Does the Wealth Effect Exist in the Market for Audit Services? An Experimental Examination

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ABSTRACT

Previous audit pricing literature has assumed that audit costs are known with certainty. In contrast, this study attempts to model the market for audit services in an auction format that incorporates cost uncertainty. I argue that the market for audit services is representative of a common value procurement auction. Auction literature has provided evidence of a winner's curse; in that auction participants fail to properly adjust their bids to deal with uncertainty, and of a wealth effect; in that increased wealth is associated with riskier bidding behavior. The winner's curse and the wealth effect have not been examined in sellers' market in which participants may incur financial losses. In a laboratory setting I find that future quasi-rents are not necessary for low balling to occur in a common value procurement auction. I also find a significant wealth effect that is present after controlling for the mutual best response and the effect of learning. A potential explanation for this behavior is that as a firm's wealth increases so does a firm's propensity for risk.

INTRODUCTION

The primary purpose of this study is to draw inferences about audit pricing by using an experiment to incorporate an assumption of cost uncertainty by modeling the market for audit services as a common value procurement auction. By adding the assumption of uncertain audit cost, this study seeks to add new insights regarding auditor pricing behavior. In addition, the findings of this study apply to other manufacturing and service industries in which (1) uncertainty exists as to the accurate cost of the product and/or service being supplied at the time of setting prices, and (2) competing companies have a very similar cost structure.

There has been considerable research performed regarding audit pricing, but in these various studies the cost of the audit service was known with certainty (e.g. DeAngelo 1981; Dopuch et al. 1989; Schatzberg 1990; Dopuch and King 1996; Mayhew 2001**;** Mayhew and Pike 2004). This study extends the previous literature by incorporating a more realistic assumption: when the audit firm prepares an offer to provide an audit service, a degree of uncertainty exists as to the true cost of providing the service.

The experimental approach used in this study has student participants play the role of an audit firm making price offerings to prospective clients. Unlike previous low balling experiments, the audit firm is not provided with the true cost of the item, but instead is provided with a signal as to the true cost of the item.

By modeling audit pricing as a first-price common value procurement auction, we make the following assumption. We assume that the cost of the item (attestation services) being sold is the same for all sellers (accounting firms). These sellers make offers to prospective buyers (audit clients). The sellers are uncertain of the item's true cost but possess private information, which provides each with a noisy signal as to the true cost of the item.

In first-price common value procurement auctions, there are two components which sellers should consider when determining the proper price offering. The first component to be considered is the profit to be earned conditional on submitting the winning offer; the asking price less the cost of the item. The second component is the probability of winning the auction. The two components are related in that by increasing (reducing) the asking price, the firm is increasing (decreasing) the profits to be earned conditional on winning but at the same time decreasing (increasing) the probability that they will win the audit.

The winner's curse has been observed in a common value auction format such that prospective buyers placed bids in excess of the item's true value (Kagel and Levin 1986; Dyer, Kagel and Levin 1989 and Kagel, Levin, Battalio and Meyer 1989). Auction experiments have also provided evidence of a wealth effect occurring in common (Kagel and Levin 1986) and private value auctions (Ham et al. 2005). In these auction formats, higher cash balances appear to be associated with lower bids. One potential explanation that is consistent with the observed bidding patterns is that as individuals amass wealth they become less risk averse.

The results of this study demonstrate that audit firms commonly make price offerings below the true cost of the item. The observed low balling is not a function of future quasi-rents, as suggested by previous literature (DeAngelo 1981), but instead provides evidence that audit firms fall prey to the winner's curse. Over time, audit firms increase their offerings indicative of learning and of a wealth effect. The wealth effect observed is consistent with the assumption that as audit firms gain wealth they become less risk averse in price offerings.

This study contributes to audit practice, accounting research and economics research. First, the study illustrates how experimenters may enhance the realism of audit pricing experiments through the incorporation of features applicable to common value procurement auctions. This study thereby extends the previous audit pricing literature by incorporating a more realistic assumption: when the firm prepares an offer to provide services, a degree of uncertainty exists as to the true cost of providing the service. As Dopuch and King (1996, 67) assert "the interaction between markets and behavioral characteristics could be a fruitful area for future research in the auditing area."

Second, accounting researchers have only recently begun to utilize auction theory to answer a variety of theoretical and empirical research questions. For example, Baiman, Fischer,

Rajan and Saouma (2007) model the relationship between managerial incentives and the efficient allocation of resources to divisions within a firm that may be achieved through having the firm's managers participate in a sealed bid second-price auction. In contrast Bloomfield and Luft (2006) utilize an almost common value procurement auction to examine the effect that responsibility for cost management has on learning.

Third, the study contributes to the economic literature by investigating factors which contribute to deviations from the risk neutral Nash equilibrium bidding strategy in sellers' markets. Previous studies of the winner's curse in a sellers' market were constructed such that participants could incur opportunity costs but not true financial losses and previous studies of the wealth effect have only utilized auction formats that occur in buyers' markets. In contrast, this study utilizes a procurement auction format to allow for an examination of the winner's curse and the wealth effect in sellers' markets. It is important to examine this auction format as it is characteristic of many real-world business settings.

LITERATURE REVIEW

In response to repeated accusations that low-balling pricing strategies impair auditor independence, DeAngelo (1981) constructed a model to investigate the theoretical foundation of such claims. The intuition provided via her model is that low-balling is merely a "competitive response to the expectation of future quasi-rents, and does not itself impair independence" (DeAngelo 1981, p. 126). Schatzberg (1990) tested DeAngelo's model in an experimental laboratory setting and found support for the assertion that low-balling occurs in competitive markets in which positive transaction costs exist.

Extending previous literature, this study models the market for audit services in an auction format that incorporates cost uncertainty. Using an auction format representative of the

market for audit services allows me to incorporate auction theory to develop testable hypotheses. The applicability of a particular auction format to the market for audit services depends upon the degree by which a specific format embodies the following: 1) the marketplace in which audit services are contracted, 2) the rules of the market for audit services, and 3) the type of information possessed by the audit firms when preparing a price offering. Table 1 provides a brief summary of the auction formats to be considered.

[Insert Table 1 about here]

The first issue to be addressed is the marketplace in which audit services are contracted. The suppliers of audit services, the audit firms, submit price offerings to prospective clients. Therefore, the market for audit services occurs in a sellers' market and is thereby considered a procurement auction.

The second issue to be addressed concerns the rules of the market for audit services. Assuming that prospective audit clients accept the lowest bid[1], the audit market is a first-price sealed bid procurement auction.

The third issue to be addressed concerns the information possessed by the audit firms about the auctioned item's value prior to submitting a quote. When submitting a price offering to a prospective client, the audit firm is unable to ascertain the exact amount and type of audit work that will have to be conducted to meet or exceed the confines of generally accepted auditing standards, thereby creating uncertainty as to the firm's cost for providing the audit. Prior to submitting an offer to provide audit services, the firm's representatives may carry out initial

[1] This assumption is consistent with the finding that local government units choose auditors on the basis of price (O'Keefe, King, and Gaver 1994).

audit planning. They may, for example, perform various preliminary audit procedures with respect to the potential client such as: perform a review of the current and/or prior financial statements; interview client personnel; develop initial assessments of materiality, inherent risk, internal control risk, and audit risk; and/or begin to develop a tailored audit program (Arens et al. 2007). One of the reasons for carrying out these initial procedures is to reduce the degree of uncertainty associated with quantifying the potential cost of the audit; nonetheless, regardless of the procedures carried out, a degree of uncertainty will remain until the audit is subsequently performed.

The audit firm awarded the contract by the client may only assess the accuracy of its original planning documents once the attestation services are actually carried out. It is only upon the completion of the planned compliance testing, for example, that an accurate assessment can be made as to the degree and type of substantive procedures required. Assuming that the costs for providing audit services do not deviate significantly among accounting firms and all firms experience uncertainty as to the cost of the audit at the time of quoting audit clients, it appears that the audit marketplace is essentially a first-price sealed bid common value procurement auction. Yet, accounting researchers know very little about this auction setting and its implications for auditor behavior.

In a common value procurement auction, the firm is competing to sell products and/or services; however, despite offering these products and/or services, the firm is uncertain of their true cost. If the firm does not use great care in developing a bidding strategy, the firm may be prone to the winner's curse. The winner's curse occurs if the firm fails to properly adjust their price offering for the information that will likely be conveyed to them upon winning the auction, which is that they received the most optimistic signal as to the item's true value. "The systematic

failure to account for this adverse selection problem is referred to as the winner's curse" (Kagel and Leven 1986, p. 894). The result is profits being obtained at levels below those associated with the risk neutral Nash equilibrium bidding strategy.

The winner's curse has been observed in buyers' markets in a common value auction format such that participants placed bids in excess of the item's true value (Kagel and Levin 1986; Dyer, Kagel and Levin 1989 and Kagel, Levin, Battalio and Meyer 1989). The winner's curse has also been observed in sellers' markets in which participants can incur opportunity costs but not financial losses (Lind and Plott 1991). In a market with cost uncertainty sellers are expected to low ball, not as a competitive responses to potential future profits but because they fail to account for the adverse selection issues inherent to the marketplace.

> H1: Future quasi-rents are not required for low balling to occur in a common value procurement auction.

Previous experimental research of common value auctions reveals individuals bidding at amounts in excess of those predicted by the risk neutral Nash equilibrium (Kagel and Levin 1986; Lind and Plott 1991). In contrast, participants in common value procurement auctions made offers below that predicted by the risk neutral Nash equilibrium (Lind and Plott 1991; See Figure 1). Common and private value auctions experiments (Kagel and Levin 1986; Ham et al. 2005) provide evidence of a relationship between wealth and bidding strategy, whereby increases in wealth are associated with reductions in bids in buyers' markets. In common and private value auctions, decreases in bids increase the amount that may be won but at the same time, decrease the probability that the bid will be the winning bid. The observed relationship between an individual's wealth level and their bidding behavior may be explained by assuming that a positive relationship exists between wealth level and propensity for risk. To more fully understand this explanation one must consider the optimization problem facing buyers in a first-

price auction. The buyer must determine their optimal bid by bidding an amount which maximizes their expected utility: Expected Utility to buyer = Utility(Value – Bid)^{a} * Probability of winning. The *a* coefficient indicates the buyer's propensity for risk. If the buyer is risk averse the value for the coefficient is < 1 and if they are risk neutral it is 1. Thus one can explain the reason for lower bids by hypothesizing that the individual is becoming less risk averse and thus is more willing to increase their profits to be earned conditional on winning by sacrificing their probability of winning.

[Insert Figure 1 about here]

If the assumption that a positive relationship exists between wealth level and propensity for risk is the correct interpretation of documented bidding behavior in common and private value auctions, then the hypothesized effect of wealth level changes on observed behavior in common value procurement auctions is that increases in wealth will be associated with increased offers in sellers' markets (see Figure 2). The reason for this change is that in a procurement auction, increases in offers increase the amount that may be won, but at the same time decrease the probability that the offer will be the winning offer. It is therefore predicted that individuals with little wealth will make lower offers than individuals with greater wealth in a common value procurement auction.

[Insert Figure 2 about here]

To more fully understand this explanation one must consider the optimization problem facing sellers in a first-price procurement auction and how it differs from the problem facing buyers in a first-price auction. The seller must determine their optimal offer by offering an amount which maximizes the following: Expected Utility to seller = Utility(Price Offering – Value)^{a} * Probability of winning. If the *a* coefficient, the seller's propensity for risk increases as their wealth level increases, the seller is thereby more willing to increase their profits to be earned conditional on winning by sacrificing their probability of winning. The seller achieves this tradeoff by making a higher price offering.

The following hypothesis is thereby consistent with the auction literature that provides evidence of a relationship between an individual's wealth level and their bidding behavior.

> H2: The propensity to make higher price offerings in a common value procurement auction is increasing in wealth.

The auction literature provides evidence that the frequency and magnitude of losses in common value auctions decreases as participants gain experience. The participants adjust their bidding strategy indicative of learning; however, they do not appear to learn to completely avoid the winner's curse but do reduce its frequency of occurrence over time (Kagel and Levin 1986; Lind and Plot 1991). Participants in a common value procurement auction in which participants can incur opportunity costs but not financial losses appear to learn to reduce the frequency and magnitude of opportunity costs with experience (Lind and Plott 1991). Bloomfield and Luft (2006) provide evidence that the ability to avoid the winner's curse in an almost common good procurement auction is reduced in settings in which individuals are responsible for cost management.

Participants in a common value procurement auction can reduce the possibility of suffering the winner's curse by increasing their price offerings. The following hypothesis is consistent with the literature that provides evidence of participants avoiding the winners curse and opportunity costs as they gain experience.

> H3: The propensity to make higher price offerings in a common value procurement auction is increasing with learning.

Bloomfield and Luft (2006) assume that differential changes to bidding strategy are indicative of differential learning. But when concluding that changes in bidding behavior are indicative of learning, care must be taken to properly address the issue that in an auction, learning and cash balances are likely correlated (Ham et al. 2005). By not incorporating wealth levels as an explanatory variable in their statistical analysis, it is possible that Bloomfield and Luft (2006) overstate the ability of learning to explain changes in bidding behavior.

> H4: Controlling for wealth level reduces the ability of learning to explain changes in audit pricing.

EXPERIMENTAL DESIGN

The experiment utilizes an experimental market setting in which student participants play the role of an audit firm making price offerings to prospective clients. There is a variety of reasons why students, rather than auditors, were chosen to be experimental participants. By using students, I adhere to the advice offered by Libby et al. (2002) that experimenters should avoid using more sophisticated subjects than necessary. There is also a greater likelihood that the financial rewards offered in this experiment dominate other regarding preferences for students.

It is also more likely that students have not previously participated in a common value procurement auction and as such their behavior would be unaffected by past experience.

The experiment was programmed and conducted with the software z-Tree (Fischbacher 2007). Each participant plays the role of an audit firm and initially receives an endowment of 300 experimental dollars (ECUs) and has the potential to receive additional experimental dollars during the course of the experiment based on their actions. For purposes of the experiment, one experimental dollar equaled $0.025. At the end of the experiment the participants receive a show-up fee of $10 in addition to their funds earned during the experiment.

The experimental market is comprised of three audit firms and one prospective client. The market operates for 15 trading periods; however, participants are not informed as to how long the market will operate to mitigate end of period effects. During each trading period, audit firms make a price offering to a prospective client for audit services. After all price offers have been submitted, information about which audit firm has been awarded the audit and at what price is then publicly disclosed. The marketplace uses computerized clients, rather than human clients, so as to achieve greater control over extraneous factors such as reputational factors, which may result from potential strategic play by human consumers. The use of computerized clients also allows for greater focus on the auditor's behavior. The client is programmed to accept the lowest costing service. Payoffs to auditors, who have contracted with a client for a trading period, are equal to their quoted price less the cost of providing the audit.

Consistent with the common value procurement auction literature, the true cost of providing the audit is unknown to the audit firm. Instead, they have access to a noisy signal of the audit's cost from which to base their quote. The cost of the audit (v) is randomly chosen by the computer from a uniform range (x, y) each period. Then the signal (x_i) is randomly chosen

over an interval $(v+\in, v-\in)$ where $\in$ is a positive value set by the experimenter (Lind and Plott 1991). Participants are informed that: $x = ECU150$, $y = ECU1500$ and $\in = ECU200$ for every trading period. This knowledge provides the audit firms with enough information to calculate the potential upper and lower limits for v, the cost of the audit. For the audit firm to avoid the winner's curse, they should assume that the true cost of the audit could exceed their signal and determine their price offering accordingly.

In addition to participation in this market, audit firms simultaneously participate in a lottery. The lottery is representative of other forms of income for each firm and allows for greater variability of wealth levels during the course of the experiment and reduces the likelihood of limited liability becoming an issue. The lottery has an expected value of ECU10 each period, as it pays ECU40 with a 50 percent probability and -ECU20 with a 50 percent probability (Ham et al. 2005). Payoffs from the lottery, for each audit firm, are randomly determined subsequent to the completion of each trading period.

To summarize, each trading period operates as follows:

1. The cost of providing the audit (v) is randomly drawn from a uniform distribution over the range (ECU150,ECU1500). Audit firms are aware of the range from which the cost of providing the audit will be drawn, but are not aware of the true cost drawn.

2. Signals are randomly chosen over an interval $(v+\in, v-\in)$ and are provided to the audit firms. The audit firms are aware of their own signal and the value of $\in$ (ECU200), but are unaware of the other audit firms' signals.

3. Each audit firm provides a quote to a potential client for providing audit services for one trading period.

4. The client contracts with the audit firm who provides the lowest costing audit.

5. The true cost of the audit (v) is announced and the audit firms' accounts are updated accordingly. For each audit firm that did not contract the payoff is zero. For the audit firm that did contract, their payoff is equal to their quoted price less the cost of the audit.

6. Each audit firm participates in a lottery. The lottery pays either ECU40 or -ECU20 with equal probability.
7. After completion of the previous steps, the next trading period begins.

Subsequent to being read the instructions the participants play five practice trading periods. Participants are required to correctly respond to two questions regarding the operation of the market before beginning the practice periods. The purpose for having the participants correctly respond to questions about the marketplace is to ensure that they correctly understand the operation of the marketplace before making any price offerings. The purpose of the practice rounds is to familiarize participants with the computer interface and to reduce the volatility of decision-making documented in early rounds of experimental markets (Forsythe and Lundholm 1990).

Experimental Variables of Interest

The dependent variable for the first hypothesis is the auditor's average profits and for the remaining hypotheses is the auditor's price offering, the independent variables are the risk neutral Nash Equilibrium price offering (NE), the auditor's wealth level and learning. Except for cost signals at the extremities of the range, the mutual set of best responses (NE) approximates auditors making price offerings equal to their signal plus the maximum amount that the signal may be below the true cost of the item. In this experiment the NE under most circumstances is for auditors to make price offerings approximately equal to their signal plus two hundred ECUs.

The auditor's wealth level is treated as a lagged variable. The auditor's beginning wealth each trading period is equal to their initial endowment plus wealth obtained during previous trading periods. The auditor's beginning wealth is obtained from participation in both prior

auctions and prior lotteries. The lottery provides for an extraneous shock to the auditor's wealth which represents other forms of income for the audit firm.

Previous auction literature has examined the possibility that learning affects bidding behavior. There does appear to be common agreement that learning affects bidding behavior but there does not appear to be consensus as to how best to account for learning in an auction environment. Bloomfield and Luft (2007) imposed a linear functional form on learning in their examination of almost common value auctions, whereas Ham et al. (2005) argue that it is more appropriate to assume that learning possesses a curvilinear functional form in their analysis of affiliated private value auctions. I choose not to impose a functional form on learning; instead I use a dummy variable coded 0 for the first eight trading periods and 1 for the last seven trading periods. As such, I attempt to determine if audit firms differ in setting their price offerings during the early and later periods of the experiment after controlling for the NE and their beginning wealth level.

Normative economic theory predicts that an auditor's price offering exactly equals the Nash equilibrium and will be unaffected by either learning and/or wealth. I assume that audit firms will use a strategy similar to normative predictions but I do expect there to be behavioral affects caused by wealth level (H2) and learning (H3). I expect the coefficient for the NE to be less than 1 (H1). I also expect learning and wealth to be positively related to price offerings, such that the inclusion of wealth level diminishes the ability of learning to explain price offerings (H4) (see Table 2).

[Insert Table 2 about here]

RESULTS

Four computerized experimental sessions were conducted, each lasting approximately one hour and fifteen minutes. Sixty-nine individuals (23 groups) were recruited at a large university in the south eastern United States. As per Table 3, the participants received an average payment of $19.61 upon completion of the experiment.

[Insert Table 3 about here]

The participants were randomly assigned to seats by the experimenter. Participants were then randomly put into groups of three by the computer program. Each participant received a copy of the instructions which were also read aloud by the experimenter. The participants retained their copy of the instructions throughout the course of the experiment and were able to refer to them as needed. The 23 groups each participated in 15 common value procurement auctions resulting in 1035 potential price offerings (23 groups * 3 per group * 15 auctions). During the four sessions, five individuals were declared officially bankrupt and were paid their $10 show up fee and were excused from the laboratory. For the remainder of the experiment, these individuals were replaced by robot sellers who made random price offerings. For purposes of evaluating the hypotheses applicable to this study, I exclude auctions involving robot sellers, thus leaving 942 price offerings to be analyzed.

Hypothesis 1 predicts that future quasi-rents are not necessary for low balling to occur in a common value procurement auction. Table 4 presents descriptive statistics regarding the winner's average profits and the frequency of losses. Consistent with the hypothesis is the

observation that low balling occurs in 66% of the auctions. The implication is that auditors fall prey to the winner's curse by failing to properly account for the adverse selection issues associated with such a marketplace. The average auction profits for every group were less than the profits that would have been achieved had the participants used the risk neutral Nash equilibrium strategy. Only 3 of the 23 groups managed to achieve positive average profits. It was also not surprising to see that 66% of the auctions were won by the individual who received the lowest or most optimistic cost signal. These results provide strong support for hypothesis 1.

[Insert Table 4 about here]

Table 5 presents bivariate correlations for variables to be used in regression analysis presented in Tables 6, 7, and 9. Hypothesis 2 predicts a positive relationship between the audit firm's price offering and wealth. The positive correlation between price offering and beginning wealth provides support for this hypothesis. Hypothesis 3 predicts a positive relationship between the audit firm's price offering and learning. The positive correlation between price offering and learning provides support for this hypothesis. Hypothesis 4 predicts that controlling for wealth level reduces the ability of learning to explain changes in audit pricing. Given that both learning and beginning wealth are significantly positively correlated with price offering provides limited support for this hypothesis. These results, however do not take into account the effects present with all variables in the model.

[Insert Table 5 about here]

Table 6 allows for a more thorough evaluation of the normative and behavioral predictions, specifically the behavioral predictions outlined in hypotheses 2 and 3. Hypothesis 2 predicts that a positive relationship exists between price offerings and wealth level. Hypothesis 3 predicts a positive relationship between price offerings and learning. These hypotheses are in stark contrast to normative economic theory which predicts no such relationships. Table 6 regresses price offering on the Nash equilibrium offer, beginning wealth and learning. In the model beginning wealth and learning are both significantly positive. These results provide strong support for both hypotheses 2 and 3.

[Insert Table 6 about here]

Table 7 allows for a more thorough evaluation of hypothesis 4. Hypothesis 4 predicts that controlling for wealth level reduces the ability of learning to explain changes in audit pricing. Normative economic theory predicts that neither learning nor wealth level affects price offerings. Table 7 presents two regression models. The first model regresses price offering on the Nash equilibrium offer and learning. The second model additionally controls for the auditor's wealth level prior to the auction. In the first model the learning dummy has a coefficient of 45.30 and is significantly positive ($p<0.01$). The addition of the beginning wealth variable in the second model reduces the coefficient on learning to 32.38 ($p < 0.05$) and results in a decrease in the significance of learning in explaining price offering. The R^2 change between the first and second model is significant ($p<0.01$). These results provide strong support for hypothesis 4.

[Insert Table 7 about here]

Supplementary Analysis

I argue that wealth level positively affects price offerings but one could also argue that the relationship exists because wealth level is a function of prior bidding behavior, in other words, wealth level could be capturing heterogeneity in bidding behavior. Of concern is the possibility of an endogenous relationship existing between wealth level and bidding behavior. In this experiment, the auditor's wealth level is equal to their wealth from participation in common value procurement auctions and from participation in lotteries. The potential endogenous relationship is between bidding behavior and wealth from auctions, the auditor's wealth obtained from their participation in a lottery each period was determined purely at random and thus has no potential endogenous relationship with bidding behavior. Table 8 allows for a more thorough examination of this issue. Table 8 presents two regression models. The first regresses price offering on the Nash equilibrium offer, beginning wealth and learning (as in Model 2 Table 7). The second model differs in that beginning wealth is decomposed into its two components, beginning wealth from auctions and beginning wealth from lotteries. In the first model beginning wealth is significantly positive ($p<0.01$). In the second model, the two individual components of beginning wealth are both significantly positive ($p<0.01$). The coefficients on the two types of wealth are also very similar. If the observed wealth effect is purely a result of heterogeneity in bidding behavior it does not explain why the effect of both forms of wealth appear to have in essence the same effect on bidding behavior.

[Insert Table 8 about here]

CONCLUSION

Prior studies of audit pricing have assumed that when pricing decisions are made by audit firms, the cost of the audit is known with certainty. This study illustrates that, by implementing a potentially more realistic assumption of cost uncertainty, the market for audit services is best modeled as a common value procurement auction. Accounting researchers have only begun to apply the extant auction literature to accounting research questions. This modeling change allows audit pricing researchers to begin to incorporate this literature in developing interesting research questions.

I find that in common value procurement auctions, many participants suffer the winner's curse in that they fail to properly adjust their price offerings for the adverse selection issue associated with a common value procurement auction format. My results suggest the existence of both learning and wealth effects in the market for audit services. Contrary to the belief that audit firms become more risk adverse as they accumulate wealth and experience, the results provide evidence that as audit firms gain pricing experience and wealth, they pursue a more risk seeking pricing strategy. In the early trading periods, firms make comparably low price offerings; however, as they learn from experience with the auction format and as their wealth levels increase, the firms increase their price offerings.

A potential extension of my study is to examine the relationships between wealth, learning and effort choices made by audit firms. If the relationships found in this study between wealth, learning and a firm's propensity for risk with respect to price offerings hold for effort choices, it would provide further evidence that wealthier and older audit firms are more risk seeking in their behavior than smaller and younger audit firms.

Certain simplifications inherent to this experimental design may reduce the generalizability of these experimental results. As part of the experimental design I impose cost equivalency among audit firms, zero transaction costs and client decision rules regarding the choice of audit firm. Future research could examine the robustness of these results by relaxing one or more of these features.

REFERENCES

Arens, A., R. Elder and M. Beasley. 2007. Auditing and Assurance Services, An Integrated Approach, Twelfth Edition. Prentice Hall, New Jersey.

Baiman, S., P. Fischer, M. Rajan, and R. Saouma. 2007. Resource Allocation Auctions within Firms. Journal of Accounting Research 45 (5): 915-946.

Bloomfield, R., and J. Luft. 2006. Reponsibility for Cost Management Hinders Learning to Avoid the Winner's Curse. The Accounting Review 81 (1): 29-47.

DeFond, M. 1992. The Association Between Changes in Client Firm Agency Costs and Auditor Switching. Auditing: A Journal of Practice and Theory 11: 16-31.

DeAngelo, L.1981. Auditor Independence, "Low balling" and Disclosure Regulation. Journal of Accounting and Economics (August): 113-127.

Dopuch, N., and R. King. 1996. The Effects of Lowballing on Audit Quality: An Experimental Markets Study. Journal of Accounting, Auditing, and Finance (Winter 1996): 45-68.

Dopuch, N., R. King, and D. Wallin. 1989. The Use of Experimental Markets in Auditing Research: Some Initial Findings. Auditing: A Journal of Practice and Theory 8 (Supplement): 98-127.

Dyer, D., J. Kagel, and D. Levin. 1989. A Comparison of Naïve and Experienced Bidders in Common Value Offer Auctions: A Laboratory Analysis. The Economic Journal 99: 108-115.

Feltham, G., J. Hughes, and D. Simunic. 1991. Empirical Assessment of the Impact of Auditor Quality on the Valuation of New Issues. Journal of Accounting and Economics 14: 35-399.

Fischbacher, U.2007. z-Tree: Zurich Toolbox for Ready-made Economic Experiments. Experimental Economics 10(2): 171-178.

Forsythe, R., and R. Lundholm. 1990. Information Aggregation in an Experimental Market. Econometrica 58 (2): 309-347.

Ham, J., J. Kagel, and S. Lehrer. 2005. Randomization, Endogeneity and Laboratory Experiments: The Role of Cash Balances in Private Value Auctions. Journal of Econometrics 125: 175-205.

Hansen, R., and J. Lott, Jr. 1991. The Winner's Curse and Public Information in Common Value Auctions: Comment. The American Economic Review 81 (1): 347-361.

Kagel, J., and D. Levin. 1986. The Winner's Curse and Public Information in Common Value Auctions. The American Economic Review 76 (5): 894-920.

Kagel, J., D. Levin, R. Battalio, and D. Meyer. 1989. First-Price Common Value Auctions: Bidder Behavior and the Winner's Curse. Economic Inquiry 27: 241-258.

Kagel, J., and D. Levin. 1991. The Winner's Curse and Public Information in Common Value Auctions: Reply. The American Economic Review 81 (1): 362-369.

Lee, P., D. Stokes, S. Taylor, and T. Walter. 2003. The Association Between Audit Quality, Accounting Disclosures and Firm-Specific Risk: Evidence from Initial Public Offerings. Journal of Accounting and Public Policy 22: 377-400.

Libby, R., Bloomfield, R., and M. Nelson. 2002. Experimental research in financial accounting. Accounting, Organizations and Society 27 (November): 775-810.

Lind, B., and C. Plott. 1991. The Winner's Curse: Experiments with Buyers and with Sellers. The American Economic Review 81 (1): 335-346.

Lucking-Reiley, D. 2000. Vickrey Auctions in Practice: From Nineteenth-Century Philately to Twenty-First-Century E-Commerce. Journal of Economic Perspectives 14: 183-192.

Mayhew, B. 2001. Auditor Reputation Building. Journal of Accounting Research 39 (3): 599-617.

Mayhew, B., and J. Pike. 2004. Does Investor Selection of Auditors Enhance Auditor Independence? Accounting Review 79 (3): 797-822.

Mukherji, A. 1996. The Handbook of Experimental Economics: A Review Essay. Behavioral Research in Accounting 8: 217-231.

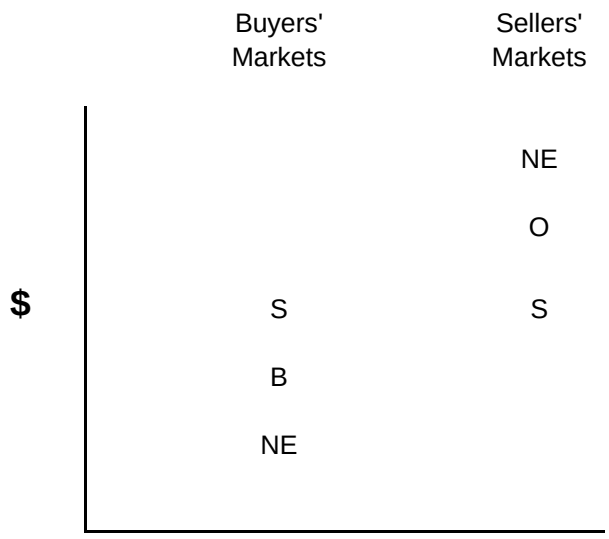
O'Keefe, T., R. King, and K. Gaver. 1994. Audit Fees, Industry Specialization, and Compliance with GAAS Reporting Standards. Auditing: A Journal of Practice & Theory 13 (2): 41-55.

Schatzberg, J. 1990. A Laboratory Market Investigation of Low Balling in Audit Pricing. The Accounting Review 65 (2): 337-362.

Simunic D., and M. Stein. 1987. Product Differentiation in Auditing: Auditor Choice in the Market for Unseasoned New Issues. Monograph for the Canadian Certified General Accountant Research Foundation.

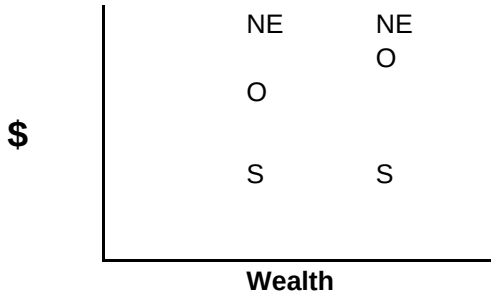
Wooldridge, J. 2003. Introductory Econometrics: A Modern Approach 2nd ed. Thomson Learning Inc.

Figure 1
Observed Behavior in Buyers' versus Sellers' Markets



S - Signal of the true value (cost) of the item
B – Participant's Bid
NE - Risk neutral Nash equilibrium
O – Participant's Offer

Figure 2
Hypothesized Wealth Effect in Sellers' Markets
As wealth increases, price offerings increase, but still remain below the risk neutral Nash equilibrium



S - Signal of the true value of the item
O – Participant's Offer
NE - Risk neutral Nash equilibrium

Table 1
Summary of Auction Formats

Market	Auction Formats	Market Mechanism	Winner of the Auction[a]	Information possessed by the participants
Buyers' Market	Private Value Auction	Buyers make bids to purchase the item and the Seller acts as the auctioneer	Buyer who submits the highest bid	The prospective buyers are aware of their exact value from possessing the item. The buyers' values are independent of one another.
	Common Value Auction	Buyers make bids to purchase the item and the Seller acts as the auctioneer	Buyer who submits the highest bid	The prospective buyers possess an estimate of the value from possessing the item. The value for the item is the same for all buyers.
Sellers' Market	Private Value Procurement Auction	Sellers make offers to supply the item and the Buyer acts as the auctioneer	Seller who submits the lowest offer	The prospective sellers are aware of their exact cost for the item. The sellers' costs are independent of one another.
	Common Value Procurement Auction	Sellers make offers to supply the item and the Buyer acts as the auctioneer	Seller who submits the lowest offer	The prospective sellers possess an estimate of the cost for the item. The cost of the item being sold is the same for all sellers.

[a] – assumes an auction format in which participants submit only one bid (offer) (i.e. a first or second-price (procurement) auction)

Table 2
Regression model of audit price offerings[a]

Model: Price Offering = α_0 + α_1Nash Equilibrium Offer + α_2Beginning Wealth + α_3Learning + ε

Variable	*Normative Economic Theory Predicted Coefficients*	*Behavioral Predictions*
Intercept	0.00	?
Nash Equilibrium Offer[b]	1.00	+ (<1.0) (H1)
Beginning Wealth[c]	0.00	+ (H1)
Learning[d]	0.00	+ (H2)

[a] Price Offering: the price offerings made by participants during the common value procurement portion of the experiment.
[b] Nash Equilibrium Offer: the risk-neutral Nash equilibrium offer for a common value procurement auction given the parameters used in the experiment.
[c] Beginning Wealth: the participant's wealth obtained during previous trading periods.
[d] Learning: a dummy variable coded 0 for the first eight trading periods and 1 for the last seven trading period.

Table 3
Experimental Participant's Payment

Variable	Mean payments to Participants[a]
Wealth from Auction[b]	245.78 ECUs ($6.14)
Wealth from Lottery[c]	138.75 ECUs ($3.47)
Show-up Fee[d]	400.00 ECUs ($10.00)
Total	784.53 ECUs ($19.61)

[a] Excludes five participants who were declared bankrupt during the experiment and as such left with only their $10.00 show-up fee.
[b] Portion of payment attributable to initial endowment and the auction portion of the experiment.
[c] Portion of payment attributable to lottery portion of the experiment.
[d] In addition to the participant's profits from the experiment they were paid a $10 show-up fee.

Table 4
Descriptive Statistics
Winner's Average Profit and the Loss Frequencies

Group[a]	# of Auctions[b]	Average Auction Profits[c]	Average RNNE predicted profits per period[d]	Auctions in which winner loses money[e]	Auctions with winner having lowest signal[f]
1	15	-$1.86	$2.60	12 (80%)	12 (80%)
2	15	-$0.86	$2.50	7 (47%)	9 (60%)
3	15	$0.90	$1.86	11 (73%)	10 (67%)
4	15	-$0.70	$2.55	10 (67%)	11 (73%)
5	15	$0.28	$1.49	5 (33%)	12 (80%)
6	15	-$1.64	$2.00	10 (67%)	14 (93%)
7	11	-$2.37	$2.76	8 (73%)	6 (55%)
8	15	-$1.84	$1.61	10 (67%)	8 (53%)
9	15	-$0.49	$2.36	10 (67%)	10 (67%)
10	15	-$1.03	$1.61	10 (67%)	10 (67%)
11	11	-$2.71	$3.01	9 (82%)	6 (55%)
12	15	-$1.58	$2.06	14 (93%)	9 (60%)
13	15	-$0.87	$2.58	7 (47%)	9 (60%)
14	15	-$1.23	$1.77	9 (60%)	11 (73%)
15	15	-$0.31	$1.95	9 (60%)	6 (40%)
16	8	-$3.69	$2.38	8 (100%)	2 (25%)
17	15	-$0.82	$2.13	9 (60%)	9 (60%)
18	6	-$9.71	$1.48	6 (100%)	4 (67%)
19	15	-$1.92	$2.96	12 (80%)	9 (60%)
20	15	-$0.62	$2.68	6 (40%)	13 (87%)
21	15	-$0.52	$2.32	11 (73%)	12 (80%)
22	8	-$5.79	$2.67	8 (100%)	5 (63%)
23	15	$0.42	$1.81	6 (40%)	9 (60%)
Total	314	-$1.44	$2.22	207 (66%)	206 (66%)

[a] Group: the 69 participants were randomly assigned to 23 groups of three.
[b] # of Auctions: the number of common value procurement auctions that group participated in.
[c] Average Auction Profits: the average profits from participating in the common value procurement auctions.
[d] Average RNNE predicted profits per period: the average profits that would have been obtained from participation in the auction had the individuals used the risk neutral Nash equilibrium strategy.
[e] Auctions in which the winner lost money: the number of auctions in which the winner of the auction low balled and thus incurred a loss
[f] Auctions with winner having lowest signal: the number of auctions in which the winner had received the lowest cost signal (i.e. received the most optimistic signal as to the actual cost).

Table 5
Bivariate correlations for variables in audit pricing model*
(N = 942)

Variable	Price Offering	Nash Equilibrium Offer	Learning	Beginning Wealth	Beginning Wealth from Auction	Beginning Wealth from Lottery
Price Offering[a]	1.00	0.88 (<0.01)	0.08 (0.01)	0.08 (0.02)	0.04 (0.27)	0.07 (0.04)
Nash Equilibrium Offer[b]	0.90 (<0.01)	1.00	0.03 (0.44)	0.01 (0.79)	-0.01 (0.78)	0.03 (0.39)
Learning[c]	0.08 (0.01)	0.03 (0.42)	1.00	0.24 (<0.01)	<0.01 (0.94)	0.39 (<0.01)
Beginning Wealth[d]	0.07 (0.05)	0.01 (0.99)	0.19 (<0.01)	1.00	0.80 (<0.01)	0.39 (<0.01)
Beginning Wealth from Auction[e]	0.02 (0.55)	-0.02 (0.55)	-0.03 (0.38)	0.69 (<0.01)	1.00	-0.23 (<0.01)
Beginning Wealth from Lottery[f]	0.06 (0.07)	0.02 (0.60)	0.38 (<0.01)	0.42 (<0.01)	-0.25 (<0.01)	1.00

* Pearson correlation statistics are reported above the diagonal and nonparametric Spearman correlation statistics are reported below the diagonal. Two-tailed probabilities are in parentheses.

[a] Price Offering: the price offerings made by participants during the common value procurement portion of the experiment.
[b] Nash Equilibrium Offer: the risk-neutral Nash equilibrium offer for a common value procurement auction given the parameters used in the experiment.
[c] Learning: a dummy variable coded 0 for the first eight trading periods and 1 for the last seven trading period.
[d] Beginning Wealth: the participant's wealth obtained during previous trading periods.
[e] Beginning Wealth from Auction: the participant's wealth obtained from the initial endowment and during previous trading periods from the common value procurement portion of the experiment.
[f] Beginning Wealth from Lottery: the participant's wealth obtained during previous trading periods from the lottery portion of the experiment.

Table 6
Regression model of audit price offerings[a]

Model: Price Offering = α_0 + α_1Nash Equilibrium Offer + α_2Beginning Wealth + α_3Learning + ε

Variable	*Normative Economic Theory Predicted Coefficients*	*Behavioral Predictions*	*Model 1*
Intercept	0	?	-95.01***
Nash Equilibrium Offer[b]	1.0	+ (<1.0)	0.94***
Beginning Wealth[c]	0	+ (H1)	0.18***
Learning[d]	0	+ (H2)	39.10**
Adjusted R^2			0.78
N			942

***, **, * Denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

[a] Price Offering: the price offerings made by participants during the common value procurement portion of the experiment.
[b] Nash Equilibrium Offer: the risk-neutral Nash equilibrium offer for a common value procurement auction given the parameters used in the experiment.
[c] Beginning Wealth: the participant's wealth obtained during previous trading periods.
[d] Learning: a dummy variable coded 0 for the first eight trading periods and 1 for the last seven trading period.

Table 7
Regression model of audit price offerings[a]

Model 1: Price Offering = $\alpha_0 + \alpha_1$Nash Equilibrium Offer + α_2Learning + ε
Model 2: Price Offering = $\alpha_0 + \alpha_1$Nash Equilibrium Offer + α_2 Beginning Wealth + α_3Learning + ε

Variable	*Behavioral Predictions*	*Model 1*	*Model 2*
Intercept		-41.90**	-95.01***
Nash Equilibrium Offer[b]	+	0.94***	0.94***
Beginning Wealth[c]	+		0.18***
Learning[d]	+	50.19***	39.10**
Adjusted R^2		0.77	0.78
R^2 Change			0.003***
N		942	942

***, **, * Denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

[a] Price Offering: the price offerings made by participants during the common value procurement portion of the experiment.
[b] Nash Equilibrium Offer: the risk-neutral Nash equilibrium offer for a common value procurement auction given the parameters used in the experiment.
[c] Beginning Wealth: the participant's wealth obtained during previous trading periods.
[d] Learning: a dummy variable coded 0 for the first eight trading periods and 1 for the last seven trading period.

Table 8
Regression model of audit price offerings[a]

Model 1: Price Offering = $\alpha_0 + \alpha_1$Nash Equilibrium Offer + α_2Beginning Wealth + α_3Learning + ε

Model 2: Price Offering = $\alpha_0 + \alpha_1$Nash Equilibrium Offer + α_2Beginning Wealth from Auction + α_3Beginning Wealth from Lottery + α_4Learning + ε

Variable	*Expected Sign*	*Model 1*	*Model 2*
Intercept		-95.01***	-94.53***
Nash Equilibrium Offer[b]	+	0.94***	0.94***
Beginning Wealth[c]	+	0.18***	
Beginning Wealth from Auction[d]	+		0.17***
Beginning Wealth from Lottery[e]	+		0.19**
Learning[f]	+	39.10**	38.27***
Adjusted R^2		0.77	0.77
N		942	942

***, **, * Denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

[a] Price Offering: the price offerings made by participants during the common value procurement portion of the experiment.

[b] Nash Equilibrium Offer: the risk-neutral Nash equilibrium offer for a common value procurement auction given the parameters used in the experiment.

[c] Beginning Wealth: the participant's wealth obtained during previous trading periods.

[d] Beginning Wealth from Auction: the participant's wealth obtained from the initial endowment and during previous trading periods from the common value procurement portion of the experiment.

[e] Beginning Wealth from Lottery: the participant's wealth obtained during previous trading periods from the lottery portion of the experiment.

[f] Learning: a dummy variable coded 0 for the first eight trading periods and 1 for the last seven trading period.