GENDER, COMPETITION, AND MANAGERIAL DECISIONS

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Abstract: Recent research has found drastic differences across gender in how performance and preferences are affected by competition. In light of these, this study addresses how gender affects the use of competitive compensation. When given information about worker ability, male managers, but not female managers, are reluctant to choose the tournament for a female worker. The data also show that even though male subjects perform better in the tournament relative to female subjects, and male subjects are generally thought of as higher ability, male subjects performing the task under the tournament perform worse when the choice of compensation is made for them by another subject.
1. INTRODUCTION

Recent experimental research has focused on performance differences and selection biases in relation to competitive payment schemes to explain the under representation of women in high paying managerial jobs. In light of these past results, this research proposes the study of a new avenue that may affect, not the supply of women into competitive jobs, but the demand for women in such positions. In light of the large differences between men’s and women’s preferences for competition, it is likely that these preferences may in turn affect the demand for women in some jobs where the use of competition is prevalent. Just as advancement by females in an organization may be affected by their relative discomfort in performing under competition, so too females advancement may differ from males if they hold disparate preferences for using competitive mechanisms among subordinates. In positions where subordinate’s wages are determined using competitive payment schemes, females may be passed over for consideration if it is believed that they have a distaste for their job duties, namely the use of competition as an incentive device.

Although the study of gender and its interaction with management roles has garnered much attention in the social psychology literature it has received very little attention from economists.\(^1\) A potential reason for this lack of research is that field data on gender differences in managerial responsibilities and compensation packages entail significant self-selection biases, as pointed out by Eagly and Johannesen-Schmidt (2007) and Gneezy & Rustichini (2006).\(^2\)

To overcome potential selection issues, I utilize a laboratory setting. With this approach we are able to generate data that allow a direct examination of the questions regarding differing managerial styles between genders with regard to a traditional
managerial task, namely the determination of the compensation structure for workers. Specifically, I address the following two questions: (1) How do a manager’s own preferences between absolute and relative compensation shape their choice of compensation scheme for a worker? and (2) Do men and women systematically differ in relation to the use of competitive payment schemes? The answers to these questions have a direct impact on the distribution of women in high paying managerial careers where relative compensation schemes are common.

2. BACKGROUND

The fact that women in the labor force have lower wages than men is well documented (see Blau & Kahn (2000) & more recently Gunderson (2006) for an overview). Recent research of the gender wage disparity has lead economists to study how men and women cope with interpersonal competition in wages, a facet of some high paying jobs. Studies have examined two ways in which men and women differ in relation to competitive situations: performance and preference. Gneezy, Niederle, & Rustichini (2003) and Gneezy & Rustichini (2004) find that when faced with relative payment (tournament) versus absolute payment (piece rate), male subjects tend to outperform their female counterparts in the tournament, even though male and female performances are not different under the piece rate. In terms of preference differences, Niederle & Vesterlund (2007) (hereafter NV), Gneezy & Rustichini (2006), and Niederle, Segal, and Vesterlund (2008) show that, while controlling for any performance differences, women choose to perform with a piece rate payment and men choose to perform under the tournament payment. The authors point to these results in an attempt to explain why so few women populate the ranks of high paid managerial jobs.³

The experimental research cited above is closely related to research by Geddes & Heywood (2003) which considers the interaction of gender and payment type. The
authors find that women are more likely than males to be paid by piece rate when compared to bonuses and commissions. It is unclear whether women choose to be paid by piece rate or if women are guided towards occupations where absolute performance, rather than relative performance, is rewarded. Certainly previous research shows a tendency for women to self-select out of competitive situations but there could also exist a glass ceiling where qualified women are effectively passed over for high paying managerial positions because of their reluctance to utilize competition as an incentive device.

3. Experimental Design & Procedures

Subjects are recruited from the student population of Purdue University using standard recruitment protocols employed at the Vernon Smith Experimental Economics Laboratory. The subjects sign up for an experimental session knowing only that the session is scheduled to last 1.5 hours and that it is an economics experiment. When subjects arrive at the laboratory they are directed to sign in and are seated by an experimenter. The subjects are seated with two people directly next to each other and each group of two separated by an empty computer terminal. The computer terminals are separated by partition walls and at each computer terminal are four pieces of blank white paper and one pen. To limit the amount of subject priming that occurs, at no time during the experiment is the issue of gender mentioned.4

Only in the third task are the subjects associated in groups of two. In the third task, subjects are asked to choose a compensation scheme for their group member. The person making the choice is called the manager and the other group member is called the worker.
To capture the impact of gender, I exogenously vary the gender composition of the groups in the manager’s choice portion of the experiment (Task 3). I will refer to these three groupings by the gender composition of the groups: male-female (Mixed), female-female (FF), and male-male (MM). By comparing across these three groupings I can systematically test if the gender of the manager impacts the decision of payment type, and also how the gender of the worker influences the payment type. The third task will be outlined in more detail below.

Once subjects are seated the experiment begins. Instructions for the first task are read aloud and subjects are asked to follow along. The experiment comprises of four sections or tasks.\(^5\) In each task, the subjects are given five minutes to find the correct sum for a series of five two-digit numbers. The numbers are shown on the computer screen with a box for input and a button to submit their answer. Once an answer is submitted the computer immediately shows a new problem along with an indication of the number of correct and incorrect problems answered to that point. Instructions are read aloud at the beginning of each of the four tasks. Prior to reading the instructions for a given task, subjects are not aware of any of the design features of the subsequent tasks. This feature minimizes any strategic concerns pertaining to subsequent performance and choices.

After all four tasks are completed, subjective questions evaluating the ability of both the worker and the manager are asked. At the conclusion of all portions of the experiment, one of the four tasks is randomly selected for payment by rolling a four-sided dice. The subjects are guaranteed a $5 fixed fee for taking part in the experiment along with their earnings from one of the four tasks in addition to earnings from the subjective questions on ability. The details of potential payments in each task are outlined below.
**Task 1 – Piece Rate:** Subjects are given five minutes to solve problems. For each correct answer they earn $0.75.

**Task 2 – Tournament:** Subjects are given five minutes to solve problems. After the five minutes have expired, each subject’s number of correct problems is compared to the number correct of a subject from a previous session of the experiment. This performance is selected randomly from the previous subject list. If the subject solves more problems correctly than the selected performance, they are paid $1.50 per correct problem. If she solves fewer problems, they are paid $0 for this task. If she solves the same number of problems, she has a 50% chance of either the $1.50 per correct problem or nothing. Subjects are not told if they have won the tournament until the conclusion of the experiment.

**Task 3- Manager’s Choice:** Subjects are placed in groups of two. At the beginning of this task, subjects are told that their group member is sitting next to them. In some instances women were grouped with men, men grouped with men, and women grouped with women.

Once groups are identified, each member is told that they are equally likely to be a manager or a worker. Two separate treatments are identified concerning the amount of information that subjects are given to make the decision of payment type for their group member. In the first treatment, subjects are shown the number correct by their group member in both the piece rate and tournament. In the second treatment, no information concerning the performance of the group member is given. Afterwards, both subjects in each group choose a compensation scheme for their group member. After both group members have chosen, it is revealed which group member is the worker and which group member is the manager. Only the manager’s choice is enforced. This design employs the so-called strategy method of choice elicitation, which allows for the collection of
twice as much data as would be the case if merely one subject was appointed the manager or some rule was used to determine the manager and worker.\textsuperscript{6}

In this task, only the workers solve problems during the five minute session. The managers earn $1 for each problem that the worker solves correctly during the five minute session. If the manager chooses piece rate, the worker earns $0.75 per correct problem. If the manager chooses tournament, the worker’s performance is compared to that of another subject’s task 2 performance from an earlier experimental session. If she correctly solves more problems than the selected performance, she earns $1.50 per correct problem. If she correctly solves fewer problems, the subject earns nothing for this task. If she correctly solves the same number of problems, the subject has a 50\% chance of either the $1.50 per correct problem or nothing. Again, the results of any tournament will not be revealed until the conclusion of the experiment.

\textbf{Task 4 – Individual Choice:} Each subject chooses how they want to get paid from either the piece rate or the tournament. If the piece rate is chosen, the subject earns $0.75 per correct problem. If the subject chooses tournament, the subject’s performance is compared to that of another subject’s task 2 performance from an earlier experimental session. If she correctly solves more problems than the selected performance, she earns $1.50 per correct problem. If she correctly solves fewer problems, the subject earns nothing for this task. If she correctly solves the same number of problems, the subject has a 50\% chance of either the $1.50 per correct problem or nothing.

\textbf{Subjective Ranking Questions:} After all four tasks are complete, the subjects are asked a series of subjective ranking questions pertaining to their own and their Task 3 group member’s performance.\textsuperscript{7} They are also asked to guess which quartile their own performance falls. For each question that is answered correctly, the subject earns $0.50
regardless of which task is selected for payment. These responses are collected prior to individuals knowing the outcome of any tournaments they took part in.8

These questions will serve two purposes in the analysis. First, by considering the rankings across both the piece rate and the tournament, we will have a measure of how the different compensation schemes affect perceived performance. Second, by varying the gender of the worker, we can compare the beliefs of male and female subjects about the ability of different genders.

4. Performance Results

Data have been collected for 310 subjects comprising 150 women and 160 men. One hundred sixty-four subjects have been assigned to Mixed groups, 78 subjects have been assigned to the MM groups, and the other 68 subjects comprise the FF groups. The breakdown of the observations by group composition and information treatment are shown in Table 1.

The average payment to a subject was $16.70 for participation in the experiment and the experiment usually lasted about 1 hour.

<table>
<thead>
<tr>
<th>Group Composition</th>
<th>Total</th>
<th>Info</th>
<th>No Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed</td>
<td>164</td>
<td>82</td>
<td>82</td>
</tr>
<tr>
<td>MM</td>
<td>78</td>
<td>38</td>
<td>40</td>
</tr>
<tr>
<td>FF</td>
<td>68</td>
<td>32</td>
<td>36</td>
</tr>
</tbody>
</table>

4.1 Performance in Task 1 & Task 2

We begin by considering the average number of correctly solved problems in Task 1 and Task 2 by gender in the figure below.
In the Task 1 piece rate, male subjects solved an average of 10.5 problems while women solved 9.8 problems (p-value=0.088). Men solved 12.5 problems in Task 2 tournament while women solved 11.2 (p-value < 0.01). Furthermore, there is a clear performance increase for both males and females from the piece rate (Task 1) to the tournament (Task 2). Men had an average performance increase from the piece rate to the tournament of 2.0 problems. Women, on the other hand, had a performance increase of 1.4 problems. This difference has a p-value of 0.078.
Figure 2 & Figure 3 show the cumulative distribution of the number of correctly solved problems under the piece rate and tournament, respectively. As shown in the mean statistics above, the performance of men is higher than that of women. Additionally, in the Task 2 tournaments there were a total of 154 winners which included 65 women and 89 men.\textsuperscript{12}

Although men and women differ in their performance, the subjects are given neither information about the distribution of performance nor any information regarding the difference in performance by gender. If this difference is anticipated it might cause managers to send male workers to the tournament more often than female workers. Nonetheless, it would seem that the performance gain from the piece rate to the tournament (again, if it is anticipated) could be a more significant incentive for managers to send a worker to the tournament. Even so, we control for beliefs about a worker’s ability with the questions about performance, and we control for performance in the analysis that follows. I rely on standard econometric techniques to disentangle these effects.

4.2 Subjective Evaluation of Ability

Subjects are asked four subjective ranking questions. They are asked to guess the ranking of the person they are matched with in Task 3 in both the Task 1 piece rate and
the Task 2 tournament and they are asked to guess their own ranking in both Task 1 and Task 2. These are given here as: 1, 2, 3, or 4. Where 1 signifies a guess of the subject’s performance is in the top 25% of all performances of that session, 2 signifies that the person’s performance is in the top 25%-50% of performances of that session, etc. This metric gives us a useful way of measuring the perceived ability of a subject in the given task with lower numbers implying a higher perceived ability. We focus here on perceived ability in the Task 2 tournament.

![Figure 4: Average Actual and Guessed Own Task 2 Ranking by Treatment](image)

Across both treatments male subjects guess on average that they are of higher ability than the female subjects guess. This difference is most dramatic in the No-Info treatment where subjects are given no information about relative ability and male subjects guess an average of 1.69 while female subjects guess 2.08 (p-value<0.01). In the Info treatment, the difference is not as dramatic with male subjects guessing an average of 1.89 and female subjects 2.15 (p-value=0.093).

Comparison with the actual quartile performance in Figure 4 yields two additional pieces of additional information. First, male performance is slightly better than female
performance with the actual male quartile being 2.30 and 2.19 compared to 2.42 and 2.48 in the No Info and Info treatments respectively. Second, the difference in the average actual quartile and average guessed quartile can be used as a measure of overconfidence. From the above figure we can see that males are slightly more overconfident than females although not significantly higher in the No Info treatment (p-value = 0.119). But there is virtually no difference in overconfidence across gender in the Info treatment (p-value = 0.823). Interestingly, male overconfidence is significantly different across treatments with a p-value of 0.045 but female overconfidence across treatments is virtually the same (p-value=0.962). These results seem to indicate that male overconfidence is increased by the lack of information about relative ability but female overconfidence is relatively smaller and not subject to drastic variation by the introduction of information on relative ability.

These results suggest that male subjects on average believe that they are of a higher ability than what female subjects on average believe is their ability level. Nonetheless, this does not directly quantify how male and female subjects rank the other gender in terms of performance. For example, a male subject may believe that he is really good at the task, but that females in general are better at this task than males in general. To measure any gender bias in subjective performance rankings we need to consider the manager’s ranking questions about the worker.
Two things are immediately obvious from Figure 5. First, both male and female managers rank female workers, on average, lower in ability than male workers. Second, the differences across gender of the manager but within the gender of the worker are small in each treatment. In the No-Info treatment, there is significant evidence to say that male workers are thought of higher ability while pooling across the gender of the manager (p-value = 0.029) but not within the gender of the managers (male p-value = 0.13, female p-value = 0.126). In the Info treatment the total difference in rankings for a male and female worker has a p-value of 0.487. These results indicate that when given no information about relative ability managers seem to believe that male workers are better suited at the task. On the other hand, when information is given about relative ability, managers do not favor one gender over the other. Nonetheless, even in the Info treatment male workers are, on average, subjectively assessed to be of higher ability.

Due to the all-or-nothing nature of the tournament it may be insightful to consider the extreme in the distribution of the rankings for men and women. The nature of the
tournament implies that only the very best get rewarded for their ability thus we consider in Figure 6 the proportion of workers who were gauged to be in the top 25% of subjects in terms of ability in the Task 2 tournament.

The treatment effect on the subjective ranking of ability in the task 2 tournament is clear from Figure 6. The information treatment has the effect of increasing the proportion of subjects who rank the worker in the top of subject ability. The effect is most dramatic for female workers. When managers have no information of ability, both male and female managers choose the top ranking substantially less often for female workers. The inclusion of information on ability somewhat mitigates these differences but notice that in all cases both male and female managers are less likely to choose the highest ranking of ability for a female worker.

To more formally investigate the effect of gender on the subjective measure of ability we estimate an ordered probit model of the choice of the manager’s tournament ranking for the worker as a function of manager’s performance, a female manager.
dummy, and a female worker dummy. In the case of the Info treatment, we also include the worker’s Task 2 performance minus Task 1 performance and the difference of the worker’s Task 2 performance and the manager’s Task 2 performance.

**Table 2: Ordered Probit of Worker's Tournament Ranking**

<table>
<thead>
<tr>
<th></th>
<th>No Info Treatment</th>
<th>Info Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient (p-value)</td>
<td>Coefficient (p-value)</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Female Manager</td>
<td>-0.043 (0.81)</td>
<td>-0.028 (0.88)</td>
</tr>
<tr>
<td>Female Worker</td>
<td>0.404 (0.02)</td>
<td>-0.081 (0.66)</td>
</tr>
<tr>
<td>Tournament Performance of Manager</td>
<td>0.025 (0.88)</td>
<td>0.001 (0.97)</td>
</tr>
<tr>
<td>Tournament minus Piece Rate Performance of Manager</td>
<td>-0.031 (0.41)</td>
<td>-0.044 (0.26)</td>
</tr>
<tr>
<td>Worker's Tournament minus Piece Rate Performance</td>
<td></td>
<td>-0.078 (0.05)</td>
</tr>
<tr>
<td>Manager’s Tournament Performance minus Worker's Tournament Performance</td>
<td></td>
<td>0.104 (0.00)</td>
</tr>
<tr>
<td>Observations</td>
<td>154</td>
<td>152</td>
</tr>
</tbody>
</table>

Consistent with the previous analysis, in the No Info treatment (column 1) women are significantly less likely than men to be thought of as being higher ability while holding the manager’s gender and performance constant. In column 2, we see that when the manager is given some information about the ability of the worker, only those pieces of information seem to be important in ranking the worker’s ability.

The analysis above suggests that when given no information about ability men are perceived as better at this task than women. Furthermore, when the manager is privy to some information about worker ability, male and female subjects are not significantly thought of as differing in ability even though on average male workers are guessed to be of higher ability by both male and female managers. To the extent that a worker’s subjective evaluation of ability is important in determining payment type, these results suggest that managers in the No Info treatment may be more reluctant to use the
tournament payment scheme when matched with a female worker but no clear choice exists when given information about relative ability.

4.3 Worker Performance

In Task 3 workers perform the addition task under the compensation chosen for them by the manager. There were 155 subjects who performed the addition task in the role of the worker. This group is comprised of 80 males and 75 females.\textsuperscript{13} Thirty-seven male workers and thirty-two female workers were chosen to perform under the tournament. With the differences in male and female preference for competition, it is feasible that worker performance may be affected by the chosen payment type. To investigate this claim we consider the performance of workers relative to their performance under similar payment types.

The Task 2 tournament supplies a yardstick for the performance of subjects competing in a tournament as the worker. The average number of correct answers in Task 2 for the 37 male subjects who participated in tournaments as workers is 12.5 compared to an average performance of 11.8 in Task 3. Using a two-sided paired t-test, this difference has a p-value of 0.057. For women, the average performance in Task 2 is 12.3 problems compared to 12.4 when chosen to compete under the tournament in Task 3 (p-value=0.626)
Additionally, of these 37 male subjects who participated in the tournament as a worker, twenty-four later choose the tournament in Task 4 for themselves. The average performance of these 24 male workers is 13.3 in the Task 4 compared to an average number of correct in the Task 3 portion of 12.2. This difference is significant with p-value < 0.01.  

This decrease in worker’s performance also seems to be restricted to only the case of the tournament. Equal numbers of male and female workers perform under the piece rate with 43 male and 43 female workers. Of these, 18 male and 22 female chose the piece rate in Task 4. For the male workers, they solved an average of 9.5 problems as the worker and 9.8 problems in Task 4 when they chose the piece rate (p-value = 0.462). For female workers, they solved an average of 10.4 problems as the worker and 10.9 problems in Task 4 (p-value = 0.361).
Given that previous research has shown that male and female subjects have different tastes for the tournament compensation scheme and that the tournament may affect performance, a natural question to explore is how the gender of the manager affects the performance of the worker. To explore this question we consider the chart below.

**Figure 8: Average Task 3 & Task 4 Performance of Workers who were chosen to be in the Tournament in Task 3**

<table>
<thead>
<tr>
<th></th>
<th>Male Worker (n=24)</th>
<th>Female Worker (n=18)</th>
<th>Male Worker (n=21)</th>
<th>Female Worker (n=17)</th>
<th>Male Worker (n=16)</th>
<th>Female Worker (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 4 Tournament Performance</td>
<td>13.8</td>
<td>14.4</td>
<td>12.2</td>
<td>12.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 3 Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 9: Average Task 3 Performance of a Worker in the Tournament by the Gender of the Manager**

<table>
<thead>
<tr>
<th></th>
<th>Male Worker (n=38)</th>
<th>Female Mgr (n=31)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Worker</td>
<td>12.5</td>
<td>12.1</td>
</tr>
<tr>
<td>Female Worker</td>
<td>10.9</td>
<td></td>
</tr>
</tbody>
</table>
Figure 9 shows that male workers who were chosen into the tournament by a female manager solve an average of 10.9 problems. Male workers who were chosen by a male manager solve an average of 12.5 problems. Although these are not statistically different (p-value = 0.178) this seems to suggest that the gender of the manager plays some role explaining the decreased performance of male workers.

In light of the above results, it is natural to question which payment type is optimal from the view point of the manager. Recall that the manager is paid $1 for each problem that the worker correctly solves during the five minute period. Thus if a manager is solely interested in choosing the payment scheme that maximizes her income, what is the correct choice? Figure 10 shows the average worker performance of male and female workers by the type of compensation scheme that is chosen for them in Task 3.

![Figure 10: Average Worker Performance in Task 3](image)

Notice that male subjects solve on average about the same number of problems under both the piece rate and tournament payment schemes (p-value = 0.791). For female subjects, the average piece rate performance is smaller than the tournament performance
(p-value = 0.139). This suggests that an optimal choice by the manager of a female worker may be to choose the tournament and that a manager of a male worker has no clear choice since male subjects perform similarly under both the piece rate and the tournament. This result is striking since the data show that males perform significantly better under the tournament in Task 2 relative to females and male subjects are perceived to be better at this task. Additionally, these results are contrary to the studies by Gneezy, Niederle, & Rustichini (2003) and Gneezy and Rustichini (2004) where competition increases the performance of male subjects but does not increase the performance of female subjects. Here is an example where competition actually decreases the performance of male subjects relative to their female counterparts and also decreases their performance relative to their own previous past performance.

5. Subject Choices

Subjects participate in Task 3 prior to making a choice of compensation scheme for themselves in Task 4, but we will discuss the results of Task 4 prior to discussing the Task 3 choices.

In Task 4, male subjects choose the tournament 66% of the time compared to only 49% of the time for female subjects. This difference is significant using a Fisher’s Exact test (p-value <0.01). NV find that 73% of men and 35% of women choose the tournament in an experiment similar to this design. Although the proportion of male subjects entering into the tournament is similar to the proportion of male subjects entering in the tournament of NV, the proportion of females is slightly higher, although not significantly different from NV.
5.1 Manager’s Choices

Subjects begin Task 3 by being placed into groups of two. The objective of Task 3 is for each subject to choose a compensation scheme for their group member. The gender of each subject's group member is not discussed but matched subjects are seated next to one another in connecting workplaces.\textsuperscript{18}

Figure 11 shows the proportion of male and female managers in each treatment who choose the tournament broken down by the gender of their associated worker. Two things are immediately obvious. First, the impact of the Info treatment seems to be localized only in male managers. Male managers seem to utilize the tournament compensation more for male workers and less for female workers when information about worker ability is given to them in the Info treatment. Second, the use of the tournament compensation is consistent across the gender of the manager and the worker in the No Info treatment.

Using a two-sided Fisher’s Exact test for differences, we find that male managers with male workers across treatments (63.2\% versus 45\%) has a p-value of 0.119. Similarly, the treatment effect on male managers with female workers has a p-value of 0.108 (46.3\% versus 26.8\%) and the gender effect for male managers in the info treatment has a p-value < 0.01 (63.2\% versus 26.8\%). Thus it seems that the gender of the worker plays a role in the decision to choose the tournament only when the manager is a male and information about the workers ability is presented to the manager.
Figure 11: Proportion Choosing the Tournament for the Worker in Task 3 by Treatment

To further analyze the decision to enter a worker into a tournament, we model the manager’s decision to enter the worker into a tournament with a probit model (1 = tournament) specified in Table 3.

In the analysis, we control for perceived worker using the subjective ranking questions. We control for the ability of the manager using data from the manager’s Task 1 and Task 2 performance. Similarly, in the Info treatment we control for workers ability by including the independent variables that capture the worker’s performance gain Task 2 over Task 1 and the difference in the worker’s and manager’s Task 2 performance. We also control for the manager’s preference between the piece rate and the tournament in Task 4.
Table 3: Probit Results

<table>
<thead>
<tr>
<th></th>
<th>No Info Treatment</th>
<th>Info Treatment</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Marginal Effect</td>
<td>Male</td>
<td>Female</td>
<td>Marginal Effect</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>(p-value)</td>
<td>(2)</td>
<td>(3)</td>
<td>(p-value)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>Female Manager</td>
<td>0.026</td>
<td>-0.073</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.763)</td>
<td>(0.438)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Worker</td>
<td>-0.091</td>
<td>-0.095</td>
<td>-0.170</td>
<td>-0.323</td>
<td>0.021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.299)</td>
<td>(0.448)</td>
<td>(0.071)</td>
<td>(0.016)</td>
<td></td>
<td>(0.887)</td>
</tr>
<tr>
<td>Tournament Performance of Manager</td>
<td>-0.004</td>
<td>-0.001</td>
<td>0.036</td>
<td>0.025</td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.763)</td>
<td>(0.957)</td>
<td>(0.08)</td>
<td>(0.366)</td>
<td></td>
<td>(0.468)</td>
</tr>
<tr>
<td>Tournament minus Piece Rate Performance of Manager</td>
<td>0.023</td>
<td>0.011</td>
<td>0.021</td>
<td>0.016</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.199)</td>
<td>(0.769)</td>
<td>(0.572)</td>
<td>(0.416)</td>
<td></td>
<td>(0.613)</td>
</tr>
<tr>
<td>Manager’s Tournament Rank for Worker</td>
<td>-0.038</td>
<td>0.023</td>
<td>-0.145</td>
<td>-0.116</td>
<td>-0.201</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.512)</td>
<td>(0.796)</td>
<td>(0.018)</td>
<td>(0.179)</td>
<td></td>
<td>(0.035)</td>
</tr>
<tr>
<td>Manager’s Own Choice</td>
<td>0.296</td>
<td>0.264</td>
<td>0.120</td>
<td>0.058</td>
<td>0.241</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.036)</td>
<td>(0.308)</td>
<td>(0.74)</td>
<td></td>
<td>(0.142)</td>
</tr>
<tr>
<td>Worker’s Tournament minus Piece Rate Performance</td>
<td>0.021</td>
<td>0.015</td>
<td>0.046</td>
<td>(0.285)</td>
<td>(0.536)</td>
<td>(0.212)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manager’s Tournament Performance minus Worker’s Tournament Performance</td>
<td>-0.062</td>
<td>-0.043</td>
<td>-0.085</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>154</td>
<td>80</td>
<td>74</td>
<td>152</td>
<td>79</td>
<td>73</td>
</tr>
</tbody>
</table>

The marginal effects are estimated at a male manager with a male worker who both solve 12 and 13 problems in the Task 1 and Task 2 portions respectively, and who chooses the tournament in Task 4 and guesses the worker’s ability as the top middle of subjects (top 25%-50% of performances).

As we expected the first three columns, which show the impact on the No Info treatment, show that the only reliable predictor of the decision of the manager is the manager’s own choice of compensation scheme. On the other hand, the last three columns of Table 3 show some peculiar differences between the decisions of male and female managers.

The results in column 4 indicate that a manager is 17% less likely to utilize a tournament for a female worker while controlling for factors such as subjective ability, past performance of both the worker and the manager and the manager’s own preference.
for the tournament. Nonetheless this is only marginally significant with a p-value of 0.071. Other important factors seem to be the manager’s performance in the tournament and the manager’s subjective ranking of ability for the worker and the information that the manager receives about the worker’s relative ability.

Contrasting columns 5 and 6 yields some interesting differences in how male and female managers choose the compensation scheme for a worker. Most importantly we find that only in the case of male managers do we see evidence that the gender of the worker plays a role in the decision of compensation type with a female worker being 32.3% less likely to be entered into the tournament. Female managers have no such inclination.

The data indicate that to make the determination of payment type, male managers rely on the gender of the worker and information about the worker’s ability. On the other hand, female managers seem to rely on the information about the worker’s ability along with their subjective evaluation of the worker’s ability. These two facts points towards very different ways of determining the appropriate compensation scheme. Where female managers tend to use information about the ability of the worker, both subjective and quantitative, male managers rely on quantitative evidence of ability and the gender of the worker to choose the appropriate compensation scheme.

6. Examination of the Propensity of Male Managers to choose the Tournament for Female Workers

We have shown that male managers shy away from using the tournament only when information about worker ability is given. When worker ability is given male managers choose the tournament more often for male workers but less often for female workers. In this section, we discuss several hypotheses that may account for this difference.
Hypothesis 1: Male managers choose the tournament relatively less for female workers because they believe that female workers are of lower ability or will not perform well under the stress of competition.

Previous studies have shown that competition can have an adverse effect on the performance of females (Gneezy & Rustichini 2004, Gneezy, Niederle, & Rustichini 2003). Additionally, we have shown in this data that male subjects believe females to be of lower ability than male subjects. These two facts suggest that the manager may be reluctant to use the tournament when matched with a female worker.

Evidence against this hypothesis comes from the fact that male managers pick the tournament substantially more often for female workers when information about worker ability is not given to the manager. If male managers believe that competition will negatively affect the performance of female workers we would expect that the same is true when information about ability is not given to the manager. Thus there should be little difference between treatments but the inclusion of information about worker ability substantially decreases the proportion of female workers who are chosen to compete in a tournament.

Hypothesis 2: Male managers are reluctant to choose the tournament for female workers because they perceive (correctly) that female workers would rather not perform under the tournament if given the choice.

Previous studies (NV, Niederle, Carmit, & Vesterlund (2008), Gneezy & Rustichini (2006)) show that females, when given the choice between a piece rate and a tournament, will predominately choose the piece rate. These results are replicated here in this design. If managers perceive this difference and believe that it may affect female performance, then they may shy away from using the tournament when matched with a female worker.
Again, evidence against this hypothesis comes from the fact that female workers are entered into the tournament less often only when the manager is given information about the ability of the worker. If managers use gender to proxy for competitive preference, we would expect that the inclusion of information about ability would mitigate this difference not exacerbate the difference as it does within our data.

The previous two hypotheses were appealing because of previous studies which have found gender differences in relation to competition. Nonetheless, it is unlikely that either of these two hypotheses can explain the findings of this paper. Even so, one other potential hypothesis is that male subjects dislike making decisions which directly lead to inequality in earnings, specifically with female subjects earning more than they do in a session. Recall that the manager earns $1 for each problem that the worker solves correctly. If the worker competes in a tournament, and is successful, the worker earns $1.50 per correct problem. Thus if a manager chooses a tournament for a worker and the worker solves more problems than the benchmark performance, the worker will effectively earn more money from this task than the manager. We cannot rule out this potential reason for the results.

7. Conclusion

The focus of this study was to determine if/how men and women choose to utilize competitive compensation in a managerial capacity. Although gender differences in managerial ability have garnered much attention by social psychologists, this topic has gone largely un-researched within the economics community. The reason for this may be attributed to inherit flaws in common economic data. Data that samples managers within the economy is marred by the fact that those subjects of study have been deemed appropriate to manage, thus the data suffer from a potentially crippling selection problem.
The lack of female representation within higher management levels undoubtedly is one indication of this selection problem. Indeed this problem in traditional econometric data is well documented within the social psychology literature and a topic of much debate therein.

Using the laboratory, we can overcome this selection problem and analyze a likely source of gender differences in managerial differences. Recent studies by Niederle & Vesterlund (2007), Gneezy & Rustichini (2004), Gneezy & Rustichini (2006), Gneezy, Niederle, & Ruschini (2003) have identified disparate preferences and reactions to the tournament compensation scheme in the laboratory. In particular, the drastic differences in how men and women choose to engage in relative payment schemes has been highlighted as evidence of lower supply of women into high paying managerial jobs where compensation is generally based on the tournament model. We further this line of research by considering the use of the tournament model in a managerial setting by both male and female managers, focusing not on what men and women prefer to choose for themselves, but what they would choose for another individual.

We find three important new results for this literature. First, we find evidence that male subject’s performance, decreases when they are chosen by another subject to be paid based on a tournament. The result of this decrease in performance is that, even though male subjects are thought to be better at the task and that they are significantly better at the task, that female subjects perform better under the tournament than do their male counterparts. Second, we find that when given no information about worker ability both male and female managers choose the piece rate more often than the tournament. Third, when the manager is given information about relative ability of the worker, male managers tend to utilize the tournament less often when matched with a female worker. Point estimates indicate that male managers of female workers are 32.3% less likely to
choose the tournament compensation for their worker, even after controlling for worker ability.

The data also indicate that male and female managers reach the decision of compensation scheme in different ways. Male managers rely on quantitative measures of worker ability and the gender of the worker to choose the appropriate compensation scheme where female managers focus mainly on measures of ability, both subjective and qualitative.

The results in this paper have a direct impact on labor market. One common application of the tournament is the promotion tournament (Lazear & Rosen 1990). This study indicates that if performance is a key component of being chosen for promotion that females would have to significantly outperform male counterparts to be considered for a promotion. Indeed, evidence from field data shows that after controlling for observable characteristics, women face higher promotion standards than similar men (Blau & DeVaro 2007).
References


The expected value of marginal product under the tournament is exactly the value of marginal product under the piece rate. Thus the tournament is generally a more powerful incentive.

An increase in effort increases the expected value of marginal product under the tournament generates two effects. Under the piece rate, an increase in effort only increases the value of the worker will win the tournament. Under the piece rate due to the performance increase that occurs from Task 1 to Task 2. It is unknown if this performance increase is due to learning or other factors. Nonetheless, if this increase is a startup or learning effect, it should be the case that later performance is better in the addition task. This is the case for female workers.

The gender composition of each session ranged from 75% female to 33% female with most of the sessions having only 1 or 2 more or less women than men in the session.

The ranking is among only the current session. For example, a guess of 1 means that they believe that their number correct is in the top 25% of subjects in that session, a guess of 2 means that they believe that there number correct is in the top-middle (25%-50%) of the subjects, etc. Although sessions were ran with differing number of subjects, no differences were found in the mean choices for the different size sessions.

One session with four subjects was run without asking the ranking questions about worker performance. All other facets of the experiment were the same. The choices that these subjects made in this session are included in the choice analysis that follows but excluded where the information on worker ability is used.

Another study by Bertrand and Hallock (2001) shows that for a large sample of US firms that only 2.5% of the top five highest paid executives are female. For examples of managerial wage discrepancies between males and females, see Ostroff & Atwater (2003), Athey, Avery, and Zemsky (2000), & Bertrand & Hallock (2001).

The results do not differ from the Mann-Whitney test. Recall that the determination of the manager and the worker is random. Thus there need not be an equal number of men and women who perform the addition task in the role of the worker.

Of the 24 male workers who also choose the tournament in Task 4, 71% experience a positive performance gain in Task 4 over Task 3. Of the 37 male workers who perform in the tournament in Task 3, only 30% experience a positive performance gain in Task 3 over Task 2.

The Task 1 Piece Rate is of little value for measuring the performance of workers who perform under a piece rate due to the performance increase that occurs from Task 1 to Task 2. It is unknown if this performance increase is due to learning or other factors. Nonetheless, if this increase is a startup or learning effect, it should be the case that later performance is better in the addition task. This is the case for female workers.

Under weak assumptions, the tournament can be shown to be a more powerful incentive than the piece rate. The intuition for this result is that increasing effort under the tournament generates two effects. An increase in effort increases the expected marginal product of a worker and increases the probability that the worker will win the tournament. Under the piece rate, an increase in effort only increases the value of the marginal product. Because, in this design, the winner in a tournament receives twice the piece rate, the expected value of marginal product under the tournament is exactly the value of marginal product under the piece rate. Thus the tournament is generally a more powerful incentive.

There are substantial differences in this experiment and that of NV. One interesting difference is the use of different subject populations. This study was conducted at the Vernon Smith Experimental Economics Laboratory at Purdue University and NV’s data was collected at the Pittsburgh Experimental Economics Laboratory at the University of Pittsburgh. The reader is directed to the replication study Price(2008) for a discussion on differences on subject populations and their impact on selecting into the tournament.

Each subject’s workplace is shielded by a wall. This prevents subjects from interacting during the experiment and limits the amount of information that subjects can exchange.

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1 See Eagly &Johnson (1990) and Eagly & Carli (2003) for an overview and meta-analysis of differences in leadership and discussion therein of female and male management styles.

2 Eagly & Johannesen-Schmidt [in press] note that some of these studies are subject to error because of “the informal methods by which they have reached their conclusions”. More precisely the authors point to a selection problem in the data. If managerial roles are stereotyped as male roles we would expect females in those positions to have adopted mostly male mannerisms. Hence the differences would be small or none at all. For an example of a study where these differences are exhibited see Gneezy & Rustichini (2006).

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4 The program is written in Z-Tree (Fischbacher 2007).

5 The gender composition of each session ranged from 75% female to 33% female with most of the sessions having only 1 or 2 more or less women than men in the session.


7 The ranking is among only the current session. For example, a guess of 1 means that they believe that their number correct is in the top 25% of subjects in that session, a guess of 2 means that they believe that there number correct is in the top-middle (25%-50%) of the subjects, etc. Although sessions were ran with differing number of subjects, no differences were found in the mean choices for the different size sessions.

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9 All comparison tests of performance and reported p-values correspond to two-sided t-tests unless otherwise stated. The results do not differ from the Mann-Whitney test.

10 Niederle, Segal, & Vesterlund (2008) find that men outperform women in both the piece rate and the tournament payment schemes but they still find a large significant difference in male and female choices about entering into the tournament.

11 This result was also noted in Niederle & Vesterlund (2007).

12 Since subjects are not matched bilaterally, there need not be exactly 155 winners to the 310 tournaments.

13 Recall that the determination of the manager and the worker is random. Thus there need not be an equal number of men and women who perform the addition task in the role of the worker.

14 Of the 24 male workers who also choose the tournament in Task 4, 71% experience a positive performance gain in Task 4 over Task 3. Of the 37 male workers who perform in the tournament in Task 3, only 30% experience a positive performance gain in Task 3 over Task 2.

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