

Chapter 12

REPUTATION MECHANISMS AND ELECTRONIC MARKETS: ECONOMIC ISSUES AND PROPOSALS FOR PUBLIC PROCUREMENT

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INTRODUCTION: THE PROBLEM OF REPUTATION

A common problem in economic transactions is the presence of relevant aspects of the exchange that cannot be fully specified in the contract, for example, because they are observable but not verifiable by a third party (court). The existence of non-verifiable aspects (some qualitative features of the exchanged goods and services that cannot be verified in court), contractual complexities, lack of information and costs due to exhaustive specifications lead parties to draw “incomplete contracts”. Contract incompleteness opens the way to two well-known informational problems: ‘adverse selection’ and ‘moral hazard.’

Adverse selection takes place when the valuation of the good or service by the buyer depends crucially on a relevant but unobservable characteristic of the seller or of the good this sells. In this context, adverse selection occurs when trade involves a good/seller that does not fit the desired characteristics (i.e., quality, efficiency, productivity, etc.) by the buyer. Moral hazard, instead, refers to possible post-contracting opportunistic behaviors of one trader that reduce the welfare of the other trader, such as reducing the level of non-contractable quality of a supplied good/service below the level agreed upon.

In public procurement tenders, adverse selection and moral hazard are relevant problems. Adverse selection occurs when it is impossible for an independent court to identify and exclude ex-ante “unreliable” bidders that are not able to deliver adequate quality of products/services, even though they are able to fulfill formal contractual terms. Moral hazard occurs, for instance, when after having won a public tendering process submitting an aggressive bid, a supplier chooses to increase its profits by reducing the

level of quality provided on all those aspects that are not specified in the contract or that are difficult/costly to monitor ex-post.

These two informational problems are particularly severe in private electronic markets because of the reduced contractual guarantees due to the distance between and the anonymity of the trading partners. Long distance ensures that raising and taking care of a contractual controversy is a much more complex and costly task than in traditional face-to-face marketplaces, which greatly increase incentives to behave opportunistically.

Transactions in large e-markets are most often occasional, not repeated: buyers and sellers are usually involved in a one-shot transaction satisfying specific needs, and it is unlikely that the two of them will trade again in the future. Because e-markets operators know they will likely not encounter each other again the same trader in the future, incentives to misbehave in an electronic transaction are further increased. These problems led electronic marketplaces to use systems able to collect information about individual traders' past (mis-)behavior and distribute it across the community, allowing each trader to build up a reputation for trustworthiness or to be recognized as an unreliable trading partner, thereby fostering trust and cooperation within the trading (virtual) community.

In this paper, we survey the most important issues raised by the economic literature on the optimal design of these systems, known as "reputation" or "feedback mechanisms." We then focus on the specific issues that emerge when applying feedback mechanisms to public e-markets, providing useful discussions for public procurement institutions. Although we debate public procurement issues having in mind the Italian Public Procurement Agency model (Consip¹), it will become evident to the reader that the problems raised and the solutions proposed are relevant for most other public (and many private) e-procurement systems.

After exploring general features of reputation mechanisms, the paper will describe the eBay's feedback mechanism, survey the relevant issues emerged in the economic literature on reputation mechanisms for private e-markets, and provide a discussion of reputation mechanisms for public procurement.

REPUTATION MECHANISMS FOR PRIVATE E-MARKETS

Reputation mechanisms are systems able to inform the market about past agents' behavior in trade. This information is based the 'feedback' about counterparts' performances that each trader is invited to post at the

end of any transaction. Trade after trade, agents obtain feedbacks that will determine their reputation profile, which provides a measure of their past behavior. Given this mechanism, agents are induced to 'behave well' in order to acquire a good reputation that will play a key role in future trading decision of many other agents. Such a device improves trading conditions, reduce procedures and legal costs of controversies, and promote efficiency in online environments.

Online reputation mechanisms present strengths and weaknesses. Information produced by online mechanisms is potentially less reliable than information transmitted in traditional person-to-person markets. In the former, the transmission of information involves anonymous traders that cannot assess the quality of information received (Resnick e Zeckhauser, 2001). Potentially unreliable information may bias reputation and trading decisions of agents. Despite their potential unreliability, online reputation mechanisms can be very powerful in stimulating cooperation among traders because information is made available quickly, at low costs and to a large scale of users.

Informational benefits from feedback mechanisms appear dominating costs of potential unreliability. This seems to be confirmed by the fact that reputation mechanisms are playing a key role in improving trading conditions of the most important electronic markets, such as eBay, Amazon, and Yahoo. eBay itself attaches to its feedback mechanism the high rate of successful transactions (Dellarocas, 2003c).

THE eBAY'S FEEDBACK MECHANISM

In this section, we describe the eBay's feedback mechanism. We focus on eBay because its online feedback mechanism is arguably the most studied to date (Dellarocas, 2003c). The eBay's feedback mechanism allows users to rate one another at the end of any transaction: ratings are positive (1), neutral (0) or negative, and can be motivated by short comments (feedbacks).² Registered users and non-users can freely observe ratings and feedback profiles. Such a profile is composed of two parts: ID card providing information about ratings (e.g. the sum of positive ratings, the reputation, the sum of recent ratings) and feedback history (list of all detailed comments).

In eBay the feedback score gives reputation. This score is the sum of positive and negative ratings that have been provided by different users, that is only one feedback per-trader matters for reputation. Assume for instance that two traders have completed N transactions: even though all ratings

posted by the buyer are positive (potential feedback score equal to '+N'), these ratings are just counted once (+1), so that the final score from this buyer is not '+N' but only '+1'. Such a way for computing reputation allows filtering the score from multiple ratings due to repeated interactions, i.e., ratings given by those traders that are involved in long-term relationships and that should not be taken into account in computing the reputation. Long-term relationships are well known to be characterized by 'endogenous trust,' such that there is no incentive for traders to deviate from agreements because any deviation can be immediately punished with the interruption of the relationship. Long-term profits losses due to deviation can be larger than their short run benefits. In one-shot relationships, incentives for opportunistic behaviors (moral hazard) are strong and lead agents to deviate from trade agreements because profits from deviations are usually higher than costs (e.g., loss of unlike potential future trade with the same buyer). These arguments indicate that feedback mechanisms should be designed to avoid that (positive) feedbacks provided in the context of long-term relationships bias reputation profile of users. The same arguments hold when negative feedbacks are provided by the so-called "bad mouthers" to destroy the reputation of competing users.

REPUTATION MECHANISMS: ISSUES AND DISCUSSION

In this section we discuss the main issues provided by the economic literature regarding the introduction of reputation mechanisms in private e-markets.

Anonymity of Transactions

Transactions taking place in e-markets are essentially anonymous: they are performed by users through pseudonymous. As already shown, anonymity is the key feature but also the main source of uncertainty in online environments. Easy access to the market and cheap pseudonymous change ('identity volatility') may generate adverse effects, in particular the opportunity for "bad" users to reset their bad reputation and start trading with a new pseudonymous (Resnick et al., 2000). The economic literature suggests some possible solution to limit such a problem. Dellarocas (2003c) suggests avoiding pseudonymous changes and allowing for market entry fees. Dellarocas also shows that, in the presence of a binary feedback mechanism (either 'positive' or 'negative') that publishes the sum of ratings, social optimum is achieved if the initial reputation is set equal to the 'worst possible reputation.' The issue about initial reputation will be discussed in detail later in this chapter.

Bi-directionality of Feedbacks

Feedbacks are often bi-directional (or two-sided), in the sense that sellers and buyers can rate one another. Two-sided mechanisms make reputation effective on both demand and supply side, but can produce potential adverse effects in terms of retaliation and reciprocation.

Retaliation

Although transactions are unsatisfactory, a buyer may be reluctant to post 'negatives' to a seller for the fear of retaliation. For example, a lower-than-agreed quality of goods delivered may not lead the buyer to post a negative feedback if the sellers can credibly threaten to (unfairly) retaliate against him. Retaliation can be also adopted strategically to discourage actual as well as future negative feedbacks. If the threat of retaliation is anticipated, one trader can be reluctant to 'punish' their counterpart because this would only result in a loss of reputation. Thus, in the presence of bi-directional mechanisms, even though the quality of transaction is lower than expected, avoiding negative feedbacks can be the best response. An important consequence of this strategic behavior is that neutral feedbacks potentially hide both neutral and poor transactions.

Agreements: Reciprocation and Negotiation

At the end of a transaction, traders may agree to reciprocate positive feedbacks. A positive feedback from a seller may create to the buyer a reciprocal obligation to return the feedback, even though the seller did not perform particularly well. Buyers and sellers may also agree to reciprocate even though trading is judged 'neutral.' Good reputation built up on this basis should be considered artificial because it does not rely on quality. On the other side, it may occur that unsatisfactory transactions are ex-post improved (e.g., through a discount on price), thus leading parties to positively rate one another (negotiation). In this case, ratings posted are backed by welfare improvements for both traders, thus contributing to a fair increase of reputation.

Both retaliation and agreements potentially bias the quality of information generated by the reputation mechanism: the former may prevent full separation of neutral from negative transactions, while the latter may prevent separation of 'unfair' reciprocation from 'fair' negotiation.

Empirical Evidence

Resnick e Zeckhauser (2001) studied the eBay's feedback mechanism on a sample of transactions for the period February–June 1999. Preliminary

summary statistics show that positive feedbacks are 99.1%, while neutrals and negatives are 0.3% and 0.6%, respectively. Positive ratings may dominate because of either wide reciprocation or high frequency of good trades.

Authors do not exclude the hypothesis of reciprocal obligation to return positive feedbacks. They find that only 0.07% and 0.81% of fully satisfied and 'weakly' satisfied sellers respectively receive a 'problematic' (neutral or negative) feedback by buyers. Moreover, a considerable correlation in the overall propensity to provide feedbacks is found, as shown in Table 1. Correlation is stronger when both buyer and seller provide the feedback.

Table 1 groups together neutral and negative feedbacks into 'problematic feedbacks.' The seller is positive 99.8% the times the buyer is, but only 39.3% of the time when the buyer is problematic. Similarly, the buyer is positive 99.7% that the seller is, but only 23.9% that the seller is problematic. Although authors conclude there is a strong correlation between feedbacks provided by sellers and buyers, they do not highlight that correlation between problematic feedbacks is only 18%. This seems to indicate that retaliation is not so frequent.

TABLE 1
Buyer-Seller Feedback

Seller feedback about buyer				
Buyer feedback about seller		problematic	positive	none
	problematic	54	35	84
	positive	17	15122	3430
	none	342	6403	10746

Source: Zeckhauser (2001).

Feedback Provision and Free-Riding

Economic theory suggests that public goods generate the so called free-riding problem that yields to the under provision of that good. Public goods, as suggested by the name, are commodities that have intrinsic 'public' nature, in the sense that consumption of a unit of that good by one agent does not preclude its consumption by another. Even though one agent does not contribute to the production of a public good, he is not prevented from consuming it.

Feedbacks are essentially public goods because they are voluntary and do not directly benefit providers. Feedback benefits other individuals that will take them into account in future trading decisions. Feedback providers obtain no specific gains; their crucial 'role' consists in spreading to the market information acquired about traders' past behavior. Thus, feedbacks are special public goods, for which positive externalities are enhanced with respect to classical public goods.

Free-riding penalizes newcomers in particular. The lack of reputation for these users discourages incumbents from trading with new users that have not been previously evaluated. The absence of any feedback substantially results in an entry barrier for new operators, and in turn, in a lower degree of market competition.

Resnick e Zeckhauser (2001) note that, despite free riding, eBay faces a remarkable rate of feedback provision: 52% of buyers post a feedback after trading, while 60% of sellers do. The interpretation of these data is not straightforward because even though they can be considered a good result, authors say that half of traders do not provide a feedback.

Recent works suggest possible solutions to the problem of under provision. Avery et al. (1999), propose to adopt a system that rewards feedback providers and fees non-providers. The system should balance because revenues from fees would be sufficient to fund rewards. Similar arguments are sustained by Miller et. al. (2003), indicating that honest and frequent reports can be obtained through a payment-based system which applies a proper scoring rule to each buyers' report, by assessing how well it predicts reports of other buyers. The idea is that feedbacks referred to one seller tend to be correlated and any 'outlier' report could be considered unfair and thus subject to penalties. If this system applies, traders are more likely to provide honest and frequent feedback. An alternative solution to under provision is illustrated by Dellarocas (2003a). In a binary feedback or eBay-style mechanism framework, Dellarocas explores the possible policy for treating misreporting: ignoring them or replacing them with positive or negative ratings. The author shows that the most efficient policy is considering misreporting as positive, in the spirit that 'no news is good news.'

The Structure of Reputation Mechanisms

Implementing an appropriate reputation mechanism involves answering several questions, for example: should assessments be numerical (ratings), qualitative (feedback comments) or both? Should assessments be given to the entire transaction or should they refer to single sub-aspects (shipping,

quality of the good, etc...)? Which scale of rating should be adopted (eBay, 1-5, 1-10, etc.)? Some of the most important e-markets, such as eBay and Amazon, adopt single rating mechanisms plus short comments for motivation. Other service-assessment specialized sites, as Citysearch, allow users to provide binary qualitative assessments on several aspects of a service, such as 'useful,' not 'useful,' 'good service,' 'not good service,' etc.

In designing reputation mechanisms particular attention must be paid to the scale of ratings. As previously shown, eBay adopts a scale -1,0,1 while Amazon adopts a scale 1-5. Dellarocas (2003c) discusses whether it would be more efficient for eBay to switch to the Amazon scale. Dellarocas analyses a family of eBay-style mechanisms in the context of a theoretical model. He shows that a binary feedback mechanism (transaction 'positive' or 'negative') that publishes the sum of recent ratings yields high levels of cooperation stable over time whose efficiency cannot be improved by a more complex rating scale (such as the one adopted by Amazon) or by publishing the entire feedback history.

Disclosure Policies and Information Filtering

How Reputation Should Be Measured?

eBay measures the reputation as the sum of rating provided by different users (feedback score). This algorithm reduces the reputation bias due to ratings provided in long run relationships. In particular, the algorithm assigns long run relationship feedbacks the same weight assigned one-shot transactions. However, feedback score computed with this method links reputation to the number of transactions completed by the user. As a result, it favours old users and does not allow for reputation comparisons. One possible solution to overcome these problems can be measuring reputation as the *sum of the most recent ratings provided by single users* (e.g., the last N ratings). This statistics is calculated over a common mass of ratings (N). It is an index of reputation and allows for reputation comparisons between users. Moreover, if the sum of recent ratings is divided for the number of recent transactions (or ratings), we obtain a measure of average reputation.

Refinements of the statistics illustrated above can be obtained taking into account both the number of transactions and the number of feedback providers. Restricting the analysis to the last K single users, it is possible to compute the average rating of the last N transaction for each of the K users. Then, by computing the average of these averages we obtain a sort of generalized formula, in which K and N can be appropriately set. By fixing particular values for K and N we get back to special cases: for example, by

setting $N=1$ we simply obtain the average rating provided by the last K single users. Setting $N=K=1$ we are in the special case in which only the last rating matters. If opportune, N and K can be set arbitrary large in order to consider a longer feedback history.

Although reputation measured by averages of ratings has several advantages with respect to the simple sum of ratings, it does not overcome the reputation bias produced by artificial transactions or unfair ratings. Moreover, as already shown, some solutions, as suggested by the economic literature (avoiding pseudonymous changes and entry fees) are not easy to implement. The literature also explored some other alternatives. One interesting solution, that seems easy to implement, is suggested by Dellarocas (2003b). The authors propose measuring the reputation using the median rating, instead of the mean of ratings. As well known, one important statistical property of the median is that it is less sensitive to extreme values with respect to the mean. Assume, without loss of generality, an eBay scale of ratings. We focus on the case of ‘ballot stuffers,’ i.e., users willing to inflate the reputation of partners. Suppose the partner faces the following sequence of ratings $(-1, 0, \underline{1}, 1, 1)$, with mean equal to 0.4 and median equal to 1. Bullot stuffers artificially boost this profile with a “flood” of positive feedbacks that generates the following sequence of ratings $(-1, 0, 1, 1, \underline{1}, 1, 1, 1, 1)$. This new sequence has a median equal to 1 and a mean equal to 0.67. Thus, while reputation measured by the median does not vary as ballot stuffers unfairly rate partners, reputation measured by the mean increases up to 0.67, thus biasing the reputation. Symmetrically, similar arguments hold in the case of ‘bad-mouthers,’ i.e., users willing to destroy reputation of competing users.

Notice also that measuring reputation through the median may impact the strategic interaction of players. If users know in advance that reputation is median-based and not mean-based, they will be discouraged to provide unfair ratings because such ratings will not bias reputation. As a result, unfair ratings should be provided with lower frequency.

How Much Information Should Be Disclosed?

The design of appropriate feedback mechanisms involves the choice about type and amount of information to disclose. eBay publishes users’ reputations, but gives no information about the number of transactions they have completed. This information could be very useful to assess how users are active in the market and how many transactions are left ‘unfeedbacked.’ Resnick et. al. (2000) emphasize that many e-markets disclose detailed information that is not easily processable, while an effective disclosure

policy may lead to publish fewer data but more informative statistics (such as the mean, the median, the fraction of negative ratings, etc.). Dellarocas (2003c) suggests that it may be optimal for eBay to ‘hide’ some detailed information and to implement a feedback mediator, a tool able to provide highly customized information given that different users are potentially interested to different information sets.

The economic literature debates about the optimal length of feedback history to disclose and highlights the existence of a trade-off between effectiveness of the reputation mechanism and completeness of information disclosed. Publishing the entire feedback history is fully informative about traders’ past behaviors but implies that the marginal rating has negligible effects on reputation. Conversely, restricting the history to recent feedbacks is less informative about users’ past behaviors but increases the power of the mechanisms because the impact of subsequent ratings on reputation is no longer negligible. At the limit, publishing only the last rating minimizes the information provided but maximizes the power of the mechanisms: it strengthens the incentives to cooperate and eliminates the temptation to ‘rest on the laurels’ that occur when traders start exploiting the good reputation acquired. Some theoretical results seem to confirm this view. For instance, Holmstrom (1999) considers the dynamics of reputation in a labour market framework. The author shows that the larger the employment history (years of employment), the greater the reputation and the lower the impact of workers’ current behavior (productivity) on their overall reputation. Therefore, as the years of employment grow, the worker will face higher incentives to shirk because he knows that a (temporary) reduction of effort has negligible effects on his (considerable) level of reputation.

Other Aspects Connected to Information

Recursive information. eBay displays the reputation of both the ratee and rater (recursive information). Resnick et. al. (2000) emphasize that recursive information may be relevant for agents’ trading decisions. This information allows evaluating the goodness of reputation acquired by ratee as a function of the reputation faced by raters. Bolton et. al. (2002) made an experiment to evaluate the informational levels necessary for cooperation to emerge in ‘strangers’ communities. The experiment shows that one part’s decision to behave well (cooperation) crucially depends on the (observable) counterpart behaviors in its immediate previous transaction. For instance, suppose one agent is trading with somebody who did not cooperate although his counterpart previously did. Knowing this, the agent may be induced not to cooperate because his counterpart behavior is judged unfair.

Instead, suppose the agent is trading with somebody who did not cooperate because he fairly punished non-cooperative behaviors of its previous counterpart. The agent perceives his counterpart's past behavior as fair and thus may be minded to cooperate. Therefore, reasons underlying agents' past decisions in trade matter in determining current patterns of cooperation.

Value of Transactions. Resnick et. al. (2000) debate if it useful for traders to know the value of transactions underlying a certain feedback. This information may be important in order to assess, for instance, possible asymmetric behaviors of sellers with respect to the dimension of buyers; that is, whether or not sellers behave in the same way with different buyers.

Portability of Reputation

In the introduction, we discussed how the development of online markets can be connected on its reputation mechanism, and the effectiveness of such a mechanisms depends, in turn, on the mass of users to whom information is distributed. The larger this mass, the greater the incentives for traders to acquire a good reputation. Resnick et. al. (2000) argues that effectiveness of reputation mechanisms can be limited in absence of sufficient distribution of information. For this reason, the authors underline that portability of reputation is a key factor that should be promoted. Although the economic literature attaches significant importance to portability, notice that currently the two most important e-markets, Amazon and eBay, decided to interrupt reciprocal import/export of reputation. Amazon's users were allowed to import their reputation acquired in eBay, but as eBay protested, claiming the property of its users' reputation, Amazon has been forced to stop its policy.

REPUTATION MECHANISMS AND PUBLIC PROCUREMENT

In this section, we look at reputation mechanisms from the standpoint of a public procurement institution. Considerations made below can be valid for a wide range of procurement bodies, including centralized procurement agencies and single Public Administrations that manage their own electronic market.

Considerations made hereafter exploit several discussions about the reputation mechanism that Consip is thinking to implement in its marketplace³, and are drawn having in mind the Italian legislation (in particular, the Presidential Decree No.101 of April 4, 2002) that regulates the activity of Consip. Given that principles, it contains are aligned with

what provided for the recent European Directive, it is clear that most of considerations remain valid also in other legislative contexts.

Economic Issues Less Relevant for Public Procurement

From the standpoint of a public procurement institution some issues discussed above seems irrelevant. This is mainly due to features and regulation of public electronic markets. The access to public e-markets is not free as in private e-markets and it is likely to be regulated by a specific legislation. Buyers (Public Administrations) are usually required to register to become users, while sellers (vendors) may have to fulfill some participation requirements.³ Thus, public procurement agencies select entry of vendors on the basis of some criteria. This selection results in a screening policy that allows ex-ante to verify if vendors are “suitable” for the market and may prevent entry of ‘unreliable’ vendors. Given these features, some issues discussed in previous section become less relevant in the context of public procurement. The anonymity of transactions is not a relevant issue for public procurement, because vendors and administrations are generally identifiable registered users.

Irrelevant for public procurement are also unfair reputation profiles due to artificial trade, provided with the goal to increase the reputation of partners or to destroy one of the competitors. These phenomena are less likely to emerge in public electronic markets. For instance, in the case of the Italian Public Administration Marketplace managed by Consip, any online purchase is recorded into the system and, in contrast with what generally happens in markets such as eBay, public purchases are subject to specific procedures and controls (for example, they have fiscal implications). Public purchases process regulation, that defines liability for the responsible units, make particularly risky, as well as of doubt convenience, artificial transactions only oriented to inflate vendors’ reputation.

Relevant Economic Issues for Public Procurement

Directionality

In the section dedicated to private e-markets, we firstly discussed the implications connected to the bi-directionality of the eBay’s feedback mechanism. Public procurement institutions should design their reputation mechanism taking into account the public nature of the e-market they manage. We believe that unilateral mechanisms suit better to public e-markets with respect to bilateral ones because they reduce the room for possible retaliation and agreements. Moreover, unilateral mechanisms are also consistent with the goal of public procurement institutions to provide

services and support to Public Administrations, giving them an additional tool for stimulating vendors to provide adequate quality in performing procurement contracts. Also, it must be said that demand side reputation is less relevant in public e-markets with respect to private ones, because the legislation may impose vendors to sell regardless of the Administration's reputation. On the other side, by adopting bilateral mechanisms, vendors would have the opportunity to post negative feedbacks in case of poor performance of the Administration (for instance delay in payment). From procurement institutions, unilateral mechanisms are preferable to bilateral ones, because it seems that pros dominate cons.

Free Riding

Free riding is particularly relevant in public e-markets. This is essentially due to the special features of the buyer, the Public Administration, whose behavioral model can be somewhat different with respect to private entities.

Who manages others' resources, such as public administrators, may act on the basis of his individual perception of optimal purchases policy rather than the full awareness of the final users' needs and thus of the intrinsic interests of the Administration. Moreover, the existence of organizational complexities may produce more difficulties for Public Administrations to fully act in the interests of the final users, for instance, in providing feedback on a certain vendor. While in private e-markets the sense of community usually leads traders to provide feedbacks, it is less likely for this sense to emerge public contexts. Public Administration may have a weaker perception of the social value of feedbacks because appropriate feedback provision implies to collect them systematically from a potentially large numbers of final users. This view is supported by the fact that, because of their nature, Public Administrations on average purchase goods and services on a larger scale with respect to single individuals, and that these purchases tend to one-to-many: the Administrations buy for the whole structure and may incur difficulties in evaluating and meeting the specific needs of its final users.

This is likely to determine a 'collective' management of feedbacks, after internal, potentially long-lasting decision processes. These considerations highlight the relative higher severity of free riding in public procurement e-markets with respect to private ones.

Another important feature that must be considered in order to design appropriate reputation mechanisms in public contexts are the IT skills. Usually, agents trading in private e-markets are used with information and

Internet technologies, thus finding quite easy to manage (even complex) online transactions and feedback mechanisms. In the case of public e-markets, it is very important to maximize the user friendliness of reputation mechanisms to allow Public Administrations to easily and quickly provide their feedback.

The solutions suggested by the economic literature to contrast *free riding* in private e-markets could not be easily applied to public contexts because of the existence of more strict legal constraints (for instance, payment-based systems do not seem an applicable solution). Simply, a possible solution is to maximize the user friendliness of the feedback mechanisms.⁴

Reputation Mechanisms and Market Entry

As already seen, the economic literature suggests several strategies to discourage pseudonymous changes in private e-markets. One interesting strategy suggests endowing new users with the ‘worst possible reputation,’ that is, the reputation faced by the user with the lowest feedback score. As already seen, pseudonymous changes are not a feature in public e-markets. All traders are fully identified by the procurement agency. However, discussing ‘starting reputation’ or ‘entry reputation’ could be useful to overcome other problems potentially occurring in public e-markets once reputation mechanisms are introduced. The existence of a reputation mechanism favours incumbents with respect to newcomers: the market ‘knows’ the former but has no information about the latter. This may generate an entry barrier: potential reluctance to interact with ‘no feedback traders’ implies less trade opportunities for new entrants. Such a barrier can discourage participation, limiting competition, and forcing new traders to enter at lower prices in order to fill the ‘reputation gap.’ Moreover, because reputation is a choice variable for Public Administrations, it should be consistent with procurement laws. With respect to this point, notice that incumbents face reputation advantages with respect to newcomers that may not be fully in line current legislations.⁵ One possible strategy to soften entry barriers consists in endowing new entrants with a starting reputation. However, this strategy can be effective under certain conditions. In particular, if the number of transactions and the entry reputation are publicly observable (transparency), new entrants and incumbents are perfectly distinguished. As a result, the entry barrier is not removed by the introduction of the entry reputation.

High degree of transparency allows knowing exactly whether a trader endowed with the entry reputation is new or incumbent, and thus prevents

new entrants from ‘hiding’. In contrast, low transparency does not allow distinguishing new entrants from incumbents; therefore, the entry barrier due to the reputation mechanism is softened. In this case, pooling between incumbents and new entrants allows the latter to overcome the entry barrier generated by the reputation mechanism. Therefore, there exists a trade-off between transparency and limitation of entry barrier: the higher the transparency, the lower the reduction of the entry barrier.

What Is the Optimal Entry Reputation?

In this section, we look at the optimal entry reputation. We discuss three possible (not exhaustive) alternatives: (1) the lowest reputation; (2) the average (overall market average of reputation or average reputation referred to a specific category of goods/services); and (3) the highest reputation. The following aspects should be considered to determine the optimal level of reputation.

Informational asymmetries. High starting reputation encourages vendors to enter the market and increases the market supply. However, it attracts low-quality vendors, generating adverse selection. Moreover, the higher the entry reputation the higher the likelihood for moral hazard to occur: vendors face higher incentives for ex-post exploitation of good reputation.

Effects on Incumbents. The larger the entry reputation, the higher the relative ‘costs’ for incumbents. Incumbents that invested in quality to acquire a good reputation are penalized by free assignments of high reputation to new entrants. Further, the higher the entry reputation, the higher the overall market average reputation. Endowing new entrants with the highest reputation increases the market average reputation. This will further penalize incumbents because their actual reputation is even lower than the (raised) market average reputation. This problem appears particularly relevant at the beginning, that is, when the number of incumbents is not large and vendors enter the market at potentially growing rates. In contrast, in ‘steady-state,’ new entries have negligible effects on average reputation and do not affect the relative positions of incumbents. However, penalization of incumbents can be limited by setting the entry reputation equal to the market average reputation, or by avoiding that entry reputation higher than the average enters the computation of the average.

Potential Bias. Entry reputation generates a bias given by the difference between the seller’s ‘true reputation’⁶ and the reputation assigned. Such a bias increases as long as the entry reputation is set to extreme values. Suppose ratings range in a scale 0,1,2 and that market average is 1. Endowing zero-quality sellers with the highest rating would obtain a bias of

2, while the bias is 1 if the same seller were endowed of the average rating. Because sellers are heterogeneous with respect to quality, the entry reputation minimizing the bias is the average reputation.

Benefits and Effects of Average Entry Reputation. The hypothesis to endow new entrants with an intermediate reputation instead of extreme reputation is supported by a recent paper of Mailath e Samuelson (2001). With respect to high reputation, the average reputation is less attractive for low-quality sellers because they do not gain that much by exploiting it, while it is attractive for high-quality sellers because they can improve it at low costs given their (good) characteristics. Low reputation is worse than the average reputation because it attracts only low-quality sellers. In fact, performing sellers are not interested in low reputation because too low with respect to their high quality and difficult/costly to increase (performing sellers may be considered of low-quality, thus discouraging buyers to trade with them). Hence, the paper shows that the average is preferable to extreme reputation because it attracts high-quality sellers and minimizes adverse selection.

From the standpoint of a public procurement agency, high entry reputation seems appropriate in the early stages of the marketplace; i.e., when benefits from attracting users overwhelm costs of inefficient assignment of reputation. Long run optimal strategy consists in bringing entry reputation towards zero because benefits from attracting (few) users are likely to be offset by inefficiency costs.

From the standpoint of sellers, apart from risk aversion, new e-markets are attractive only if the value of entry is high, because risks are counterbalanced with high entry reputation. However, in the long run e-markets are likely to be populated. Many traders and sellers will find entry much more valuable regardless of the entry reputation received.

Possible Structures of Reputation Mechanisms

In designing reputation mechanisms, public procurement agencies should take into account possible legal constraints. For instance, despite efficiency, mechanisms that allow for negatives are difficult to implement because of legal limitation and possible reluctance of vendors. Whether these concerns apply, procurement agencies should design mechanisms with only positive ratings, trying to minimize connected efficiency losses⁷. 'High-quality' vendors are rewarded for high-quality transactions, while 'low-quality' vendors are not 'punished,' even though they are in relative terms. By maximizing the perception that the reputation mechanism can be

a business opportunity for firms two important goals can be achieved simultaneously: attracting vendors and increasing quality.

Reputation Measures and Disclosure Policies

How Reputation Should Be Measured? Disclosure policies of procurement agencies may be subject to specific legal restrictions that also involve reputation. We already showed how private e-markets often publish a large quantity of information that is not easily processable by users. We also described what economic literature suggests concerning providing users with more informative/processable data. Consistently with implementation constraints and costs, procurement agencies may to set-up an 'ID vendor Card', in which the reputation is measure by averages of ratings.

Other Disclosable Information. eBay, as well as other e-markets, publish several information, such as the total number of ratings, but neglects any information about the number of transaction completed. This information should be taken into account by procurement bodies, because it can be important in assessing how frequently users trade in the system and also to have information about transactions completed but left unevaluated.

Portability of Reputation. It is widely recognized that the effectiveness of reputation mechanisms in private e-markets crucially depends on information disclosed. For centralized procurement bodies, managing both classical supply contracts and electronic marketplaces services portability can be important, as long as the fraction of vendors that are active in both channels is not negligible. The portability of reputation has also a considerable external value. If reputation is observed also by all non-users, the feedback mechanism becomes much more effective because high-quality delivery goods or services is observed by a large scale of individuals.

Time

EBay allows providing feedbacks within 90 days since online trade is complete. This period of time is believed sufficient to execute the contract (shipping and payment of good/services) and thus for users to provide appropriate feedbacks.

It is relevant for public procurement agencies to fix the time within which feedbacks can be posted. This is particularly important for bilateral mechanisms, for which the procurement agency has concern about traditionally lengthy payments of public administrations, which makes

vendors potentially unsatisfied but unable to release a negative feedback if the deadline is short. Conversely, shipment is usually faster than payment, unless it refers to services that are executed in a certain period of time.⁸ These problems become less relevant for unilateral mechanisms. In this latter case, the procurement agency concerns are focused on shipment. Given implementation and financial constraints, one possible solution to reduce free-riding consistent with “pro-activity”, is to introduce in the e-platform a page dedicated to the provision of feedbacks: that is, a page in which administrations are summarized transactions and are allowed to evaluate them at any time.

CONCLUDING REMARKS

Recent works recognize the importance of reputation or feedback mechanisms in building trust in online communities, emphasizing the success of the eBay’s feedback mechanism. However, it seems that the economic literature does not investigate whether and how reputation mechanisms could be implemented in public procurement contexts. This paper discussed the implementation of reputation mechanisms in public e-markets and provided useful discussions for public procurement institutions (that can also be valid in private contexts). Particular attention has been paid to unilateral vs. bilateral feedback mechanisms, scale of ratings, measures of reputation and the entry reputation for newcomers. Considerations aimed at designing reputation mechanisms able to promote quality in the provision of goods and services in public e-markets consistently with the characteristics of the supply.

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NOTE

1. Consip S.p.A. is an Italian Public Procurement Agency, a joint-stock company totally and directly owned by the Italian Ministry of Economy and Finance (MEF), and it operates exclusively to serve Public Administrations. With the Financial Act of year 2000 (Law No. 488,

December 23, 1999) Consip is mandated to stipulate frame-contracts of national relevance with suppliers. In year 2002 the Italian Government has issued an innovative Presidential Decree (No. 101, April 4th 2002) that regulates the use of digital procedures in public procurement. Public Administrations can now use digital procedures as a whole, or as a partial replacement of traditional tender phases through the Electronic Market for amounts below the European thresholds.

2. Purchases above a certain threshold can be guaranteed by third financial intermediary (Escrow) that collects the payment, gross of intermediation fees, and diverts it to sellers once the buyer expresses his satisfaction for the shipped good. In case the buyer is not satisfied, he can return the good to the seller.
3. For instance, the access to the Italian Public Administration's Marketplace is subject to some requirements, such as minimum revenues, digital signature, quality certification and other technical requirements, depending on the category of supply vendors apply for.
4. Spagnolo and Dini (2004) explore in more detail a proposal for the Public Administration's Electronic Marketplace and frame-contracts managed by Consip.
5. This is the case of Italian procurement legislation imposing purchasing process of public administrations to guarantee equal trade opportunity among vendors.
6. The 'true reputation' is meant to be the reputation that would be acquired by the seller only on the basis of its behavior in trade.
7. Spagnolo and Dini (2004) discuss these problems for the Consip's case.
8. Payment conditions can also depend on the way purchases take place. For instance, in case of 'direct purchase,' the Italian Public Administration's Marketplace requires Administrations to pay within 60 days, while payment schedules are freely established by the parties in case of 'Request for Quotation.'

REFERENCES

- Avery, C., Resnick P., & Zeckhauser, R. (1999). "The Market for Evaluations," *American Economic Review*, 89(3), 564-584.
- Ba, S. & Pavlou P. (2002). "Evidence of the Effect of Trust Building Technology in Electronic Markets: Price Premiums and Buyers Behavior," *MIS Quarterly*, 26 (3): 243-268.

- Bajari, P., & Hortacsu, A. (2003). "Winners' Curse, Reserve Prices and Endogenous Entry: Empirical Insights from Ebay Auctions," *Rand Journal of Economics*, 34 (2): 329-355.
- Bolton, G.E., Katok E. & Ockenfels A. (2002). How "Effective are Online Reputation Mechanisms? An experimental investigation." (*Discussion Paper 25-2002*). Jena, Germany: Max Planck Institute for Research into Economic Systems.
- Cabral L. & Hortacsu A. (2004). "The Dynamic of Sellers Reputation: Theory and Evidence From eBay" (*NBER Working Paper No.10363*).
- Dellarocas, C. (2003a). "Efficiency and Robustness of Binary Feedback Mechanisms in Trading Environments with Moral Hazard." (*Working paper 4297-03*). Cambridge, MA: MIT.
- Dellarocas, C. (2003b). "The Design of Reliable Trust Management Systems for Electronic Trading Communities" (*Working paper*). Cambridge, MA: MIT.
- Dellarocas, C. (2003c). "The Digitalization of the Word of Mouth: Promise and Challenges of Online Feedback Mechanisms," *Management Science*, 49 (10): pp. 1407-1424.
- Eaton, D. H. (2002). "Valuing Information: Evidence from Guitar Auctions on eBay" (*Working paper 0201*). Murray, KY: Department of Economics, Murray State University.
- Ederington, L.H. & Dewally, M. (2003). "A Comparison of Reputation, Certification, Warranties, and Information Disclosure as Remedies For Information Asymmetries: Lessons from the Online Comic Book Market" (*Working Paper*) Norma, OK: Price College of Business, University of Oklahoma.
- Holmstrom, B. (1999). "Managerial Incentive Problems: A Dynamic Perspective," *Review of Economic Studies*, 66 (1):169-182.
- Houser, D. & Wooders, J. (2000). "Reputation in auctions: Theory and evidence from eBay" (*Working paper 00-01*). Tucson, AZ: Department of Economics, University of Arizona.
- Kauffman, R. J. & Wood, C. (2000). "Running up the Bid: Modelling Seller Opportunism in Internet Auctions." *Proceedings of American Conference of Information System* (pp. 929-935). Long Beach, CA: Association for Information Systems.

- Kreps, D. & Wilson, R. (1982). "Reputation and Imperfect Information," *Journal of Economic Theory*, 27 (2): 253-279.
- Mailath G.J & Samuelson, L. (2001). "Who Wants a Good Reputation?" *Review of Economic Studies*, 68: 415-441.
- Milgrom P. & Roberts, J. (1982). "Predation, Reputation and Entry Deterrence", *Journal of Economic Theory*, 27 (2), 280-312.
- Miller, N., Resnick P., & Zeckhauser, R. (2002). "Eliciting Honest Feedback in Electronic Markets" (*Working paper* RWP02-039). Cambridge, MA: Harvard University, J. F. Kennedy School of Government.
- Resnick, P., Zeckhauser, R., Friedman, E. & Kuwabara, K. (2000). "Reputation Systems," *Commerce ACM*, 43 (12): 45-48.
- Resnick, P. & Zeckhauser, R. (2001). "Trust Among Strangers in Internet Transaction: Empirical Analysis from Ebay Reputation Systems." In M. R. Baye (Ed.), *The Economics of the Internet and E-commerce: Advances in Applied Microeconomics, Vol. 11*. Greenwich, CT: JAI Press.
- Spagnolo, G. & Dini, F. (2004) "Reputation Mechanisms and Electronic Markets: Economic Issues and Proposals for Public Procurement", *Mimeo*.
- Wilson, R. (1985). "Reputation in Games and Markets." In A. Roth (Ed.), *Game-Theoretic Models of Bargaining* (pp. 27-62). Cambridge, UK: Cambridge University Press.