended. We apply the strategy method for expert decision making, implying that each expert has to decide on his effort level for each single consumer in case that she will visit him. In Figure 1 we present experts' decision screen.

Entscheiden Sie, welche Aktion Sie ausführen möchten, falls Spieler B Sie aufsucht.

Falls ein Spieler B Sie aufsucht, erhalten Sie hierfür pauschal 2.0 Taler sowohl für die Auswahl von Aktion 1 als auch für Aktion 2.

Konsequenzen	Ein Spieler B	Ein Spieler B	Ein Spieler B	Ein Spieler B
Wenn Sie Aktion 1 wählen, kostet Sie dies 1 Taler. Sie senden dann automatisch den korrekten Wert an diesen Spieler B, wenn er Sie aufsucht.	<input type="checkbox"/> Aktion 1	<input type="checkbox"/> Aktion 1	<input type="checkbox"/> Aktion 1	<input type="checkbox"/> Aktion 1
Wenn Sie Aktion 2 wählen, kostet Sie dies 0 Taler. Sie senden dann automatisch einen falschen Wert an diesen Spieler B, wenn er Sie aufsucht.	<input type="checkbox"/> Aktion 2	<input type="checkbox"/> Aktion 2	<input type="checkbox"/> Aktion 2	<input type="checkbox"/> Aktion 2

Figure 1: Experts' decision screen

At the beginning of each period, consumers receive an endowment of $\theta = 12$. In the following, they can visit up to $M = 4$ experts for diagnosis for costs of $s + d = 2.2$ per visit or leave the market at any time. If a consumer decides to consult an expert, one of the $M = 4$ experts is randomly chosen in order to avoid reputation building³. After having received at least

²Notice that recommendations are automatically send according to effort decisions and cannot be chosen freely in order to reduce complexity. Moreover, we implemented in the programming that false recommendations never lead to a correct signal and, therefore, two identical signals automatically reveal correct recommendations.

³If a consumer has already visited one or more experts and decides to receive an-

one recommendation, a consumer can buy the corresponding service of any formerly received recommendation. Therefore, a consumer can always go back to any formerly consulted expert for buying and is not bound to the last one visited. To buy a service, consumers has to pay costs $p = 5$ which is paid directly to the providing expert. If the bought service is based on a correct recommendation, a consumer will receive a payoff of $V = 13$. If the bought service is based on a false recommendation, she will get zero payoff.

⁴ In Figure 2 we present consumers' decision screen.

Figure 2: Consumers' decision screen

The experiment comprises of 10 rounds with an identical course:

- (i) Nature determines the actual problem for each consumer.
- (ii) Each expert decides whether he will invest high or low effort in diagnosis for each of the $N = 4$ consumers.
- (iii) Consumers decide how many experts they want to visit for diagnosis and whether they want to buy a service based on any recommendation.
- (iv) Decisions are implemented and each subject receives a summary of the results. ⁵

other recommendation, one of the so far unvisited experts in the actual period is chosen randomly.

⁴The instructions for the game are presented in the Appendix.

⁵Consumers get a summary of how many experts they have visited, whether they

Notice that in order to avoid individual reputation building, consumers' presentation on expert decision screens are randomly displayed in a new order in every period. Additionally, consumers are unable to identify an expert from which they get a recommendation.

4.1 Treatment conditions

We implement four experimental treatment conditions which differ in terms of whether there are high skilled experts in the market and how much they more they are qualified compared to low skilled experts.

noQuali: The market comprises of homogeneous experts only. All experts are low skilled, i.e $a = 0$.

Quali0.2: The market comprises of heterogeneous experts with a share of $a = 0.5$ being high skilled experts. High skilled experts have the probability $y = 0.2$ to make a correct recommendation with low effort.

Quali0.4: The market comprises of heterogeneous experts with a share of $a = 0.5$ being high skilled experts. High skilled experts have the probability $y = 0.4$ to make a correct recommendation with low effort.

Quali0.7: The market comprises of heterogeneous experts with a share of $a = 0.5$ being high skilled experts. High skilled experts have the probability $y = 0.7$ to make a correct recommendation with low effort.

4.2 Procedure

For *noQuali* / *Quali0.2* / *Quali0.4* / *Quali0.7*, there were 8/8/9/11 sessions with 96/96/96/112 participants. Experiments were conducted with a standard subject pool across disciplines in the Laboratory of Behavioral Economics at the University of Goettingen; using ORSEE (Greiner 2004) and z-Tree (Fischbacher 2007). The sessions lasted about 40 minutes, whereby

have bought a service and their payoff from a potentially bought service. An expert gets informed how many consumers visited him, how many times he decided for high and low effort for these and how many consumers bought his service. Additionally, all subjects get informed how much they have earned in the actual, as well as over all periods so far.

subjects earned EUR 9.20 on average including a EUR 2.50 show-up fee. As some subjects participated two times in different treatment conditions, we controlled for multiple participation.

5 Hypotheses

In this section, we insert our experimental parameters to our theoretical framework to obtain hypotheses about subjects' behavior and the overall market outcome. Table 1 provides an overview of some given and the expected parameter values.

	a	y	S	B	f	x_h	x_l	π_C	π_{Eh}	π_{El}
<i>noQuali</i>	0	-	1.37	0.73	0.82	-	0.64	13.15	-	6.86
<i>Quali0.2</i>	0.5	0.2	2.22	0.46	0.23	0.11	1	13.15	6.90	8.57
<i>Quali0.4</i>	0.5	0.4	2.22	0.46	0.45	0	0.88	13.15	8.80	8.97
<i>Quali0.7</i>	0.5	0.7	2.22	0.46	0.45	0	0.58	13.15	9.57	7.81

Table 1: Game parameters and theoretical predictions

In our first treatment, we assume homogeneous experts, i.e. all being low skilled, which represents a market like in Pesendorfer and Wolinsky (2003). This serves as baseline treatment to compare how the introduction of more qualified experts changes market outcome. In all other treatments, we introduce a share $a = 0.5$ of high skilled experts. We expect that with high skilled experts, consumers will opt for the low skilled expert equilibrium as long as experts' effort choices are perfectly adaptable. By raising y across treatments, we investigate how the market reacts to more qualified experts. We expect that consumers will react to this by searching for matching opinions more often to counterbalance high skilled experts reduced incentives for high effort. Moreover, we expect no irrational behavior of consumers, i.e. leaving the market in the beginning, leaving the market without purchase but with consultations, buying after receiving two or more non-matching recommendations only.

Hypothesis 1 ("consumer behavior")

H1a) If $a = 0$, consumers will choose the low skilled expert equilibrium,

i.e. $f = f_l^*$.

- H1b)** In *Quali0.2*, consumers will choose $f = f_h^*$. In *Quali0.4* and *Quali0.7*, consumers will choose $f = f_l^*$.
- H1c)** Consumers will restrain from irrational behavior.
- H1d)** By introducing high skilled experts, consumers will consult more experts.
- H1e)** Consumers' probability for receiving a true diagnosis z will remain unaffected by y .

We expect experts to act according to their type of qualification and consumers' expected search behavior. In treatments with only low skilled experts in the market, i.e. $a = 0$, they will be indifferent between high and low effort as consumers choose $f = f_l^*$, resulting in $z = x_l^*$. As consumers will adapt their searching behavior to an increasing degree of qualification y , experts will not change their effort choices.

Hypothesis 2 ("expert behavior")

- H2a)** With increasing y experts will choose high effort less often.
- H2b)** In *Quali0.2*, high skilled experts will choose their mixed strategy and low skilled experts will always choose high effort, i.e. $x_l = 1$ and $x_h = x_h \in \{\underline{x}_h, \overline{x}_h\}$.
- H2c)** In *Quali0.7* and *Quali0.4*, high skilled experts will always choose low effort, i.e. $x_h = 0$ and low skilled experts will choose their mixed strategy $x_l = x_h \in \{\underline{x}_l, \overline{x}_l\}$.

6 Results

In the following analysis of our data all tests are carried out treating one market (=one group with 4 experts and 4 consumers) as one independent observation only. Moreover, we only state results with no significant differences regarding subjects' multiple participation.

6.1 Expert Behavior

In a first step, we examine expert behavior regarding their willing to invest in high diagnostic effort. Recall that experts have to decide how they want to treat each single consumer for the hypothetical case that she visits him. Figure 3 depicts experts propensity to invest in high diagnosis across treatments. Over all treatments, we do not find significant differences in experts' average high effort choices (Wilcoxon-Rank-Sum-tests: $p \geq 0.32$). In contrast to *H2a*, we do not observe a significant decline with an increasing degree of qualification but rather high effort choices remain relatively stable across treatments and over all periods.

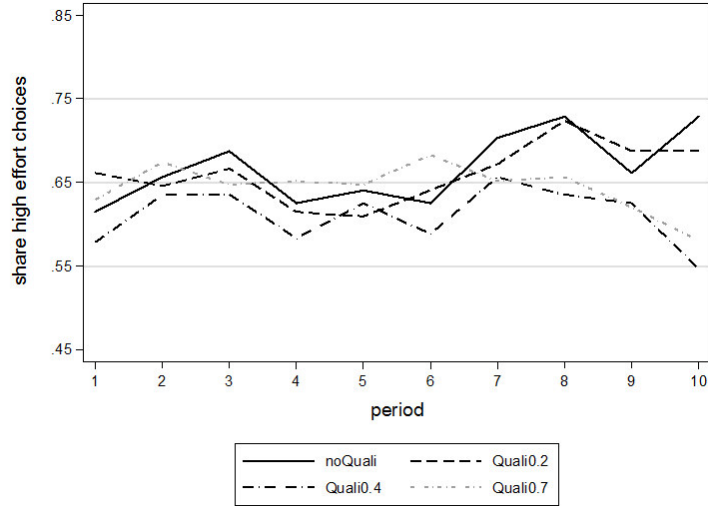


Figure 3: Experts' propensity to choose high effort

Looking at expert behavior differentiated by their qualification, we observe that low skilled experts do not change their behavior regarding their high effort choices across between treatments. In *noQuali/Quali0.2/Quali0.4/Quali0.7* the average likelihood of high effort choices for low skilled experts amounts to 67%/68%/65%/71%. In contrast, across all treatments, high skilled experts show a much greater willingness for high effort than theory predicted. In *Quali0.2/Quali0.4/Quali0.7* the average likelihood of high effort choices for high skilled experts amounts to 65%/53%/55%. In sum, these results contradict *H2b* and *H2c*.

The consistency in high effort choices leads to higher probabilities for consumers to receive a correct diagnosis with increasing qualification. Figure 4 depicts consumers' probability for receiving a correct recommendation of a randomly contacted expert in the market. We can observe significant differences between *Quali0.7* and all other treatments (Wilcoxon-Rank-Sum-test: for *noSignal* $z = -2.290$ and $p = .0220$; for *Quali0.2* $z = -1.749$ and $p = .0803$; for *Quali0.4* $z = -1.903$ and $p = .0570$) which contradicts *H1e*. However, there are no significant differences between all other treatments (Wilcoxon-Rank-Sum-tests: $p \geq 0.3553$).

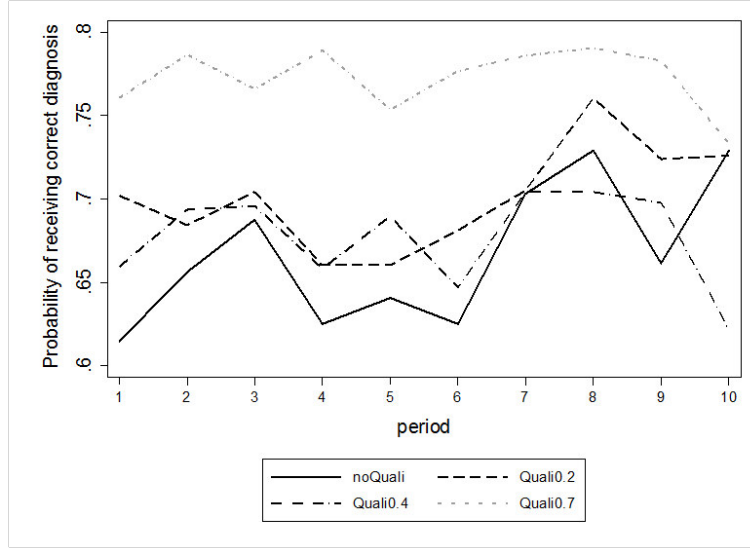


Figure 4: Consumers' probability to receive a correct diagnosis

6.2 Consumer Behavior

Looking at consumer behavior, we can observe a significant increase in first buy choices (buying after receiving exactly one recommendation) in *Quali0.7* in comparison to all other treatments (Wilcoxon-Rank-Sum-test: for *noSignal* $z = -1.807$ and $p = .0707$; for *Quali0.2* $z = -2.371$ and $p = .0177$; for *Quali0.4* $z = -1.933$ and $p = .0532$). In Figure 5 we display the share of consumers who buy after one recommendation across treatments and over periods. In *noQuali/Quali0.2/Quali0.4/Quali0.7* the average likelihood of buying after one recommendation amounts to 19%/16%/18%/30%. This deviates significantly from our theoretical predictions for consumers' first buy choices for all treatments (Wilcoxon matched-pairs signed-ranks test:

for *noSignal* $z = -3.066$ and $p = .0022$; for *Quali0.2* $z = -1.805$ and $p = .0711$; for *Quali0.4* $z = -3.063$ and $p = .0022$; for *Quali0.7* $z = -2.733$ and $p = .0063$) which contradicts *H1a* and *H1b*.

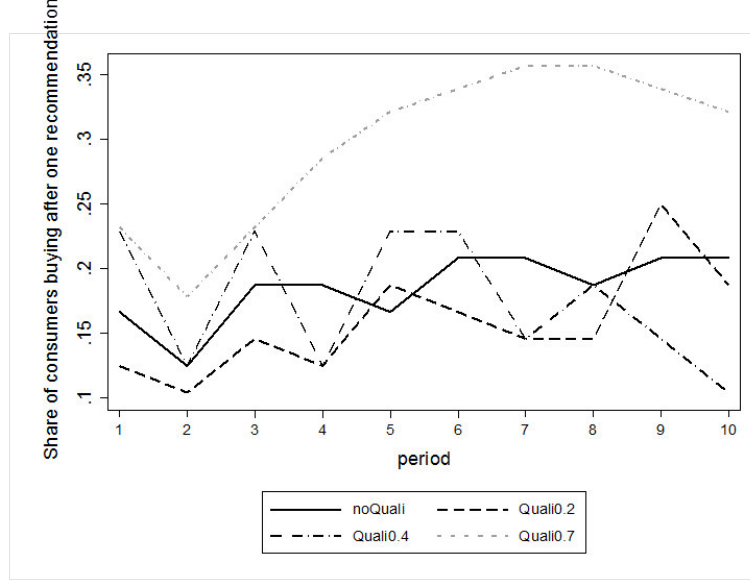


Figure 5: Share of consumers buying after exactly one recommendation

However, we do not find significant differences between treatments in consumers searching for matching opinions (Wilcoxon-Rank-Sum-test: $p \geq 0.2903$). In *noQuali/Quali0.2/Quali0.4/Quali0.7* the average likelihood of buying after receiving matching opinions amounts to 49%/48%/54%/47%. This implies that a considerable share of consumers deviates from equilibrium strategies. Recall that we defined a consumer choice which is neither a first buy or matching opinions buy choice as irrational behavior. In Figure 6 we depict consumers' irrational actions across treatments. Despite we see differences in the average likelihood for irrational actions between treatments with 33%/37%/28%/23%, they are not significant (Wilcoxon-Rank-Sum-tests: $p \geq 0.1102$). However, since we expected consumers to completely restrain from irrational behavior, this result clearly contradicts *H1c*. Looking at the average number of consulted experts per period, we also do not see significant differences between treatments (Wilcoxon-Rank-Sum-tests: $p \geq 0.2358$) which contradicts *H1d*.

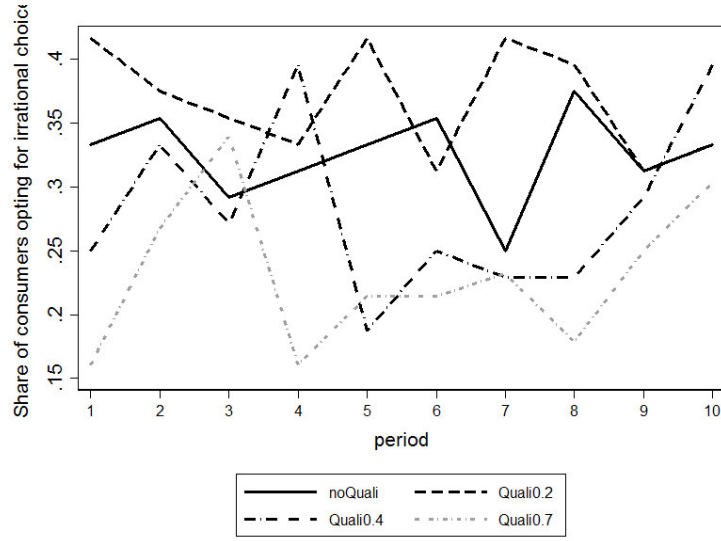


Figure 6: Share of consumers choosing irrational actions

6.3 Discussion

In sum, our results show that subjects behaved much different than theory predicted. Experts show a general high willingness to invest in high diagnostic effort. Even we can observe a drop in high effort choices by high skilled experts in *Quali0.4* and *Quali0.7*, these values lie far above the expected complete reduction. While we would expect consumers to anticipate or at least react to it by higher propensities for first buy choices, we only observe a corresponding increase in *Quali0.7*. The willingness of first buy choices are, in general, smaller than it would even had been optimal when experts had acted according to their mixed strategy equilibrium with less high effort choices. With experts choosing high effort more often, consumers distrust in experts' recommendations appears even more remarkable. It might be the case that due to risk aversion consumers are afraid of buying services after only one recommendation. Another explanation could be that consumers play some kind of tit-for-tat by overestimating bad experiences which leads to a general distrust against all experts in the market for the rest of the game.

Even we cannot determine exactly what drives consumers reluctance to make first buy choices more often, our data shows that it is significantly reduced with higher qualification in *Quali0.7*. However, it remains unclear whether

this effect is driven by consumers reacting to the higher likelihood of receiving a correct recommendation, i.e. the increase in z , or by consumer trusting experts in market more in general as high skilled experts are more qualified. By looking at Figure 5 it appears more plausible that consumers react to the increase in z as their likelihood for first buy choices only increases after the first periods. Moreover, it is remarkable that this increase in trust by higher qualified experts takes only place in *Quali0.7* and not in the other two treatments with qualification. We suspect that a critical threshold must be exceeded for the effects to take place.

7 Conclusion

Even there is a broad literature about credence goods markets, investigations about experts having to invest in costly diagnosis to identify consumers' problems are rare. However, as consumers in this markets are neither able to ex ante observe effort decisions nor whether an expert is high or low skilled, we suspected that this might lead to a market for lemons with high skilled experts unwilling to invest in costly diagnosis anymore as they have no ability to credibly signal their qualification. For this reason, we introduced heterogeneous experts in the model of Pesendorfer and Wolinsky (2003) where experts have to invest in costly diagnosis and consumers can visit multiple experts to verify recommendations. For simplification, we assumed experts to have either high or low skill which we modeled by high skilled experts having some probability to identify a consumer's problem even with low effort. In our theoretical model, we varied the degree of qualification for the high skilled experts while holding the share of high and low skilled constant. Our model enabled us to derive behavioral hypothesis on the effects of increasing qualification of high skilled experts in a market for credence goods which we tested experimentally.

Our results show that experts are in general more willing to invest in costly diagnosis than our theory predicted. Moreover, the expected drop in high effort choices for high skilled experts with increasing qualification did not take place but remained rather constant on a relatively high level. This led to an increasing probability for consumers to receive a correct diagnosis with higher qualified experts. Consequently, the increase in qualification for high skilled experts led to a higher quality in diagnosis. Notice that we

only increased the qualification of high skilled experts across treatments, i.e. increasing the degree of heterogeneity, but did not change the qualification of low skilled experts or the share of both in the market. In reaction to the increased qualification of high skilled experts, consumers were more willing to buy a service after only one recommendation. Due to the substantial increase of first buy choices after the first periods, we suspect that consumers react to the increase in probability for correct diagnosis. However, it is important to mention that the described results by higher qualification only took place in our treatment with the highest difference in qualification between high and low skilled experts. We suspect that for the effects to take place it is important to exceed a critical threshold.

In sum, our results indicate that by introducing higher qualified experts in a market for credence goods not only the quality of diagnosis is increased but consumers are also more likely to rely and trust the first recommendation they have received and therefore restrain more often from verifying recommendations by other experts. This should lead to an increase in welfare as multiple consultations result in overall welfare losses due to transactions costs.

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Appendix A - Proof of Lemmas

Proof of Lemma 1: Since $s + d > 0$, receiving recommendation(s) without purchase cannot be optimal for a principal. This implies, to enter the market she must get a positive expected utility from purchasing which is higher than her outside option θ , only possible with a bought service based on a correct diagnosis. Moreover, it cannot be optimal for a principal to continue searching after two matching recommendations, since searching is costly and matching recommendations reveal a correct diagnosis.⁶ Moreover, by referring to Pesendorfer and Wolinsky (2003), we show that stopping and purchasing after two or more non-matching recommendations cannot be optimal for principals either as long as a principal has some of her budget θ left and there are still not consulted experts in the market.

Suppose a principal has contacted $2 \leq n < N$ experts who gave all different recommendations. Let $\phi(n)$ be the probability that exactly one randomly drawn recommendation out of these n resembles the correct diagnosis.

$$\phi(n) = \frac{(1-z)^{n-1}z}{(1-z)^n + n(1-z)^{n-1}z} = \frac{z}{1 + (n-1)z}.$$

Let $\tau(n)$ be the probability that the next recommendation, i.e. the $(n+1)$ -st, will match one of the former n recommendations.

$$\tau(n) = nz \frac{z}{1 + (n-1)z}.$$

While still assuming this principal has contacted n experts who gave distinct recommendations, to continue searching for matching opinions she needs her expected continuation value W^n by searching to be greater than her outside option, i.e. $\theta - \sum_{i=1}^n d_i - ns$. Since she can always decide to buy from the last contacted expert, continuation in searching also requires

$$W^n \geq zV - p - (s + d),$$

For being a best response, the principal needs to maximize W^n . This maximization problem stems from the principal always having the choice to (i) leave the market without purchase; (ii) buy the service based on any former

⁶Due to extreme improbability of matching wrong signals, we exclude this case from analysis.

recommendation; (iii) get a new recommendation.

$$\max(W^n) = \max\{\theta - \sum_{i=1}^n d_i - ns, \phi(n)V - p, -(s+d) + (1-\tau(n))W^{n+1} + \tau(n)(V-p)\},$$

As principals' outside option shrinks by the number of contacted experts, a principal's outside option decreases in n . Consequently, if a principal's expected profit by entering in the market is higher than her outside option with $n = 0$ contacted experts, it could never be optimal to leave the market for the outside option after $n > 0$ consulted experts.

If a principal decides for getting another recommendation, she will receive matching ones with probability $\tau(n)$ and will buy the service from one of the two experts. With probability $1 - \tau(n)$ she gets another different recommendation.

Assuming it would be optimal if she buys the service in $n + 1$ while still having only different recommendations, her expected utility would be

$$W^{n+1} = \phi(n+1)V - p.$$

Inserting this into the former maximization problem gives

$$\begin{aligned} \max(W^n) &= \max\{\theta - \sum_{i=1}^n d_i - ns, \phi(n)V - p, -(s+d) + (1-\tau(n))(\phi(n+1)V - p) + \tau(n)(V-p)\} \\ &= \max\{\theta - \sum_{i=1}^n d_i - ns, \phi(n)V - p, -(s+d) + Vz - p\} \end{aligned}$$

According to our assumption $\phi(n+1)V - p = W^{n+1} \geq \max\{\theta - \sum_{i=1}^n d_i - ns, -(s+d) + Vz - p\}$. Since $\phi(n)$ is decreasing in n , we get

$$\phi(n)V - p > \max\{\theta - \sum_{i=1}^n d_i - ns, -(s+d) + Vz - p\}.$$

This reveals that it would be optimal to buy after n distinct recommendations instead after $n + 1$. Consequently, it could never be optimal for the principal to purchase after two or more different recommendations.

In contrast to Pesendorfer and Wolinsky (2003), we introduced a limited number of N experts in the market. This might change principals' behavior as they are no longer able to search infinitely long for matching recommen-

dations. If a principal has consulted $n = N$ experts and received distinct recommendation only, she is not able to continue searching for matching opinions. In this case, she has to decide whether to purchase the service from any formerly visited expert or leave the market without purchase. In this case, a principal's maximization problems becomes

$$\max(W^{n=N}) = \max\{\theta - \sum_{i=1}^N d_i - ns, \phi(n)V - p\}$$

Setting both prospective outcomes equal, we receive a critical threshold for z

$$z^{crit} = \frac{\theta + p - n(s + d)}{V - (n - 1)[\theta + p - n(s + d)]}.$$

In maximizing her welfare, a principal will opt for purchasing from a random expert under these circumstances, if z lies above this critical threshold. Otherwise she will choose to leave the market without purchase. However, ending up with $n = N$ distinct recommendations cannot be optimal for a principal, as not only her outside option decreases in n but it would have been better to purchase the service from any of the $n - 1$ consulted expert before as well. Consequently, a principal will only opt for matching opinions if the expected duration to get matching opinions $\frac{2}{z}$ does not exceed the available number of N experts in the market.

In sum, if principals decide to enter the market, they will...

- never leave the market without purchasing if $n < N$;
- never stop and buy after receiving different recommendations only, if $n < N$;
- either stop after the first recommendation with purchasing;
- or search until two recommendation coincide and then purchase;
- will leave without purchasing, if $z < z^{crit} = \frac{\theta + p - n(s + d)}{V - (n - 1)[\theta + p - n(s + d)]}$ and they have received $n = N$ distinct recommendations.

Proof of Lemma 2: The following proof is closely adapted from Pesendorfer and Wolinsky (2003). We fix (z, f) . We denote n as the number of recommendations received prior to the sampling of expert k . Let H_k be the set of histories such that k is sampled and let $P(n|H_k)$ be the probability that a principal receives n recommendations prior to sampling expert k (conditional on k being sampled). Let t denote the random stopping time of the search over the set of experts excluding k . We compute $P(n|H_k)$ by decomposing the sampling process over experts other than k into the disjoint events, $T = 1, 2, \dots$. This yields,

$$P(n|H_k) = \sum_{m \leq n+1} P(n|T = m; H_k) Pr(T = m|H_k).$$

Notice that

$$P(n|T = m; H_k) = \begin{cases} 1/m & \text{if } 0 \leq n \leq m-1 \\ 0 & \text{otherwise.} \end{cases}$$

Furthermore,

$$\begin{aligned} Pr(T = m|H_k) &= \frac{Pr(H_k|T = m)Pr(T = m)}{\sum_{n \leq 1} Pr(H_k|T = n)Pr(T = n)} \\ &= \frac{mPr(T = m)}{\sum_{n \leq 1} nPr(T = n)} \end{aligned}$$

where the last equality uses the fact that

$$\frac{Pr(H_k|T = m)}{Pr(H_k|T = n)} = \frac{m}{n}$$

(To compute the likelihood ratio of two zero probability events we take the limit of shrinking neighbourhoods of positive probability. Hence,

$$\frac{Pr(H_k|T = m)}{Pr(H_k|T = n)} = \lim_{\epsilon \rightarrow 0} \frac{Pr(\{H_{\tilde{k}}|\tilde{k} \in [k, k + \epsilon]\}|T = m)}{Pr(\{H_{\tilde{k}}|\tilde{k} \in [k, k + \epsilon]\}|T = n)} = \lim_{\epsilon \rightarrow 0} \frac{1 - (1 - \epsilon)^m}{1 - (1 - \epsilon)^n} = \frac{m}{n}.$$

Substituting the former equations yields

$$\begin{aligned}
B = P(0|H_k) &= \frac{\sum_{m \geq 1} Pr(T = m)}{\sum_{n \geq 1} Pr(T = n)} \\
&= \frac{1}{f + (1 - f)\frac{2}{z}}.
\end{aligned}$$

where the last equality follows since $\sum m \geq 1 Pr(T = m) = 1$ and $\sum n \geq 1 Pr(T = n) = f + (1 - f)\frac{2}{z}$.

Appendix B - Further Calculations

Proof of conditions for non-degenerate equilibrium:

(i) Solving (12) reveals the possible values for $z \in \{\underline{z}, \bar{z}\}$

$$\begin{aligned}
V - p - 2\frac{s + d}{z} &= zV - p - (s + d) \\
z^2 - \frac{z(V + d + s)}{V} &= -\frac{2(s + d)}{V} \\
z_1, z_2 &= \pm \sqrt{\left(\frac{V + d + s}{2V}\right)^2 - \frac{2(s + d)}{V}} + \frac{V + d + s}{2V}.
\end{aligned}$$

(ii) Building the f.o.c. for (12) determines the maximum value for s according to z

$$\begin{aligned}
\frac{\delta \bar{s}}{\delta z} &= \frac{(V - 2Vz)(2 - z) + Vz(1 - z)}{(2 - z)^2} \stackrel{!}{=} 0 \\
&= (z - 2)^2 - 2 \\
z_1, z_2 &= \pm\sqrt{2} + 2.
\end{aligned}$$

Since $z \in [0, 1]$, the only feasible solution is $z^* = 2 - \sqrt{2}$.

By inserting this into (12), we get the maximum value for \bar{s}

$$\begin{aligned}
\bar{s}(z^*) &= \frac{V(2 - \sqrt{2})(1 - (2 - \sqrt{2}))}{2 - (2 - \sqrt{2})} \\
&= V(3 - 2\sqrt{2}).
\end{aligned}$$

Appendix C - Instructions

Allgemeine Informationen zum Experiment

In diesem Experiment werden Gruppen aus acht Spielern gebildet. Zwischen den einzelnen Gruppen findet zu keinem Zeitpunkt eine Interaktion statt. Jede einzelne Gruppe besteht aus vier Spielern vom Typ A und vier Spielern vom Typ B. Zu Beginn des Experiments wird zufällig entschieden, ob Sie als Spieler A oder als Spieler B spielen. Die Gruppen und die Rollenverteilung bleiben über das gesamte Experiment hinweg bestehen. Das Experiment umfasst insgesamt 10 Runden.

Generell geht es in dem Spiel darum, dass jeder Spieler B ein **Problem** hat. Dieses wird durch einen zufällig ermittelten Zahlenwert zwischen 0 und 1 (mit zwei Nachkommastellen) dargestellt, z.B. 0,12. Um dieses Problem zu lösen, müssen die Spieler B einen oder mehrere Spieler A aufsuchen, um **Signale** über ihr Problem zu erhalten und eine **Maßnahme** ausführen zu lassen. Jedes Signal stellt ebenfalls einen Zahlenwert zwischen 0 und 1 (mit zwei Nachkommastellen) dar. Ein Signal kann entweder korrekt oder falsch sein. Wenn das Signal korrekt ist, sind der Wert des Signals und der Wert des Problems identisch. Wenn das Signal falsch ist, unterscheiden sich beide Werte. Die Spieler B können nicht erkennen, ob ein Signal korrekt oder falsch ist. Jeder Spieler B kann bis zu vier Signale erhalten (maximal eines von jedem Spieler A). Um ihr Problem zu lösen, müssen die Spieler B eine **Maßnahme** auf Grundlage eines **korrekten Signals** ausführen lassen.

Im Gegenzug entscheidet jeder Spieler A, wie er sich gegenüber jedem einzelnen Spieler B verhalten möchte, falls dieser ihn aufsucht. Spieler A stehen hierbei stets zwei Aktionen zur Auswahl, die automatisch dazu führen, dass entweder ein korrektes oder ein falsches **Signal** an Spieler B gesendet wird.

Ihr Verdienst im Spiel hängt von Ihren Entscheidungen und denen der anderen Mitglieder in Ihrer Gruppe ab. Ihre Gewinne werden in Talern berechnet, wobei **1 Taler = 0.07 Euro** entspricht. Am Ende jeder Runde sehen Sie, welche Auszahlung Sie in der jeweiligen Runde erzielt haben und wie hoch Ihr Ertrag über alle Runden hinweg bislang ist. Am Ende des Spiels wird Ihr Gewinn von Talern in Euro umgerechnet (aufgerundet) und Ihnen zuzüglich einer Teilnahmegebühr von 2,50 Euro ausgezahlt.

Der Spielablauf

Das Experiment umfasst insgesamt **10 Runden**. Jede Runde hat einen identischen Ablauf:

1. Jeder Spieler A entscheidet im Vorfeld für jeden einzelnen Spieler B, welche Aktion er ausführen will, falls dieser Spieler B ihn aufsucht.
2. Jeder Spieler B entscheidet, ob und wenn ja wie viele Spieler A er für ein Signal aufsuchen und ob er eine Maßnahme ausführen lassen will.
3. Die Entscheidungen werden umgesetzt.
4. Jeder Spieler bekommt seinen Gewinn für diese Runde und seinen Gewinn über alle bisherigen Runden angezeigt.

Der Ablauf und die Entscheidungsmöglichkeiten der beiden Spielertypen werden im Folgenden im Detail erklärt.

Die Rolle als Spieler A

Als Spieler A entscheiden Sie in jeder Runde für jeden einzelnen der vier Spieler B Ihrer Gruppe, welche Aktion Sie ausführen wollen. Sie treffen diese Entscheidungen für den Fall, dass ein Spieler B Sie für ein Signal aufsucht. Insgesamt müssen Sie also in jeder Runde vier Entscheidungen treffen. Eine Entscheidung wird allerdings nur dann umgesetzt, wenn Sie der entsprechende Spieler B tatsächlich aufsucht. [Qualifikation: Als Spieler A erhalten Sie außerdem zu Beginn des Experiments zufällig die Eigenschaft 1 oder die Eigenschaft 2 zugeteilt. Die zugeteilte Eigenschaft hat Einfluss auf die Konsequenzen Ihrer Aktionen und verändert sich im Laufe des Experimentes nicht. Dies wird im Folgenden weiter erläutert.]

Es stehen Ihnen für jeden einzelnen Spieler B stets zwei Aktionen zur Auswahl.

- Wenn Sie **Aktion 1** auswählen, **kostet Sie dies 1 Taler** und Sie senden automatisch den korrekten Wert des Problems an diesen Spieler B.
- Wenn Sie **Aktion 2** auswählen, **kostet Sie dies 0 Taler** [no Quali: und Sie senden automatisch einen falschen Wert an diesen Spieler B.] [Qualifikation: Die Konsequenzen hängen dabei von Ihrer Eigenschaft als Spieler A ab:
 - Wenn Sie die **Eigenschaft 1** besitzen, senden Sie automatisch mit einer 20% Wahrscheinlichkeit den korrekten Wert und automatisch mit einer 80% Wahrscheinlichkeit einen falschen Wert an diesen Spieler B (siehe erste Tabelle).
 - Wenn Sie die **Eigenschaft 2** besitzen, senden Sie automatisch einen falschen Wert an diesen Spieler B (siehe zweite Tabelle auf der nächsten Seite).]

Pro Spieler B, der Sie aufsucht, erhalten Sie eine pauschale Zahlung von 2 Talern, unabhängig davon, welche Aktion Sie für ihn auswählen. Hiervon werden dann noch die Kosten von 1 Taler abgezogen, wenn Sie für diesen Spieler B Aktion 1 gewählt haben. Beachten Sie, dass eine Entscheidung von Ihnen nur dann umgesetzt wird, wenn der zugehörige Spieler B Sie tatsächlich aufsucht. Es werden Ihnen somit auch nur dann durch die Auswahl von Aktion 1 die Kosten von 1 Taler abgezogen, wenn ein Spieler B Sie tatsächlich aufsucht.

Die Spieler B können nicht erkennen, von welchem Spieler A ein Signal kommt [quali:, welche Eigenschaft ein Spieler A besitzt] und ob das gesendete Signal korrekt oder falsch ist. Die folgende[n] Tabelle[n] zeigen Ihre Entscheidungsmöglichkeiten für jeden einzelnen Spieler B zusammengefasst:

[quali: Aktionen und Konsequenzen als Spieler A mit Eigenschaft 1:

Auswahlmöglichkeit	Konsequenzen
Aktion 1	Wenn Sie Aktion 1 wählen, kostet Sie dies 1 Taler. Sie senden automatisch den korrekten Wert des Problems an diesen Spieler B, falls er Sie aufsucht.
Aktion 2	Wenn Sie Aktion 2 wählen, kostet Sie dies 0 Taler. Sie senden automatisch mit einer 20% Wahrscheinlichkeit den korrekten Wert und automatisch mit einer 80% Wahrscheinlichkeit einen falschen Wert an diesen Spieler B, falls er Sie aufsucht.

Aktionen und Konsequenzen als Spieler A **mit Eigenschaft 2:**

Auswahlmöglichkeit	Konsequenzen
Aktion 1	Wenn Sie Aktion 1 wählen, kostet Sie dies 1 Taler. Sie senden automatisch den korrekten Wert des Problems an diesen Spieler B, falls er Sie aufsucht.
Aktion 2	Wenn Sie Aktion 2 wählen, kostet Sie dies 0 Taler. Sie senden automatisch einen falschen Wert des Problems an diesen Spieler B, falls er Sie aufsucht.

Beispiel: Ein Spieler B hat in dieser Runde das Problem mit dem zufälligen Wert 0,12. Angenommen **[quali: Sie besitzen die Eigenschaft 2 und]** dieser Spieler B wird Sie aufsuchen. Wenn Sie Aktion 1 wählen, erhalten Sie 1 Taler (2 Taler - 1 Taler) und senden das Signal 0,12 an diesen Spieler B. Wenn Sie Aktion 2 wählen, erhalten Sie 2 Taler (2 Taler - 0 Taler) und senden einen zufälligen falschen Wert, z.B. 0,76, an diesen Spieler B.

[no separation: Sobald ein Spieler B von Ihnen ein Signal erhalten hat, kann er eine Maßnahme zum Preis von 5 Talern bei Ihnen ausführen lassen. Beachten Sie, dass das Senden eines Signals nicht automatisch zu der Ausführung einer Maßnahme bei Ihnen führen muss. Jeder Spieler B kann hierbei frei zwischen allen Spielern A wählen, von denen er in einer Runde ein Signal erhalten hat (sehen Sie hierzu auch *Die Rolle als Spieler B*).]

Im Folgenden ist Ihr Entscheidungsbildschirm als Spieler A abgebildet. **Beachten Sie, dass die Zuordnung der Spieler B in den Spalten in jeder Runde neu und per Zufall erfolgt.** Sie wissen also nicht, welcher Spieler B in welcher Spalte dargestellt wird.

Entscheidungsbildschirm für Spieler A **[mit Eigenschaft 2]:**

Entscheiden Sie, welche Aktion Sie ausführen möchten, falls Spieler B Sie aufsucht.

Falls ein Spieler B Sie aufsucht, erhalten Sie hierfür pauschal 2.0 Taler sowohl für die Auswahl von Aktion 1 als auch für Aktion 2.

Konsequenzen	Ein Spieler B	Ein Spieler B	Ein Spieler B	Ein Spieler B
Wenn Sie Aktion 1 wählen, kostet Sie dies 1 Taler. Sie senden dann automatisch den korrekten Wert an diesen Spieler B, wenn er Sie aufsucht.	<input type="checkbox"/> Aktion 1	<input type="checkbox"/> Aktion 1	<input type="checkbox"/> Aktion 1	<input type="checkbox"/> Aktion 1
Wenn Sie Aktion 2 wählen, kostet Sie dies 0 Taler. Sie senden dann automatisch einen falschen Wert an diesen Spieler B, wenn er Sie aufsucht.	<input type="checkbox"/> Aktion 2	<input type="checkbox"/> Aktion 2	<input type="checkbox"/> Aktion 2	<input type="checkbox"/> Aktion 2

Zusammenfassung der Auszahlungsmöglichkeiten für Spieler A in einer Runde:

Die folgende Auszahlung bezieht sich auf einen einzelnen Spieler B. Ihre Gesamtauszahlung von einer Runde ergibt sich aus der Summe der Ergebnisse mit allen vier Spielern B:

- **[no sep: Pro Spieler B, der Sie aufsucht und bei Ihnen eine Maßnahme ausführen lässt erhalten Sie:**
Gewinn = 5 Taler (Preis Maßnahme) + 2 Taler (Senden Signal) – 1 Taler (wenn Aktion 1 gewählt wurde)]
- **Pro Spieler B, der sie aufsucht [no separation: aber bei Ihnen keine Maßnahme ausführen lässt], erhalten Sie:**
Gewinn = 2 Taler (Senden Signal) – 1 Taler (wenn Aktion 1 gewählt wurde)
- **Wenn ein Spieler B Sie nicht aufsucht, erhalten Sie von ihm in dieser Runde keine Auszahlung.**

Beispiel: [anpassen für separation!!] Angenommen Sie sind Spieler A und entscheiden sich dazu, die folgenden Aktionen auszuführen, falls der jeweilige Spieler B Sie aufsucht:

Spieler	Entscheidung von Ihnen als Spieler A
Erster Spieler B	Aktion 1
Zweiter Spieler B	Aktion 1
Dritter Spieler B	Aktion 2
Vierter Spieler B	Aktion 1

Angenommen der erste, dritte und der vierte Spieler B suchen Sie für ein Signal auf und der erste Spieler B entscheidet sich außerdem dafür, bei Ihnen eine Maßnahme ausführen zu lassen. Sie erhalten dann in dieser Runde eine Auszahlung von 9 Talern. Diese setzt sich folgendermaßen zusammen:

Spieler	Auszahlung von diesem Spieler in dieser Runde
Erster Spieler B	6 Taler = 5 Taler (Maßnahme) + 2 Taler (Signal) - 1 Taler (Aktion 1)
Zweiter Spieler B	0 Taler (kein Besuch; also auch kein Abzug durch Auswahl Aktion 1)
Dritter Spieler B	2 Taler (Signal)
Vierter Spieler B	1 Taler = 2 Taler (Signal) - 1 Taler (Aktion 1)
Gesamt	9 Taler = 6 Taler + 0 Taler + 2 Taler + 1 Taler

Die Rolle als Spieler B

Als Spieler B haben Sie in jeder Runde ein neues Problem, welches durch einen zufälligen Zahlenwert (zwischen 0 und 1 mit zwei Nachkommastellen) dargestellt wird, z.B. 0,12. **Dieser Wert wird in jeder Runde neu und zufällig bestimmt.** Sie erfahren zu keinem Zeitpunkt, welchen Wert Ihr Problem hat. Ihr Problem wird dann gelöst, wenn Sie eine Maßnahme ausführen lassen, bei dem das zugrunde liegende Signal korrekt war. **Wenn Ihr Problem gelöst wird, erhalten Sie eine Auszahlung von zusätzlich 13 Talern.**

Zu Beginn jeder Runde erhalten Sie als Spieler B eine Grundausrüstung von 12 Talern. Sie müssen dann entscheiden, ob und wenn ja wie viele Spieler A Sie für den Erhalt eines Signals aufsuchen wollen. Außerdem müssen Sie entscheiden, ob Sie auf Grundlage eines der zuvor erhaltenen Signale eine Maßnahme ausführen lassen möchten. Jedes von einem Spieler A erhaltene Signal stellt einen Wert zwischen 0 und 1 (mit zwei Nachkommastellen) dar. Dieser Wert stimmt allerdings nur dann mit dem Wert Ihres Problems überein, wenn das zugrundeliegende Signal korrekt ist. Wenn Sie zwei Signale mit identischem Wert erhalten, sind beide Signale in jedem Fall korrekt.

Sie haben in jeder Runde die folgenden Handlungsoptionen:

- Einen (weiteren) Spieler A aufsuchen (Kosten: 2,2 Taler)
Sie können einen (weiteren) Spieler A aufsuchen, um von ihm ein Signal zu erhalten. Dies kostet Sie 2,2 Taler. Wenn Sie diese Option wählen, erhalten Sie von einem zufällig bestimmten Spieler A, den Sie in dieser Runde noch nicht aufgesucht haben, sein Signal. Es können in jeder Runde maximal vier Spieler A aufgesucht werden.
- Eine Maßnahme ausführen lassen (Kosten: 5 Taler; beendet die Runde)
Sie können auf Grundlage eines von einem beliebigen Spieler A erhaltenen Signals eine Maßnahme ausführen lassen. Dies kostet Sie 5 Taler und beendet die Runde. Sie können hierbei aus allen in dieser Runde erhaltenen Signalen frei auswählen. Diese Option steht erst zur Verfügung, wenn Sie mindestens ein Signal erhalten haben. Wenn das Signal korrekt ist, erhalten Sie eine zusätzliche Auszahlung von 13 Talern. Wenn das Signal falsch ist, erhalten Sie keine zusätzlichen Taler.
- Die Runde beenden (beendet die Runde, entstandene Kosten bleiben bestehen)
Sie können die Runde beenden, ohne eine Maßnahme ausführen zu lassen und/oder ein Signal erhalten zu haben. Alle bis dahin entstandenen Kosten behalten ihre Gültigkeit (wenn Sie z.B. drei Spieler A aufgesucht haben und dann die Runde ohne Maßnahme beenden, bleiben Kosten von 6,6 Talern bestehen).

Auf der nächsten Seite ist der Entscheidungsbildschirm für Spieler B abgebildet.

Entscheidungsbildschirm für Spieler B:

Entscheiden Sie, wie Sie sich in dieser Runde verhalten möchten.

Ihre Kosten für ein neues Signal durch einen Spieler A: 2.2 Taler.
Ihre Kosten zur Durchführung einer Maßnahme: 5 Taler.
Bisher angefallene Kosten durch in Anspruch genommene Signale: 6.6 Taler

Der erste Spieler A, den Sie besucht haben, hat das Signal 0.92 gesendet.

Der zweite Spieler A, den Sie besucht haben, hat das Signal 0.40 gesendet.

Der dritte Spieler A, den Sie besucht haben, hat das Signal 0.40 gesendet.

Einen weiteren Spieler A aufsuchen

Eine Maßnahme ausführen lassen

Diese Runde beenden

Zusammenfassung der Auszahlungsmöglichkeiten für Spieler B in einer Runde:

- **Wenn Sie eine Maßnahme ausführen lassen und das Signal von diesem Spieler A korrekt war:**
Gewinn = 13 Taler (gelöstes Problem) + 12 Taler (Grundausrüstung) – 5 Taler (Preis der Maßnahme) – 2,2 Taler * Anzahl aufgesuchter Spieler A
- **Wenn Sie eine Maßnahme ausführen lassen und das Signal von diesem Spieler A nicht korrekt war:**
Gewinn = 12 Taler (Grundausrüstung) – 5 Taler (Preis der Maßnahme) – 2,2 Taler * Anzahl aufgesuchter Spieler A
- **Wenn Sie keine Maßnahme ausführen lassen:**
Gewinn = 12 Taler (Grundausrüstung) – 2,2 Taler * Anzahl aufgesuchter Spieler A

Beispiel: Angenommen Sie sind Spieler B und suchen zwei Spieler A für ein Signal auf. Sie entscheiden sich dann zur Ausführung einer Maßnahme beispielsweise bei dem zweiten von Ihnen besuchten Spieler A:

- Falls das Signal dieses Spielers A korrekt war, erhalten Sie in dieser Runde eine Auszahlung von 15,6 Taler (= 13 Taler + 12 Taler – 5 Taler – 2,2 Taler * 2).
- Falls das Signal dieses Spielers A nicht korrekt war, erhalten Sie in dieser Runde eine Auszahlung von 2,6 Taler (= 12 Taler – 5 Taler – 2,2 Taler * 2).