The Determinants of Online Payment Service Adoption: In Online Consumer-to-Consumer Auction Markets

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Abstract

Sellers/buyers in an online auction marketplace can choose to accept/make payments by credit cards or electronic checks through adopting online payment services (OPS), which have been designed to facilitate the transaction and to some degree protect the involved parties against fraud. However, despite of all the merits that OPS's possess, there are still significant amount of transactions settled without adopting such services, namely through other payment methods, esp. personal checks. This paper asks the question why there are still a substantial fraction of the total transactions settled through personal checks instead of OPS's. Seller and buyer's OPS adoption decisions are examined through a one-shot game with cheap talk, in which the seller could signal his/her type by adopting OPS's. There are two pooling equilibria and one hybrid equilibrium but no separating equilibrium in this model. The results suggest one possible explanation for the fact that there is still a substantial fraction of the traders who trade without adopting OPS: The buyer's prior belief of the fraction of sellers who are honest, is pretty high. Another finding is that in the two pooling equilibria, trade is always guaranteed but in the hybrid equilibrium, there's no trade.

I. Introduction

In the past several years, the consumer-to-consumer online auction has been one of the fastest growing sectors of e-commerce. However, the reported online auction fraud has also been on the top of the online fraud list. According to the annual report of the Internet Fraud Complaint Center[1] (IFCC), during 2002, Internet auction fraud was the most reported offense, comprising 46.1% of referred fraud complaints. This represents a 7.7% increase from 2001 (42.8%) levels of reported auction fraud.

In an online auction market place, the buyer almost bears all the risk. According to the author's correspondences with eBay.com, the common practice is that the seller would not ship the good until the payment is verified. Hence no matter what kind of payment methods the buyer uses, chances are few that the buyers could cheat. On the contrary, the seller could either get the payment but never ships the good; or the good the seller ships to the buyer is not as described as in the auction listing. Hence this is a scenario of "one-side risk".

There are mainly three types of payment methods in an online auction market place: money orders; personal checks and OPS's like Paypal. Usually there's a relatively high bank charge for using money orders so most of the people who use money orders to settle the transactions are people who do not have a bank account or credit card. Online payment services (OPS) such as Paypal, are designed to facilitate transactions between individuals, and between individuals and small businesses, and to some extent protect and insure traders against fraudulent acts of their trading partners. OPS's facilitate online auction transactions because they allow an individual to accept credit card payments and process such payments; or in the case of echecks, OPS's allow an individual to transfer fund online from his/her bank account to another individual.

1.The Internet Fraud Complaint Center (IFCC) is a partnership between the Federal Bureau of Investigation (FBI) and the National White Collar Crime Center (NW3C).

Plus OPS's are usually free of charge to the buyers and would charge the seller a certain amount of service fee based on the transaction amount .[2] In addition such service fee can't be shifted to the buyer.[3]

In this paper the anti-fraud features of OPS are the focus, namely the insurance function for the buyer. If the buyer paid for a certain transaction through an OPS, then in case of fraud, the OPS would reimburse the buyer any funds the OPS is able to collect on the buyer's behalf up to a certain maximum[4], although a full refund is not guaranteed. The reason that OPS's could offer such insurance is because of the built-in anti-fraud features. For example, Paypal requires a user to authenticate an account through two additional financial instruments: credit card and bank account. Linking a valid credit card number and billing address to a PayPal account helps validate a user's identity. Linking a bank account to a PayPal account further validates a user's identity. Once such a link is established, PayPal makes two ACH deposits of arbitrary amounts to the user's bank account. By determining the value of the two deposits and relaying that information back to PayPal, the user confirms his or her identity to PayPal. (Jones, 2001) Such information would help increase the chance that Paypal would be able to collect funds on behalf of the buyer, in case the seller cheats. In addition, another benefit for the buyer to pay through OPS's is that he/she needs never reveal financial information to the seller and need not worry about the ongoing exposure that might allow sellers to mismanage, misuse, or leak credit-card information. Neither are buyers required to reveal a social security number when opening an account.

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2. http://www.paypal.com/cgi-bin/webscr?cmd=p/gen/fees-outside

3. http://pages.ebay.com/help/payments/sellerguide/policies.html#CHARGEFEE

4. http://www.paypal.com/cgi-bin/webscr?cmd=_protections-buyer-outside

In contrast to the insurance function of OPS is the vulnerability of personal checks to fraud. According to IFCC's report on Internet auction fraud[5], among all the reported Internet auction fraud cases in 2000 and 2001, transactions with personal checks as the payment methods constitute about 32%, the second highest category, next to money orders.

On one hand, OPS's like Paypal are by design to greatly facilitate online transactions and to some extent insure buyers against fraud, while personal checks are proven to be more vulnerable to fraud. However, a significant fraction of the total transactions are settled through payment methods other than OPS. For example, by July 2002, only about 40 percent[6] of eBay's transactions were settled through OPS's. This is so despite of the fact that Paypal or Billpoint is completely free for buyers once they sign up and transactions through personal checks are slower to process than Paypal or Billpoint. Plus in contrast to the case of using personal checks, the buyer's financial information is never revealed to the seller if paying through Paypal or Billpoint.

This paper asks the question why some people choose using personal checks for their transactions over OPS's. Put it another way, given all the merits of using OPS's for online auction transaction, especially the insurance function, why is there a substantial fraction of the total eBay transactions still conducted through personal checks but not OPS's? To answer this question, the seller and buyer's OPS adoption decisions are examined through a one-shot game with cheap talk, in which the seller could signal his/her type by adopting OPS's.

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5. IFCC. " Internet Auction Fraud", www.ifccfbi.gov, May 2001

6. Chris Gaither. "EBAY TO ACQUIRE PAYPAL FOR $1.5B STOCK DEAL UNITES ONLINE AUCTION GIANT, NET PAYMENT SERVICE", *Boston Globe*, Jul 09, 2002

This question has very important policy implications, given the seriousness of online auction fraud. In 2002, almost half of 75,000 offences filed with the FBI-backed Internet Fraud Complaint Centre were internet auction fraud. Meanwhile, 90 per cent of the 37,000 complaints to the US National Consumers League's www.fraud.org concerned online auctions[7]. Auction fraud has negative consequences on both consumer's welfare and auction marketplaces' profit. OPS's provide a way to insure the buyer against fraud to some extent, while facilitating online consumer-to-consumer transactions. For the buyer's protection and to encourage online commerce, we want to encourage the use of OPS. Therefore we need to understand the decision process of OPS adoption.

This paper proceeds as follows. First, the one-shot game with cheap talk is analyzed and solved. Then the equilibria are summarized, followed by the interpretation of the results.

II. The Model

1. Agents in Online Auction Marketplaces with Online Payment Services

There are sellers and buyers in the market place and there are two types of sellers and only one type of buyers: the honest and cheater-type sellers but only honest buyers. This assumption is realistic because in an online auction setting, chances are few that the buyer could cheat.

2. Timing of the Game

a) Nature determines a seller's type, h, which can be either honest (H) or cheater (L). The probability that $h = H$ is q.

b) A seller learns his/her type and then chooses to accept *(a=1)* or not to accept *(a=0)* OPS as one of the payment methods, namely the seller's action space is $a = \{0,1\}$.

7. Andy Favell, The Independent, July 9, 2003, 1392 words, SCIENCE & TECHNOLOGY: BUYER BEWARE,

c) A buyer observes a seller's action (not type), namely whether a certain seller accepts OPS as a payment method or not and chooses to buy from this seller or not. The buyer's action space is $b = \{0,1\}$.

3. Model Set-up

Assumption 1

The fixed cost associated with signing up for OPS is negligible[8], both for the seller and the buyer. In the model, set this fixed cost equal to zero.

Assumption 2

The seller pays for the OPS service fee and this fee can't be shifted to the buyer.

Assumption 3

The marginal costs of using the OPS are the same for the honest seller and the cheater type of seller and $c > 0$

$$c_a(H, a) = c_a(C, a)\,;\ c_1(H,1) = c_1(C,1) = c\,; c_0(H,0) = c_0(C,0) = 0$$

Assumption 4

The seller's type is private information.

These assumptions open the possibility that a cheater-type seller could try to mimic an honest seller's action.

Notations

M---the transaction amount in a certain trade

V^b ---buyer's net utility value of the property to be purchased in a certain trade excluding other costs, such as shipping

8. "You can sign up for PayPal in less than 3 minutes!" ------------

http://pages.ebay.com/help/payments/sellerguide/new.html

V^s---seller's reservation value of the property being sold in a certain trade excluding the shipping fee and other costs

U^b----buyer's expected utility from a certain trade

U_0^s---seller's expected utility from a certain trade when online payment is not adopted

U_1^s--- seller's expected utility from a certain trade when online payment is adopted

r----the rate of payment service fee, based on the percentage of the transaction amount

Assumption 5

If an Internet fraud happens, the loss is assumed to be completely unrecoverable in the transaction amount for an honest buyer or in the value an honest seller reserves at the time being.

Assumption 6

No substitution effect is considered regarding other risk-reduction choices, such as insurance.

Assumption 7

If OPS is adopted in a certain trade, then in case of fraud, the OPS would reimburse the buyer the involved transaction amount.

Assumption 8

When there is no trade, both the seller and the buyer receive a payoff of zero.

4. Payoffs and Equilibria

This is a one-shot game with cheap talk. The signal in this model is the adoption of OPS. The adoption of OPS does not have direct costs so it is costless communication. However, since the seller does have to pay for the OPS, if the buyer chooses to pay through OPS in a certain transaction, the signal does affect the payoffs. Hence the signal in this model is kind of cheap talk. Three kinds of perfect Bayesian equilibria can exist in this model: pooling, separating and hybrid.

The decisions of the seller and buyer as well as the payoffs under different circumstances are described as in Figure 1(on next page). The payoffs in the brackets are the seller's payoff and the buyer's payoff, respectively.

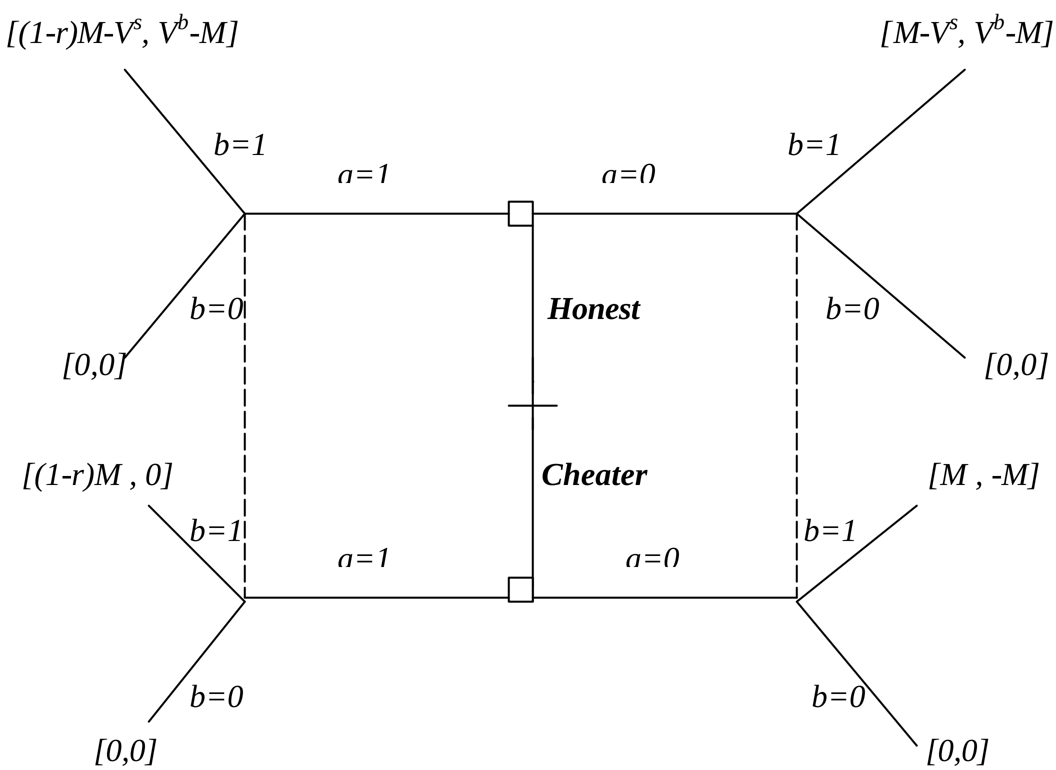

Figure 1: Game Tree

Now we turn to the analysis of the equilibria existing in this model.

Pooling Equilibria: In pooling equilibria, the two types of sellers choose the same action, i.e. both the honest and the cheater-type sellers choose either to adopt OPS or not to adopt OPS.

- ***[a(H)=1 and a(C)=1]:*** If both the honest and cheater-type sellers choose to adopt OPS, then the buyers' belief after observing ***a=1*** must be the prior belief,

  $m(h = H \mid a = 1) = q$; $m(h = C \mid a = 1) = 1 - q$

  which in turn implies that the buyer's expected utility from buying from the seller after observing ***a=1*** is:

  $U^b(a = 1) = q(V^b - M) + (1 - q)\ (M\text{-}M) = q(V^b - M)$

  In this case, since $V^b > M$, $U^b(a = 1) > 0$. Hence when observing ***a=1***, the buyer's best response is to buy from the seller***, i.e. b(a=1)=1.***

  If the buyer observes ***a=0***, his/her expected utility from buying from the seller is $U^b(a = 0) = q(V^b - M) + (1 - q)(-M) = qV^b - M$.

  Hence the buyer's strategy after observing ***a=0*** is as follows:

  $$b(a = 0) = \begin{cases} 1\ if\ \ qV^b > M \\ 0\ if\ \ qV^b < M \end{cases}$$

  This completes the description of the buyer's strategy. Now decompose the buyer's strategy into two cases:

  Case 1--- b(a=1)=1; b(a=0)=1 if $qV^b > M$. In this case, the buyer would always buy from the seller whether the seller adopts OPS or not, as long as the condition $qV^b > M$ holds. However, given such buyer strategy, it is to the seller's interest not to adopt OPS because of the cost involved, no matter the seller is honest or a cheater. ($(1 - r)M - V^s > M - V^s$;*(1-r)M>M. For payoffs, referred to figure 1)* Hence, such buyer strategy can't support ***[a(H)=1 and a(C)=1]*** as a perfect Bayesian equilibrium.

Case 2--- b(a=1)=1; b(a=0)=0 if $qV^b < M$. In this case, the buyer would buy from the seller if he/she observes *a=1* but wouldn't buy if observing *a=0* and if $qV^b < M$. Here given such buyer strategy, both the honest seller and the cheater-type seller would adopt OPS because for the honest seller, $U_1^s(H) = (1-r)M - V^s > 0$; and for the cheater-type seller, $U_1^s(C) = (1-r)M > 0$, Hence with such buyer strategy, ***[a(H)=1 and a(C)=1]*** could be supported as a perfect Bayesian equilibrium.

For completeness, this pooling perfect Bayesian equilibrium is described as follows:

Seller Strategy	*a(H)=1 and a(C)=1*
Buyer's Belief	$m(h = H \mid a = 1) = q$; $m(h = C \mid a = 1) = 1 - q$
Buyer Strategy	*b(a=1)=1; b(a=0)=0 if* $q < M / V^b$

<u>Pooling Equilibria(Continued)</u>

- ***[a(H)=0 and a(C)=0]:*** If both the honest and cheater-type sellers choose not to adopt OPS, then the buyers' belief after observing ***a=0*** must be the prior belief,

  $m(h = H \mid a = 0) = q$; $m(h = C \mid a = 0) = 1 - q$

  which in turn implies that the buyer's expected utility from buying from the seller after observing ***a=0*** is:

  $U^b(a = 0) = q(V^b - M) + (1 - q)\,(-M) = qV^b - M$

  The buyer's best response given ***a=0*** is as follows:

  If $qV^b - M > 0$, i.e. $q > M / V^b$, **b(a=0)=1.**

  If $qV^b - M < 0$, i.e. $q < M / V^b$, **b(a=0)=0.**

  If the buyer observes ***a=1***, his/her expected utility from buying from the seller is $U^b(a = 1) = q(V^b - M) + (1 - q)(M - M) = q(V^b - M) > 0$.

  Hence the buyer's best response after observing ***a=1*** is to buy from the seller. This completes the description of the buyer's strategy.

Now decompose the buyer's strategy into two cases:

Case 1--- b(a=1)=1; b(a=0)=1 if $qV^b > M$. In this case, the buyer would always buy from the seller whether the seller adopts OPS or not, as long as the condition $qV^b > M$ holds. Given such buyer strategy, the seller's best response is not to adopt OPS because of the cost involved, no matter the seller is honest or a cheater. ($(1-r)M - V^s > M - V^s$ *;(1-r)M>M. For payoffs, referred to figure 1)*

Hence, such buyer strategy could support ***[a(H)=0 and a(C)=0]*** as a perfect Bayesian equilibrium.

For completeness, this pooling perfect Bayesian equilibrium is described as follows:

Seller Strategy	*a(H)=0 and a(C)=0*
Buyer's Belief	$m(h = H \mid a = 0) = q$; $m(h = C \mid a = 0) = 1 - q$
Buyer Strategy	*b(a=1)=1; b(a=0)=1 if* $q > M / V^b$

Case 2--- b(a=1)=1; b(a=0)=0 if $qV^b < M$. Given such buyer strategy, the seller's best response is to adopt OPS because in case of no trade, the seller receives zero but as long as there's trade, the seller receives positive payoff no matter the seller is honest or a cheater. Hence, ***[a(H)=0 and a(C)=0]*** can't be supported as a perfect Bayesian equilibrium.

<u>Separating Equilibria</u>: in separating equilibria, honest sellers and cheater-type sellers choose different strategies, i.e. either $[a(H) = 1, a(C) = 0]$ or $[a(H) = 0, a(C) = 1]$.

- ***[a(H)=1, a(C)=0]***:In the separating perfect Bayesian equilibrium which involves the strategy $[a(H) = 1, a(C) = 0]$, the buyer's belief after observing these actions is $m(h = H \mid a = 1) = 1$ and $m(h = H \mid a = 0) = 0$, which implies that the buyer's strategy is *[b(a=1)=1 and b(a=0)=0]* . Given such buyer strategy, the seller would always choose to adopt OPS because if the seller wouldn't adopt OPS, then there's no trade and in case of no trade, the seller receives zero but if the seller adopts OPS, then there's trade and the seller receives positive payoff, no matter he/she is honest or a cheater. Hence $\left[a(H)=1, a(C)=0\right]$ can't be supported as a perfect Bayesian equilibrium.

- ***[a(H)=0, a(C)=1]:*** In the separating perfect Bayesian equilibrium which involves the strategy $\left[a(H)=0, a(C)=1\right]$, the buyer's belief after observing these actions is $m(h=H \mid a=0)=1$ and $m(h=H \mid a=1)=0$, If observe *a=1*, then the buyer knows that the seller is a cheater for sure, the buyer is indifferent from buying and not buying because under both circumstances, his/her payoff is zero. If the buyer observes *a=0*, then the seller is honest for sure. The buyer will buy would buy from the seller for sure. Hence the buyer strategy is

  [*b(a=1)=1; b(a=0)=1*] or [*b(a=1)=0; b(a=0)=1*].

  In the first case, the buyer always chooses to buy, then the seller's best response is not to adopt OPS no matter he/she is honest or a cheater because of the cost involved. In the second case, the buyer buys when observing *a=0*, but wouldn't buy when observing *a=1*. Given such buyer strategy, the seller would not adopt OPS whatever of his/her type. In sum ***[a(H)=0, a(C)=1]*** can not be supported as a perfect Bayesian equilibrium.
- There's no separating equilibria in this model.

<u>Hybrid Equilibria</u>: In hybrid equilibria, one type chooses either ***a=1*** or ***a=0*** with certainty**,** and the other type randomizes between pooling with the first type and separating from the first type. We focus on the cases where the cheater-type seller randomizes.

- ***[a(H)=1; a(C) =1 with probability p and a(C)=0 with probability 1-p]***:

  Suppose the honest seller chooses to adopt OPS, i.e. ***a=1***, but the cheater-type seller randomizes between choosing ***a=1*** (with probability ***p***) and choosing ***a=0*** (with probability *1-**p***).

Signaling requirement then determines the buyer's belief after observing ***a=1*** or ***a=0***: Bayes' rule yields

$$m(H \mid a=1) = \frac{q}{q+(1-q)p}, \text{ and } m(H \mid a=0) = 0.$$

There are three important observations: first, since the honest seller always chooses to adopt OPS(***a=1***) , but the cheater-type seller dOPS so only with probability p , observing ***a=1*** makes it more likely that the seller is honest so $m(H \mid a=1) > q$; second, as p approaches zero the cheater-type seller almost never pools with the honest seller so $m(H \mid a=1)$ approaches one; third, as p approaches one the cheater-type seller almost always pools with the honest seller so $m(H \mid a=1)$ approaches the prior belief q.

Now turn to the buyer's strategy. If the buyer observes *a=1*, his/her expected utility from buying from the seller is

$$U^b(a=1) = \frac{q}{q+(1-q)p}(V^b - M) + \left[1 - \frac{q}{q+(1-q)p}\right](M - M) = \frac{q}{q+(1-q)p}(V^b - M) > 0$$

So the buyer's strategy when observing *a=1*, is to buy from the seller, i.e. *b(a=1)=1*. If the buyer observes *a=0*, then according to the buyer's belief, the seller is a cheater with certainty. The buyer's expected utility from buying from the seller under such circumstance is $U^b(a=0) = -M < 0$ so the buyer's best response is not to buy, i.e. *b(a=0)=0*. Hence the buyer's strategy is [*b(a=1)=1; b(a=0)=0*]. Given such buyer strategy the seller would always choose to adopt OPS whatever of his/her type because otherwise, there's no trade and he/she receives zero.

In sum, ***[a(H)=1; a(C) =1 with probability*** p ***and a(C)=0 with probability 1-***p***]*** can not be supported as a perfect Bayesian equilibrium.

- ***[a(H)=0; a(C)=0 with probability x and a(C) =1 with probability 1-x]***:

  Suppose the honest seller chooses not to adopt OPS, i.e. ***a=0***, but the cheater-type seller randomizes between choosing ***a=0*** (with probability *x*) and choosing ***a=1*** (with probability *1-x*). Signaling requirement then determines the buyer's belief after observing ***a=0*** or ***a=1***: Bayes' rule yields

$$m(H \mid a=0)=\frac{q}{q+(1-q)x}, \text{ and } m(H \mid a=1)=0 .$$

Given *a=0*, the buyer's expected utility from buying from the seller is

$$U^b(a=0)=\frac{q}{q+(1-q)x}(V^b-M)+\left[1-\frac{q}{q+(1-q)x}\right](-M)=\frac{q}{q+(1-q)x}V^b-M .$$

So the buyer's best response when observing *a=0* is

$$b(a=0)=\begin{cases}1 & if \ \frac{q}{q+(1-q)x}V^b>M \\ 0 & if \ \frac{q}{q+(1-q)x}V^b<M\end{cases} .$$

Now given *a=1*, according to the buyer's belief, the seller is a cheater with certainty. The buyer's expected utility from buying from the seller is $U^b(a=1) = M - M = 0$. Hence the buyer is indifferent from buying and not buying when observing *a=1*, i.e. either *b(a=1)=1* or *b(a=1)=0*.

Case 1----When condition $\frac{q}{q+(1-q)x}V^b>M$ holds, the buyer would choose to buy if observing *a=0*. In this case the cheater-type seller has no incentive to randomize between a=1 and a=0. He/she would simply choose a=0 because of the cost involved in adopting OPS. Hence when $\frac{q}{q+(1-q)x}V^b>M$ holds, there's no hybrid equilibrium in this model.

Case 2---When condition $\frac{q}{q+(1-q)x}V^b < M$ holds, the buyer wouldn't buy from the seller if observes *a=0*. Since the buyer is indifferent from buying and not buying if observes a=1, we need to consider two sub-cases:

- When the buyer's strategy is as follows:(Assume $\frac{q}{q+(1-q)x}V^b < M$ holds.)

  [*b(a=0)=0* and *b(a=1)=1*] . Then the seller's best response is to adopt OPS whatever of his/her type. Hence no hybrid equilibrium exists in this sub-case.

- When the buyer's strategy is as follows: (Assume $\frac{q}{q+(1-q)x}V^b < M$ holds.)

  [*b(a=0)=0* and *b(a=1)=0*]. Since the OPS fee is based on the percentage of the transaction amount, as long as there's no trade, there's no cost involved in adopting OPS. Hence the seller is indifferent from adopting and not adopting OPS. Therefore given such buyer strategy, ***[a(H)=0; a(C)=0 with probability x and a(C) =1 with probability 1-x]*** can be supported as a perfect Bayesian equilibrium.

III. Results and Interpretation

- **Results**

According to the results of the last section, in this model, there exist two pooling equilibria and one hybrid equilibrium but no separating equilibria. They are summarized as follows:

- ✓ If $q < M/V^b$, there exists one pooling equilibrium in which both honest sellers and cheater-type sellers would choose to adopt OPS and the buyer would buy from the seller if and only if the seller adopts OPS.
- ✓ If $q > M/V^b$, there exists another pooling equilibrium in which both honest sellers and cheater-type sellers would choose not to adopt OPS and the buyer would always buy from the seller.

- ✓ There exits no separating equilibrium in this model.
- ✓ There exists a hybrid equilibrium in which the honest seller chooses not to adopt OPS and the cheater-type seller chooses to randomize between adopting and not adopting OPS and the buyer would never buy from the seller as long as the condition $\frac{q}{q+(1-q)x}V^b < M$ holds.

- **Interpretations:**
  - ✓ Pooling Equilibria: When the prior belief q is high, the buyer would always buy from the seller, then both the honest and the cheater-type sellers find it not necessary to adopt OPS; when the prior belief q is low, the buyer will buy only if the seller adopts OPS because OPS provides insurance for the transaction. Hence one possible explanation for the fact that currently there're still substantial amount of transactions not settled through OPS is that the prior belief q is pretty high. This could be due to the online auction houses' claims like " Although there are occasionally fraud cases, most of the transactions conducted through our sites are safe." These claims give the buyers the impression that the online auction market is a safer marketplace than it actually is. This in turn implies that to encourage the use of OPS and protect buyers, the regulatory authorities should try to inform the buyers the accurate picture of the online auction marketplace, with actions like running information campaign about the real online auction figures, the distribution of the fraud cases according to payment methods, etc.

  - ✓ Separating Equilibria: There's no separating equilibrium in this model. This may be due to the fact that this model analyzed a rather extreme case, where the OPS's are assumed to reimburse the buyer the full transaction amount in case of seller fraud, while the cheater seller could get away with the money. In reality, if seller fraud happens, the OPS will investigate the transaction and reimburse the buyer any fund it could collect on the buyer's behalf, but a full refund is not guaranteed. Hence a more realistic assumption would be that there's a positive probability that the seller couldn't get away with the money. The higher this probability, the more effective the OPS's anti-fraud function. Obviously, the prediction would be that when this probability is bigger than some critical value, there will exist some separating equilibrium.

- ✓ "Bad" Equilibrium Vs. Guarantee of Trade: The only hybrid equilibrium in this model is a "bad" equilibrium in the sense in this equilibrium, there's no trade. In contrast, in the above two pooling equilibria, trade is always guaranteed. Recall in the two pooling equilibria, no matter q is high or q is low, there's always trade. This indicates that in order to encourage trade, we need to guarantee the existence of pooling equilibria while preventing the hybrid equilibrium from occurring.

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