Last Minute Feedback*

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Abstract

Feedback mechanisms that allow trading partners to rate each other after a transaction are considered crucial for the success of anonymous internet trading platforms. Lately, the concern has been raised that a substantial portion of negative feedbacks might not be given at all on eBay, the largest among those platforms, because of the fear of retaliative negative feedback. Conversely, positive feedbacks may be given mostly in order to encourage reciprocation. Therefore, feedback scores might be biased. In this paper, we investigate the design of the eBay feedback mechanism, with particular focus on the ending rule for the period in which feedbacks can be left as well as agents' actual behavior induced by such a rule, particularly in terms of the timing of different types of feedbacks. We point out potential drawbacks of the current eBay feedback mechanism, and conclude with easy-to-implement suggestions geared at improving the design of the feedback mechanism and the informational content of its records.

JEL Classification: D44, L15, L86.
Keywords: eBay, reputation mechanism, strategic feedback behavior, informational content, reciprocity, fear of retaliation.

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1. Introduction

Feedback mechanisms in electronic markets allow trading partners to rate each other after a transaction. These schemes, also referred to as "reputation mechanisms," are claimed to be crucial for the success of anonymous trading platforms such as eBay. On these platforms the room for opportunistic behavior on both sides of the market is particularly wide: anonymity and distance allow sellers to cheat on the quality of the good. Likewise, buyers can be dishonest concerning their payment behavior.[1] A reputation mechanism collects and distributes information of partners' evaluation of an agent's past behavior and may be able to discipline these forms of opportunisms with the threat that, if you misbehave today, you will have a bad evaluation and will therefore be avoided by other traders in the future. Public statements by eBay emphasize the (potential) ability of the feedback mechanism to discipline transacting parties by informing potential future trading partners about their current conduct.[2]

In spite of the incentive to free ride—providing feedback appears a purely altruistic act *prima facie*—feedback is given in the better part of the transactions on eBay.[3] Therefore, it could be argued that this device plays an important role in diminishing informational asymmetries by enhancing the discipline of the transacting parties. Currently, there is a lively discussion about the economic effects of reputation mechanisms in electronic markets.[4]

On eBay, both the seller and the buyer of an object are allowed to rate each other after a transaction. Mostly, feedbacks are positive. Moreover, it is well known that the correlation between first and second feedbacks is very high.[5] In particular, leaving a positive feedback might at least partly be driven by expectations on *feedback reciprocity*, i.e. expecting the trading partner to reciprocate.[6] It has been argued that agents dissatisfied with their

[1] According to the Internet Crime Complaint Center (IC3) 2005 Internet Fraud Crime Report "internet auction fraud was by far the most reported offense, comprising 62.7% of [97,076] referred complaints." See http://www.ic3.gov/media/annualreports.aspx (September 2006). Likewise, the FTC reports that "internet auction fraud is on the rise, with an increasing number of consumers complaining about sellers who deliver their advertised goods late or not at all, or deliver something far less valuable than promised." See the FTC's "Top Ten Dot Cons" on http://www.ftc.gov/bcp/conline/edcams/dotcon/auction.htm (February 2006).

[2] eBay states that the feedback "comments and ratings are valuable indicators of your reputation as a buyer or seller on eBay," see http://pages.ebay.com/help/feedback/questions/feedback.html (February 2006). Moreover, in the founder's letter posted on February 26, 1996, Pierre Omidyar claims that "some people are dishonest. Or deceptive... But here, those people can't hide. We'll drive them away." See http://pages.ebay.com/services/forum/feedback-foundersnote.html (February 2006).

[3] Resnick and Zeckhauser (2001) were among the first to investigate feedback behavior on eBay. They find that in about 52 per cent of the transactions feedback is left.

[4] See Dellarocas (2005) for a useful survey of recent research on reputation mechanisms. The effects of seller reputation on prices and the probability of selling the object are usually found to be negligible or positive. See, for example, Melnik and Alm (2002), Bajari and Hortaçsu (2003), Cabral and Hortaçsu (2005), Livingston and Evans (2004), Lucking-Reiley, Bryan, Prasad, and Reeves (2005), Houser and Wooders (forthcoming). See also Bajari and Hortaçsu (2004) as well as Resnick, Zeckhauser, Swanson, and Lockwood (2004) for an overview.

[5] See, e.g., Resnick and Zeckhauser (2001).

[6] This tendency to reciprocate may be due to behavioral components in agents' decision making

trading partners anticipate the risk of revenge, and may therefore refrain from leaving negative feedbacks at all, reducing and biasing the informational content of the reputation index towards positive outcomes. If agents who give the first feedback expect the opponent to reciprocate positive feedbacks, or retaliate negative feedbacks, then, relative to truthful reports, one would expect negative first feedbacks to be rare and positive ones to be common, a pattern that is usually found.[7] If an eBay user is not fully aware of this fact, she might therefore overestimate the informational content of feedback records.[8]

In this paper, rather than focusing on the *effects* of reputation, for example on prices or the probability of selling, we focus on the design of the reputation mechanism—on its effects in terms of fostering retaliation/reciprocation—, and on the *timing* of feedbacks. We conclude with proposing easy-to-implement design changes which are likely to improve the eBay system, and any other bilateral feedback system, in the sense of inducing "truthful" reporting.

In particular, we focus on the "ending rule" of the period in which trading partners can post their feedback ratings. This phase follows the end of each eBay auction. Sincerely dissatisfied participants may be (rightly) concerned that—if they post a deserved negative feedback—the trading partner could retaliate with another—non-deserved—negative because the feedback is immediately observable to other traders once it is left. It turns out that the common perception of a final, deterministic "last minute" in which feedback can be left could induce dissatisfied users to leave truthful negative feedbacks more often: if the negative is left in the last minute, then, the trading partner will not have the time to retaliate.

"Last minute bidding" in English auctions with fixed ending time (Roth and Ockenfels, 2002) is a similar phenomenon. In both cases last minute action is exploited in order to prevent the opponents' reaction to the revelation of private information. However, if one were to consider mechanisms without fixed ending times, agents in an auction would still prefer placing a bid to abstaining.[9] On the contrary, giving a negative feedback becomes less attractive because of the fear of retaliation. Therefore, from a welfare point of view, the presence of a last minute is desirable in the context of feedbacks, whereas in the context of bids, it is not necessarily so. In light of these considerations, it is surprising that—in contrast to many users' perception—the end of the feedback period is in fact stochastic on eBay. Even more surprisingly, in turn of our empirical analysis we found

processes, similar to the ones found by Fehr and Schmidt (1999), due to the attempt to build up a reputation as a "reciprocator" or "impersonator" in order to discourage future negative feedbacks and encourage positive ones—"the high courtesy equilibrium" of Resnick and Zeckhauser (2001)—, or due to a combination of both motives. Dellarocas, Fan, and Wood (2004) relate the motivation for leaving positive feedback to the user's expectation of reciprocal behavior from their trading partners.

[7]See, for example, Resnick, Kuwabara, Zeckhauser, and Friedman (2000), Resnick and Zeckhauser (2001), Bajari and Hortaçsu (2004), Cabral and Hortaçsu (2005), and Chwelos and Dhar (2005). This point is also confirmed by a very recent study of Dellarocas and Wood (2006) estimating that only about 86 per cent of eBay users are actually happy with the underlying transaction.

[8]Jin and Kato (2002) find in a field experiment that "at least some buyers" overestimate the informational content of feedback score and "drastically underestimate the risk of trading online." Likewise, Resnick, Zeckhauser, Swanson, and Lockwood (2004) question whether price premia, which they find, reflect a reputation equilibrium, and should in fact not be observed in the data.

[9]For example, Amazon type auctions end only when no more bids are placed.

that once a first feedback is left, the trading partner always has at least an additional 90 days to reply with a feedback! That is, the real ending rule of the feedback period on eBay is similar to the one of Amazon for auctions. There, a "last minute" bid prolongs the auction period automatically.[10] With its similar structure, the eBay feedback mechanism may thus discourage truthful negative ratings by giving the opponent enough time to retaliate.

In Section 2, we describe the feedback mechanism in detail. Section 3 contains an analysis of feedback behavior with a focus on the timing of ratings. Finally, Section 4 presents possible improvements of such bilateral feedback mechanisms. One obvious improvement is to introduce a deterministic last minute. However, a better way to improve the mechanism is to reveal feedbacks to the trading partner and the community only after no more feedbacks can be left.

2. The eBay Feedback Mechanism

eBay is by far the biggest internet trading platform that brings together both private and professional buyers and sellers. In 2005, the number of listings exceeded 1.9 billion and eBay's gross merchandise volume accounted to more than 44 billion U.S. dollars.[11] Amongst other services, eBay provides a second price auction mechanism in which the seller describes the object and specifies a reservation price as well as the length of the auction period. Then, potential buyers can enter their bids.

As a matter of principle, eBay is only involved in the post auction transaction process if problems arise. In general, information on the conduct of the two parties is neither observable to us nor to future trading partners. However, eBay encourages its users to leave a feedback for each other within 90 days after the termination of the auction. If a feedback is given, it consists of a positive or negative or neutral mark, and is accompanied by unformatted comments. For ease of the exposition, we follow the literature and occasionally group neutral and negative marks together, see e.g. Resnick and Zeckhauser (2001) and Cabral and Hortaçsu (2005). We will refer to them as negatives.[12]

As already mentioned, on eBay, feedbacks are immediately observable to the counterpart. For every user, eBay keeps a feedback record which contains all feedbacks received and left from transactions in which she was involved.[13] A recorded feedback cannot be removed unless both parties agree to. But as few observers appear to have noticed, if both parties agree, the left feedbacks can be withdrawn.[14]

[10]See http://www.amazon.com/gp/help/customer/display.html?ie=UTF8&nodeId=1161360 (September 2006).

[11]See http://investor.ebay.com/news/Q405/EBAY0118-123321.pdf (February 2006).

[12]However, we should emphasize that separating neutral from negative marks would not qualitatively change our results.

[13]eBay also offers internet shop services. Thus, feedbacks may also be based on experiences in trading via this channel, rather than auction trading.

[14]eBay states that "[a]fter both parties have agreed to withdraw the feedback, both parties will have their feedback scores adjusted at the same time... eBay will add a note to the feedback comment, saying that the feedback was mutually withdrawn... If you haven't left feedback for your trading partner

All marks are summarized in a feedback score and several summary statistics including the percentage of positive feedbacks.[15] While the feedback score can easily be observed by any partner in the bidding process, the observation of the detailed remarks is more involved.

Feedback behavior can be influenced by several forces including the outcome of the transaction and strategic considerations. Strategic considerations are important if a user is planning to interact with other users in the future, and therefore attaches positive value to her own reputation. That is, she derives positive utility (expected payoff) from a positive and negative utility from a negative feedback received. This will be the case as long as there is some potential future trading partner believing that the feedback score is informative about the likely behavior of its holder.[16]

Truthful reporting may be in conflict with *strategic feedback behavior* which is present whenever agents anticipate the opponents' reactions when giving feedback. Whereas the former truthfully reveals information on the outcome of the transaction and thus leads to establishing credible feedback records the latter yields potentially biased reports, as they are influenced by the anticipation of the possible reaction of the trading partner.

The following newsgroup discussion contains interesting insights of some eBay users. Its title is "Fix some eBay problems" and the contributions show that users are well aware of feedback retaliation.[17] One buyer reports

> Just last week, I had my first unpleasant experience in five years of eBay'ing. I received an item from a seller who had not left feedback for me (I mailed my money order the day after the auction ended). I was not happy with the item - flaws were not disclosed in the listing - and I notified the seller. After three e-mails and three phone calls went unanswered, I left negative feedback for her. She turned around and posted retaliatory negative feedback for me ruining my 100% rating. Indeed, the system needs to be improved.

Another user writes

> In the past I've not left any neg[ative] feedback as I'm afraid of revenge feedback that'll paint me as a bad trading partner... the dodgy seller ends up with

and you go through the Mutual Feedback Withdrawal process, you will no longer be able to leave feedback for that transaction... You may only request Mutual Feedback Withdrawal once for every feedback left... Members may initiate a request to mutually withdraw feedback within 30 days of either person leaving feedback or within 90 days of the transaction end date, whichever is later." Taken from http://pages.ebay.com/help/feedback/questions/mutual-withdrawal.html (September 2006).

[15] The feedback score is calculated as the number of users who left at least one positive feedback minus the number of users who left at least one negative feedback.

[16] As was already pointed out in footnote 4 price effects of reputation are usually found to be nonnegative. Therefore, a "good" reputation on eBay is currently valuable to sellers. In principle, potential buyers in an auction could distinguish feedbacks the seller has received as a seller from feedbacks she has received as a buyer. However, it is a complex task to infer separate summary statistics from the records. See also Cabral and Hortaçsu (2005) who find that at least some sellers were able to build up their reputation as buyers. Even pure buyers can benefit from a "good" reputation record since sellers are allowed to exclude buyers from their auctions. This is possible on the basis of their subjective judgement of a bidder's reputation record.

[17] Quotes are taken from http://ideas.4brad.com/archives/000018.html (February 2006).

> getting away with it just to rip someone else off.

Yet another user notes

> As a buyer I have had problems with false item descriptions, even if you get a refund ... you end up paying postage for the item to you and back. Up till now I have not left any feedback for these bastards because of revenge.

and one concludes that

> I have been basing my purchase decisions [on eBay] on sellers' feedback scores. I had no idea these scores are so unreliable ... They are holding this feedback system out as the reason we should trust sellers, but the system has little to no basis in truth ... I suspect there are many, many people out there who have had actual monetary losses from this behavior.

Another user reasons[18]:

> Sooner or later we all face this dilemma on e-Bay. Do we slag an obvious jerk with a negative feedback, only to get a retaliatory negative feedback from him. You have to decide if it's worth it. Always check out his feedback first. See if he posts retaliatory feedbacks. Avoid him like the plague if he does. In your case, seeing as how you aren't out any cash, I would just let this one slide. Let this moron fester in his own little crooked world. There are a lot of goofs out there in e-Bayland, just steer clear of them if possible. IMHO [in my humble opinion], save your negative feedbacks for the really bad experiences that cost you serious money. Cheers!

This shows that many eBay users are aware of the risk of negative feedback retaliation, or "revenge." Retaliating against deserved negative feedbacks (and reciprocating positives) may be useful, for example, to build a reputation of being an imitator, who always replies strategically to a positive feedback with a positive one, and to a negative feedback with a negative one. Such a reputation may be valuable because it encourages future partners to give positive feedbacks and discourages them from giving negative ones. eBay even sells a service to sellers allowing them to automatically reciprocate positive feedbacks.[19] Such behavior is in principle observable to other users on eBay.[20] The expectation that a deserved negative feedback may induce a non-deserved retaliation is further justified by the possibility to withdraw feedbacks by mutual consent. If a party receives a negative, it can retaliate with another negative to have "something to trade" to persuade its partner to withdraw.[21]

[18]Taken from http://antiqueradios.com/forums/Forum14/HTML/000994.html (February 2006).

[19]The price for an online seller tool which includes this service is currently $15.99 a month, see http://pages.ebay.com/sell/automation.html (February 2006) for a description.

[20]In particular, the feedbacks a user gets and the replies she leaves can be inferred from her feedback record.

[21]In game-theoretic jargon, the possibility to withdraw feedbacks by mutual consent makes retaliating is a dominant strategy in the subgame starting after a first negative feedback is posted, see Figure 1 and the accompanying explanation.

While eBay *guarantees* that feedback comments are recorded if left within 90 days after the end of the auction, at least some users are not aware of the fact that this does not completely exclude the possibility of leaving feedback after this 90 day period. In eBay's own, opaque words: "eBay only commits to items being available for 90 days, so if it is greater than 90 days you may not be able to leave feedback."[22]

After 90 days, eBay removes the link on a member's personal "My eBay" page that encourages one to leave feedback. However, since the item number identifying a particular transaction is known in principle, one might still be able to leave feedback for a transaction by doing so manually.

The following newsgroup discussion, however, shows that many eBay users are not aware of this, and perceive the 90 minutes deadline as a fixed, deterministic end after which no more (e.g. retaliatory) feedback can be left: [23]

> The secret... is to wait until the 90 day feedback period is nearly up and then zap em w[ith a] negative feedback when they only have a few hours remaining to respond... That way they can't retaliate... This only wor[ks] if you are able to hold a grudge for 90 days...

Moreover, it has been suggested in various newsgroups to set up a service that automates strategic feedback timing. In a typical conversation, a user suggests[24]

> will someone out there please invent FEEDBACK SNIPER SOFTWARE that allows one to leave feedback (good or bad) at the last second? that way, you can leave legit[imate] bad feedback w[ith] no fear of retaliatory bad feedback left for you- thus purifying the ebay world, making ebay stock go up, and just making ebay a better community as a whole. i do not leave deserved bad feedback for fear of retaliatory bad feedback left on me!!!

And indeed, Auctionhawk, a company specialized on offering services around eBay, developed and advertised a service, for payment, to give feedback in the last minute.[25]

For many eBay users, therefore, the perceived structure of the feedback period is the one depicted in the state chart in Figure 1.

Each circle in the graph represents a state and each arrow a transition from a state into another state or into itself. Such a transition happens in every instant of time.

For example, we enter the feedback game from the left. Then, we are in the state in which nobody has left feedback so that it can still be left by both. In the next instant of

[22] See http://pages.ebay.com/help/feedback/questions/leaving-feedback.html (September 2006).

[23] See http://www.the-gas-station.com/messages.cfm?type=normal&thread_id=49933&lastdays=2000& (February 2006).

[24] See, e.g., http://community.auctionsniper.com/groupee/forums/a/tpc/f/785608021/m/308108399/r/3721016131 (February 2006). The quotes that follow are taken from this site.

[25] See http://auctionbytes.com/cab/abn/y04/m08/i10/s01 (February 2006). A free reminder service for "last minute feedback" is offered by U.K. Auction Watch at http://www.ukauctionhelp.co.uk/remindme.php (February 2006).

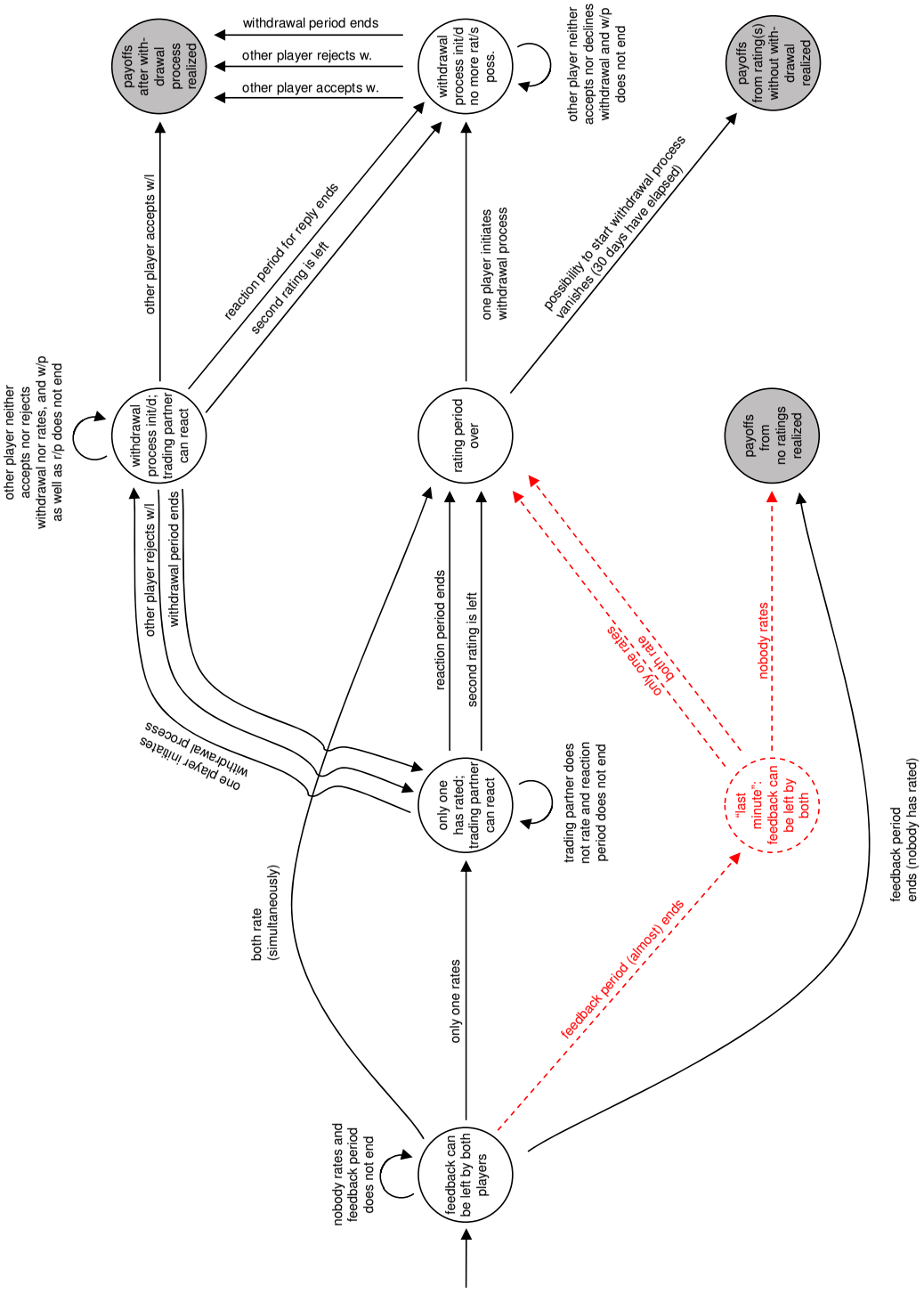

Figure 1: State Chart

feedback	positive	0.982
	neutral	0.008
	negative	0.01

$2,471,459$ observations.

Table 1: Sample probabilities for the type of feedback.

time, either no one rates and the feedback period is not over, or only one of the two parties rates, or both rate each other simultaneously, or the feedback period is over. Depending on the actions of the players we transit into another state.

The last (grey shaded) state is always the payoff state. Depending on the history, either no feedbacks have been left, or feedbacks have been left without being withdrawn—the usual case—, or feedbacks have been left and withdrawn thereafter. Note that here, for ease of the exposition, we make the simplifying assumption that we can always enter the feedback withdrawal process after at least one feedback has been left. In reality, every player may initiate this only once, see footnote 14 for details. Note that only a subset of the users on eBay is likely to be aware of the possibility of withdrawal.

The dashed part of the graph represent the misperception of the existence of a last minute. To be more specific, the misperception is that after 90 days there is a transition into a "last minute" state in which the trading partner cannot react to a feedback. In the next section we characterize feedback behavior on eBay. In doing so, we also find evidence for suboptimal last minute feedback behavior by some agents.

3. Feedback Patterns

The data for the empirical analysis were collected in the second quarter of 2005 from the eBay platform. Starting from randomly drawn auctions we created a data set consisting of $2,471,459$ auction records including respective feedbacks and their timing. By construction, the data include auctions for which at least one feedback was left. It is a random sample with respect to the category of the auctioned good which we think is appropriate for the purpose of this empirical analysis since we want to study feedback behavior *in general*. The data collection procedure is described in more detail in the Appendix.

Table 1 contains sample probabilities for the first feedback being positive, neutral, or negative. Observe that 98 per cent of all feedbacks given are positive. Resnick and Zeckhauser (2001) report a similar table and find that at least one feedback is left in 52 per cent of the transactions. If reporting was truthful and non strategic, the other 48 per cent of the feedbacks could reasonably be assumed to be missing at random. Otherwise, it could well be that disproportionately many neutrals or negatives are hiding behind these missing feedbacks.

In the sequel we refer to the first and second feedback as *feedback* and *reply*, respec-

		reply			
		positive	neutral	negative	missing
unconditional		0.697	0.003	0.006	0.295
feedback	positive	0.709	0.002	0.002	0.288
	neutral	0.044	0.096	0.042	0.818
	negative	0.025	0.010	0.367	0.598

$2,471,459$ observations.

Table 2: Unconditional and conditional sample probabilities for the reply.

tively. Table 2 contains unconditional and conditional sample probabilities for the reply being positive, neutral, negative, or missing. In 70 per cent of the cases a reply is left. In about 71 per cent of the cases we observe that a positive feedback is reciprocated whereas only in about 37 per cent of the cases a negative feedback is retaliated.

We shall now focus on the relationship between the timing and type of the feedback. In Figure 2, we have plotted the dependence between the reply and both the time of the feedback and its type. This was done by nonparametric local linear regressions of indicator variables for the type of the reply on the time of the feedback.[26] All graphs show that the later the feedback is given the less likely it is that a reply is given *at all*. More precisely, the probability that a reply is missing is increasing in time. This observation is independent of the type of the feedback.

Figure 3 shows empirical distribution functions of the time the feedback is given conditioned on the type of feedback. In particular, we find that in a first order stochastic dominance sense feedback is given earlier if it is positive rather than neutral, and in turn is given earlier if it is neutral rather than negative. With respective p-values of 0 this is confirmed by one-sided Kolmogorov-Smirnov tests.

However, even if feedback behavior was non strategic, negative or neutral marks could be given later simply because the transaction was delayed and *therefore*, a negative or neutral feedback was left. These effects could entirely stem from transactions characterized by late delivery in which a truthful negative report is posted late. Conversely, those transactions characterized by timely delivery on both sides are likely to produce truthful positive feedbacks that are posted early. Resnick and Zeckhauser (2001, Table 2) have analyzed the feedback comments belonging to a sample of negative or neutral marks. On one hand, they find that 11 per cent of the complaints were about slow shipment. Additionally, in 23 per cent of the cases buyers claimed not to have received the item after they had paid for it. Hence, there is at least some scope for delays. On the other hand, however, in 24 per cent of the cases the good was shipped in time but was in poor condition, thus giving room for truthful negative and timely feedback. While these obser-

[26] We used a Gaussian kernel. It turned out that the choice of the bandwidth did not have a substantial impact on these estimates. Here, we chose them *ad hoc*. Notice that the bootstrapped confidence intervals are extremely narrow due to the size of the data set.

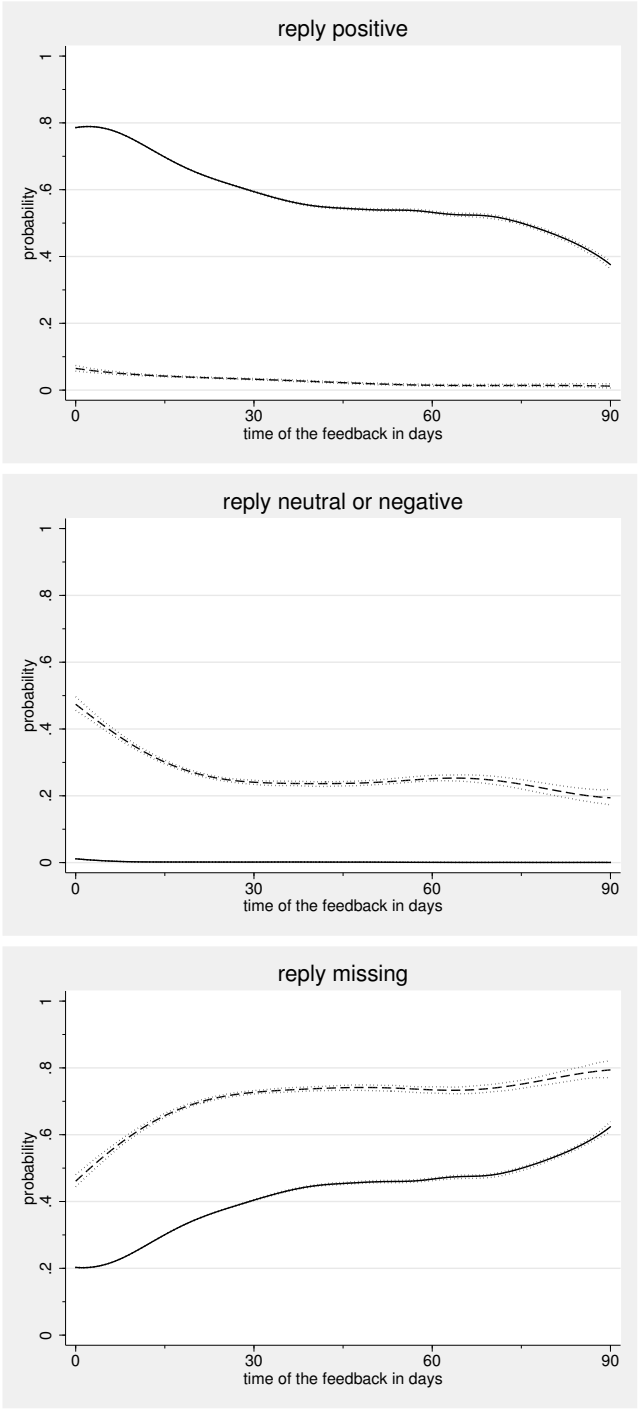

Figure 2: The probability of a positive (top), negative or neutral (middle), and missing (bottom) reply given a positive (solid line) and negative or neutral (dashed line) feedback against time of the feedback. Local linear regressions and bootstrapped 95 per cent confidence intervals (100 replications).

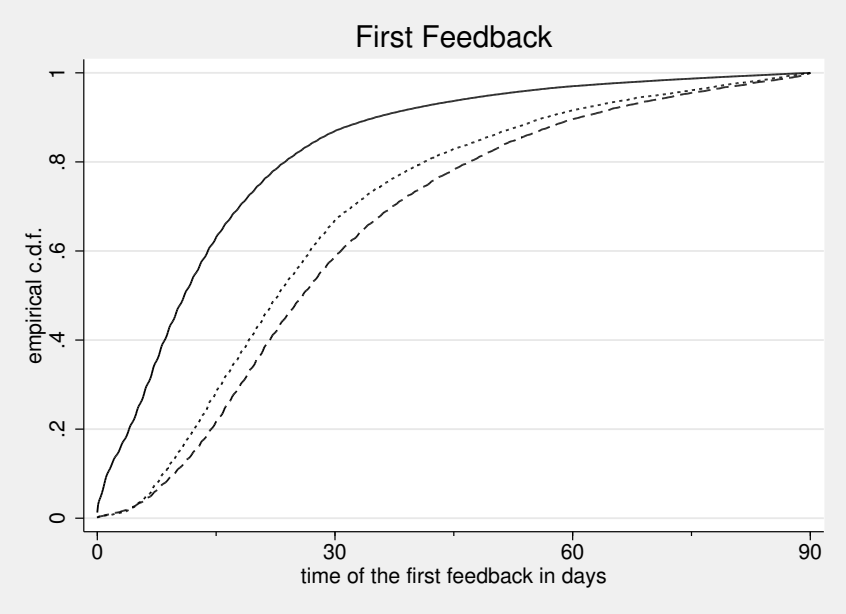

Figure 3: Empirical cumulative distribution functions for the timing of the feedback given that it is positive, neutral, or negative (from left to right). Note that negative and neutral feedback is given later in a first order stochastic dominance sense.

vations contribute to the explanation of the observed pattern, they quantitatively work in the same direction as the incentive to act strategically, and thus to postpone negative or neutral marks.

3.1. The Role of the "Role"

In general, we suppose sellers to be more likely to be sellers in future transactions so that they are more interested in getting a positive feedback and avoiding a negative one. In consequence, the effects we have documented in Figure 3 should be more pronounced for sellers once agents act strategically, since sellers' interest in their reputation is higher. Figure 4 shows that *feedbacks are in fact given substantially earlier if they are positive and given by the seller, as compared to positives given by the buyer. Along these lines, we find that negative or neutral marks are given later by sellers.*[27] We interpret this as further evidence for strategic, retaliatory concerns.

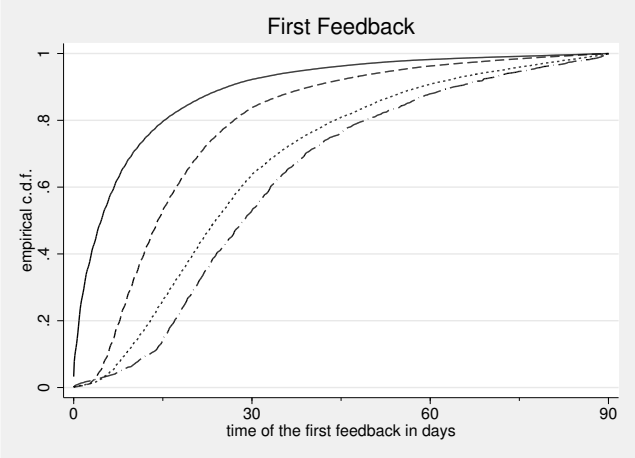

Figure 4: Empirical cumulative distribution functions for the timing of the feedback given that it is given by the seller and that it is positive positive, buyer and positive, buyer and negative or neutral, seller and negative or neutral (from left to right).

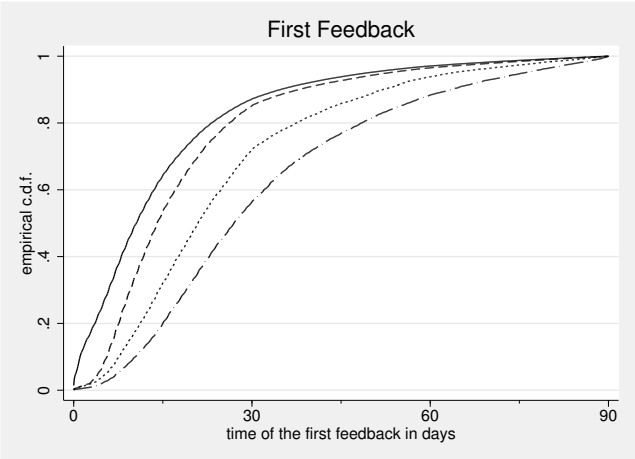

Figure 5: Empirical cumulative distribution functions for the timing of the feedback given high experience and the feedback being positive, low experience and positive, low experience and negative or neutral, high experience and negative or neutral (from left to right).

3.2. Experience

In decades of experimental economics evidence has been accumulated on the effect of players' experience in strategic interactions. An important aspect therein is a deepened understanding of the opponent's strategic reaction to one's own action once a strategic situation is experienced repeatedly. On eBay, a proxy for experience that is easily observable is an agent's feedback score. Once feedback behavior is strategic, we should therefore again expect the *observed patterns to be more pronounced for experienced agents*. Figure 5 shows that this is the case in our data.[28] High experience is defined by a feedback score of at least 20. We have also run regressions in which we include the role of the agent giving feedback and its experience as explanatory variables. The results confirm this finding since the effect is statistically significant at any level. Such an analysis is sensible because experience and role are positively correlated.

3.3. The 90th Day Spike

These estimates are complemented with estimated conditional probabilities of the feedback being positive as well as the probability of a feedback being neutral or negative, conditional on the time of the feedback, respectively. Recall that most feedback is positive and is left relatively early within the 90 day period. However, Figure 6 shows that the later the feedback is left, the more likely it is to be negative or neutral—even culminating into a spike right at the end of the 90 day period. Hence, there is last minute feedback in the sense that feedback left in the "last minute" is much more likely to be negative.

Figure 6 shows that the probability that a negative or neutral feedback is left increases in the first 30 to 40 days after the end of an auction. This increase could be explained by information revelation over time in problematic, possibly delayed, transactions which result in a negative or neutral feedback. This idea of information revelation over time is consistent with the patterns in Figure 2. Thereafter, the probability of a negative or neutral mark seems not to depend on the timing of the feedback. However, it increases close to the 90th day after the end of an auction. As for statistical inference, we have regressed an indicator variable for a negative or neutral feedback on a spline function in the time of the feedback, controlling for experience of the trading partners, and on whether the feedback was left by the buyer or the seller. It reveals that the probability that a given feedback is negative or neutral on the last half a day of the 90 day period after the end of the auction increases by about 6 per cent on average. This increase is highly significant at any level. This can hardly be reconciled with non strategic behavior since that would require that all of a sudden more negative or neutral than positive information on the trading partner would be revealed on the second half of the 90th day, compared to the 50 day period preceding this day.

[27]With respective p-values of 0 one-sided Kolmogorov-Smirnov tests indicate that positive feedback is given earlier and negative feedback is given later by sellers.

[28]With respective p-values of 0 one-sided Kolmogorov-Smirnov tests indicate that positive feedback is given earlier and negative feedback is given later by experienced agents.

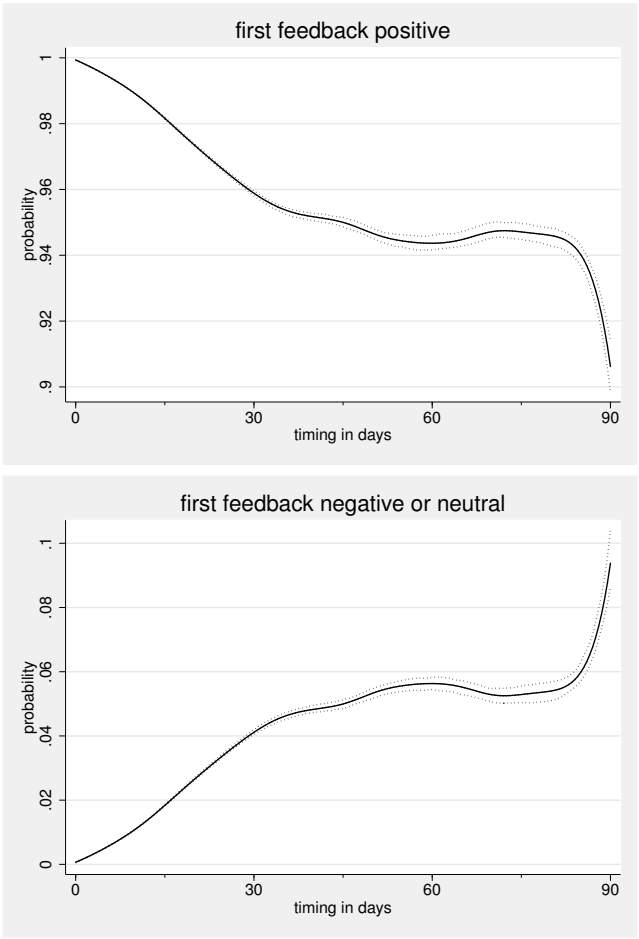

Figure 6: The probability of a positive (top) and neutral/negative (bottom) feedback against time. Local linear regressions and bootstrapped 95 per cent confidence intervals (100 replications).

4. Discussion and Policy Implications

We have argued in this paper that the existence of a deterministic last minute of the feedback period could be beneficial since it would allow users to leave a negative feedback without the fear of retaliation. On eBay, in contrast, the end of the feedback period is stochastic. Moreover, our empirical analysis led us to discover a previously unnoticed feature of the feedback mechanism: the fact that after the first feedback is given, the system automatically opens a period of at least 90 days within which the second feedback can be left. Hence, there is *no way* to leave a feedback without giving the opponent the possibility to react.

While some users seem to believe that a "last minute" of the feedback period exists—the dashed part in Figure 1—the fact that only 0.1 (0.5) per cent of all feedbacks were left after the 89th (85th) day suggests that many users are well aware that leaving "last minute feedback" is not a promising strategy. In fact, the newsgroup discussion from

Section 2 continues with the remark that

> It has already been suggested on this forum a handful of times. The problem is that it's not an exact 90 days. It can be several days longer.

and the reply

> random time and not 90 days, eh? that would definitely throw the idea for a loop. if we could isolate the time generator at eBay and get a handle on how these times are generated we could do it an[d] eBay would be a purer place as crooks would think twice about fraud.

Auctionhawk, the company who offered a "last minute feedback" service, appears to have realized this as well, as it has stopped advertising this service in the meantime.

Let us finally develop some ideas towards improving on the design of the feedback mechanism.[29] Our analysis suggests that to reduce concerns for retaliation and foster expression of deserved dissatisfaction the "feedback game" should be made less transparent to both parties. In particular, favorable "anonymity" should be pursued, so that both feedbacks are revealed to the trading partners and the public only if no more feedbacks can be left. This could be done after a fixed period, or after both have already given their feedback. Note that this device requires that feedback withdrawal is not possible. Otherwise, under general conditions, it remains a dominant strategy for the players to always leave a negative feedback in order to be able to renegotiate after feedbacks have been revealed.

In general, the performance of buyers, if asked to pay first, is subject to little uncertainty. It is also easier to discipline them: either the full payment arrives in time, and bank transfer details can demonstrate this, or it does not. Sellers can instead "cheat" in non evident ways on a variety of aspects of their performance, and this opaqueness creates room for opportunistic behavior. Therefore, it may be worthwhile to limit feedbacks to buyers rating sellers as in Amazon auctions.[30]

Appendix: Data Collection

We first randomly drew auction numbers and downloaded the respective auction details. From these auction details we obtained the respective seller member ID and randomly selected $10,000$ sellers from the United States.

In a next step, for each seller, we used the information in her feedback profile to obtain auction details including the corresponding feedback which was received and left, and the respective timing information. By construction, since we start from a member's feedback profile, our sample consists of auction records for which at least one feedback was left by either the seller or the buyer. In order to minimize the loss of information, we included only those auctions into our data set which ended at least 100 days before the date of

[29] Roth (2002) makes a strong case for economists helping to *design* markets and institutions.

[30] This is also suitable for e-procurement platforms. See Dini and Spagnolo (2005a,b) for further details.

our data collection. Moreover, we required the auctions to have ended at most 125 days before the date of our data collection. This value is suggested by the data because after 125 days auction details might not be available any more.

We restricted our attention to standard eBay auctions. That is, we dropped auctions that belong to "eBay Motors," are "Live Auctions," serve as an "Advertisement Only," and are "Quantity Items." Moreover, we did not consider auctions that ended early.

Mutually withdrawn feedbacks were coded as negatives.

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