CHAPTER 13

REPUTATION ON THE INTERNET

LUÍS CABRAL

1. Introduction: What Is Special About Reputation on the Internet?

Economists have long studied the phenomenon of reputation, broadly defined as what agents (e.g., buyers) believe or expect from other agents (e.g., sellers). In a recent (partial) survey of the literature (Cabral, 2005), I listed several dozen contributions to this literature. So it is only fair to ask: What is special about reputation on the Internet? Why should a chapter like this be worth reading?

There are several reasons that reputation on the Internet is a separate phenomenon in its own right, and one worth studying. First, the growth of the Internet has been accompanied by the growth of formal, systematic review and feedback systems (both of online market agents and of offline market agents who are rated online). By contrast, the traditional research on reputation was typically motivated by real-world problems where only "soft" information was present (for example, the reputation of an incumbent local monopolist such as American Airlines for being "tough" in dealing with entrants into its market).

The second reason that reputation on the Internet forms a separate research area is that formal online reputation systems generate a wealth of information hitherto unavailable to the researcher. As a result, the economic analysis of online reputation is primarily empirical, whereas the previous literature on reputation was primarily of a theoretical nature.

A third reason that the present endeavor is worthwhile is that online markets are important and increasingly so. Specifically, consider the case of eBay, one of

of the seller to give buyers a negative or neutral grade (sellers could choose to leave positive or no feedback for buyers). However, the core of the feedback system has remained the same.[3]

Based on the feedback provided by agents (buyers and sellers), eBay displays several aggregates corresponding to a seller's reputation, including (1) the difference between the number of positive and negative feedback ratings; (2) the percentage of positive feedback ratings; (3) the date when the seller registered with eBay; and (4) a summary of the most recent feedback received by the seller.[4] Finally, eBay provides a complete record of the comments received by each seller, starting with the most recent ones. All of the information regarding each seller is publicly available; in particular it is available to any potential buyer.

While this chapter focuses primarily on literature regarding the eBay platform, eBay is by no means the only online feedback and reputation system. Amazon.com offers a system of customer reviews whereby buyers can rate both the product itself and, if buying from a seller other than Amazon, the seller. Although Amazon's seller review system is quite similar to that of eBay, its product review system is somewhat more complex, as reviewers can rate other reviews. Unlike eBay, Amazon's seller reputation system is one-sided: buyers review sellers but sellers do not review buyers (eBay still offers sellers the option to rate buyers positively). Of course eBay is not the only two-sided system. For example, at couchsurfing.net, where travelers find free places to stay while traveling, both hosts and travelers can rate each other.

Despite the great variety of online reputation mechanisms, most of the economics literature has focused on eBay. This is partly justified by the economic significance of eBay, the size of which dwarfs almost all other online trade platforms, and by the fact that a considerable amount of data is available for eBay. Accordingly, most of the evidence presented in this chapter corresponds to eBay.

3. Do Buyers Care About Online Reputations?

The fact that there exists a feedback reputation system in a given online market does not imply that such system matters, that is, that it has any practical significance. In principle, it is possible that agents (buyers and sellers) ignore the reputation levels generated by the system. If that were the case, there would be little incentive to provide feedback, which in turn would justify the agents' not caring for the system in the first place. More generally, many if not most games of information transmission (such as feedback and rating systems) admit "babbling equilibria," that is, equilibria where agents provide feedback and ratings in a random way (or simply don't provide any feedback), and, consistently, agents ignore the information generated by the system.

For this reason, an important preliminary question in dealing with online reputation systems is, Does the system matter at all? In other words, do the reputations derived from formal feedback systems have any bite? One first step in answering this question is to determine whether buyers' actions (whether to purchase; how much to bid, in case of an auction; and so forth) depend on seller's reputation.

At the most basic level, we would expect a better seller reputation to influence the price paid for an otherwise identical object. Many studies attempt to estimate the following equation: sale price as a dependent variable and seller reputation as an independent variable (along with other independent variables). Alternative left-hand side variables include the number of bids (in the case of an auction) or the likelihood the item in question is sold.

These studies typically find a weak relation between reputation and price. However, as is frequently the case with cross-section regressions, there are several problems one must take into account. First, unobserved heterogeneity across sellers and sold items may introduce noise in the estimates, possibly reducing the estimates' statistically significance. Conversely, as first pointed out by Resnick et al. (2003), several unobservable confounding factors may lead to correlations for which there is no underlying causality relation. For example, sellers with better reputation measures may also be much better at providing accurate and clear descriptions of the items they are selling, which in turn attract more bidders; hence their writing ability, not their reputation, may be underlying cause of the higher prices they receive. (In fact, there is some evidence that spellings mistakes in item listings are correlated with lower sale prices; and that "spelling arbitrage" is a profitable activity—that is, buying items with misspelled listings and selling them with correctly spelled listings.)

Such caveats notwithstanding, a series of authors have addressed the basic question of the effect of reputation on sales rates and sales price by taking the cross-section regression approach. The list includes Cabral and Hortacsu (2010), Dewan and Hsu (2004), Eaton (2005), Ederington and Dewally (2003), Houser and Wooders (2005), Kalyanam and McIntyre (2001), Livingston (2005), Lucking-Reiley, Bryan, Prasad, and Reeves (2006), McDonald and Slawson (2002), Melnik and Alm (2002), and Resnick and Zeckhauser (2002).[5] For example, Cabral and Hortacsu (2010) find that a 1 percent level increase in the fraction of negative feedback is correlated with a 7.5 percent decrease in price, though the level of statistical significance is relatively low. These results are comparable to other studies, both in terms of coefficient size and in terms of statistical significance.

One way to control for seller heterogeneity is to go beyond cross-section regression and estimate the effects of reputation based on panel data. From a practical point of view, creating a panel data of online sellers is much more difficult than creating a cross-section. For some items on eBay, it suffices to collect data for a few days in order obtain hundreds if not thousands of observations from different sellers. By contrast, creating a panel of histories of a given set of sellers takes time (or money, if one is to purchase an existing data set).[6]

Cabral and Hortacsu (2010) propose a strategy for studying eBay seller reputation. At any moment in time, eBay posts data on a seller's complete feedback history.

Although there is no information regarding past transactions' prices, the available data allows for the estimation of some seller reputation effects. Specifically, Cabral and Hortacsu (2010) propose the following working assumptions (and provide statistical evidence that they are reasonable working assumptions): (1) the frequency of buyer feedback is a good proxy for the frequency of actual transactions; (2) the nature of the feedback is a good proxy for the degree of buyer satisfaction. Based on these assumptions, they collect a series of seller feedback histories and estimate the effect of reputation on sales rate. They find that when a seller first receives negative feedback, his weekly sales growth rate drops from a positive 5 percent to a negative 8 percent. (A disadvantage of using seller feedback histories is that one does not obtain price effects, only quantity effects.)

As an alternative to panel data, one strategy for controlling for omitted-variable biases is to perform a controlled field experiment. Resnick, Zeckhauser, Swanson, and Lockwood (2006) do precisely that: they perform a series of sales of identical items (collector's postcards) alternatively using a seasoned seller's name and an assumed name with little reputation history. They estimate an 8 percent premium to having 2,000 positive feedbacks and 1 negative over a feedback profile with 10 positive comments and no negatives. In a related research effort, Jin and Kato (2005) assess whether the reputation mechanism is able to combat fraud by purchasing ungraded baseball cards with seller-reported grades, and having them evaluated by the official grading agency. They report that while having a better seller reputation is a positive indicator of honesty, reputation premia or discounts in the market do not fully compensate for expected losses due to seller dishonesty.

A related, alternative strategy consists of laboratory experiments. Ba and Pavlou (2002) conduct a laboratory experiment in which subjects are asked to declare their valuations for experimenter generated profiles, and find a positive response to better profiles. As every other research method, laboratory experiments have advantages and disadvantages. On the plus side, they allow the researcher to create a very tightly controlled experiment, changing exactly one parameter at a time; they are the closest method to that of the physical sciences. On the minus side, a major drawback is that the economics laboratory does not necessarily reflect the features of a real-world market.

In summary, while different studies and different research methodologies arrive at different numbers, a common feature is that seller reputation does have an effect on buyer behavior: buyers are willing to pay more for items sold by sellers with a good reputation, and this is reflected on actual sale prices and sales rates. As I mentioned already, from a theoretical point of view there could exist an equilibrium where buyers ignore seller reputation (consistently with the belief that feedback is given in a random manner); and seller feedback is given in a random manner (consistently with the fact that seller reputation is ignored by buyers). The empirical evidence seems to reject this theoretical possibility.

Finally, I should mention that buyer feedback and seller reputation are not the only instrument to prevent opportunistic behavior on the seller's part. In traditional markets, warranties play an important role in protecting buyers. What

role can warranties play in online markets? Roberts (2010) addresses this issue by examining the impact of the introduction of eBay's buyer protection program, a warranty system. He shows that, under the new system, the relation between seller reputation and price becomes "flatter." This suggests that warranties and seller reputation are (partial) substitute instruments to protect consumers in a situation of asymmetric information in the provision of quality products.

4. Do Sellers Care About Online Reputations?

Given that reputations do have a bite, in the sense that buyers care about it, a natural next question is, What do sellers do about it? Specifically, interesting questions include, How do sellers build a reputation? How do sellers react to negative feedback: by increasing or by decreasing effort to provide quality? Do sellers use or squander their reputation by willfully cheating buyers?

Cabral and Hortacsu (2010), in the essay introduced earlier, address some of these questions. As previously mentioned, following the first negative feedback received by a seller, the sales growth rate drops from a positive 5 percent to a negative −8 percent. This suggests that buyers care about seller reputation. In addition, Cabral and Hortacsu also show that following the first negative feedback given to the seller, subsequent negative feedback ratings arrive 25 percent more frequently and don't have nearly as much impact as the first one. This change, they argue, is due to a shift in seller behavior. Intuitively, while a seller's reputation is very high, the incentives to invest on such reputation are also high. By contrast, when a perfect record is stained by a first negative, sellers are less keen on making sure buyer satisfaction is maximized; and as a result negative feedback is received more frequently.[7]

Cabral and Hortacsu (2010) also find that a typical seller starts his career with a substantially higher fraction of transactions as a buyer relative to later stages of his career as an eBay trader. This suggests that sellers invest in building a reputation as a buyer and then use that reputation as a seller. Moreover, a seller is more likely to exit the lower his reputation is; and just before exiting sellers receive more negative feedback than their lifetime average.

Note that the "end of life" evidence is consistent with two different stories. First, it might be that exit is planned by the seller and his reputation is "milked down" during the last transactions. Alternatively, it might be that the seller was hit by some exogenous shock (he was sick for a month and could not process sales during that period), which led to a series of negative feedbacks; and, given the sudden drop in reputation, the seller decides that it is better to exit. Additional evidence is required to choose between these two stories. Anecdotal evidence suggests that the

former plays an important role. For example, in their study of sales of baseball cards on eBay Jin and Kato (2005) report that they "encountered two fraudulent sellers who intentionally built up positive ratings, committed a series of defaults, received over 20 complaints, and abandoned the accounts soon afterward" (p. 985).

In sum, the evidence suggests that reputation matters not only for buyers but also for sellers. In particular, sellers' actions too are influenced by reputation considerations.

5. The Feedback Game

User feedback is the backbone of online reputations. How and why do feedback mechanisms work? To an economist following the classical homo economicus model, the answer is not obvious. Giving feedback takes time. Moreover, to the extent that feedback can be given by both parties to a transaction, giving feedback may also influence the other party's decision to give feedback (and the nature of such feedback). One must therefore be careful about measuring the costs and benefits of feedback-giving.

Formal feedback and review mechanisms induce relatively well-defined extensive form games: each agent must decide, according to some rules, if and when to send messages; and what kind of messages to send. Understanding the equilibrium of these games is an important step towards evaluating the performance of reputation mechanisms, both for online and offline markets.

Empirically, one noticeable feature of the eBay feedback mechanism is that there is a very high correlation between the events of a buyer providing feedback to seller and a seller providing feedback to buyer. Jian et al. (2010) argue that eBay sellers use a "reciprocate only" strategy about 20 to 23 percent of the time. Bolton et al. (2009) also provide information that supports the reciprocal nature of feedback giving. For example, they show that the timing of feedback-giving by buyer and seller is highly correlated.

The reciprocal nature of feedback also seems consistent with another important stylized fact from the eBay system (and possibly from other two-way feedback systems): the extremely low prevalence of negative feedback. Klein et al. (2006) and Li (2010) present confirmatory evidence. They show that a substantial fraction of the (little) negative feedback that is given takes place very late during the feedback window, presumably in a way that reduces the likelihood of retaliation. Conversely, positive feedback is given very early on, presumably as a way to encourage reciprocal behavior.

Given the strategic nature of feedback giving, several proposals have been made to make the process more transparent and closer to truth telling. For example, Bolton et al. (2009) propose that feedback be given simultaneously, thus preventing one party from reacting to the other. They also present evidence from Brazilian

MercadoLivre which suggests that such a system induces more "sincere" feedback-giving without diminishing the overall frequency of feedback (one of the concerns with simultaneous feedback). Additional evidence is obtained by considering RentACoder.com, a site that enables software coders to bid for contracts offered by software buyers. In 2005, the site's eBay-like feedback mechanism switched to blind feedback. The data from Bolton et al. (2009) suggest that the shift led to a lower degree of feedback reciprocity.

Feedback is a positive good, since the information that it generates benefits all potential market traders. Unless there is a strong altruistic component in feedback-giving, or a significant degree of reciprocity in positive feedback-giving, it is possible that feedback may be underprovided with respect to social welfare, or maybe even the private welfare of each agent (sellers in particular). One interesting question is therefore how to increase the frequency (and precision) of feedback. Li (2010) proposes a system whereby sellers give buyers a rebate conditional on providing feedback. She shows there exists a pooling equilibrium where both good and bad sellers choose such a rebate option.

The fact that online users give so much feedback (in addition to writing numerous product reviews) suggests that material compensation is not the only—and maybe not the main—motive to action. In a recent field experiment, Chen et al. (2010) explore the possibility of using personalized social information as a means to enhance participation in online communities. Specifically, they send a random subsample of the participants in MovieLens.com an email with information about other users' degree of participation. They show that upon receiving this information, users below the median increase their activity dramatically. While this experiment pertains to product reviews (movies, to be more specific), a tantalizing possibility is that similar effects also apply to agent reviews (as in the case of eBay).

6. The Positive and Normative Theory of Reputation on the Internet

An important difference of online markets with respect to traditional markets is that the market maker has considerable flexibility when it comes to market design, specifically the design of reputation mechanisms. This possibility has led various researchers to not only study the workings of actual online reputation mechanisms (positive analysis) but also to design optimal or at least better reputation mechanisms (normative analysis). Bolton and Ockenfels (2006), for example, study "perfect reputation systems" (their title), presenting some experimental evidence to support their results. Ghose, Ipeirotis, and Sundararajan (2007) analyze textual feedback using econometrics and present the "first *objective*, *quantifiable*, and

context-sensitive evaluation of opinions." Regarding the disclosure of seller information, Dellarocas (2005) shows that instead of reporting every single transaction feedback, a better reputation mechanism is to aggregate the k most recent events and publish an aggregate (as the eBay system does). Intuitively, such a system avoids buyer punishment when occasional and possibly erroneous negative feedback takes place.[8] Aperjis and Johari (2010) in turn show that it is better to place greater weight to more recent transactions in a seller's history (as the eBay system does).

As mentioned previously, "opportunistic" exit seems to be common on eBay (that is, sellers with a bad record exit, and sometimes the bad record is part of their planned exit strategy). One reason for this is that online markets are considerably more anonymous than traditional markets. A *New Yorker* cartoon of a few years ago shows two dogs in front of a desktop computer running an Internet browser. One of the dogs comments, with visible satisfaction, that "on the Internet nobody knows you are a dog." Indeed, online agents know very little about other online agents. Reputation mechanisms are a way to deal with this, but they may be of little use if agents may change their name easily and thus start a new reputation. Friedman and Resnick (2001) consider this problem from a theoretical point of view. They consider a moral hazard repeated matching game and show that, the availability of cheap pseudonyms notwithstanding, a large degree of cooperation may still emerge. The idea is that in equilibrium, new players (that is, players with a new name) must "pay their dues" by accepting poor treatment from other players. Indeed, there is some evidence on eBay (and including the paper by Resnick et al., 2006, cited earlier) that is consistent with this view.[9] However, there are alternative explanations for this pattern; more on this later.

The normative analysis of reputation mechanisms is an area where much can still be done. The problem at hand is interdisciplinary in nature. First, a good mechanism must be incentive compatible (in the broad sense of the expression), thus requiring the contribution of game theory. Second, a good mechanism must take into account behavioral patterns that go beyond utilitarian economics, especially in matters related to feedback-giving behavior, and here psychology has an important contribution to make. Finally, the mechanism must be feasible from a logistical point of view, which requires the input from computer and information scientists.

Regarding game theory's contribution, it is important to understand the precise nature of agent reputation in each online platform. Specifically, economic models of reputation may be classified broadly into two categories. One is based on the concepts of asymmetric information and Bayesian updating. Suppose buyers are uncertain about the seller's type (e.g., honest versus dishonest). Formally, this corresponds to a prior distribution over the set of possible seller types (a belief). In this context, the observation of the seller's actions (or a signal of those actions) leads buyers to update their beliefs (basically by applying Bayes rule). At each moment, the seller's reputation corresponds to the buyers' belief regarding the seller's type. In this context, one can show that there are equilibria where sellers refrain from cheating consumers, even though that would be in their short-run interest (Kreps

et al, 1982). The reason is that in equilibrium, such deviation would be followed by an unfavorable drop in the seller's reputation, which in turn hurts the seller in future periods.

A second model of reputation is based on the folk theorem in repeated games. For example, Klein and Leffler (1981) have shown that, again, there are equilibria where sellers refrain from cheating consumers, even though that would be in their short-run interest. The reason is that, in equilibrium, such deviation would be followed by a boycott on the part of consumers, who would stop purchasing from this seller. Strictly speaking, this is more a model of trust (what buyers expect sellers to do) than it is of reputation (what buyers believe sellers to be).[10] However, frequently it is presented as a model of reputation.

These two theories of reputation are based on very different mechanisms. As shown by Cabral and Hortacsu (2010) these two theories of reputation are observationally very similar. Perhaps for this reason they are frequently treated as part of the same theory (e.g., Dellarocas, 2003), though they are sometimes explicitly distinguished (e.g., Belleflamme and Peitz, 2010). However, the underlying mechanisms are quite different, and the theoretical and practical implications in terms of optimal reputation mechanisms can also differ considerably.

7. Concluding Remarks

I briefly reviewed the economics knowledge regarding online reputation and online reputation mechanisms. As I mentioned at the outset, I have not attempted a comprehensive survey of the literature, rather a brief summary of what I think are the main problems and the main ideas that have emerged from economics research.

Online markets are important, in monetary terms and otherwise; and they are bound to become even more important in the future. Our knowledge of online reputation is still very sketchy; there are many unresolved problems, namely at the level of optimal design of reputation mechanisms. For this reason, I believe this in an area with ample research opportunities for theoretical and empirical economists alike.

Notes

1. See http://www.msnbc.msn.com/id/3078461/ns/technology_and_science-security/t/man-arrested-huge-ebay-fraud/; http://www.truetex.com/ebayfraud.htm; http://www.smallbusinesscomputing.com/emarketing/article.php/3079321/Victimized-My-First-eBay-Fraud.htm (all accessed in May 2011).
2. eBay also offers an escrow service, but this service is used for only a small fraction of the transactions.

3. See Klein et al. (2006) for a description of various changes to the eBay reputation system.
4. Indicators (b) and (c) have only been presented since March 1, 2003.
5. See Dellarocas (2003) and Bajari and Hortacsu (2004) for surveys of these results.
6. Many of the datasets used for studying eBay and other online reputation mechanisms are created by means of a web crawler (a.k.a. spider). This is a computer program (written in Pearl or in a similar language) that browses the web in a methodical, automated manner, collecting data and storing it in a computer for later analysis.
7. There are many other possible explanations, many of which relate to buyer behavior. For example, it might be that no buyer wants to "throw the first stone," so that once the first negative feedback has been given buyers feel more free to give negative feedback. Cabral and Hortacsu (2010) go through a series of possible buyer-related explanations and show that they are not supported by the data.
8. There is an interesting similarity with the literature on umbrella branding and moral hazard; see Cabral (2009).
9. A more general treatment of the problem of "reputation restarting" in moral hazard repeated games is provided by Ray (2002).
10. See Cabral (2005).

References

Aperjis, C., Johari, R., 2010. Designing Reputation Mechanisms for Efficient Trade. mimeo, Stanford University.

Ba, S., Pavlou, P., 2002. Evidence of the Effect of Trust Building Technology in Electronic Markets: Price Premiums and Buyer Behavior. MIS Quarterly 26.

Belleflamme, P., Peitz, M., 2010. Industrial Organization: Markets and Strategies, Cambridge University Press.

Bolton, G., Greiner, B., Ockenfels, A., 2009. Engineering Trust: Reciprocity in the Production of Reputation Information. Economics Working Paper No. 42, University of Cologne.

Cabral, L., 2005. The Economics of Reputation and Trust. mimeo, New York University.

Cabral, L., 2009. Umbrella Branding with Imperfect Observability and Moral Hazard. International Journal of Industrial Organization 27, pp. 206–213.

Cabral, L., Hortacsu, A., 2010. The Dynamics of Seller Reputation: Theory and Evidence from eBay. Journal of Industrial Economics 58, pp. 54–78.

Chen, Y., Harper, M., Konstan, J., Xin Li, S., 2010. Social Comparisons and Contributions to Online Communities: A Field Experiment on MovieLens. American Economic Review 100, pp. 1358–1398.

Dellarocas, C., 2003. The Digitization of Word-of-Mouth: Promise and Challenges of Online Reputation Mechanisms. Management Science 49, pp. 1407–1424.

Dellarocas, C., 2006. How Often Should Reputation Mechanisms Update a Trader's Reputation Profile?. Information Systems Research 17, pp. 271–285.

Dewan, S., Hsu, V., 2004. Adverse Selection in Electronic Markets: Evidence from Online Stamp Auctions. The Journal of Industrial Economics 52, pp. 497–516.

Eaton, D., 2005. Reputation Effects in Online Auction Markets. Murray State University.

Ederington, L., Dewally, M., 2003. A Comparison of Reputation, Certification, Warranties, and Information Disclosure as Remedies for Information Asymmetries: Lessons from the On-Line Comic Book Market. mimeo.

Friedman, E., Resnick, P., 2001. The Social Cost of Cheap Pseudonyms. Journal of Economics and Management Strategy 2, pp. 173–199.

Ghose, A., Ipeirotis, P., Sundararajan, A., 2007. Opinion Mining Using Econometrics: A Case Study on Reputation Systems. Proceedings of the Association for Computational Linguistics.

Houser, D., Wooders, J., 2005. Reputation in Auctions: Theory and Evidence from eBay. Journal of Economics and Management Strategy 15, pp. 353–369.

Jian, L., MacKie-Mason, J., Resnick, P., 2010. I Scratched Yours: The Prevalence of Reciprocation in Feedback Provision on eBay. The B.E. Journal of Economic Analysis & Policy (Volume 10).

Jin, G., Kato A., 2006. Price, Quality and Reputation: Evidence From An Online Field Experiment. Rand Journal of Economics 37, pp. 983–1004.

Kalyanam, K., McIntyre S., 2001. Returns to Reputation in Online Auction Markets. mimeo.

Klein, B., Leffler, K., 1981. The Role of Market Forces in Assuring Contractual Performance. Journal of Political Economy 89, pp. 615–641.

Klein, T., Lambertz, C., Spagnolo, G., Stahl, K., 2006. Last Minute Feedback. CEPR Discussion Papers 5693, C.E.P.R.

Kreps, D., Milgrom, P., Roberts, J., Wilson, R., 1982. Rational Cooperation in the Finitely Repeated Prisoners' Dilemma. Journal of Economic Theory 27, pp. 245–252.

Li, L., 2010a. What is the Cost of Venting? Evidence from eBay. Economics Letters 108, pp. 215–218.

Li, L., 2010b. Reputation, Trust, and Rebates: How Online Auction Markets Can Improve Their Feedback Mechanisms. Journal of Economics and Management Strategy 19, pp. 303–331.

Livingston, J., 2005. How Valuable is a Good Reputation? A Sample Selection Model of Internet Auctions. Review of Economics and Statistics 87, pp. 453–465.

Lucking-Reiley, D., Bryan, D., Prasad, N., Reeves, D., 2006. Pennies from eBay: the Determinants of Price in Online Auctions. The Journal of Industrial Economics.

McDonald, C., Slawson, V., 2002. Reputation in an Internet Auction Market. Economic Inquiry 40, pp. 633–650.

Melnik, M., Alm, J., 2002. Does A Seller's eCommerce Reputation Matter? Evidence from eBay Auctions. The Journal of Industrial Economics 50, pp. 337–350.

Ray, D., 2002. The Time Structure of Self-Enforcing Agreements. Econometrica 70, pp. 547–582.

Resnick, P., Zeckhauser, R., 2002. Trust Among Strangers in Internet Transactions: Empirical Analysis of eBay's Reputation System. In: M. Baye (Ed), Advances in Applied Microeconomics (Volume 11), Elsevier Science, Amsterdam, pp. 667–719.

Resnick, P., Zeckhauser, R., Swanson, J., Lockwood, K., 2006. The Value of Reputation on eBay: A Controlled Experiment. Experimental Economics 9, pp. 79–101.

Roberts, J., 2011. Can Warranties Substitute for Reputations?. American Economic Journal: Microeconomics 3, pp. 69–85.