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Sukari Farrington Date

Attracting the right worker:
Incomplete knowledge of task specific skill, employment contract type, and task difficulty

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B.A., Howard University, 2004

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An abstract of
A thesis submitted to the Faculty of the
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ABSTRACT

Attracting the right worker:
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and task difficulty

By

Sukari Farrington

The purpose of this paper is to examine the interactive effects of incomplete knowledge of task specific skill, employment contract type, and task difficulty on workers' contract selection. Using an experiment with salient incentives, I compare contract selection given an array of individual performance-based pay schemes or an array of relative performance-based pay schemes, for easy and difficult tasks, given workers possess incomplete knowledge of their task specific skill. Results provide mixed support for the hypothesis that incomplete knowledge of task specific skill leads to directionally biased self-assessments which systematically influence contract selection, dependent on employment contract type and task difficulty. Findings suggest that when selecting from an array of individual performance-based pay schemes, contract selection is consistent with underestimation given easy tasks. Further, workers believe they are above average on easy tasks and below average on difficult tasks. As a result, in a relative performance-based pay regime, workers faced with an easy task are more likely to select performance-based pay than workers faced with a difficult task.

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I. INTRODUCTION

A fundamental function of management accounting is the use of information to design employment contracts that enhance firm productivity by motivating effort and attracting appropriate workers (Bonner et al. 2000; Sprinkle and Williamson 2006). Efficient self-sorting enhances productivity by effectively matching job requirements and worker task specific skill. This is because workers select contracts to maximize subjective expected utility (Demski and Feltham 1978; Waller and Chow 1985); therefore performance-based pay is more attractive to workers who possess the requisite task specific skill than to workers who do not. Even though evidence suggests both incentive effects and self-sorting are equally important determinants of performance (Cadsby et al. 2007; Lazear 2000), research has mainly focused on the former objective while overlooking the latter (Gerhart and Rynes 2003).

While it is acknowledged that workers' perceptions of task specific skill influence contract selection (Demski and Feltham 1978; Waller and Chow 1985), prior analytical research (e.g. Demski and Feltham 1978; Spence 1973) makes the simplifying assumption that workers possess complete knowledge of their task specific skill and perceptions are thus perfectly accurate. Experimental studies (e.g. Chow 1983; Dillard and Fisher 1990; Waller and Chow 1985) operationalize this assumption by providing participants performance feedback prior to contract selection.[1] [2] However, in practice, workers' knowledge of their task specific skill is likely heterogeneous due to differences

[1] The majority of experimental procedures follow a similar structure. Participants perform a task (e.g. decode letters), receive performance feedback, select a contract, and then perform the same task (e.g. decode different letters). Cadsby et al. (2007) and Kachelmeier and Williamson (2008) follow this general procedure except no performance feedback is provided. Neither study makes predictions regarding knowledge of task specific skill nor report the accuracy of participants' perceptions.

[2] One exception is Hyatt and Taylor (2008), who examine the effect of incomplete knowledge of their task specific skill on selection of relative performance-based pay by manipulating the presence or absence of relative feedback.

in relevant task experience and performance feedback (MacDonald 1982a, 1982b, 1982c).

When workers possess incomplete knowledge of their task specific skill, self-assessments are likely subject to estimation error. Based on empirical evidence and theory from the psychology literature, estimation error does not result in random noise, but instead in biased self-assessments (e.g. Kruger 1999; Kruger and Dunning 1999; Tversky, and Kahneman 1974). I hypothesize that biased self-assessments systematically influence employment contract self-selection, dependent on two factors – type of employment contract (i.e. individual performance-based pay or relative performance-based pay) and task difficulty, as explained below.

Incomplete knowledge of task specific skill leads to individual and relative self-assessments that are less extreme than reality (Krueger and Mueller 2002; Moore and Small 2007). Individual assessments tend to be biased downward[3] when a task is easy, and upward when a task is difficult (Burson et al. 2006; Erev et al. 1994). Given perceptions of task specific skill influence contract selection (e.g. Demski and Feltham 1978; Waller and Chow 1985), I predict that underestimation (overestimation) will result in selection of less (more) performance intensive pay when workers select from an array of individual performance-based contracts given an easy task (difficult task). Results provide mixed support for this hypothesis. Findings suggest that when selecting from an array of individual performance-based contracts, for an easy task underestimation leads to

[3] Underestimation may seem incongruent with the notion that individuals' self-assessments are motivated by a goal to enhance self-perceptions of ability (Festinger 1954; Kunda 1990). However, given actual ability on an easy task is high, underestimation still results in perceptions of task specific skill that are consistent with self-enhancement.

selection of less performance intensive pay. Further, knowledge of task specific skill has the opposite effect on contract selection dependent on task difficulty.

Incomplete knowledge of task specific skill also leads to biased estimates of comparative tasks specific skill. However, the direction of the bias is in the opposite direction of individual assessments. For easy tasks, self-assessments of task specific skill relative to others tend to be biased upward, leading to the well-documented "above-average effect" (Kruger 1999; Kruger and Dunning 1999; Moore and Small 2007). Conversely, when a task is difficult, relative self-assessments tend to be biased downward, resulting in a "below-average effect" (Burson et al. 2006; Erev et al. 1994; Kruger 1999; Moore and Small 2007). I hypothesize that the above-average effect (below-average effect) will lead to selection of more (less) performance intensive pay when workers select from an array of relative performance-based contracts. Consistent with prior literature, I find that individuals believe they are above average on easy tasks and below average on difficult tasks. Further, results provide partial support for the prediction that the above-average effect (below-average effect) results in selection of more (less) performance-intensive pay.

Using a web-based experiment, I conduct an investigation of whether incomplete knowledge of task specific skill, employment contract type, and task difficulty interact to affect contract selection. Incomplete knowledge of task specific skill is operationalized as the absence or presence of performance feedback. Task difficulty is manipulated at two levels (easy, difficult). Employment contract type is manipulated by offering participants either a choice between flat pay and individual performance-based pay or a choice between flat pay and relative performance-based pay. The primary dependent variable is

contract selection, measured as the degree to which task specific skill is commensurate with performance intensity of selected contracts, percentage of contracts selected that are performance-based, and performance intensity[4] of selected contracts.

The remainder of the paper is structured as follows. Section II develops the hypotheses. Section III presents a description of the experiment. Sections IV reports results of the main hypothesis tests and supplementary analysis. Conclusions and implications are discussed in the final section.

II. HYPOTHESIS DEVELOPMENT

Since workers select contracts to maximize subjective expected utility (Demski and Feltham 1978; Spence 1973; Waller and Chow 1985), performance-based pay is more attractive to workers who possess the requisite task specific skill than workers who do not. Thus, performance-based employment contracts can enable firms to effectively match job requirements and worker attributes through contract selection. However, for self-sorting to be effective, workers must be able to estimate the expected utility of various employment schemes available in the labor market.

Waller and Chow (1985) provide a conceptual framework that outlines the inputs into the expected utility calculation and the contract selection decision. Inputs include worker attributes (e.g. task specific skill, preferences for risk, wealth, and effort) and employment contract attributes (e.g. performance measures, type of performance benchmarks). In addition, I include a third factor, environmental attributes, which incorporates factors such as task difficulty, task dimensionality, organizational climate,

[4] Performance intensity refers to the degree to which pay is performance dependent.

and state uncertainty.[5] Workers' contract selection is contingent upon their perceptions of worker, contract, and environmental attributes and a subjective evaluation of the match among these attributes.

Incomplete Knowledge of Task Specific Skill

While the self-sorting literature is limited, the majority of research has focused on whether worker attributes, namely task specific skill (e.g. Cadsby et al. 2007; Chow 1985; Lazear 2000) and risk preferences (e.g. Cable and Judge 1994; Cadsby et al. 2007; Kachelmeier and Williamson 2008) influence contract selection. While it is acknowledged that workers' perceptions of their task specific skill affect contract choice (Demski and Feltham 1978; Waller and Chow 1985), a fundamental assumption in both the analytical (e.g. Demski and Feltham 1978; Spence 1973) and experimental[6] (e.g. Chow 1983; Dillard and Fisher 1990; Waller and Chow 1985) research is that workers possess complete knowledge of task specific skill, and as a consequence perceptions are perfectly accurate. Thus, workers are able to select employment contracts that maximize their expected utility, allowing firms to design employment contracts that effectively sort workers in the labor market.

In practice, workers often possess incomplete knowledge of their task specific skill (Demski and Feltham 1978; Salop and Salop 1976; Spence 1973) due to differences in task experience and performance feedback (MacDonald 1982a, 1982b, 1982c). For example, new entrants into the labor market and workers switching jobs may possess incomplete knowledge of their task specific skill. This likely affects a considerable

[5] Organizational climate and state uncertainty are included in Waller and Chow's (1985) employment contract framework but are not categorized as environmental attributes.
[6] Hyatt and Taylor (2008) conduct a study in which participants are randomly assigned to either complete or incomplete knowledge of task specific skill conditions by manipulating whether participants receive feedback on their performance capability.

portion of the labor market given the transient nature of today's workforce. To illustrate, recent survey evidence suggests the average baby boomer held over ten jobs between the age of 18 and 42 (Bureau of Labor Statistics 2006).

Further, workers moving laterally or horizontally within the same firm may also possess incomplete knowledge of task specific skill for new positions. For example, in public accounting, as auditing professionals are promoted to higher levels within the firm, different skills are required for superior performance (Bhamornsiri and Guinn 1991; Tan 1999; Tan and Libby 1997). At the staff level, technical knowledge and teamwork are key skills. For seniors, problem-solving efficiency is crucial, while managers must possess communication and leadership skills to be successful. Finally, at the partner level, business acumen, client knowledge, and decisiveness are critical. Examining the impact of incomplete knowledge of task specific skill on contract selection is important because, based on psychology theory, estimation error does not merely lead to noisy self-assessments, but rather to self-assessments that are directionally biased. Given workers select contracts to maximize their expected utility, biased self-assessments are predicted to systematically influence workers' contract selection decisions.

Employment Contract Type

When workers select from an array of employment contracts based on individual performance, perceptions of oneself are relevant for contract selection. Alternatively, when workers select from an array of employment contracts based on relative performance, perceptions of oneself, as well as perceptions of others, are relevant for contract selection. Since individuals generally possess more information about themselves than others (Dawes and Mulford 1996; Epley and Dunning 2006), self-

assessments tend to be more accurate than other-assessments (Fiedler 1996, 2000). Given that workers select contracts that best match their perceived task specific skill (e.g. Cadsby et al. 2007; Dillard and Fisher 1990; Waller and Chow 1985), more accurate self-assessments are expected to result in more effective self-sorting. In other words, there will be a better match between task specific skill and contract performance intensity (i.e. the degree to which pay is based on performance) under an individual performance-based pay regime than under a relative performance-pay regime.

> **H1:** The link between performance intensity and task specific skill is ***stronger*** when workers select from an array of ***individual*** performance-based pay schemes than from an array of ***relative*** performance-based pay schemes.

In addition to employment contract type, attributes of the environment also impact self-selection. In particular, attributes of the task itself influence contract selection (Waller and Chow 1985). Empirical evidence demonstrates that perceptions of both individual and relative task specific skill are moderated by task difficulty (Krueger and Mueller 2002; Kruger and Dunning 1999, 2002; Moore and Small 2007). First, I will discuss the effect of incomplete knowledge of task specific skill on estimates of oneself and formulate Hypothesis 2, regarding individual performance-based contract selection for both easy and difficult tasks. Second, I will discuss the influence of incomplete knowledge of task specific skill on estimates of oneself relative to others and formulate Hypotheses 3 and 4, regarding relative performance-based contract selection for both easy and difficult tasks.

Individual Performance-Based Pay and Task Difficulty

When workers possess incomplete knowledge of their task specific skill, individual self-assessments tend to be biased away from extremes (Burson et al. 2006;

Erev et al. 1994; Moore and Small 2007). To illustrate, when a task is easy (and performance is high), self-assessments tend to be biased downward. Conversely, when a task is difficult (and performance is low), self-assessments are generally biased upward. Knowledge of task specific skill gained via relevant task experience and performance feedback (MacDonald 1982a, 1982b, 1982c), provides valuable information cues to more accurately estimate one's task specific skill, leading to self-assessments that are less pessimistic for easy tasks and less optimistic for difficult tasks (Moore and Small 2007).

Given workers select contracts such that perceived task specific skill is commensurate with contract performance intensity (e.g. Cadsby et al. 2007; Dillard and Fisher 1990; Waller and Chow 1985), incomplete knowledge of task specific skill is predicted to systematically influence individual performance-based contract selection as follows.

> **H2a:** Given ***individual*** performance-based pay and an ***easy*** task, when workers possess incomplete knowledge of task specific skill they are ***less likely*** to select performance intensive pay than when they possess knowledge of their task specific skill.
>
> **H2b:** Given ***individual*** performance-based pay and a ***difficult*** task, when workers possess incomplete knowledge of task specific skill they are ***more likely*** to select performance intensive pay than when they possess knowledge of their task specific skill.

Relative Performance-Based Pay and Task Difficulty

When individuals possess incomplete knowledge of relative task specific skill, they routinely overestimate themselves relative to their peers in several domains. For instance, individuals believe they are above average in their ability to drive, ride a bicycle, or use a computer mouse (Kruger 1999; Svenson 1981). However, individuals also consistently underestimate themselves in other domains. For example, people believe

they are below average in their ability to juggle, live past 100, or cope with the death of a loved one (Blanton et al. 2001; Chambers et al. 2003; Kruger 1999). Two related hypotheses provide a parsimonious explanation for this apparent contradiction, differential weighting (for a review see Chambers and Windschitl 2004) and differential information (Moore and Small 2007). Both explanations posit that individuals believe they are above average in domains in which the probability of success is high and below average in domains in which the probability of success is low.

Differential weighting posits that when individuals make comparative assessments, they usually focus on themselves and insufficiently account for others. Therefore, when a task is easy (and the probability of success is high), individuals generally believe they are above average; whereas, when a task is difficult (and probability of success is low), individuals tend to believe they are below average. In other words, relative assessments are extrapolated from individual assessments.

According to the differential information hypothesis (Moore and Small 2007), above-average and below-average effects are byproducts of imperfect relative assessments. People usually have more information about themselves than others (Dawes and Mulford 1996; Epley and Dunning 2006) and can therefore make more informed estimates of themselves than others (Fiedler 1996, 2000). However, individuals have imperfect self-insight, which leads to estimates of oneself that are biased away from extremes (Burson et al. 2006; Erev et al. 1994). Since assessments of others are based on less information, individuals must rely on guesses about group base rates and average outcomes (Moore and Small 2007). As a result, perceptions of others are even more biased away from extremes than perceptions of oneself (Miller and McFarland 1987;

Sande et al. 1988). When a task is easy (and task specific skill is high) perceptions of oneself are pessimistic, and perceptions of others are even more pessimistic (Moore and Small 2007).

Consequently, on easy tasks, people tend to underestimate their individual task specific skill and overestimate their relative task specific skill. I predict that, consistent with the above-average effect, given an easy task, incomplete knowledge of task specific skill leads to selection towards more performance-intensive pay.

H3a: Given ***relative*** performance-based pay and an ***easy*** task, when workers possess incomplete knowledge of task specific skill they are ***more likely*** to select performance intensive pay than when they possess knowledge of others' task specific skill.

On the other hand, when a task is difficult (and task specific skill is low) people tend to be optimistic about themselves and even more optimistic about others (Ehrlinger et al. 2008; Erev et al. 1994; Moore and Small 2007). Individuals tend to overestimate their individual task specific skill and underestimate their relative task specific skill (Ehrlinger et al. 2008; Kruger and Dunning 1999). Consistent with the below-average effect, I hypothesize that given a difficult task, incomplete knowledge of task specific skill leads to contract selection away from performance intensive pay.

H3b: Given ***relative*** performance-based pay and a ***difficult*** task, when workers possess incomplete knowledge of task specific skill they are ***less likely*** to select performance intensive pay than when they possess knowledge of others' task specific skill.

Although knowledge of others' task specific skill results in more accurate relative assessments, and knowledge of one's task specific skill leads to more accurate self-assessments, knowledge of one's task specific skill does not necessarily translate into more accurate relative assessments (Moore and Small 2007). This is because individuals

differentially weight information cues (Chambers and Windschitl 2004; Kruger 1999; Fiedler 1996, 2000). In particular, individuals tend to overemphasize information about themselves and fail to sufficiently account for others when making relative assessments (Kruger 1999; Tversky and Kahneman 1974). Therefore knowledge of one's task specific skill is expected to impact self-perceptions more than other-perceptions.

Given easy tasks, individuals tend to underestimate themselves and others even more so, leading to the above-average effect. Thus, more accurate self-perceptions result in less pessimistic assessments of one's task specific skill, but also lead to a larger gap between perceptions of oneself and others (Fiedler 1996, 2000; Moore and Small 2007). In other words, workers who possess knowledge of their task specific skill for an easy task are more overconfident in their relative task specific skill than workers with incomplete knowledge of their task specific skill (Moore and Small 2007). Given perceptions of task specific skill influence contract selection (e.g. Cadsby et al. 2007; Dillard and Fisher 1990; Waller and Chow 1985), Hypothesis 4a is as follows:

> **H4a:** Given ***relative*** performance-based pay and an ***easy*** task, when workers possess incomplete knowledge of task specific skill they are ***less likely*** to select performance intensive contracts than when they possess knowledge of their task specific skill.

Conversely, for difficult tasks, individuals overestimate themselves and others even more so, leading to pessimistic relative assessments (Moore and Small 2007). More accurate self-perceptions reduce optimistic assessments of individual task specific skill and exacerbate the below-average effect (Fiedler 1996, 2000; Moore and Small 2007). Hence, given a difficult task, comparative assessments are more pessimistic when workers possess knowledge of their task specific skill than when workers are uncertain of

their task specific skill (Moore and Small 2007). Incomplete knowledge of task specific skill is predicted to directionally influence self-selection, as follows.

> **H4b:** Given ***relative*** performance-based pay and a ***difficult*** task, when workers possess incomplete knowledge of task specific skill they are ***more likely*** to select performance intensive contracts than when they possess knowledge of their task specific skill.

To summarize, as shown in Table 1, I predict a three-way interaction between incomplete knowledge of task specific skill, employment contract type, and task difficulty. Consistent with psychology literature, I hypothesize that estimation error will result in biased self-assessments of oneself and others. Given workers select employment contracts such that perceived task specific skill is commensurate with contract performance intensity (e.g. Cadsby et al. 2007; Dillard and Fisher 1990; Waller and Chow 1985), incomplete knowledge of task specific skill is predicted to systematically affect contract selection. I expect that the direction of the effect is dependent on employment contract type and task difficulty. Additionally, knowledge of one's task specific skill is predicted to have an opposite directional impact on self-selection under an individual performance-based pay regime than under a relative performance-based pay regime. Next, I describe the experimental design, and then I analyze results of the hypotheses tests.

[INSERT TABLE 1 HERE]

III. EXPERIMENTAL METHOD

Participants

Fifty-two business students (35 men, 17 women) at a large, private university participated in the experiment. Participants were recruited from graduate level accounting classes and took an average 8.2 business, 1.9 statistics and 2.4 economics courses. Ten

percent were undergraduates and ninety percent were MBA students. The mean age was 28.2 years. On average, participants had 5.3 years of professional experience and worked for 2.3 different employers. All participants voluntarily took part in the study and received $10 plus any additional money earned during the experiment. On average, participants earned $14.69.

Experimental Procedures and Task Description

The study was conducted in two stages (pre-contracting stage and contracting stage). The pre-contracting stage was conducted online, lasted one round (Round 0), and took approximately ten minutes. The contracting stage was conducted in a computer laboratory, lasted three rounds (Rounds 1, 2, 3), and took approximately forty-five minutes.

Task Description

The task involved selecting the best synonym for a given word from a list of four words and/or phrases adapted from the website www.freerice.com. In each round, twenty-five vocabulary words were selected at random from a database of over 800 words. Participants were randomly assigned to either the easy task condition or the difficult task condition for all four rounds. Task difficulty was determined by the level assigned to each vocabulary word on www.freerice.com, from 1 to 60. Participants in the easy task (difficult task) condition received level 15 through 30 (40 through 60) vocabulary words.

Pre-contracting Stage

The pre-contracting stage was necessary to establish average task specific skill, which was used to determine appropriate performance benchmarks for the employment

contracts used in the contracting stage of the experiment. One week prior to the computer laboratory sessions, participants received an email and were asked to complete an online study. Thirty-six participants completed the pre-contracting stage. On average, participants assigned to the easy task (difficult task) answered 22.33 (9.45) questions correctly.

Contracting Stage

The contracting period sessions were performed in a computer laboratory. Fifty-two participants completed the contracting stage. All participants who completed the pre-contracting stage completed the contracting stage. Each session lasted three rounds (Rounds 1, 2, 3). Round 1 was used to determine task specific skill and to measure self-perceptions prior to contract selection. Participants were informed they would not be compensated for their Round 1 performance. At the beginning of Round 2, participants selected an employment contract from an array of three contracts, as described in the following section. At the beginning of Round 3, participants selected another employment contract from the same array. Participants were informed that their compensation was based on either their Round 2 contract selection and their Round 2 performance, or their Round 3 contract selection and their Round 3 performance, selected at random.

After completing Round 1, participants provided self-assessments of their task specific skill,[7] but did not receive performance feedback. Participants then selected their

[7] Perceptions measures are based on Round 1 self-reported task specific skill. After completing the Round 1 task, participants estimated how many questions they answered correctly from 0 to 25 (one's task specific skill); how many questions the average participant would answer correctly from 0 to 25 (others' task specific skill); and percentile rank between 1 and 100, such that 1 indicates worse than 99% and 100 indicates better than 99%.

employment contract for Round 2. Since this choice was made without receiving performance feedback, Round 2 contract choice represents self-selection given incomplete knowledge of task specific skill. After the Round 2 task was completed, participants received performance feedback and selected their Round 3 employment contract, which represents contract selection given knowledge of task specific skill. After completing Round 3, in order to assess risk preferences, participants provided their preferences for a series of hypothetical lotteries (Brink 2008). Participants then provided demographic information, received payment, and were dismissed.

Experimental Design

The primary experimental design is a 2 x 2 between-participant design. The two independent variables, task difficulty (easy, difficult) and employment contract type (individual performance-based pay, relative performance based-pay) are manipulated between participants. Nested within employment contract type is the third independent variable, incomplete knowledge of task specific skill, which is manipulated within participants. Incomplete knowledge of task specific skill is operationalized as the presence or absence of performance feedback. The fourth factor, manipulated within participants, is round, which has four levels (Round 0, 1, 2, 3). The three primary dependent variables are degree to which task specific skill is commensurate with performance intensity of selected contracts; percentage of contracts selected that are performance-based; and performance intensity of selected contracts.

Employment Contract Type

As shown in Table 2, participants selected a pay scheme from an array of three employment contracts which varied in performance intensity from lowest (Contract A) to

highest (Contract C).[8] Participants were randomly assigned to either the individual performance-based pay regime, in which contract performance benchmarks were expressed in terms of absolute performance (i.e. number of correct answers out of 25) or the relative performance-based pay regime, in which performance benchmarks were expressed in terms of average performance. In both employment contract conditions the performance benchmark was based on average performance in Round 0.

[INSERT TABLE 2 HERE]

In the individual performance-based pay regime, for the easy task (difficult task) the performance benchmark was set to 22 (10). To illustrate, as shown in Table 2, Panel A, participants assigned to the individual performance-based pay, easy task condition who selected Contract B received 700 lira if they answered more than 22 questions correctly, and 300 otherwise. Whereas participants who selected Contract A received 500 lira regardless of their performance. As shown in Table 2, Panel C, in the relative performance-based pay regime, participants were informed that their payouts were dependent on their performance relative to the number of questions answered correctly by the average study participant. For example, participants assigned to the relative performance-based pay regime who selected Contract C received 900 lira if they scored higher than the average participant (i.e. more than 22 for the easy task or more than 10 for the difficult task), and 100 otherwise. It is important to note that contracts based on individual performance are mathematically equivalent to contracts based on relative performance. This is because the average was determined by Round 0 scores and is equal to the performance benchmarks used in the individual performance-based contracts.

Incomplete Knowledge of Task Specific Skill

[8] Contract A is a flat-wage pay scheme. Contracts B and C are performance-based pay schemes.

Nested within employment contract type, is the independent variable, incomplete knowledge of task specific skill, which is operationalized as the presence or absence of performance feedback at three levels (none, self, other) within participants. In Round 2, all participants were assigned to the incomplete knowledge of task specific skill condition (none feedback). Thus, before making the Round 2 contract selection, participants did not receive any feedback about their Round 1 performance.

In Round 3, participants were either assigned to the knowledge of one's task specific skill condition (self feedback) or the knowledge of others' task specific skill condition (other feedback), dependent on employment contract type. In the individual performance-based pay regime, knowledge of one's task specific skill is relevant for the contract selection decision. Thus, participants in the individual performance-based pay regime all received self feedback in Round 3, and were informed how many questions out of 25 they answered correctly in Round 2. In the relative performance-based pay regime, knowledge of one's task specific skill, as well as knowledge of others' task specific skill is relevant for the employment contract selection. Hence, participants in the relative performance-based pay regime either received self feedback or other feedback in Round 3. Participants who received self feedback were informed how many questions they answered correctly in Round 2. Participants who received other feedback were informed of the number of questions participants answered correctly on average (based on Round 0 scores). In other words, participants in the relative performance-based pay, other feedback condition who were contracting for an easy task (difficult task), were informed that on average, study participants answered 22 (10) questions correctly.

Given incomplete knowledge of task specific skill was manipulated within participants, such that in Round 2 participants did not receive performance feedback while in Round 3 participants did receive feedback, it is possible that incomplete knowledge of task specific skill is confounded with task experience. However, I do not predict a main effect of incomplete knowledge of task specific skill on contract selection. Rather, I hypothesize that providing performance feedback will have an opposite effect on contract selection, dependent on employment contract type and task difficulty. Therefore, if experience does have a main effect on contract selection, it will bias away from finding a significant interactive effect of incomplete knowledge of task specific skill, employment contract type, and task difficulty.

Dependent Variables

There are three primary dependent variables. The first dependent variable is degree to which task specific skill is commensurate with performance intensity of selected contracts. Contract selection is deemed commensurate if it meets the following criteria. For a flat wage contract selection (Contract A) to be classified as commensurate, task specific skill[9] must be at or below the employment contract performance benchmark of 22 (10) for an easy task (difficult task). For a performance-based contract selection (Contract B or C) to be classified as commensurate, task specific skill must be above 22 (10) for an easy task (difficult task). The second dependent variable is percentage of contracts selected that are performance-based, which is calculated as the number of Contract B and C selections divided by the total number of contract selections. The third dependent variable is performance intensity of selected contracts, which is determined by

[9] Task specific skill is measured as the number of correct answers in Round 1.

the average performance intensity of selected contracts, setting Contracts A, B, and C equal to 1, 2, and 3, respectively. Higher scores indicate greater performance intensity.

IV. RESULTS

Manipulation and Other Checks

As expected, in all four rounds, scores on the easy task are higher than scores on the difficult task ($p < 0.01$), as reported in Table 3, Panel A. Over the four rounds, participants answered an average 22.85 questions correctly for the easy task, compared to 9.00 for the difficult task.

[INSERT TABLE 3 HERE]

Performance Benchmarks

Employment contract performance benchmarks are determined by Round 0 scores and are meant to reflect average task specific skill, measured as Round 1 scores. As reported in Table 3, Panel B, scores in Round 0 are statistically equivalent to Round 1 for both the easy task ($t = 0.03$, *ns*) and the difficult task ($t = 0.57$, *ns*). Given an easy task, 56% exceeded the performance benchmark of 22, which is not significantly different than 50% ($z = 0.58$, *ns*). However, for the difficult task, only 24% of participants exceeded the performance benchmark of 10, which is significantly lower than 50% ($z = 2.60$, $p < 0.01$). Thus, it appears that while the performance benchmark is appropriate for the easy task, it is too high for difficult task.

Perception of Task Specific Skill

Table 4 reports descriptive statistics and Figure 1 provides a graphical summary of actual and perceived task specific skill. Estimates of oneself are predicted to be more accurate than estimates of others. Results (not tabulated) suggest that perceptions of

others are significantly different than actual task specific skill given an easy task (*t = 4.52, p < 0.01*) or a difficult task (*t = 1.77, p = 0.08*). However, perceptions of oneself are no more accurate than perceptions of others for either an easy task (*t = 0.30, ns*) or a difficult task (*t = 1.12, ns*). Overall, results indicate that people are poor judges of themselves as well as others.

[INSERT FIGURE 1 HERE]

[INSERT TABLE 4 HERE]

Results support predictions that, given an easy task, individuals underestimate their own task specific skill (*t = 3.07, p < 0.01*), and overestimate their comparative task specific skill. Participants rank themselves in the 70^{th} percentile, which is significantly higher than the average (*t = 4.56, p < 0.01*), even though they believe their task specific skill is equal to that of others (*t = 0.30, ns*). Contrary to predictions of overconfidence, participants also underestimate their task specific skill on difficult tasks (*t = 3.98, p < 0.01*). Consistent with the below-average effect, individuals believe their task specific skill is significantly lower than others (*t = 4.81, p < 0. 01*), and estimate their rank to be 42%, significantly below average (*z = 1.80, p = 0.04*). Results support underestimation and the above-average effect for easy tasks, and the below-average effect for difficult tasks.

Knowledge of one's task specific skill is expected to exacerbate the above-average and below-average effects. To test this prediction, relative assessments given no performance feedback (Round 1) are compared to relative assessments given self feedback (Round 3). When a task is easy, self feedback exacerbates the above-average effect, as evidenced by a 15% increase in perceived rank from Round 1 to Round 3 (*t =*

2.27, p = 0.01). However, given a difficult task, self feedback has no effect on relative assessments (*t = 0.30, ns*). Results provide mixed support for the effect of knowledge of one's task specific skill on relative assessments.

Hypotheses Tests

Hypothesis 1 predicts that the association between contract performance intensity and task specific skill is stronger when workers select from an array of individual performance-based pay schemes than from an array of relative performance-based pay schemes. As reported in Table 5, in the individual performance-based pay regime, 48% of selected contracts are commensurate with task specific skill as compared to 45% in the relative performance-based pay regime. However, the difference is not significant (*z = 0.22, ns*). Results do not support H1.

[INSERT TABLE 5 HERE]

Hypothesis 2 predicts an interaction between incomplete knowledge of task specific skill and task difficulty when workers select from an array of individual performance-based contracts. The dependent variable, contract selection, is measured as the percentage of contracts selected that are performance-based and the performance intensity of selected contracts. As reported in Table 6, Panel B, a simple effects analysis is performed to test for an interaction. As shown in Figure 2, Panel A, the pattern of results is consistent with the prediction that knowledge of task specific skill increases (decreases) the likelihood of selecting performance-based pay given an easy task (difficult task). As reported in Table 6 when contracting for an easy task, 54% of participants select performance-based pay in Round 2 versus 77% in Round 3 (*z = 1.24, p = 0.11*). Further, as reported in Table 7, the performance intensity of selected contracts is

lower in Round 2 than in Round 3 (*t = 1.52, p = 0.07*). Findings support the hypothesis that given an easy task, when workers possess incomplete knowledge of their task specific skill they underestimate themselves and select less performance intensive contracts than when workers possess knowledge of their task specific skill. Consistent with H2b, contract selection in Round 2 is more performance intensive than in Round 3, however the difference is not significant (*t = 0.74, ns*).[10]

[INSERT FIGURE 2 HERE]

[INSERT TABLE 6 HERE]

[INSERT TABLE 7 HERE]

Additionally, I expect that in Round 2, workers in the easy task condition are less likely to select performance-based pay than workers in the difficult task condition, due to underconfidence in the former and overconfidence in the latter, but find no significant difference in contract selection (*t = 0.66, ns*). However, results are consistent with the prediction that knowledge of task specific skill has an opposite effect on contract selection for easy tasks and difficult tasks. In Round 3, workers in the easy task group are more likely to select a performance-based contract than workers in the difficult task group (*t = 2.25, p = 0.01*). In sum, findings suggest that when workers select from an array of individual performance-based contracts, the effect of incomplete knowledge of task specific skill is dependent on job difficulty.

Hypothesis 3 predicts the following interaction between incomplete knowledge of task specific skill and task difficulty under a relative performance-based pay regime.

[10] It is worth noting that only 24% of participants' task specific skill exceeded the performance benchmark, as shown in Table 1, Panel B. Consistent with overconfidence, when participants do not receive performance feedback, 40% selected performance-based pay.

Given relative performance-based pay, when a task is easy (difficult), workers with incomplete knowledge of task specific skill believe they are above average (below average) and are thus more (less) likely to select performance intensive pay than workers with knowledge of others' task specific skill. As reported in Table 6, Panel C, a simple effects analysis is performed to test H3. For an easy task, in Round 2 contract selection is 20% more heavily performance-based than in Round 3 ($z = 1.05$, *ns*). However the performance intensity of selected contracts remains unchanged ($t = 0.00$, *ns*), and neither measure is significant. For a difficult task, results are directionally inconsistent with predictions. As shown in Table 6, Panel A, in Round 2, 44% of participants select performance-based pay versus 33% in Round 3 ($t = 0.49$, *ns*).[11] Findings suggest individuals faced with an easy task (difficult task) believe they are above average (below average), but providing feedback about others' task specific skill does not lead to selection of less (more) performance intensive contracts.

Further, I expect that given incomplete knowledge of their task specific skill, workers contracting for an easy task (who believe they are above average) and are more likely to select performance-based pay than workers contracting for a difficult task (who believe they are below average). Results support this prediction, whether workers receive performance feedback ($t = 1.67$, $p = 0.09$) or not ($t = 2.21$, $p = 0.01$). As shown in Figure 2, Panel B, results are consistent with the notion that workers believe they are above

[11] This result may be a function of the inflated performance benchmark used in employment contracts given for difficult task. In Round 3, participants were informed that on average, participants answered 10 questions correctly. Assuming participants select employment contracts to maximize their expected payout, in order to select performance-based pay, participants must believe they can answer at least 11 questions correctly. Only 24% of participants in the difficult task condition were able to do so. Therefore, it is likely that in Round 3, providing other feedback influenced contract selection away from performance-based pay.

average for easy tasks and below average for difficult tasks and these biased self-assessments systematically influence contract selection.

Hypothesis 4a predicts that under a relative performance-based pay regime, given an easy task, knowledge of one's task specific skill exacerbates the above-average effect and leads to selection of more performance intensive contracts. Although the performance intensity of selected contracts is slightly higher in Round 3 than in Round 2, the difference is not significant (*t = 0.68, ns*), as reported in Table 7. Further, the percentage of performance-based contracts selected is unchanged from Round 2 to Round 3 (*t = 0.00, ns*). Hypothesis 4b predicts that given relative performance-based pay, when a task is difficult, knowledge of one's task specific skill exacerbates the below-average effect and reduces the likelihood of selecting performance-based pay. However, in Round 3, 17% more (*z = 0.59, ns*) performance-based contracts are selected, and performance intensity of selected contracts is 0.16 points higher (*t = 0.36, ns*) than in Round 2, although neither effect is significant.

Results of simple effects analysis reported in Table 6, Panel C and graphically depicted in Figure 2, Panel C, are consistent with the prediction that workers in the easy task group are more likely to select performance-based contracts than workers in the difficult task group given incomplete knowledge of task specific skill (*t = 2.21, p = 0.01*). However, contrary to expectations, knowledge of one's task specific skill does not magnify the difference in contract selection between easy and difficult tasks (*t = 0.48, ns*). In summary, findings do not support the prediction that providing individual performance feedback exacerbates the above-average effect (below-average effect) and

leads to a larger gap in performance intensity of selected contracts between task difficulty conditions.

Additional Analysis

To further test whether biased self-assessments systematically influence contract selection, I examine the interactive effects of employment contract type and task difficulty given incomplete knowledge of task specific skill. Figure 3 depicts underconfidence (overconfidence),[12] as evidenced by employment contract selection relative to task specific skill in Round 2. Given incomplete knowledge of task specific skill, participants' contract selection decisions are consistent with patterns predicted in H2 and H3. In other words, when workers select from an array of individual performance-based contracts, contract selection is consistent with underconfidence (overconfidence) given an easy task (difficult task). Further, contract selection is also consistent with the above-average effect (below-average effect) when workers contract for an easy task (difficult task), under a relative performance-based pay regime.

[INSERT FIGURE 3 HERE]

When contracting for an easy task, workers selecting from an array of individual performance-based contracts are predicted to select less performance intensive contracts than workers selecting from an array of relative performance-based contracts, due to underconfidence in the former and overconfidence in the latter. As reported in Table 6, Panel D, and shown in Figure 2, Panel D, results provide support for this prediction. The

[12] Over (under) confidence is calculated as the actual percentage of performance-based contract selections minus the expected percentage of performance-based contract selections x 100. The expected percentage of performance-based contract selections is determined as follows. For individual employment contracts, the expected percentage is equal to the percentage of participants whose task specific skill is above the performance benchmark of 22 for the easy task or 10 for the difficult task. For relative employment contracts, expected percentage is equal to 50%.

proportion of performance-based contracts selected by participants in the individual performance-based pay group is 32% lower than in the relative performance-based pay group ($z = 1.81$, $p = 0.04$), and the performance intensity of selected contracts is significantly lower ($t = 1.44$, $p = 0.08$) (not tabulated). Further, I predict that when workers contract for difficult tasks, they are more likely to select performance-based pay when choosing from an array of individual performance-based contracts than from an array of relative performance-based contracts, due to overconfidence in the former and underconfidence in the latter. However, I find no significant difference between the two groups ($t = 033$, *ns*).

Comparison of Round 2 contract selection across employment contract type and task difficulty provides mixed support for the predicted pattern of results. In summary, results for the main hypotheses tests and additional analysis provide partial evidence that biased self-perceptions of oneself and others systematically influence contract selection.

V. CONCLUSION

Accounting systems provide information about performance that can be used to design employment contracts to attract the right workers. Given that self-sorting accounts for nearly 50% of the effect of incentives on performance (Cadsby et al. 2007; Lazear 2000), the degree to which employment contracts enable workers to effectively self-sort into different jobs has a significant impact on productivity, However, for self-sorting to be effective, workers must be able to select appropriate employment contracts. In practice, this may be difficult as workers often lack relevant experience and performance feedback necessary to accurately assess their task specific skill (MacDonald 1982a, 1982b, 1982c).

I find that consistent with prior research, given incomplete knowledge of task specific skill, for easy tasks workers underestimate their individual task specific skill, but believe they are above average relative to others. Further, for difficult tasks workers believe they are below average. I hypothesize that biased self-assessments systematically influence contract selection. Findings provide mixed support for this prediction. When workers select from an array of employment contracts based on individual performance, findings are consistent with underestimation for easy tasks, but are not consistent with overestimation for difficult tasks. In other words, when a task is easy, workers with incomplete knowledge of task specific skill are less likely to select performance intensive pay than workers with knowledge of their task specific skill. When workers select from an array of employment contracts based on relative performance, results of the main hypotheses tests do not support the prediction that providing relative performance feedback reduces the influence of the above-average or below-average effects on contract selection. However, I find that consistent with the above-average and below-average effects, workers contracting for easy tasks are more likely to select relative performance-based pay than workers contracting for difficult tasks.

This study provides an examination of important factors that influence self-sorting and answers recent calls for research that examines how employment contract design affects worker contract selection (Bonner and Sprinkle 2002; Gerhart and Rynes 2003). Findings suggest that incomplete knowledge of task specific skill does not lead to random noise, but rather to systematic bias in self-assessments. Thus, firms should take into account the interactive effects of incomplete knowledge of task specific skill and task difficulty when designing compensation schemes.

There are several limitations to this study. First, manipulating incomplete knowledge of task specific skill within participants raises the possibility of a confound between feedback and task experience. However, while experience is expected to have a main effect on contract selection, feedback is predicted to have a differential effect, dependent on employment contract type and task difficulty. Second, results of the main hypotheses tests do not provide robust support for the predicted pattern of results. One reason for this may be a lack of power due to small sample sizes for several cells, as shown in Table 1. In addition, the contract performance benchmark used for the difficult task was miscalibrated, likely contributing to contract selection away from the hypothesized direction. Third, another limitation of the study is the scope. This study examines how salient worker, contract, and environmental factors affect self-sorting. However it is also important to understand the impact of contract selection on performance. Further research should examine whether factors that systematically influence contract selection also impact performance.

REFERENCES

Bhamornsiri, S., and R. Guinn. 1991. The road to partnership in the "Big Six" firms: Implications for accounting education. *Issues in Accounting Education* 6 (1): 9–24.

Bonner, S., R. Hastie, G. Sprinkle, and S. Young. 2000. A review of the effects of financial incentives on performance in laboratory tasks: Implications for management accounting. *Journal of Management Accounting Research* 12: 19–64.

Bonner, S., and G. Sprinkle. 2002. The effects of monetary incentives on effort and task performance: theories, evidence, and a framework for research. *Accounting, Organizations, and Society* 27: 303–345.

Bureau of Labor Statistics. 2006. *Number of Jobs Held, Labor Market Activity, and Earnings Growth among the Youngest Baby Boomers: Results from a Longitudinal Survey.* Available at http://www.bls.gov/news.release/pdf/nlsoy.pdf

Blanton, H., D. Axsom, K. McClive, and S. Price. 2001. Pessimistic bias in comparative evaluations: A case of perceived vulnerability to the effects of negative life events. *Personality and Social Psychology Bulletin* 27: 1627–1636.

Brink, A. 2008. The effects of risk preference and loss aversion on individual behavior under bonus, penalty, and combined contract frames. Working Paper, Virginia Commonwealth University.

Burson, K. A., Larrick, R. P., & Klayman, J. 2006. Skilled or unskilled, but still unaware of it: How perceptions of difficulty drive miscalibration in relative comparisons. *Journal of Personality and Social Psychology* 90: 60–77.

Cable, D., and T. Judge. 1994. Pay preferences and job search decisions: A person-organization fit perspective. *Personnel Psychology* 47: 317–348.

Cadsby, C., F. Song, and F. Tapon. 2007. Sorting and incentive effects of pay for performance: An experimental investigation. *Academy of Management Journal* 50 (2): 387–405.

Chambers, J., and P. Windschitl. 2004. Biases in social comparative judgments: The role of nonmotivated factors in above-average and comparative optimism effects. *Psychological Bulletin* 130 (5): 813–838.

Chambers, J., P. Windschitl, and J. Suls, 2003. Egocentrism, event frequency, and comparative optimism: When what happens frequently is "more likely to happen to me." *Personality and Social Psychology Bulletin 29:* 1343–1356.

Chow, C. 1983. The effects of job standard tightness and compensation scheme on performance: An exploration of linkages. *The Accounting Review* 58: 667–685.

Dawes, R. and M. Mulford. 1996. The false consensus effect and overconfidence: Flaws in judgment or flaws in how we study judgment? *Organizational Behavior and Human Decision Processes* 65: 201–211.

Demski, J., and G. Feltham. 1978. Economic incentives in budgetary control systems. *The Accounting Review* 53 (2): 336–359.

Dillard, J., and J. Fisher. 1990. Compensation schemes, skill level, and task performance. *Decision Sciences* 21: 121–137.

Dohmen, T., and A. Falk. 2006. Performance pay and multi-dimensional sorting: Productivity, preferences, and gender. IZA Discussion Paper.

Ehrlinger, J., K. Johnson, M. Banner, D. Dunning, and J. Kruger. 2008. Why the unskilled are unaware: Further explorations of (absent) self-insight among the incompetent. *Organizational Behavior and Human Decision Processes* 105: 98–121.

Epley, N., and D. Dunning. 2006. The mixed blessings of self-knowledge in behavioral prediction: Enhanced discrimination but exacerbated bias. *Personality and Social Psychology Bulletin* 32: 641–655.

Erev, I., T. Wallsten, and D. Budescu. 1994. Simultaneous over- and underconfidence: The role of error in judgment processes. *Psychological Review* 101: 519–527.

Festinger, L. 1954. A theory of social comparison processes. *Human Relations* 7 (2): 117–140.

Fiedler, K. 1996. Explaining and simulating judgment biases as an aggregation phenomenon in probabilistic, multiple-cue environments. *Psychological Review* 103: 193–214.

Fiedler, K. 2000. Illusory correlations: A simple associative algorithm provides a convergent account of seemingly divergent paradigms. *Review of General Psychology* 4: 25–58.

Gerhart, B., and S. Rynes. 2003. *Compensation: Theory, Evidence, and Strategic Implications.* Thousand Oaks: Sage Publications.

Hyatt, T., and M. Taylor. 2008. The effects of incomplete personal capability knowledge and overconfidence on employment contract selection. *Behavioral Research in Accounting* 20 (2): 37–53

Kachelmeier, S., and M. Williamson. 2008. Attracting creativity: The initial and aggregate effects of contract selection on creativity-weighted productivity. Working Paper, University of Texas at Austin.

Kunda, Z. 1990. The case for motivated reasoning. *Psychological Bulletin* 108 (3): 480–498.

Krueger, J., and R. Mueller. 2002. Unskilled, unaware, or both? The better-than-average heuristic and statistical regression predict errors in estimates of own performance. *Journal of Personality and Social Psychology* 82: 180–188.

Kruger, J. 1999. Lake Wobegon be gone! The "Below-Average Effect" and the egocentric nature of comparative ability judgments. *Journal of Personality and Social Psychology* 77 (2): 221–232.

Kruger, J., and D. Dunning. 1999. Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology* 77 (6): 1121–1134.

Kruger, J., and D. Dunning. 2002. Unskilled and unaware – but why? A reply to Krueger and Mueller (2002). *Journal of Personality and Social Psychology* 82 (2): 189–192.

Lazear, E. 2000. Performance pay and productivity. *The American Economic Review* 90 (5): 1346–1361.

MacDonald, G. 1982a. A market equilibrium theory of job assignment and sequential accumulation of information. *The American Economic Review* 72 (5): 1038–1055.

MacDonald, G. 1982b. Information and job choice. *The Canadian Journal of Economics* 15 (1): 28–50.

MacDonald, G. 1982c. Information in production. *Econometrica* 50 (5): 1143–1162.

Miller, D., and C. McFarland. 1987. Pluralistic ignorance: When similarity is interpreted as dissimilarity. *Journal of Personality and Social Psychology* 53: 298–305.

Moore, D., and D. Small. 2007. Error and bias in comparative judgment: On being both better and worse than we think we are. *Journal of Personality and Social Psychology* 92 (6): 972–989.

Sande, G., G. Goethals, and C. Radloff. 1988. Perceiving one's own traits and others': The multifaceted self. *Journal of Personality and Social Psychology* 54: 13–20.

Salop, J., and S. Salop. 1976. Self-selection and turnover in the labor market. *Quarterly Journal of Economics* 90 (4): 619–627.

Spence, M. 1973. Job market signaling. *Quarterly Journal of Economics* 87 (3): 355–374.

Sprinkle, G., and M. Williamson. 2006. Experimental research in managerial accounting. In C. Chapman, A. Hopwood, and M. Shields (Eds), *Handbook of Management Accounting Research, Vol. 1*. Oxford: Elsevier.

Svenson, O. (1981). Are we less risky and more skillful than our fellow drivers? *Acta Psychologica* 47: 143–151.

Tan, H. 1999. Organizational levels and perceived importance of attributes for superior audit performance. *Abacus* 35 (1): 77–90.

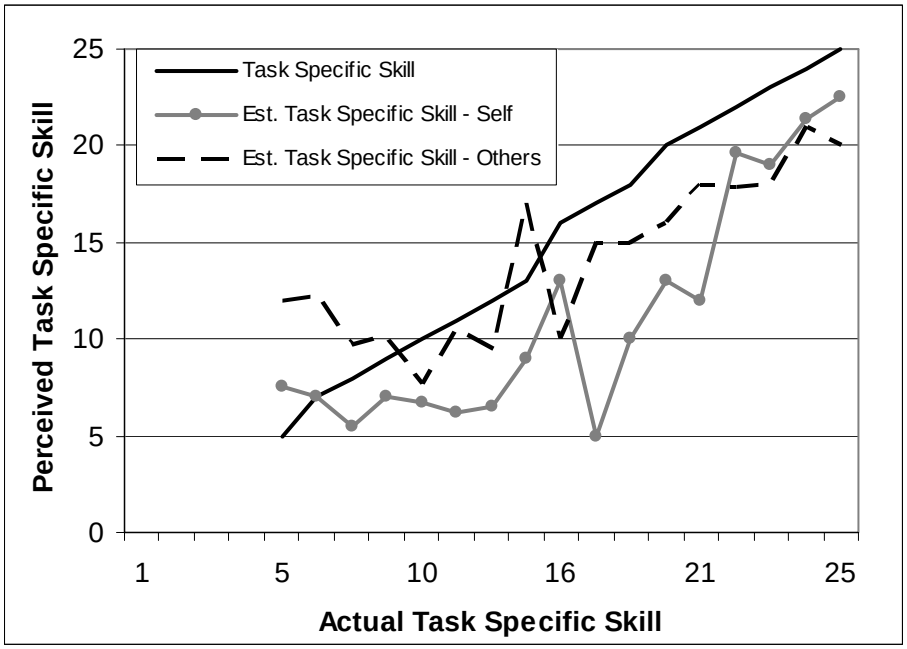
Tan, H., and R. Libby. 1997. Tacit managerial versus technical knowledge as determinants of audit expertise in the field. *Journal of Accounting Research* 35 (1): 97–113.

Tversky, A., and D. Kahneman. 1974. Judgment under uncertainty: Heuristics and biases. *Science* 185: 1124–1131.

Vroom, V. 1964. *Work and Motivation.* New York: Wiley.

Waller, W., and C. Chow. 1985. The self-selection and effort effects of standard-based employment contracts: A framework and some empirical evidence. *The Accounting Review* 60 (3): 458–476.

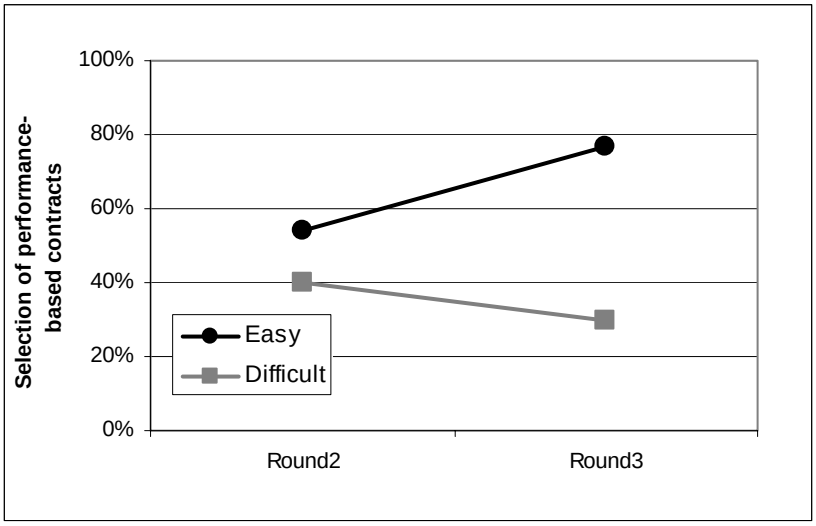
FIGURE 1
Actual[a] and Perceived Task Specific Skill (Round 1)



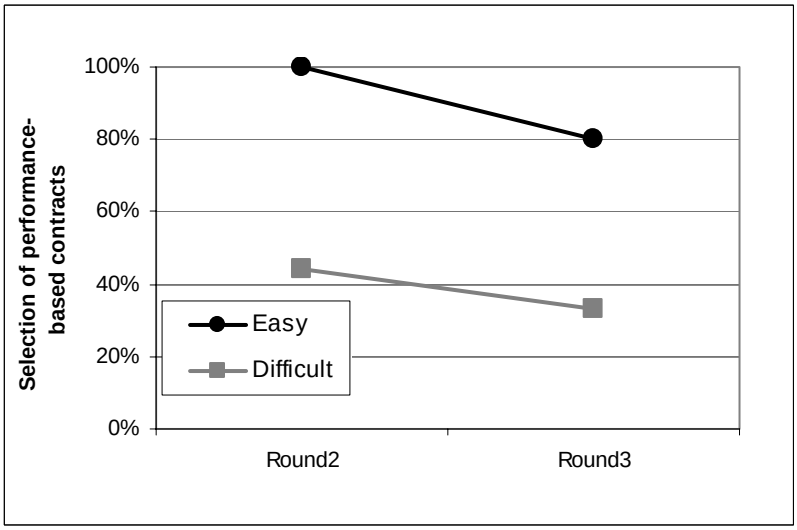
[a] Actual task specific skill is measured as the number of questions answered correctly in Round 1.

FIGURE 2
Performance-Based Contract Selection

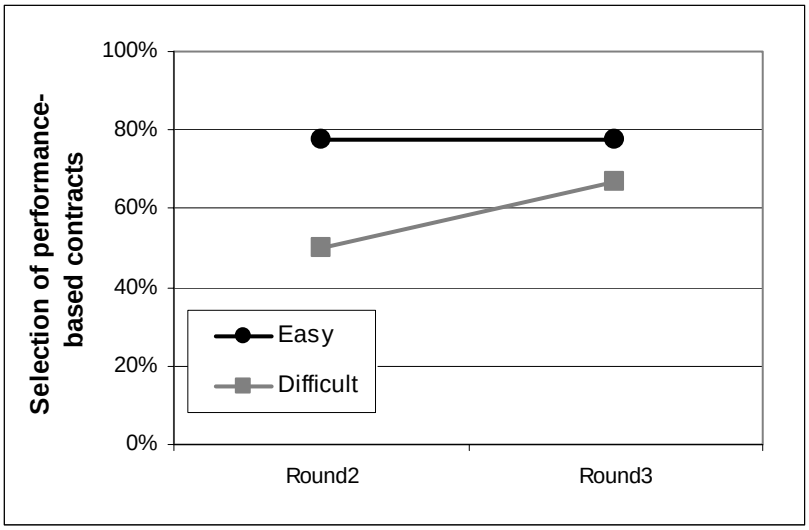
Panel A: Individual Performance-Based Contract Selection, Incomplete Knowledge (R2)[a] and Knowledge – Self (R3)[b]



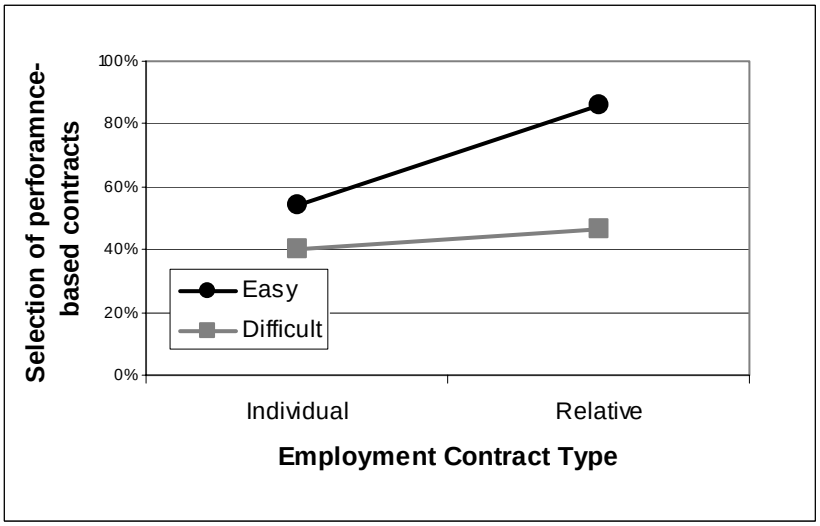
Panel B: Relative Performance-based Contract Selection Incomplete Knowledge (R2) and Knowledge – Others (R3)[c]



Panel C: Relative Performance-based Contract Selection
Incomplete Knowledge (R2) and Knowledge – Self (R3)



Panel D: Individual and Relative Performance-Based Contract Selection
Incomplete Knowledge (R2)

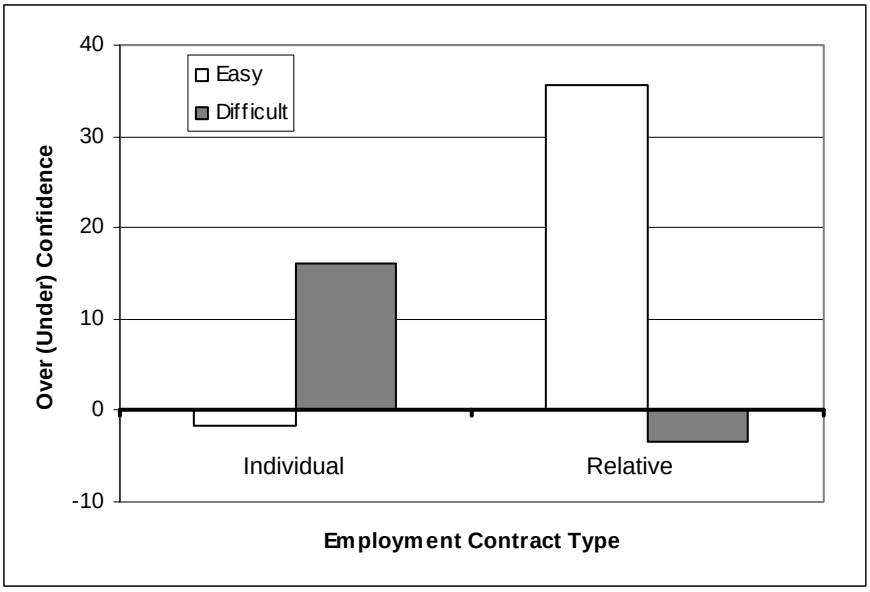


[a] Incomplete – Knowledge (R2) represents contract selection given incomplete knowledge of task specific in Round 2.

[b] Knowledge – Self (R3) represents contract selection given knowledge of one's task specific skill.

[c] Knowledge – Others (R3) represents contract selection given knowledge of others' task specific skill.

FIGURE 3
Over(Under) Confidence, Incomplete Knowledge (R2)[a]



[a] Over (under) confidence is calculated as the actual percentage performance-based contract selected minus the expected percentage of performance-based contract selected x 100 in Round 2. The expected percentage of performance-based contract selected is determined as follows. For individual employment contracts, expected percentage is equal to the percentage of participants whose task specific skill is above the performance benchmark of 22 for the easy task or 10 for the difficult task. For relative employment contracts, it is equal to 50%.

TABLE 1
Experimental Design

Panel A: Experimental Design

		Easy Task	Difficult Task
Individual Employment Contract	Incomplete Knowledge(R2)[a]/ Knowledge-Others (R3)[b]		
	Incomplete Knowledge (R2)/ Knowledge-Self (R3) [c]	n = 13	n = 10
Relative Employment Contract	Incomplete Knowledge(R2)/ Knowledge-Others (R3)	n = 9	n = 6
	Incomplete Knowledge (R2)/ Knowledge-Self (R3)	n = 5	n = 9

[a] Incomplete – Knowledge (R2) represents contract selection given incomplete knowledge of task specific in Round 2.
[b] Knowledge – Others (R3) represents contract selection given knowledge of others' task specific skill.
[c] Knowledge – Self (R3) represents contract selection given knowledge of one's task specific skill.

TABLE 2
Employment Contract Arrays

Panel A: Individual Employment Contract Array, Easy Task

	Payout amount (lira)	
Pay Schedule	22[a] or fewer correct answers	More than 22 correct answers
A	500	500
B	300	700
C	100	900

Panel B: Individual Employment Contract Array, Difficult Task

	Payout amount (lira)	
Pay Schedule	10[b] or fewer correct answers	More than 10 correct answers
A	500	500
B	300	700
C	100	900

Panel C: Relative Employment Contract Array, Easy and Difficult Task

	Payout amount (lira)	
Pay Schedule	At or below Average[c]	Above Average
A	500	500
B	300	700
C	100	900

Panel D: Conversion From Experimental Currency (Lira) to Dollars ($)

Experimental Currency (lira)	Dollars ($)
100	10
300	12
500	14
700	16
900	18

[a] The performance benchmark of 22 is determined by the average number of questions answered correctly by participants in the easy task condition in Round 0.

[b] The performance benchmark of 10 is determined by the average number of questions answered correctly by participants in the difficult task condition in Round 0.

[c] Average is equal to the average number of questions answered correctly by participants in Round 0. For the easy task, the average is 22. For the difficult task the average is 10.

TABLE 3
Performance Benchmarks, Task Specific Skill, and Performance

Panel A: Task Specific Skill and Performance Compared by Task Difficulty, Mean, (standard deviation), n

		Task Difficulty		Easy – Difficult	
Round	Measure	Easy	Difficult	Mean	t (p-value)
0	Performance benchmark	22.37 (5.05) 19	9.45 (3.73) 17	12.92	8.64 (<0.01)
1	Task specific skill	22.33 (3.13) 27	8.96 (1.88) 25	13.37	18.51 (<0.01)
2	Performance – Incomplete Knowledge of Task Specific Skill	23.22 (2.36) 27	8.92 (2.29) 25	14.30	22.15 (<0.01)
3	Performance – Knowledge of Task Specific Skill	23.48 (1.78) 27	8.68 (3.15) 25	14.80	23.38 (<0.01)

Panel B: Comparison of R1 Task Specific Skill and Performance to R0 Task Specific Skill and Performance Benchmarks

		Compared to Round 0		Compared to Performance Benchmark		
Round	Measure	Difference	t (p-value)[a]	Benchmark	% Exceed	z (p-value)[a]
Easy Task						
1	Task Specific Skill	0.04 (1.20)	0.03 (0.98)	22	56%	0.58 (0.56)
2	Performance – Incomplete Knowledge of Task Specific Skill	1.11 (1.05)	0.77 (0.45)	22	74%	2.50 (0.01)
3	Performance – Knowledge of Task Specific Skill	0.85 (1.11)	1.06 (0.30)	22	63%	1.35 (0.18)
Difficult Task						
1	Task Specific Skill	-0.49 (0.87)	0.57 (0.58)	10	24%	2.60 (0.01)
2	Performance – Incomplete Knowledge of Task Specific Skill	-0.53 (093)	0.57 (0.57)	10	24%	2.60 (0.01)
3	Performance – Knowledge of Task Specific Skill	-0.77 (0.99)	0.78 (0.44)	10	28%	2.20 (0.03)

[a] The p-values are reported on a one-tailed basis.

TABLE 4
Task Specific Skill and Employment Contract Selection

Panel A: Actual and Perceived Task Specific Skill (R1),[a] Mean (Standard Deviation)

	Task Difficulty	
	Easy	Difficult
n	27	25
Task Specific Skill	22.33 (0.60)	8.96 (0.38)
Perceived Task Specific Skill – Self	18.70 (1.01)	6.6 (0.46)
Perceived Task Specific Skill – Other	18.48 (0.60)	10.2 (0.59)
Perceived Percentile Rank	70.00% (4.39)	41.84% (4.52)

Panel B: Individual Employment Contract Selection, Incomplete Knowledge (R2),[b] Mean

Task Difficulty	Selected Contract	N	Perceived Task Specific Skill	Task Specific Skill	Performance	Payout ($)
Easy	A	6	18.33	23.71	23.67	14.00
	B	5	19.60	22.60	23.60	15.20
	C	2	23.50	24.50	24.00	18.00
Difficult	A	6	5.83	9.50	7.67	14.00
	B	3	9.00	5.50	8.67	13.33
	C	1	9.00	9.00	5.00	10.00

Panel C: Relative Employment Contract Selection, Incomplete Knowledge (R2), Mean

Task Difficulty	Selected Contract	N	Perceived Task Specific Skill	Task Specific Skill	Performance	Payout ($)
Easy	A	2	12.00	18.00	20.00	14.00
	B	9	17.56	21.56	22.67	14.22
	C	3	22.67	24.67	25.00	18.00
Difficult	A	8	6.13	8.63	9.25	14.00
	B	4	8.75	10.25	11.50	15.00
	C	3	8.00	7.00	8.67	10.00

[a] Actual task specific skill is measured as the number of questions answered correctly in Round 1.

[b] Incomplete – Knowledge (R2) represents contract selection given incomplete knowledge of task specific in Round 2.

TABLE 5
Commensurate Employment Contract Selection given Incomplete Knowledge (R2)[a], Frequency and Percentage

Task Difficulty	Contract Selection[b]	Individual Contract n	Commensurate		Relative Contract n	Commensurate		z (p-value)[c]
All	Flat wage	12	6	50%	10	6	60%	
	Performance-based	11	5	45%	19	7	37%	
	Mean	23	11	48%	29	13	45%	0.22 (0.42)
Easy	Flat wage	6	2	33%	2	1	50%	
	Performance-based	7	4	57%	12	6	50%	
	Mean	13	6	46%	14	7	50%	0.20 (0.58)
Difficult	Flat wage	6	4	83%	8	5	63%	
	Performance-based	4	1	25%	7	1	14%	
	Mean	10	5	50%	15	6	40%	0.49 (0.31)

[a] Incomplete – Knowledge (R2) represents contract selection given incomplete knowledge of task specific in Round 2.
[b] Contract selections A are categorized as flat wage. Contract selections B and C are categorized as performance-based.
[c] The p-values are reported on a one-tailed basis.

TABLE 6
Performance-Based Contract Selection

Panel A: Performance-Based Contract Selection, Percentage (Frequency)

Hyp	Employment Contract Type	Task Difficulty	Round 2/Round 3 Knowledge of Task Specific Skill	n	Selection of Performance-Based Contract: Round 2	Selection of Performance-Based Contract: Round 3
H2a	Individual	Easy	Incomplete Knowledge[a]/ Knowledge-Self[b]	13	54% (7)	77% (10)
H2b	Individual	Difficult	Incomplete Knowledge/ Knowledge-Self	10	40% (4)	30% (3)
H3a	Relative	Easy	Incomplete Knowledge/ Knowledge-Others[c]	5	100% (5)	80% (4)
H3b	Relative	Difficult	Incomplete Knowledge/ Knowledge-Others	9	44% (4)	33% (3)
H4a	Relative	Easy	Incomplete Knowledge/ Knowledge-Self	9	78% (7)	78% (7)
H4b	Relative	Difficult	Incomplete Knowledge/ Knowledge-Self	6	50% (3)	67% (4)

Panel B: Simple Effects for Individual Performance-Based Contracts

	Pred Sign	Mean	z (p-value)[d]
Effect of Incomplete knowledge of task specific skill (Incomplete knowledge vs. Knowledge – Self) given easy task	–	–23%	1.24 (0.11)
Effect of Incomplete knowledge of task specific skill (Incomplete knowledge vs. Knowledge – Self) given difficult task	+	10%	0.47 (0.32)
Task difficulty	?	30%	2.05 (0.04)
Effect of Task difficulty given Incomplete knowledge (R2)	–	14%	0.66 (0.26)
Effect of Task difficulty given Knowledge – Self (R3)	?	47%	2.25 (0.01)

Panel C: Simple Effects for Relative Performance-Based Contracts

	Pred Sign	Mean	z (p-value)[d]
Effect of Incomplete knowledge of task specific skill (Incomplete knowledge vs. Knowledge – Other) given easy task	+	20%	1.05 (0.15)
Effect of Incomplete knowledge of task specific skill (Incomplete knowledge vs. Knowledge –Other) given difficult task	–	11%	0.49 (0.69)
Effect of Incomplete knowledge of task specific skill (Incomplete knowledge vs. Knowledge – Self) given easy task	–	0%	000 (0.50)
Effect of Incomplete knowledge of task specific skill (Incomplete knowledge vs. Knowledge –Self) given difficult task	+	-17%	0.59 (0.72)
Task difficulty	?	35%	2.81 (0.01)
Effect of Task difficulty given Incomplete knowledge (R2)	+	39%	2.21 (0.01)
Effect of Task difficulty given Knowledge – Others (R3)	?	47%	1.67 (0.09)
Effect of Task difficulty given, Knowledge – Self (R3)	+	11%	0.48 (0.32)

Panel D: Simple Effects for Incomplete Knowledge (R2)

	Pred Sign	Mean	z (p-value)[d]
Effect of Employment contract type given an Easy task	–	-32%	1.81 (0.04)
Effect of Employment contract type given a Difficult task	+	-7%	0.33 (0.63)

[a] Incomplete – Knowledge represents contract selection given incomplete knowledge of task specific in Round 2.

[b] Knowledge – Self represents contract selection given knowledge of one's task specific skill.

[c] Knowledge – Others represents contract selection given knowledge of others' task specific skill.

[d] The p-values are reported on a one-tailed basis given a directional prediction and on a two-tailed basis given there is no directional prediction.

TABLE 7
Performance Intensity of Selected Contracts, Mean (Standard Deviation)

Hyp	Employment Contract Type	Task Difficulty	Round 2/Round 3 Knowledge of Task Specific Skill	n	Performance Intensity of Selected Contracts[a] Round 2	Performance Intensity of Selected Contracts[a] Round 3	R2 – R3 Pred Sign	R2 – R3	t (p-value)[b]
H2a	Individual	Easy	Incomplete Knowledge/ Knowledge-Self	13	1.69 (0.75)	2.15 (0.80)	–	-0.46	1.52 (0.07)
H2b	Individual	Difficult	Incomplete Knowledge/ Knowledge-Self	10	1.5 (0.71)	1.3 (0.15)	+	0.20	0.74 (0.24)
H3a	Relative	Easy	Incomplete Knowledge/ Knowledge-Others	5	2.4 (0.55)	2.4 (0.89)	+	0.00	0.00 (0.50)
H3b	Relative	Difficult	Incomplete Knowledge/ Knowledge-Others	9	1.67 (0.87)	1.56 (0.88)	–	0.11	0.27 (0.60)
H4a	Relative	Easy	Incomplete Knowledge/ Knowledge-Self	9	1.89 (0.60)	2.11 (0.78)	–	-0.22	0.68 (0.25)
H4b	Relative	Difficult	Incomplete Knowledge/ Knowledge-Self	6	1.67 (0.82)	1.83 (0.75)	+	-0.16	0.36 (0.64)

[a] Performance intensity is calculated as the average performance intensity of selected contracts, coding Contract A, B, and C equal to value 1, 2, and 3, respectively.

[b] The p-values are reported on a one-tailed basis.