

Self-Regulation: Experimental Evidence on Reputation and Peer Review

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October 2009

Revised Draft – Comments Greatly Appreciated – Please do not quote without permission.

We appreciate the support of the University of Wisconsin-Madison School of Business Doctoral Research Awards Program and the Department of Accounting. We appreciate comments from workshop participants at the University of Wisconsin-Madison, the University of South Carolina, and Marquette University, as well as individual comments from Karla Johnstone and Adam Vitalis.

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Abstract

This paper examines the ability of self-regulation to motivate and facilitate high quality choices in an experimental market setting. We examine both reputation and peer review as forms of self-regulation. The U.S. government recently replaced peer review of public company auditors with PCAOB oversight. This change signaled the government's dissatisfaction with peer review's ability to discipline auditor behavior. However, the AICPA continues to utilize peer review to oversee audits of private companies. We start with individual reputation as a form of self-regulation. Similar to prior research, we find reputation formation facilitates high quality sporadically across markets. We then examine whether different implementations of peer review facilitate reputation formation and high quality. A peer review treatment that requires truthful peer reports does no better than reputation alone in promoting high quality. A peer review treatment that does not require truthful peer reports generates lower quality. Finally, a peer review treatment with no truth telling constraint, but the ability to punish transgressors, generates high quality at the same rate as the reputation only treatment. We observe that up to a third of peer based reports are intentionally inaccurate suggesting the reports are used strategically. Our results provide initial evidence that peer review does little to enhance quality choices.

Keywords: Audit quality, peer review, self-regulation, reputation

Data availability: Contact the authors

INTRODUCTION

This paper investigates quality choices that individuals make under self-regulation. Self-regulation is a process by which a profession or industry maintains quality standards without formal external government oversight or regulation. For example, self-regulation is present in the financial securities industry, as well as the legal, medical, and auditing professions in the United States. Audit firms remain subject to self-regulation under the American Institute of Certified Public Accountants' (AICPA) Center for Public Company Audit Firms Peer Review Program (AICPA 2006). The audit profession's continued use of peer review motivates us to examine the impact of peer review in a controlled experimental economics market setting. This experimental approach allows us to observe both quality and peer reporting choices, while also observing the underlying basis for the peer reporting choices. Neither actual quality nor the underlying support for peer reports is observable via archival data.

The U.S. government recently replaced peer review of public company auditors with PCAOB oversight. This change signaled dissatisfaction in peer review's ability to discipline auditor behavior. Self-regulation's effectiveness in promoting and maintaining high quality is debatable. Self-regulation can provide the necessary oversight to generate high quality by enabling knowledgeable members to oversee their peers' actions. However, individuals' unwillingness to report misconduct by peers can inhibit the effectiveness of such systems (ABA 2005; Hilary and Lennox 2005). Peer reviewers can also report opportunistically in an effort to send negative signals about their competitors, further inhibiting self-regulation's effectiveness. We have found little literature that empirically investigates individuals' quality and reporting choices under self-regulation.

Self-regulation remains an important topic despite the Public Company Accounting Oversight Board's (PCAOB) regulatory intervention. The PCAOB has come under criticism for its oversight of the profession (Glover et al. 2009). Criticisms include inspectors' lack of recent experience in practice, the primarily non-expert/non-CPA composition of the Board, and political motivations (Glover et al. 2009). Self-regulation also remains important as the AICPA recently revised peer review standards and continues searching for ways to strengthen the peer review process (AICPA 2006). Research such as ours aims to provide insight and guidance into current and future debates on how to best monitor and promote high quality auditing.

This paper examines two facets of self-regulation. The first facet represents the individual's concern for his or her own reputation. The second facet relies on individuals to regulate peers via public reports on peers' behavior. This type of self-regulation can take different forms. Central governing bodies can oversee self-regulation. The Financial Industry Regulatory Authority plays this role for all United States based securities firms.¹ At the other extreme, professions can rely on members informally monitoring peers and reporting concerns to an oversight board. For example, the legal profession relies on judges and lawyers to report inappropriate conduct of fellow legal professionals to the local bar association (ABA 2005). Alternatively, professions can utilize individuals within the profession to systematically investigate and report on fellow members. The AICPA peer review program follows this model for non-public audit clients.² We consider the ability of peer review to out-perform and/or assist individual reputation in promoting and maintaining high quality.

We employ a simple research design where sellers make investment decisions and sell the resulting assets to buyers each period. Sellers choose between two investment options that

¹ See <http://www.finra.org> for more information.

² See <http://www.aicpa.org/Professional+Resources/Peer+Review> for more information.

represent selecting between low and high quality. The low quality investment option costs 200 experimental dollars (ED) less than the high quality investment option. The high (low) investment option generates a high (low) value asset 80 percent of the time and a low (high) value asset 20 percent of the time. Our market models high quality as higher cost and greater expected returns. This approach parallels the higher cost of performing an audit that is more likely to identify material misstatements. The probabilistic asset value inhibits buyers' ability to directly infer sellers' low quality investment choices. In a given period, buyers cannot determine whether an observed low asset value is due to low investment or to the probability of a low asset associated with high investment. However, over a number of periods buyers can make inferences about sellers' investment levels based on observed asset values. This feature enables sellers to build individual reputations based on their investment decisions. In peer review conditions, each seller is assigned another seller who observes the investing decision and issues a peer report on that investing decision.

We investigate several research questions. First, we explore whether self-regulation impacts quality choices. We compare quality choices where only reputation matters to quality choices under peer review that require peer reviewers to issue truthful reports about peers' quality choices. This setting enables us to assess whether peer review can outperform reputation alone. Second, we consider how two modifications to the truthful peer review setting impact quality choices. We start by relaxing the truthful peer review reporting requirement and allow peer reviewers to choose whether to report truthfully. This permits us to evaluate whether peer review without the truthful reporting constraint can generate high quality choices. We then allow peers to issue sanctions (penalties) when they observe low quality investments and investigate whether the ability of peers to issue penalties impacts quality choices. Finally, we explore the

honesty of peer reviewers' reports in the conditions where peer reviewers are not constrained to report truthfully.

We find participants make high quality investments approximately two-thirds of the time under reputation alone and when faced with truthful peer review. Truthful peer review does not appear to directly increase quality choices in our setting, despite the fact there is room for improvement over the reputation only setting. Our results suggest that high quality investment levels decrease when we allow peers to choose what to report rather than requiring truthful peer reporting. When we allow peers to impose penalties on those who make low quality investments, the level of high quality investments returns to similar levels observed under truthful peer reporting or reputation alone. Our findings suggest peer review does little to enhance quality decisions and, when the peer reviewer is not monitored, can even produce lower levels of quality.

We do not formally model any group-level incentives, but our design allows group-level reputations to form endogenously in the markets. Supplementary analysis suggests that individual returns are partially influenced by the group's reputation. However, we do not directly link individual incentives to the group. It seems quite likely that the individuals in our markets are not aware of the impact of the other group members on their individual payoffs. Explicit group incentives have been shown to be important in other research (Grant et al. 1996). We think further investigation of explicit versus implicit group incentives is appropriate in assessing the role of peer review. It is worth noting, however, that explicit linkage of peer review to group incentives is not clear in field settings.

Our paper adds to the self-regulation literature on a number of fronts. First, we expand the reputation literature to include the ability of peer review to enhance or facilitate reputation

formation. Our results suggest that peer review does little if anything to facilitate reputation formation. Second, we examine peer review in a setting where individual reputation can make the need for peer review obsolete. Prior experimental research relies on assumed group-level incentives when studying peer review (Grant et al. 1996; Hepp and Mayhew 2008). Peer review appears useful in settings where explicit group incentives are present. However, these settings provide no opportunity for individual reputations to impact results. Third, we expand on prior peer review experimental research by investigating the peer reviewers' reporting choices. Our experimental setting allows us to observe not only the reporting choices, but also the underlying quality of those reporting choices. This design enables us to provide additional insight to prior archival literature considering factors that could bias peer reviewers (e.g., Anantharaman 2007). Finally, our research also informs regulators and standard setters regarding the ability of self-regulation to effectively monitor and generate high quality audits. The PCAOB faces significant criticism and it seems likely that the profession and government will revisit the role of peer review in disciplining auditor behavior in the future (Glover et al. 2009; Fredriksson and Lindahl 2008). Given the potential for policy change, it is important to understand conditions under which peer review will or will not be successful.

The paper proceeds with a discussion of peer review's background and prior research in section II. We describe our method in section III, develop research questions in section IV, and discuss results in section V. Section VI concludes the paper.

BACKGROUND AND PRIOR RESEARCH

Peer Review in Auditing Overview and Background

Professions use peer review to promote high quality decisions among members. Peer review also provides assurance to users of the profession's services and the public that the profession is monitoring the overall quality provided by its members. The need for peer review arises because users cannot directly observe the quality of services provided. For example, lawyers and doctors both submit to some level of peer review. In both cases, it can be difficult to evaluate the quality of services provided based on the outcomes users observe. Proponents of peer review argue that professional peers are best able to evaluate the quality delivered based on their own professional knowledge and expertise. Critics argue that peer reviewers have weak incentives to call out their peers for substandard service as it may impact the overall profession's reputation.

Professions typically promote self-regulation as a more efficient and effective monitoring mechanism than government-based regulation. Self-regulation potentially provides more efficient monitoring because it utilizes monitors who are experts engaged in the same activity in which they monitor. Such experts presumably know where problem or quality-related issues arise and can identify these issues more quickly and effectively than a regulator. Peer reviewers also can provide more effective monitoring as their expertise evolves over time to incorporate new developments in the profession. Their expertise enables them to differentiate between questionable changes and legitimate evolutions in practice. Further, some argue that regulators are compelled to find issues to justify their role to the public (Fredriksson and Lindahl 2008). Peer reviewers need not justify their positions to society by finding problems.

Audit report users cannot directly observe audit quality due to the complex nature of financial reporting and the long lag between audit completion and the time when it becomes apparent there are potential problems. Peer review helps ensure the public that audit firms' audit

processes adhere to professional standards. The public benefits from the resulting increase in high quality audits. The profession benefits by enhancing and maintaining its reputation for quality and by maintaining self-monitoring rather than regulatory oversight. The AICPA currently requires peer review for all members engaging in public practice that “issue reports purporting to be in accordance with AICPA professional standards” (AICPA 2009).³

The audit profession has not always employed peer review. Prior to the 1970’s, there did not appear to be any meaningful form of peer-based oversight. Peer review arose in the 1970’s in response to government investigations surrounding significant audit failures. Peer review began on a voluntary basis as part of attempts to rehabilitate firms associated with audit failures. Peer review did not become mandatory until the late 1980’s, only after SEC threats to impose a review program (Fogarty 1996). Mandatory peer review applied only to AICPA members auditing public companies, while other members could submit to voluntary peer review.

The fact that peer review implementation followed events that damaged the profession’s reputation and government scrutiny of the profession supports the assertion that the audit profession attempts to use peer review to protect and enhance its reputation and to limit the threat of government regulation (Fogarty 1996). The profession’s effort to avoid government regulation recently failed for auditors of public companies when SOX created the PCAOB to inspect auditors of public companies. The AICPA continues to oversee peer review for audits of private companies, so many audit firms are subject to monitoring by both the PCAOB and the AICPA’s peer review system.

³ This requirement captures all firms that perform audits and reviews, including those for government entities. It is interesting to note that the audit firm that audited Barry Madoff’s investment fund did not undergo peer review. The firm repeatedly lied to AICPA inquires as to whether it was performing audits and, therefore, was subject to peer review.

Prior Research on Peer Review

Our interest in peer review stems from its potential use to generate high quality choices by individual members of peer groups. In this sense, peer review serves as a substitute for regulation to generate high quality outcomes. Prior research considers peer review's application in the audit profession and finds inconclusive evidence on the effectiveness of peer review in maintaining high quality audits.

Hilary and Lennox (2005) examine peer review reports of U.S. audit firms and the resulting impact on audit firms' client gains or losses. They find audit firms that receive clean opinions gain clients and audit firms that receive modified or adverse opinions lose clients. Such evidence suggests that peer review opinions differentiate quality levels among firms. However, Hilary and Lennox (2005) find very few firms receive modified or adverse opinions. Only 41 of 1,001 firms receive these negative opinions. Indeed, Fogarty (1996) cites audit peer review research stretching back to the initial implementation of peer review that also shows little evidence of negative peer-reporting. Such a low rate of reported substandard work suggests that either peer review is highly effective in maintaining high quality or that peers are reluctant to issue negative reports. Archival research cannot observe actual quality underlying reports, making it difficult to differentiate between the two explanations. Our design enables us to provide evidence on the nature of reporting in a peer review setting.

Recent research builds on Hilary and Lennox (2005) by comparing peer review reports with initial PCAOB reports. Anantharaman (2007) considers bias in the peer review system and reports that firms acting as peer reviewers and firms that negotiate directly with peer reviewers instead of having reviewers appointed are each more likely to receive favorable peer reviews than PCAOB reports. These findings suggest reciprocal behavior may occur under peer review.

Further, Anantharaman (2007) finds that firms with non-competing peer reviewers are also more likely to receive favorable peer reviews than PCAOB reports, suggesting the possibility of strategic reporting or more scrutinizing reviews by competing peer reviewers.

Gunny and Zhang (2009) investigate how useful each monitoring system is in distinguishing audit quality using four client measures: (1) abnormal current accruals, (2) restating earnings, (3) just meeting analysts' forecasts, and (4) a going concern opinion. Gunny and Zhang (2009) report that firms that receive seriously deficient PCAOB reports allow more income increasing accruals, have more clients with earnings restatements, and have more clients who just meet analysts' forecasts. However, Gunny and Zhang (2009) do not find that seriously deficient PCAOB reports relate to issuing more going concern opinions. Gunny and Zhang's (2009) results do not show a relation between peer reviews and low audit quality. The authors report that deficient peer reviews do not relate to higher client restatements, clients just meeting analysts' forecasts, or issuing more going concern opinions, and that firms with deficient peer reviews actually allow *less* accruals management (Gunny and Zhang 2009). Their findings suggest that PCAOB inspections are better than peer reviews at identifying low audit quality and, therefore, that peer reviews are not as effective as PCAOB inspections.

Lennox and Pittman (forthcoming) also investigate the ability of peer reviews and PCAOB reports to provide information about audit quality. Lennox and Pittman (forthcoming) report that audit firms are more likely to switch (retain) peer reviewers when the reviewer issues the firm an unfavorable (favorable) peer review. This suggests that audit firms find peer review reports to be meaningful and also that firms choose reviewers strategically (Lennox and Pittman forthcoming). Further, Lennox and Pittman (forthcoming) find evidence that the PCAOB focused early inspections on audit firms with deficient peer reviews, suggesting that the PCAOB

considered peer reviews informative regarding audit firm quality (Lennox and Pittman forthcoming). However, Lennox and Pittman (forthcoming) also find that neither post-PCAOB peer reviews nor PCAOB reports relate to client gains or losses. This finding suggests that peer reviews are no longer as informative and that PCAOB reports are not informative regarding auditor quality (Lennox and Pittman forthcoming).

Casterella et al. (2009) investigate whether weaknesses in peer reviews relate to malpractice claims (i.e., audit failure) using data from an insurance company that provides professional liability coverage to audit firms. They find that the number of peer review weaknesses positively correlates with malpractice claims. Casterella et al.'s (2009) findings suggest that peer reviews are effective in distinguishing audit quality. However, the authors are still unable to observe the actual underlying audit quality in the cases of audit failure.

Prior experimental research examines the ability of self-regulation to increase quality choices. Grant et al. (1996) compare quality choices across conditions that vary the presence of a self-regulatory organization (SRO). Participants choose between low and high quality contributions to the group with corresponding differences in cost. Prices increase or decrease directly with the number of high quality contributions to the group. The design creates an incentive for group members to cooperate by maximizing the number of high quality contributions, but individuals can maximize their own returns by saving the cost of high quality contribution. In the SRO treatment, participants can choose to be part of a self-regulatory organization that inspects 50 percent of members' quality choices each period. If caught supplying low quality, SRO members are banned from the SRO the remainder of the game. They compare results of the SRO treatment with a non-SRO treatment where there is not self-regulatory oversight of the group. Grant et al. (1996) find that presence of the SRO increases

high quality contributions and the overall increase is driven entirely by members who choose to be part of the SRO.

Hepp and Mayhew (2008) extend the Grant et al. (1996) design to consider willingness of group members to investigate, at a small cost, fellow group members' contributions. The Hepp and Mayhew (2008) design is a first step in evaluating whether group members are willing to expend resources to self-monitor. They find strong evidence that group members are willing to expend small resources to monitor fellow group members who do not make high quality choices. This approach results in substantially higher levels of high quality investments than the baseline case without self-monitoring. In Hepp and Mayhew's (2008) design, participants only chose to investigate. They did not choose the type of report to issue and did not control the resulting punishment of identified low-quality providers. Our design allows participants to make these additional decisions.

We take a different approach from these prior experiments. We do not model the self-regulation setting as one that specifically relies on group reputations or group returns. Instead, we consider the potential for self-regulation in a setting where individual reputations can discipline behavior. We choose this approach based on peer review's history in the audit profession. Peer review was not part of the profession's early development. It was only added after the profession found itself under scrutiny for the actions of individual members. Prior experimental studies of self-regulation do not consider the potential of individual reputations to maintain high quality. Individual reputation-building could negate the need for peer review. Firms or individuals could choose high quality in expectation that the market will differentiate between service providers that consistently deliver high quality and those that do not. One can argue the audit profession operated under such principles prior to the implementation of peer

review. In addition to capturing this link to practice, our approach relies on fewer assumptions about group-level incentives.

Experimental Economics Research on Reputation

Early experimental economics research in accounting and auditing explored reputation formation in simple settings (DeJong et al. 1985a, b). These early settings found it surprisingly difficult to identify conditions under which reputations formed reliably. A single treatment would consistently yield some sessions where reputations for high quality emerged and other sessions where lemons markets formed (DeJong et al. 1985 a, b).

The early reputation research expanded into settings where auditor reputation was investigated. These complex settings involved buyers, sellers and auditors (Dopuch et al. 1989, Dopuch and King 1991, Kachelmeier 1991). These complex settings did not produce consistent reputation building even though the only potential value of the auditor relied on that auditor's own reputation for quality. Mayhew (2001) explicitly explored reputation building in an audit market setting. He found evidence that reputations could form reliably when the market rewarded participants quickly for high quality choices. This quick reward arose endogenously when evidence of low and high quality was unambiguous and there was an excess of bidders such that prices were very competitive. Extensions of this research that relax the ambiguity about high or low quality immediately result in a return into unpredictable reputation formation (Mayhew et al. 2001).

The current paper contributes to the research on reputation formation by examining it under different peer review conditions. Peer review has the potential to eliminate information asymmetry between the producer and the purchaser of the resulting asset.

PARTICIPANTS AND DESIGN

Participants

Table 1 presents demographic detail. We employ 142 undergraduate students, 17 graduate students, and one non-traditional student at a large Midwestern university (74 females and 86 males). The mean participant age is 21 years. Forty-four participants are accounting majors or have a dual major with accounting, 80 are other business majors, and 36 are non-business majors. On average, participants have had one internship.

[INSERT TABLE 1]

Experimental Design

We examine peer review using an experimental economic market implemented over a computerized network.⁴ Each session consists of four sellers and four buyers. We randomly assign participants to seller or buyer roles. At the start of the experiment, each seller receives a 2,000 ED (experimental dollars) endowment and each buyer receives a 20,000 ED endowment. We convert participants' account balances at the end of the experiment from ED to U.S. dollars and privately pay participants.

After reading the instructions, participants complete a short multiple-choice knowledge quiz to confirm their understanding of the instructions prior to beginning the experiment. We discuss any incorrect choices with participants to make sure they understand the setting.⁵ Participants go through three practice periods to become familiar with the screens for their participant type and the flow of the experiment prior to the actual experiment.

⁴ We program and conduct the experiment in z-Tree (Fischbacher 2007).

⁵ Thirty-four participants (eighteen sellers, sixteen buyers) had one incorrect choice, seven participants (five sellers, two buyers) had two incorrect choices, and three participants (two sellers, one buyer) had three incorrect choices.

We run five sessions in each of four treatments (*reputation*, *truthful peer report*, *choice peer report*, and *penalty choice peer report*) for twenty sessions total. Participants know that there will be at least 20 periods and that in period 20, and each subsequent period, there is an 80 percent probability that there will be another period before the end of the experiment.⁶ Each session lasts 23 periods. Participants follow the experiment procedures outlined below each period (also see Figure 1). We include each step's purpose in *italics* to assist understanding the design in an audit context.

1. Sellers choose whether to make a high or low investment in an asset. A high investment costs sellers 350 ED and has an 80 percent chance of yielding an asset with a value of 1500 ED (a high value asset). A low investment costs sellers 150 ED and has an 80 percent chance of yielding an asset with a value of 500 ED (a low value asset). There is a 20 percent chance that a high investment will yield a low value asset or that a low investment will yield a high value asset. Each seller invests in and sells one asset per period. All assets are sold each period. *The choice of high or low investment represents the auditor's choice of high or low effort on an audit and the asset represents the resulting audit report. High audit effort is more likely to yield a more useful (higher value) audit report. However, even with high audit effort, there is a chance that the audit will not reveal a material misstatement and the resulting audit report will not be as useful to users. Similarly, low audit effort is more likely to yield a less useful (lower value) audit report. However, there is still a chance that the low-effort audit will be effective and the resulting audit report useful to users.*
2. Buyers make bids to purchase the assets. Buyers must make bids on all assets available for sale in the period. The minimum bid is zero (0 ED) and the maximum bid per asset is the high asset value (1500 ED). Total bids to purchase all assets available in the period cannot exceed the buyer's account balance. *Buyers' bids provide information regarding buyers' perceptions about the usefulness of sellers' investment choices, representing users' confidence in audit reports.*
3. After all buyers make their bids, all sellers and buyers learn the asset values and updates to their individual accounts. *All participants have the same information regarding asset values each period. In reality, auditors and users do not learn the "true" usefulness of all audit reports. However, information regarding audit clients becomes available in capital markets, providing some indications of the appropriateness of audit reports. Revealing asset values in the experiment represents*

⁶ We predetermine the end period before the experiment based on these probabilities. All sessions have the same number of periods.

this information and facilitates measuring buyers' perceptions about the usefulness of sellers' investment choices. Participants' accounts update each period as follows.

- a. Sellers' accounts increase by the amount of the high bid and decrease by the cost of the seller's chosen investment.
 - b. The buyer who makes the high bid for the asset increases his or her account by the value of the asset and decreases it by the amount of his or her winning bid. Buyers can purchase more than one asset per period. Buyers without high bids for any assets in a period have no change to their accounts for that period. The computer randomly chooses the winner of high bid ties.
4. In sessions with peer review, each seller is randomly assigned to investigate one fellow seller's investment choice. We randomly reassign sellers to a new fellow seller each period.⁷ Each investigating seller learns the actual investment choice made by the fellow seller. *Sellers' investigations of fellow sellers represent peer reviews in audit practice. Sellers learn fellow sellers' investment choices, just as peer reviewers learn about audit effort by reviewing audit working papers. We randomly reassign sellers each period to thwart sellers' attempts to form reputations or strategic alliances with and retaliations against fellow sellers.* Sellers' investigation actions and reporting to buyers and sellers are as follows. In all conditions, all sellers and buyers also learn the seller ID number of the investigating seller. *This is consistent with audit peer review reports, which identify both reviewed firms and peer reviewers.*
- a. In the *truthful* peer report condition, each investigating seller reports the actual high or low investment by the fellow seller that period. All sellers and buyers learn the asset value and actual seller investment level for all assets each period. *This condition provides a baseline to gauge sellers' investment choices when these choices are transparent to all participants.*
 - b. In the *choice* peer report condition, each investigating seller chooses to report either high or low investment by the fellow seller, regardless of the fellow seller's actual investment. All sellers and buyers learn the asset value and seller investment level as reported by the investigating seller for all assets each period. *This condition allows us to investigate the impact on sellers' investment and report choices when investigating sellers choose report values.*
 - c. In the *penalty choice* peer report condition, if a seller made a low investment, the investigating seller chooses whether to impose an additional cost (equal to the difference in cost between the low and high investment) on the fellow seller. Only the investigating seller and the fellow seller know if the investigating seller imposes this additional cost. Each investigating seller then chooses to report either

⁷ Random assignment of investigating sellers took place during the programming stage and is built into the z-Tree program.

high or low investment by the fellow seller, regardless of the fellow seller's actual investment and regardless of whether the investigating seller imposes the additional cost. All sellers and buyers learn the asset value and seller investment level as reported by the investigating seller for all assets each period. *This condition allows us to investigate the impact on sellers' investment and report choices when investigating sellers choose report values and have the opportunity to impose an additional cost on low-investing sellers. We also gain insight to circumstances under which investigating sellers impose additional costs on low-investing sellers. The additional cost represents the additional audit effort the auditor would have put forth had he or she originally performed a high-effort audit.*

5. In the *penalty choice* peer report condition, sellers who have the additional cost imposed on them by investigating sellers receive an update to their accounts.

[INSERT FIGURE 1]

After period one, a history box appears at the top of the screen showing asset value, winning bid, reported investment (in applicable conditions), and peer review seller (in applicable conditions) by seller number. By providing the asset value by seller number, we enable sellers to form reputations for high quality investment independent of the peer review report. The peer review report history enables buyers to use the peer report in their assessment of quality. After the last period, participants complete a short computerized questionnaire with manipulation check and demographics questions. Participants meet individually with the researcher to receive payment based on their final account balances. The average pay is \$21.24 for experiments that lasted approximately 75 minutes.⁸

Independent Variables

We manipulate one independent variable (report condition) in four conditions in a between-subjects design. The *reputation* condition relies only on reputational concerns to

⁸ The average pay is approximately the same across conditions and sessions. The average pay by condition is \$21.56 in the *reputation* report, \$21.78 in the *truthful* peer report, \$20.41 in the *choice* peer report, and \$21.21 in the *penalty choice* peer report. Average pay across sessions ranges from \$19.96 to \$22.87.

discipline behavior. The *truthful* peer report condition requires peer sellers to report actual high or low investments by fellow sellers. The *choice* peer report condition allows peer sellers to choose to report either high or low investments by fellow sellers, regardless of fellow sellers' actual investments. The *penalty choice* peer report condition allows peer sellers to choose to impose an additional cost on low-investing fellow sellers and to report either high or low investments by fellow sellers, regardless of fellow sellers' actual investments and regardless of whether investigating sellers impose the additional cost. The appendix includes sample screens from the computerized experiment to illustrate how we manipulate report condition.

Dependent Variables

We measure the following dependent variables: (1) sellers' investment choices in all four conditions, (2) investigating sellers' report choices in the *choice* peer report and *penalty choice* peer report conditions, and (3) investigating sellers' choices to impose the additional cost on low-investing sellers in the *penalty choice* peer report condition. The appendix includes sample screens from the computerized experiment to illustrate how we collect these measures.

RESEARCH QUESTIONS

The experimental design captures the key aspects of peer review in a setting where individual reputations can form and discipline behavior. We do not formally model the equilibrium for these settings, but briefly sketch the relevant strategies here. Like prior experiments on reputation there is not a unique Nash equilibrium to this game because of the uncertain end period. A single period game produces a lemons equilibrium where the seller makes a low investment and the buyer's winning bid approximates the expected value of low

investment (700 ED). The multiple periods and uncertain end period allow for any number of multi-period equilibria including one in which the seller always makes the high investment and buyer provide a winning bid equal to the expected value of high investment (1300 ED). To maintain such a reputation equilibrium the seller must continue to make the high investment or at least appear to or risk that buyers will lower their prices and play will evolve toward the lemons equilibrium.

We establish the baseline based on reputation only. In the *reputation* condition, individual sellers can build reputations for high value assets with buyers. We compare the *reputation* condition with the *truthful* peer report condition, where a peer seller investigates the seller's investment choice and truthfully reports the result to buyers. The *truthful* peer report condition provides sellers the opportunity to clearly communicate to buyers the investment choices they make. This setting should remove any buyer doubt about the investment choices made by sellers and enhance the ability of sellers to form reputations for high quality. In general, this setting should greater levels of high investment than the *reputation* condition. The setting parallels to some degree the certain information about quality choices present in Mayhew (2001). However, the change in information it does not change the basic strategic interactions between buyers and sellers. The change is best viewed as potentially providing support for achieving one set of equilibria over another. Given the lack of prior research on the impact of such information, we do not propose formal hypotheses. Instead we provide research questions that we seek to address with the data. Our first research question evaluates the impact of truthful peer review compared with reputation alone.

RQ1: Does peer review increase the level of high investment compared with no peer review?

We then remove the truthful reporting requirement and allow peer reviewers to issue peer review reports that do not agree with the information they receive about their peer's actual investment choice. The *choice* peer report condition enables us to observe both the reports by the peer reviewers and the underlying investment selections by sellers. The *choice* peer report condition enables us to compare investment choices to those generated by truthful peer review. We expect the potential for untruthful reporting to reduce the investment quality level. However, the potential for individual reputation building makes it possible that we will not see differences across our conditions.

RQ2: Does the peer reviewer's choice to issue truthful reports result in fewer high investments when compared with required truthful reporting?

We then incorporate a condition where we allow the peer reviewer to punish his peer seller for a low quality investment. We want to explore the criticism that peer reviewers under the AICPA program are not able to penalize peers directly (Fogarty 1996). Under the AICPA program, the peer reviewers have little ability to punish peers who they find are providing low quality audits. They can issue unqualified reports, similar to what we allow in the *choice* peer report condition, but they typically cannot implement penalties.⁹ Ostrom (2002) describes conditions that maximize the potential for collective solutions. The ability to penalize members who do not conform is a key attribute to those solutions. The penalty treatment gives the sellers the power to discipline each other and potentially reach a high quality equilibrium. In fact, the addition of a penalty creates the potential for an equilibrium where sellers always make high

⁹ The AICPA Peer Review Board may terminate a member's enrollment in the peer review program or other action deemed appropriate (AICPA 2008). However, the peer reviewer does not have authority to implement sanctions.

investments, always punish their peers who do not, and buyers pay the expected value of high investment.

In our experiment, the peer reviewer punishes his peer by fining him the same cost as the difference between making high quality investment and low quality investment. We chose this level of penalty to capture the idea that a peer reviewer can ask his peer to correct the omitted procedures. This level of penalty also creates the potential for the seller to avoid the expected cost of high investment if the peer reviewers do not penalize every time s/he makes the low investment. Again, this setting allows us to compare the percentage of high investment choices with the other two settings.

RQ3: Does the portion of high investment choices in the *penalty choice* peer report condition differ from the *choice* and *truthful* peer report conditions?

We also examine whether peer reviewers issue truthful reports. We do not have any prior research or theory from which to build a hypothesis concerning the frequency of truthful peer reporting in this setting.¹⁰ Instead we provide descriptive statistics on the level of truthful reporting. Again, we do not have any theory from which to predict differences in truthful reporting across the *choice* peer report and the *penalty choice* peer report conditions. However, the ability to penalize peers gives the reviewer more reason to attend to the reporting decision and more power to influence the behavior of his peers. This ability gives rise to potential differences in truthful reporting, which we examine in our final research question.

RQ4: Does the portion of truthful reports differ between the *choice* peer report condition and the *penalty choice* peer report condition?

¹⁰ Prior research suggests that peer reviewers are sometimes reluctant to issue negative peer review reports (e.g., Hilary and Lennox 2005; Anantharaman 2007). However, this research is not conclusive so we do not feel confident making an assertion regarding the frequency of truthful peer reporting.

We also conduct additional analyses based on the findings relating to the above research questions in an attempt to discover underlying causes for observed results.

RESULTS

Manipulation Checks

We ask participants two manipulation check questions relating to report condition. The first addresses participants' understanding that peer sellers review fellow sellers' investment choices in the peer review conditions. Participants indicate their agreement with the following statement on a scale of one (strongly disagree) to five (strongly agree):

“Each seller reviewed one other fellow seller's investment level each period.”

The mean response in the *reputation* condition (3.32) is significantly different from the mean responses in the *truthful* peer report condition (mean=4.55; $t=4.775$; $p=0.000$), *choice* peer report condition (mean=4.62; $t=5.469$; $p=0.000$), and *penalty choice* peer report condition (mean=4.42; $t=4.333$; $p=0.000$).¹¹ The mean responses in the *truthful*, *choice*, and *penalty choice* peer report conditions are not significantly different (*truthful/choice* $t=0.461$ and $p=0.646$; *truthful/penalty choice* $t=0.674$ and $p=0.502$; *choice/penalty choice* $t=1.262$ and $p=0.211$). The median response in the *reputation* condition is 3, while the median response is 5 in each of the *truthful*, *choice*, and *penalty choice* peer report conditions. The results suggest a successful manipulation.

The second manipulation check question confirms participants' understanding that sellers report actual investment levels in the *truthful* peer report condition but can choose what

¹¹ Mean tests use session level percentages ($n=4$ per session). All t -values assume heteroscedasticity. All p -values are two-tailed.

investment level to report in the *choice* and *penalty choice* peer report conditions. Participants indicate their agreement with the following statement on a scale of one (strongly disagree) to five (strongly agree):

“Sellers reported investment levels of fellow sellers each period and the reported investment level was the actual investment level by the seller being reported on.”

The mean response in the *truthful* peer report condition (4.58) is significantly greater than the mean responses in the *choice* peer report condition (mean=2.20; $t=11.042$; $p=0.000$) and *penalty choice* peer report condition (mean=2.45; $t=9.778$; $p=0.000$). The mean responses in the *choice* and *penalty choice* peer report conditions are not significantly different ($t=0.976$; $p=0.332$). The median response in the *truthful* peer report condition is 5. The median response is 2 in each of the *choice* and *penalty choice* peer report conditions. These results also suggest a successful manipulation.

Sellers' Investment Choices

Sellers make an investment choice (high or low) each period. Table 2 summarizes sellers' high investment choices in Panel A, results of mean tests in Panel B, and regression analysis results in Panel C. The *reputation* condition generates 64.35 percent high investment, but includes substantial variation – ranging from 36.96 percent to 90.22 percent high investment across sessions.¹² The *truthful* peer report condition produces 61.52 percent high investments, again with high variation across sessions (35.87 percent to 83.70 percent). When we allow peer sellers to choose to report either high or low investments in the *choice* condition, sellers choose

¹² Each condition has 460 investment decisions (4 sellers x 23 periods x 5 sessions). Tables 2, 3, and 4 present data for all 23 periods and for the last ten periods. The overall percentages do not vary greatly between all periods and the last ten periods suggesting that participants' strategies do not change as the experiment nears completion. Consequently, we only discuss results for all periods in the text.

high investments 37.39 percent of the time. The *choice* condition includes one extreme session (83.70 percent) and four other sessions that are relatively low and less disperse (20.65 percent to 34.78 percent). When we add the ability to impose an additional cost on low-investing fellow sellers in the *penalty choice* condition, sellers choose high investments 63.04 percent but in a narrower range than the other sessions (52.17 percent to 71.74 percent).¹³

RQ1 asks whether sellers' high investments differ between the *reputation* and *truthful* peer report conditions. Means tests in table 2, panel B shows that the two are not significantly different ($t=0.203$; $p=0.844$). It appears that peer review does not improve the level of high quality above reputation alone. It is important to note that there is room for improvement as sellers choose low investment nearly one-third of the time.

RQ2 considers whether allowing peers to choose the peer report decreases high investment. Table 2, panel B suggests that on a two-tailed basis the amounts are not different between the *truthful* and *choice* conditions ($t=1.607$; $p=0.149$). However, the difference is marginally significant on a one-tailed basis. This result suggests that allowing sellers to choose whether to report truthfully generally results in lower investment. A closer look suggests that one session of the *choice* condition produces a high rate of investment which, given the limited number of observations, makes finding a significant difference statistically difficult. Moreover, it shows that even with choice the peer report conditions can generate high investment.

RQ3 investigates whether the portion of high investment choices in the *penalty choice* peer report condition differs from the *choice* and *truthful* peer report conditions. Table 2, panel B indicates that allowing peers to penalize low-investing fellow sellers does not increase high investments compared with required truthful reporting ($t=0.154$; $p=0.884$). However, the ability

¹³ While the session level variation appears smaller at the session level means, the standard deviation of high investment at the individual seller level does not appear to differ across conditions.

to penalize does significantly increase high investments compared with the *choice* peer report condition ($t=2.077$; $p=0.096$).

We also run regression analysis to investigate whether report condition significantly impacts sellers' investment choices. The dependent variable is percent high quality investments. The independent variables are indicator variables for the *truthful*, *choice*, and *penalty choice* peer report conditions. The intercept represents the *reputation* condition. Sellers' high quality investments in the *choice* peer report condition are 27 percent less than the *reputation* condition, which is significant ($t=1.83$; $p=0.083$). Compared with the *reputation* condition, sellers' high quality investments are only about three percent less in the *truthful* peer report condition ($t=0.22$; $p=0.830$) and about one percent less in the *penalty choice* peer report condition ($t=0.13$; $p=0.900$). In untabulated analysis, we control for gender and whether or not the individual is an accounting major. The inclusion of the two control variables does not change the reported results. We find weak evidence that females are more likely to make high investment choices, but this result becomes insignificant when we control for non-independent clusters at the session level.

[INSERT TABLE 2]

Investigating Sellers' Report Choices

In the *choice* peer report and *penalty choice* peer report conditions, investigating sellers choose to report either high or low investments by fellow sellers, regardless of fellow sellers' actual investments. This design gives four possible peer seller report scenarios – (1) accurate report of high investment, (2) misreport of high investment as low investment, (3) accurate report of low investment, or (4) misreport of low investment as high investment. RQ4 considers

whether the portion of truthful reports differs between the *choice* peer report condition and the *penalty choice* peer report condition.

Table 3 summarizes investigating sellers' accurate report choices in Panel A, results of mean tests in Panel B, and regression analysis results in Panel C. In the *choice* peer report condition, investigating sellers report accurately in 308 (66.96 percent) of 460 report decisions.¹⁴ Peer sellers report 62.36% (71.34%) accurate reports of high (low) investments by fellow sellers. In the *penalty choice* peer report condition, investigating sellers report accurately in 336 (73.04 percent) of 460 report decisions. 69.97 (78.71) percent are accurate reports of high (low) investments by fellow sellers. There is not a significant difference between conditions in accurate reporting of high ($t=0.723$; $p=0.491$) or low investments ($t=0.847$; $p=0.422$).

We run two separate logit regression analyses to investigate whether report condition significantly impacts sellers' accurate reporting of high and low investments. The dependent variable in each regression is accurate reporting, which has a value of one (zero) if the individual reports (does not report) accurately. The independent variable is an indicator variable for the *penalty choice* peer report condition. The intercept represents the *choice* peer report condition. We also control for gender and whether the individual is an accounting major. The results in table 3, panel C suggest that female participants more often reported high investments accurately ($z=4.18$; $p=0.000$), while accounting majors more often report low investments accurately ($z=2.28$; $p=0.023$). Participants in the *penalty choice* peer report condition also more often report low investments accurately ($z=1.81$; $p=0.070$).

[INSERT TABLE 3]

Investigating Sellers' Choices to Impose Additional Cost on Low-Investing Sellers

¹⁴ Each condition has 460 report decisions (4 sellers x 23 periods x 5 sessions).

In the *penalty choice* peer report condition, peer sellers choose whether to impose an additional cost on low-investing fellow sellers. Peer sellers can impose the additional cost whether they report accurately (report low investments by fellow sellers as low investments) or misreport (report low investments by fellow sellers as high investments). Table 4 summarizes investigating sellers' choices to impose the additional cost on low-investing sellers in Panel A and a mean test considering the propensity to penalize in Panel B. Peer sellers impose the penalty in 59.59 percent of low investments by fellow sellers. Peer sellers accurately report 76.19 percent of the time when they impose the additional cost on low-investing fellow sellers.

Peer sellers do not impose penalties on low-investing sellers 40% of the time. Given the parameters in our setting, if the peer sellers imposed the penalty 100% of the time, the investing sellers should choose high investment every time. By not imposing the penalty, the peer sellers change the calculus of the investing decision such that investing sellers can choose low investment. The rationality of that choice depends on the price differential they can receive if they build a reputation with buyers. We address buyers' prices below.

[INSERT TABLE 4]

Supplemental Analyses

Why doesn't truthful peer review lead to more high investments?

We took a closer look at the *truthful* condition to see if we could infer why these markets did not generate consistently greater levels of high investment. It is important to note that the average level of 62 percent high investment leaves ample opportunity to reach higher levels. Sessions 2-4 all generated higher than average high investment levels (hereafter High sessions), and sessions 1 and 5 produced lower than average high investment (hereafter Low sessions). The

most striking difference between these two groups is that the initial level of high investment is much higher in the High sessions than in the Low sessions. In the first period of the High sessions, all sellers select high investment. In contrast, sellers select high investment only 25 percent of the time in the Low sessions' first periods. This initial contrast continues to persist throughout the sessions. Session 5 provides some insight into why it persists. Seller 4 in this session selects high investment 21 out of 23 opportunities and builds a reputation for quality that results in bids very near the 1,300 ED expectation, given high investment. At first, it is rather perplexing why the other sellers do not follow suit, as average bids are well below the 200 ED difference that would justify additional investment. However, it appears that with truthful peer reporting, where buyers learn exactly what the seller has chosen, buyers appear reluctant to reward sellers who switch to high investment with higher bids. The buyers appear wary that the sellers will switch back to low investment. After a few periods of not getting rewarded for high investment, the sellers return to low investment, which of course reinforces the buyers' beliefs. The result is that sellers who initially select low investment have a difficult time building a new reputation for high investment. We believe further research is justified into how buyers react to changes in seller reputations. Such research would require controlling sellers' decisions and measuring buyers' reactions to the seeded patterns.

Do Group Reputations Matter in Buyer Bids?

We consider whether group reputations for high quality investment based on actual values observed and/or peer reports impact buyer bids in table 5. We only use data after period 10 in each session to allow time for each seller to establish a reputation for delivering high value assets or receiving peer reports that suggest high value investment.

To evaluate whether or not group reputations impact winning bids we run the following regression models:

$$\text{Winning Bid}_t = \beta_1 \text{Cumulative Percent High Asset Value}_{t-1} + \beta_2 \text{Cumulative Percent High Peer Report}_{t-1} + \varepsilon$$

$$\text{Winning Bid}_t = \beta_1 \text{Cumulative Percent High Asset Value}_{t-1} + \beta_2 \text{Cumulative Percent High Peer Report}_{t-1} + \beta_3 \text{Group Cumulative Percent High Asset Value}_{t-1} + \beta_4 \text{Group Cumulative Percent High Peer Report}_{t-1} + \varepsilon$$

Where:

Winning Bid = the winning bid for a seller's asset in period t (where t is > 10).

Cumulative Percent High Asset Value_{t-1} = percentage of total assets that were high value assets as of period t-1 for seller i.

Cumulative Percent High Peer Report_{t-1} = percentage of peer seller reports that were high investment reports as of period t-1 for seller i.

Group Cumulative Percent High Asset Value_{t-1} = percentage of total assets that were high value assets as of period t-1 for sellers other than seller i in the same session.

Group Cumulative Percent High Peer Report_{t-1} = percentage of peer seller reports that were high investment reports as of period t-1 for sellers other than seller i in the same session.

The group variables are intended to examine whether or not group reputations impact winning bids. We present results based on these regressions in table 5. We evaluate winning bids separately for each condition to gain more insight into the conditions under which asset or peer report reputations matter more.

The *reputation* condition only includes cumulative asset value variables because the condition does not include peer reporting. The results suggest group reputations matter as we see the group variable, as well as the individual asset variable, is significant. This result suggests bidding for one seller's assets depends partially on the other sellers' histories.

The *truthful* condition results are similar but reflect the presence of truthful peer reports. Buyers appear to use the history of truthful peer reports to formulate bids rather than the history of asset values. This approach makes sense because the peer reports convey the seller's actual

investment levels rather than just the observed asset realizations. The key remains that some of the buyers bids appear to reflect the reputations of the other sellers in addition to the individual seller's reputation.

The *choice* and *penalty* conditions also suggest that group reputations impact bids, but are more difficult to interpret. The *choice* condition in table 5, panel A shows little evidence that individual asset or peer report reputations impact winning bids. This result may reflect the low level of high quality investment generally found in this condition. When we add in the group asset and peer report variables in table 5, panel B, both group variables are significant. Group assets are positive and group peer reports are negative. This result seems a little odd, but may reflect the low reliability of peer reports. The penalty condition results are also a bit odd. There is some evidence that peer reports are relied upon in Panel A, and evidence that all four independent variables are significant in panel B. However, the magnitude of the variables does not make much sense, nor does the intercept. There appears to be a fair amount of collinearity in this case that may be impacting the coefficients. However, we find the panel B model has the highest adjusted R^2 's, which suggests the model describes the behavior in these markets.

Overall, table 5 suggests that group reputations impact buyer bids. We continue to evaluate the robustness of this result. We note that when we control for clusters all the group results go away. However, since we control for clusters at the session level, we would expect it to remove any session level effects such as group reputation. We continue to search for a way to examine the impacts of group reputation that takes into account the lack of independence within sessions.

Strategic Peer Reports

It is interesting to note in Table 3 that some participants appeared to act strategically and use misreporting to influence outcomes. Almost one-third misreport high investments as low, and another one-third misreport low investments as high. The first case is consistent with participants acting strategically in their own interests. By misreporting high investments as low, a peer seller can attempt to build an individual reputation by making it appear that other sellers are making low investments while the reporting seller is making high investments. This strategy could also be an attempt to maintain hope among buyers for high returns. If buyers see low reported investments tied to high asset values, buyers could believe that low quality investments do not lead to low asset values. So a low-investing seller would want it to appear the frequency of low investments yielding high asset values is higher than the stated probabilities.

The second case is consistent with participants acting strategically to improve the overall perception of the group. By misreporting low investments as high, peer sellers can attempt to signal to buyers that the group is making high investments and that low asset values are due to the probabilities associated with high investment choices.

CONCLUSIONS

We investigate quality choices that individuals make under self-regulation. We use simple high or low investment choices to proxy for high or low quality choices. We compare investment choices made in a condition where only reputation disciplines behavior to conditions where peers review and issue reports on the investment choices made by their peers. We find little evidence to support peer-based self-regulation increasing high quality investment when compared with the condition that relies on reputation alone. We also examine the truthfulness of peer reports when peers are not constrained to provide honest reports and find that peers

misreport their fellow sellers investment choices about one-third of the time. Peer reports under these conditions actually lower high quality choices unless the peer reviewers can penalize sellers who make low quality investments, in which case high quality investment returns to the levels under truthful peer reporting or reputation alone.

Our study does not formally incorporate group-level incentives that can impact the value of peer review. Other studies have modeled these group-level incentives and found some evidence that peer review enhanced quality choices (Grant et al. 1996; Hepp and Mayhew 2008). We intentionally did not incorporate such incentives. Instead we include the opportunity for individual reputations, which prior research excludes, to impact quality choices. We believe our results provide insight into the effectiveness of peer review. However, additional research is necessary to better understand the role peer review can play when we formally include group incentives, especially in settings where individual reputations can also play a disciplining role. The other natural question is how does peer review compare to government or other external regulation? Given the creation of the PCAOB, we believe the question of government regulation should be compared with peer review and with individual reputation as well.

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Appendix Sample Screens

Seller Investment Screen: All Conditions

Period
1

Below is information regarding asset values, probabilities for asset values given your investment level choice, and your cost for each investment level. Please choose your investment level for this period's asset and press OK.

Your account balance is 2000.
Your cost to make a **high** investment in this period's asset is 350.
Your cost to make a **low** investment in this period's asset is 150.

The probability that a **high** investment yields a **high** asset value of 1500 is 0.80.
The probability that a **high** investment yields a **low** asset value of 500 is 0.20.

The probability that a **low** investment yields a **high** asset value of 1500 is 0.20.
The probability that a **low** investment yields a **low** asset value of 500 is 0.80.

Your investment in this period's asset

Low
 High

OK

Investigating Seller Report Screen: *Truthful* Peer Report Condition

Period
1

You are responsible for investigating one fellow seller's investment choice each period. You are randomly reassigned to a new fellow seller each period. Below is the asset information for the seller you are investigating this period.

Seller ID number	4
Asset value	1500
Seller's investment level	High

You must report to buyers and the other sellers regarding your investigation. You must report the actual high or low investment by this seller for this period. The report will present the seller ID number for the seller you investigate and that seller's actual investment level. The report will also present your seller ID number as reporting seller. Please press OK to report this information.

OK

Appendix (continued)
Sample Screens

Investigating Seller Report Screen: *Choice Peer Report Condition*

Period 1

You are responsible for investigating one fellow seller's investment choice each period. You are randomly reassigned to a new fellow seller each period. Below is the asset information for the seller you are investigating this period.

Seller ID number	4
Asset value	500
Seller's investment level	Low

You must report to buyers and the other sellers regarding your investigation. You may report either high or low investment by this seller for this period, regardless of the seller's actual investment shown above. The report will present the seller ID number for the seller you investigate and your reported investment level. The report will also present your seller ID number as reporting seller.

Which investment level for this asset do you wish to report to buyers and other sellers this period? Low High

OK

Investigating Seller Report Screen, Low-Investor: *Penalty Choice Peer Report Condition*

Period 1

You are responsible for investigating one fellow seller's investment choice each period. You are randomly reassigned to a new fellow seller each period. Below is the asset information for the seller you are investigating this period.

Seller ID number	1
Asset value	500
Seller's investment level	Low

The seller you are investigating this period made a low investment so you may choose to impose an additional cost on the seller. The cost is equal to the difference in cost between the low and high investment. Only you and the seller you investigate will be aware that the seller is paying this cost.

Do you wish to impose the additional cost on this seller this period?
 No Yes

You must report to buyers and the other sellers regarding your investigation. You may report either high or low investment by this seller for this period, regardless of the seller's actual investment shown above and regardless of whether you choose to impose the additional cost on this seller. The report will present the seller ID number for the seller you investigate and your reported investment level. The report will also present your seller ID number as reporting seller.

Which investment level for this asset do you wish to report to buyers and other sellers this period?
 Low High

OK

Appendix (continued)
Sample Screens

Investigating Seller Report Screen, High-Investor: *Penalty Choice* Peer Report Condition

Period
1

You are responsible for investigating one fellow seller's investment choice each period. You are randomly reassigned to a new fellow seller each period. Below is the asset information for the seller you are investigating this period.

Seller ID number	2
Asset value	1500
Seller's investment level	High

You must report to buyers and the other sellers regarding your investigation. You may report either high or low investment by this seller for this period, regardless of the seller's actual investment shown above. The report will present the seller ID number for the seller you investigate and your reported investment level. The report will also present your seller ID number as reporting seller.

Which investment level for this asset do you wish to report to buyers and other sellers this period?

Low
 High

OK

Report Screen to All Participants: *Truthful* Peer Report Condition

Period
1

Each seller is randomly assigned to investigate one fellow seller each period. Sellers are randomly reassigned to a new fellow seller each period. Each seller learns the actual investment (low or high) made by the seller he or she investigates and must then report the actual high or low investment by the fellow seller this period.

Sellers made the following investments this period:

Seller ID	1	2	3	4
Asset value	500	1500	1500	1500
Seller's investment level	Low	High	Low	High
Reporting seller ID number	3	4	1	2

OK

Appendix (continued)
Sample Screens

Report Screen to All Participants: *Choice* Peer Report Condition

Period 1

Each seller is randomly assigned to investigate one fellow seller each period. Sellers are randomly reassigned to a new fellow seller each period. Each seller learns the actual investment (low or high) made by the seller he or she investigates. Investigating sellers then choose to report to everyone else that the investigated seller made either a low or high investment, regardless of the fellow seller's actual investment in this period's asset.

Sellers chose to report that fellow sellers made the following investments this period:

Seller ID	1	2	3	4
Asset value	500	500	1500	500
Reported seller's investment level	Low	High	High	High
Reporting seller ID number	3	4	1	2

OK

Report Screen to All Participants: *Penalty Choice* Peer Report Condition

Period 1

Each seller is randomly assigned to investigate one fellow seller each period. Sellers are randomly reassigned to a new fellow seller each period. Each seller learns the actual investment (low or high) made by the seller he or she investigates. Investigating sellers then choose to report to everyone else that the investigated seller made either a low or high investment, regardless of the fellow seller's actual investment in this period's asset.

If the seller being reviewed makes a low investment, the investigating seller may also choose to impose an additional cost on the seller being reviewed. (Note: Investigating sellers may choose to impose this cost regardless of what investment level the investigating sellers report to buyers and other sellers.) The cost is equal to the difference in cost between the low and high investment. Only the investigating seller and the seller being reviewed will be aware that the seller is paying this cost.

Sellers chose to report that fellow sellers made the following investments this period:

Seller ID	1	2	3	4
Asset value	500	1500	1500	500
Reported seller's investment level	Low	High	Low	High
Reporting seller ID number	3	4	1	2

OK

Figure 1
Experiment Procedures

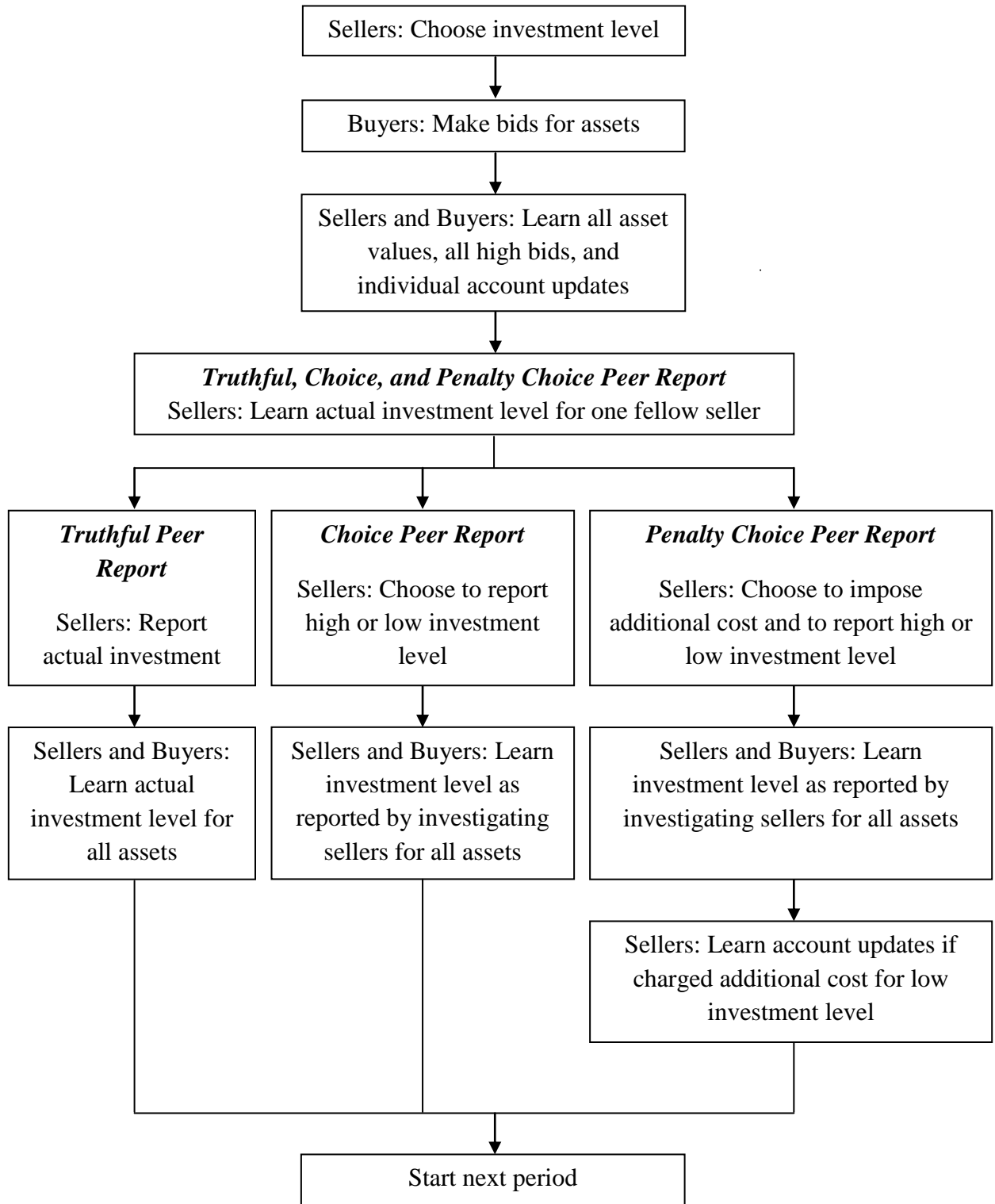


Table 1
Demographics

		<u>N</u>	<u>%</u>
Gender	Female _____	74	46.25%
	Male _____	<u>86</u>	<u>53.75%</u>
	Total _____	160	100.00%
Age	Mean: 20.86 years		
	Median: 21.00 years		
Year in School	Sophomore _____	44	27.50%
	Junior _____	43	26.88%
	Senior _____	55	34.38%
	Graduate _____	17	10.63%
	Non-traditional _____	<u>1</u>	<u>0.63%</u>
	Total ¹⁵ _____	160	100.00%
Major	Accounting _____	44	27.50%
	Other business _____	80	50.00%
	Non-business _____	<u>36</u>	<u>22.50%</u>
	Total _____	160	100.00%
Number of Internships	Mean: 0.98		
	Median: 1.00		

¹⁵ Total percent adds up to slightly more than 100.00% due to rounding.

Table 2
Sellers' High Investment Choices

Panel A: High Investment Choices				
	All Periods		Last 10 Periods	
	<u>N</u>	<u>%¹⁶</u>	<u>N</u>	<u>%¹⁷</u>
<i>Reputation Condition</i>				
Session 1 _____	83	90.22%	35	87.50%
Session 2 _____	80	86.96%	31	77.50%
Session 3 _____	51	55.43%	22	55.00%
Session 4 _____	48	52.17%	16	40.00%
Session 5 _____	<u>34</u>	<u>36.96%</u>	<u>12</u>	<u>30.00%</u>
Overall _____	296	64.35%	116	58.00%
<i>Truthful Peer Report Condition</i>				
Session 1 _____	33	35.87%	13	32.50%
Session 2 _____	77	83.70%	35	87.50%
Session 3 _____	67	72.83%	30	75.00%
Session 4 _____	66	71.74%	29	72.50%
Session 5 _____	<u>40</u>	<u>43.48%</u>	<u>18</u>	<u>45.00%</u>
Overall _____	283	61.52%	125	62.50%
<i>Choice Peer Report Condition</i>				
Session 1 _____	19	20.65%	4	10.00%
Session 2 _____	77	83.70%	34	85.00%
Session 3 _____	32	34.78%	8	20.00%
Session 4 _____	20	21.74%	4	10.00%
Session 5 _____	<u>24</u>	<u>26.09%</u>	<u>7</u>	<u>17.50%</u>
Overall _____	172	37.39%	57	28.50%
<i>Penalty Choice Peer Report Condition</i>				
Session 1 _____	66	71.74%	28	70.00%
Session 2 _____	57	61.96%	24	60.00%
Session 3 _____	64	69.57%	28	70.00%
Session 4 _____	48	52.17%	21	52.50%
Session 5 _____	<u>55</u>	<u>59.78%</u>	<u>24</u>	<u>60.00%</u>
Overall _____	290	63.04%	125	62.50%

Panel B: Mean Tests¹⁸

	<u>t-value</u>	<u>p-value</u>
<i>Reputation</i> versus <i>Truthful Peer Report</i>	0.203	0.844
<i>Reputation</i> versus <i>Choice Peer Report</i>	1.711	0.126
<i>Reputation</i> versus <i>Penalty Choice Peer Report</i>	0.119	0.910
<i>Truthful Peer Report</i> versus <i>Choice Peer Report</i>	1.607	0.149
<i>Penalty Choice Peer Report</i> versus <i>Truthful Peer Report</i>	0.154	0.884
<i>Penalty Choice Peer Report</i> versus <i>Choice Peer Report</i>	2.077	0.096

Panel C: Regression Analysis¹⁹

$$\text{Percent High Quality Investments} = \beta_1 \text{Truthful} + \beta_2 \text{Choice} + \beta_3 \text{Penalty Choice} + \varepsilon$$

	<u>Coefficient Estimate</u>	<u>Standard Error</u>	<u>t-value</u>	<u>p-value</u>
Intercept (<i>Reputation</i>)	0.643	0.097	6.62	0.000
<i>Truthful</i>	-0.028	0.130	-0.22	0.830
<i>Choice</i>	-0.270	0.147	-1.83	0.083
<i>Penalty Choice</i>	-0.013	0.103	-0.13	0.900
N=80 (20 per condition), 20 clusters (5 per condition)		F(3,19)=1.68, p=0.2052		R ² =0.147

¹⁶ Each session (condition) has 92 (460) investment decisions (4 sellers x 23 periods x 5 sessions).

¹⁷ Each session (condition) has 40 (200) investment decisions (4 sellers x 10 periods x 5 sessions).

¹⁸ Mean tests use session level percentages (n=4 per session). All t-values assume heteroscedasticity. All p-values are 2-tailed.

¹⁹ The independent variables are condition indicator variables. We adjust standard errors for clusters by session.

Table 3
Investigating Sellers' Accurate Report Choices

Panel A: Accurate Report Choices				
	<u>All Periods</u>		<u>Last 10 Periods</u>	
	<u>N</u>	<u>%</u> ^{20,21}	<u>N</u>	<u>%</u> ^{24,22}
Accurate report of high investment				
<i>Choice Peer Report Condition</i>				
Session 1 _____	15	84.44%	4	100.00%
Session 2 _____	53	70.84%	24	73.89%
Session 3 _____	16	50.15%	4	41.67%
Session 4 _____	11	54.58%	3	66.67%
Session 5 _____	<u>13</u>	<u>51.79%</u>	<u>5</u>	<u>54.17%</u>
Overall _____	108	62.36%	40	67.28%
<i>Penalty Choice Peer Report Condition</i>				
Session 1 _____	28	44.91%	10	38.19%
Session 2 _____	54	95.66%	24	100.00%
Session 3 _____	42	65.54%	16	58.18%
Session 4 _____	40	74.84%	15	54.17%
Session 5 _____	<u>35</u>	<u>68.89%</u>	<u>11</u>	<u>68.75%</u>
Overall _____	199	69.97%	76	63.86%
Accurate report of low investment				
<i>Choice Peer Report Condition</i>				
Session 1 _____	55	76.45%	24	66.67%
Session 2 _____	10	79.17%	5	66.67%
Session 3 _____	32	52.12%	15	48.26%
Session 4 _____	46	63.89%	26	71.46%
Session 5 _____	<u>57</u>	<u>85.06%</u>	<u>26</u>	<u>92.26%</u>
Overall _____	200	71.34%	96	69.06%
<i>Penalty Choice Peer Report Condition</i>				
Session 1 _____	20	73.77%	10	89.58%
Session 2 _____	33	95.45%	15	95.83%
Session 3 _____	23	86.11%	10	83.33%
Session 4 _____	35	80.77%	18	93.75%
Session 5 _____	<u>26</u>	<u>57.45%</u>	<u>12</u>	<u>53.13%</u>
Overall _____	137	78.71%	65	83.12%
<hr/>				
Panel B: Mean Tests ²³				
<i>Penalty Choice Peer Report versus Choice Peer Report</i>	<u>t-value</u>	<u>p-value</u>		
Accurate report of high investment	0.723	0.491		
Accurate report of low investment	0.847	0.422		

²⁰ Each session (condition) has 92 (460) investment decisions (4 sellers x 23 periods x 5 sessions).

²¹ Percentages based on actual number of high or low investments. Session (overall) percentages are averages of individual (session) percentages.

²² Each session (condition) has 40 (200) investment decisions (4 sellers x 10 periods x 5 sessions).

²³ Mean tests use session level percentages (n=4 per session). All t-values assume heteroscedasticity. All p-values are 2-tailed.

Table 3
Investigating Sellers' Accurate Report Choices

Panel C: Logit Regression Analyses²⁴

$$Accurate\ Report = \beta_1 Penalty\ Choice + \beta_2 Female + \beta_4 Accounting\ Major + \varepsilon$$

Accurate report of high investment

	<u>Coefficient Estimate</u>	<u>Standard Error</u>	<u>z-value</u>	<u>p-value</u>
Intercept (<i>Choice</i>)	-0.156	0.165	-0.94	0.346
<i>Penalty Choice</i>	0.307	0.397	0.77	0.440
Female	1.138	0.272	4.18	0.000
Accounting Major	0.495	0.477	1.04	0.299

N=462 (172 in *choice* condition, 290 in *penalty choice* condition), 10 clusters (5 per condition)

Wald $\chi^2(3)=30.82$, $p=0.000$

Accurate report of low investment

	<u>Coefficient Estimate</u>	<u>Standard Error</u>	<u>z-value</u>	<u>p-value</u>
Intercept (<i>Choice</i>)	0.385	0.418	0.92	0.357
<i>Penalty Choice</i>	0.709	0.391	1.81	0.070
Female	0.381	0.345	1.10	0.270
Accounting Major	0.767	0.337	2.28	0.023

N=458 (288 in *choice* condition, 170 in *penalty choice* condition), 10 clusters (5 per condition)

Wald $\chi^2(3)=6.00$, $p=0.112$

²⁴ Accurate report is 1 (0) if the individual reports (does not report) accurately. *Penalty Choice* is a condition indicator variable. Female is 1 (0) if the individual is female (male). Accounting Major is 1 (0) if the individual is (not) an accounting major. We adjust standard errors for clusters by session.

Table 4
Investigating Sellers' Choices to Impose Additional Cost on Low-Investing Sellers
in *Penalty Choice* Condition

Panel A: Choices to Impose Additional Cost				
	<u>All Periods</u>		<u>Last 10 Periods</u>	
	<u>N</u>	<u>%²⁵</u>	<u>N</u>	<u>%²⁸</u>
Impose cost overall				
Session 1 _____	19	72.92%	12	100.00%
Session 2 _____	14	46.36%	6	41.67%
Session 3 _____	21	72.50%	10	83.33%
Session 4 _____	33	56.25%	15	56.25%
Session 5 _____	<u>17</u>	<u>49.92%</u>	<u>9</u>	<u>62.50%</u>
Overall _____	104	59.59%	52	68.75%
Impose cost and report accurately as low				
Session 1 _____	15	66.48%	10	89.58%
Session 2 _____	13	93.33%	6	100.00%
Session 3 _____	17	83.33%	8	75.00%
Session 4 _____	28	80.60%	15	100.00%
Session 5 _____	<u>11</u>	<u>57.22%</u>	<u>7</u>	<u>77.78%</u>
Overall _____	84	76.19%	46	88.47%

Panel B: Mean Tests ²⁶		
	<u>t-value</u>	<u>p-value</u>
Investigating sellers impose cost overall	1.717	0.161
Investigating sellers impose cost and report accurately as low	4.094	0.015

²⁵ Session (overall) percentages are averages of individual (session) percentages. Percentages for imposing the cost overall are number of times seller chose to impose cost as percentage of low investments investigated by that seller. Percentages for imposing cost and reporting accurately based on number of times the investigating seller chose to impose the additional cost.

²⁶ One-sample mean tests use session level percentages versus 0.50 (n=4 per session). All t-values assume heteroscedasticity. All p-values are 2-tailed.

Table 5
Individual and Group Reputation Analyses

Panel A: Individual Reputation²⁷

$$\text{Winning Bid}_t = \beta_1 \text{Cumulative Percent High Asset Value}_{t-1} + \beta_2 \text{Cumulative Percent High Peer Report}_{t-1} + \varepsilon$$

<i>Period > 10</i>	<i>Reputation</i>		<i>Truthful Peer Report</i>		<i>Choice Peer Report</i>		<i>Penalty Choice Peer Report</i>	
Variable	Coeff. Estimate (Std. Error)	t-value (p-value)	Coeff. Estimate (Std. Error)	t-value (p-value)	Coeff. Estimate (Std. Error)	t-value (p-value)	Coeff. Estimate (Std. Error)	t-value (p-value)
Intercept	770.272 (38.669)	19.92 (0.000)	542.993 (39.088)	13.89 (0.000)	822.143 (31.587)	26.03 (0.000)	784.851 (56.287)	13.94 (0.000)
Cumulative Percent High Asset Value	525.830 (61.541)	8.54 (0.000)	-80.660 (115.141)	-0.70 (0.484)	17.532 (78.066)	0.22 (0.822)	107.481 (109.983)	0.98 (0.329)
Cumulative Percent High Peer Report	NA	NA	893.664 (77.716)	11.50 (0.000)	59.037 (57.183)	1.03 (0.303)	402.545 (113.486)	3.55 (0.000)
N ²⁸	260		260		260		260	
Adjusted R ²	0.218		0.616		0.000		0.094	

Panel B: Group Reputation^{1,29}

$$\text{Winning Bid}_t = \beta_1 \text{Cumulative Percent High Asset Value}_{t-1} + \beta_2 \text{Cumulative Percent High Peer Report}_{t-1} + \beta_3 \text{Group Cumulative Percent High Asset Value}_{t-1} + \beta_4 \text{Group Cumulative Percent High Peer Report}_{t-1} + \varepsilon$$

<i>Period > 10</i>	<i>Reputation</i>		<i>Truthful Peer Report</i>		<i>Choice Peer Report</i>		<i>Penalty Choice Peer Report</i>	
Variable	Coeff. Estimate (Std. Error)	t-value (p-value)	Coeff. Estimate (Std. Error)	t-value (p-value)	Coeff. Estimate (Std. Error)	t-value (p-value)	Coeff. Estimate (Std. Error)	t-value (p-value)
Intercept	643.519 (64.583)	9.96 (0.000)	789.768 (80.162)	9.85 (0.000)	796.690 (38.327)	20.79 (0.000)	-1449.991 (461.902)	-3.14 (0.002)
Cumulative Percent High Asset Value	501.299 (61.785)	8.11 (0.000)	-31.439 (121.890)	-0.26 (0.797)	149.956 (82.603)	1.82 (0.071)	909.731 (191.160)	4.76 (0.000)
Cumulative Percent High Peer Report	NA	NA	831.280 (86.354)	9.63 (0.000)	28.236 (58.519)	0.48 (0.630)	542.670 (128.840)	4.21 (0.000)
Group Cumulative Percent High Asset Value	237.485 (97.424)	2.44 (0.015)	-674.886 (186.670)	-3.62 (0.000)	557.722 (139.817)	3.99 (0.000)	2180.533 (500.609)	4.36 (0.000)
Group Cumulative Percent High Peer Report	NA	NA	257.171 (114.702)	2.24 (0.026)	-592.891 (105.615)	-5.61 (0.000)	902.266 (212.768)	4.24 (0.000)
N ²	260		260		260		260	
Adjusted R ²	0.232		0.634		0.103		0.170	

²⁷ Winning Bid_t is the amount the seller received for asset at *t*. Cumulative Percent High Asset Value_{t-1} is the percentage that the individual's asset value was high through *t-1*. Cumulative Percent High Report Value_{t-1} is the percentage that the peer reviewer reported high investment for the individual through *t-1*. We do not adjust standard errors for clusters by session in these analyses.

²⁸ 4 sellers x 13 periods x 5 sessions.

²⁹ Group Cumulative Percent High Asset Value_{t-1} is the percentage that the other three sellers' asset values were high through *t-1*. Group Cumulative Percent High Report Value_{t-1} is the percentage that the peer reviewers for the other three sellers reported high investment through *t-1*.