Tournament incentives, social competition and portfolio choice

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Abstract

Incentive schemes resulting in tournament competition have been criticized for inducing excessive risk-taking among investment managers. Another feature of tournament incentives is that they induce a particular kind of risk-taking: when underperforming it becomes optimal to invest in positively skewed idiosyncratic assets, whereas when outperforming a negatively skewed portfolio that correlates with the market would be optimal. We test these propositions with a lab experiment where experimental participants choose portfolios from among correlated, idiosyncratic, and positively, negatively or zero skewed assets. We show that tournament incentives indeed lead to a preference for positively skewed idiosyncratic portfolios when lagging in performance, and negatively skewed correlated portfolios when leading. However the effect persists even with linear incentives, provided that a current ranking of relative performance is displayed to investment managers. We conclude that competitive social preferences alone are enough to induce biases in portfolio selection.

JEL classification: C91, G11.
Keywords: Portfolio choice, tournaments, social comparison, experiments.

1. Introduction

Rajan (2006) argues that one of the main origins of instability in highly developed financial markets are widely used convex incentives structures in financial institutions. It has also been argued that part of the reason for the excessive risk-taking before the financial crisis in 2007-2008 were tournament-style and non-linear compensation structures in financial institutions (see e.g. Bebchuk and Spaman, 2010; Dewatripont et al. 2010; French et al. 2010; Gennaioli et al. 2010). However, these tournament compensation schemes include two major components: they include higher private reward with higher rank (”income-effect”) and higher reputation with higher rank (”reputation-effect”). In this paper we investigate the influence of tournament-style incentives and social comparison on risk-taking in a portfolio-choice experiment.

Since the 1980s performance comparison among peers and tournament style incentives have become very popular and important in the financial industry (Rajan, 2006). For instance, hedge fund managers' are typically compensated according to the 2/20-rule as they receive 2 percent of the managed capital and 20 percent of profits during the year (Goetzman et al., 2003). Importantly, the managers' explicit compensation contract does not have tournament features. However, as investors typically delegate funds to previously successful managers, the 2-percent component includes an implicit tournament component. It is reported that the best performing funds capture the lion's share of the capital inflow while the underperformers only loose little of their invested capital. This asymmetry makes tournament incentives convex in profits and thus creates strong incentives of being better than the others (see e.g. Brown et al., 1996; Chevalier and Ellison, 1997; Sirri and Tufano, 1998). These features of compensation contracts clearly breed particular behavior among the managers. For instance, Brown et al. (1996) report that mid-year losers tend to increase fund volatility in the latter part of an annual assessment period to a greater extent than mid-year winners. Evidence of greater risk-taking by underperformers is also reported by Lin (2011). He shows that underperforming fund managers subsequently invest in assets with positively skewed returns, i.e., lottery-like returns, while outperforming fund managers prefer assets with negatively skewed returns, i.e., assets that generate a large loss with a small probability. Similarly, Kaniel and Kondor (2011) show that fund managers might prefer strategies with less market risk and higher idiosyncratic risk when convex fund-flows reward large outperformance disproportionally. The gains from outperforming when the market is going down are larger than the losses from underperforming when the market is going up.

However, the effects of underperformers taking more risks and their preference for non-correlated assets might not solely be due to extrinsic monetary incentives. Status concerns and an intrinsic desire to outdo one's peers could also distort asset allocations in a similar way. For example, Roussanov (2010) models how the desire to "get ahead of the Joneses" leads to lower aversion to idiosyncratic risks than aversion to correlated risks.

We study the influence of social comparison and convex tournament-style incentives on risk-taking in a portfolio-choice experiment. In a within-subjects design experimental participants interact in three treatments that vary with respect to the degree of social comparison and whether payouts are tournament-based. Treatment INDIVIDUAL is characterized by linear payouts and no comparison with peers. Treatment SOCIAL is identical to Treatment INDIVIDUAL but provides subjects with the performance of their peers without being relevant for payout. Treatment TOURNAMENT is identical to Treatment SOCIAL except that payout is organized in a tournament with inverse convex payouts as a function of rank. Subjects can choose among six assets (modeled as lotteries) which differ in their level of skewness and whether their outcome is positively correlated or idiosyncratic.

In particular we address the following research questions:

RQ1: Do monetary incentives and social comparison generate different preferences for skewness between the treatments?

According to literature we expect underperformers in treatments TOURNAMENT and SOCIAL to exhibit a preference for assets with positively skewed returns while outperformers prefer to negatively skewed assets. As monetary incentives in treatment TOURNAMENT reinforce the effect of social comparison we expect stronger results in TOURNAMENT compared to SOCIAL

RQ2: Does the rank in Treatment TOURNAMENT influence subjects' preferences differently for correlated and idiosyncratic assets compared to Treatment SOCIAL?

We assume that underperformers in treatments TOURNAMENT and SOCIAL show preferences for assets with idiosyncratic returns while outperformers prefer assets with correlated returns. Again, sronger effects are expected in Treatment TOURNAMENT because of monetary incentives reinforce the effects of social comparison.

We find a (i) strong positive relationship between rank and preferences for the positively skewed assets in treatments TOURNAMENT and SOCIAL. Hence underperformers exhibit a strong preference for positively skewed assets whereas outperformers avoid these assets because of a high probability for a loss. We show that (ii) this effect becomes stronger towards the end of the experiment only in Treatment TOURNAMENT. Conversely we report that (iii) rank is negatively correlated with the preference for negatively skewed assets especially in Treatment SOCIAL. Outperformers prefer negatively skewed assets as they offer a moderate gain with high probability. Finally, we find that (iv) idiosyncratic assets are mainly selected by underperformers towards the end of the experiment in Treatment TOURNAMENT. Hence, these subjects exhibit strong gambling behavior towards the end as they mainly invest in positively skewed idiosyncratic assets to reach a higher rank and a higher payout.

2. Related Literature

The body of literature on fund managers' incentives shows that tournament incentives drive their behavior in several ways. Among others, Brown et al. (1996) examine incentives of fund managers in a tournament setting. They find that mid-year losers tend to increase fund volatility in the latter part of an annual assessment period to a greater extent than mid-year winners.[1] The mutual fund managers' explicit compensation contract does not have tournament features. However, the fund manager's compensation typically depends on the size of the fund and the best performing funds capture the lion's share of the capital inflow (see e.g. Chevalier and Ellison, 1997; Sirri and Tufano, 1998). Since fund size is mechanically linked to inflow, the competition in the fund industry can be viewed as a tournament where managers compete for investor cash flow.

Kaniel and Kondor (2011) focus on fund managers' choices between picking assets with either more market risk or unsystematic risk. They show how fund managers, compared to individual investors, might prefer contrarian strategies with less systemic risk and more idiosyncratic risk when convex fund-flows reward large overperformance disproportionally. The gains from overperforming when the market is going down are larger than the losses from underperforming when the market is going up. Empirical results also show that the average actively managed fund overperforms the market in recessions and underperforms in expansions (see e.g. Moskowitz, 2000 and Glode, 2011).

Instead, Lin (2011) analyzes investment managers' choice between assets with different levels of skewness. Fund managers that underperform invest in assets with positively skewed returns, i.e. lottery-like returns. Fund managers overperforming invest in assets with negatively skewed returns, i.e., assets that

[1] Elton et al. (2003) show that mutual funds with incentive fees and poor performance increase risk more than poorly performing mutual funds without incentive fees. Brown et al. (2001) show that fund managers' risk strategies depends on relative rather than absolute performance. They also find that well performing funds will reduce volatility while poorly performing funds do not increase volatility.

generate a large loss with a small probability. Lin (2011) also shows that this tail-risk taking increases with the convexity of the fund managers' incentives.

In line with these results, Prospect Theory suggests that loss averse individuals will prefer negative skewness over positive skewness. A loss-averse investor evaluates changes in wealth relative to a reference point and would therefore prefer a one-time substantial loss to a succession of small losses. On the other hand, based on Tversky and Kahneman's (1992) cumulative prospect theory, Barberis and Huang (2008) argue that positively skewed assets can be "overpriced". In cumulative prospect theory, people evaluate risk using transformed probabilities. The transformed probabilities are obtained from the objective probabilities by applying a weighting function. The weighting function overweigh the tails of the distribution making an asset with positively skewed returns more valuable and an asset with negatively skewed returns less valuable.

Preference reversals over positively and negatively skewed lotteries have been documented in experiments (see e.g. Lichtenstein and Slovic, 1971). Subjects typically prefer the negatively skewed lottery to the positively skewed lottery with the same expected value. On the other hand, when asked to put a value on the lotteries, subjects typically put a greater value on the positively skewed lottery.

Preferences for assets with skewed returns and idiosyncratic risks might also be driven by social status concerns. Veblen (1899) posited that consumption and leisure can be used to signal social status. Such preferences for relative consumption could for example explain saving behaviour (Duessenberry, 1949), or the distribution of wages within firms (Frank, 1984). Models that incorporate status concerns usually predict excessive consumption of positional status goods (Frank, 1985; Hopkins and Kornienko, 2004). However besides consumption decisions, social comparison could also affect risk-taking. Robson (1992) for example argues that people could have convex utility over certain ranges of income, when a small increase in income would imply a jump into a higher social class. Becker et al .(2005) show that concerns for status would induce risk-taking until a stable income distribution endogenously emerges, and risk-taking is higher with more equal initial distributions.

Relative preferences could also affect portfolio choice. For example, Park (2009) shows that an attitude of "Keeping up with the Jones" could produce rational herding and a preference for correlated assets. By contrast, Roussanov (2010) models how the desire to "Get ahead of the Joneses" leads to lower aversion to idiosyncratic risks than aversion to correlated risks. Krasny (2009) examine the impact of status seeking considerations on investors' portfolio choices. In his model, low-status investors invest in portfolios that maximize their chances of moving up the ladder. High-status investors, on the other hand, look to maintain the status quo and hedge against the choices made by the low-status investors.

There is some experimental evidence that concerns over relative outcomes could affect risk-preferences and thus portfolio choice. Schoenberg and Haruvy (2009) show that markets where traders receive feedback about the top performer display larger asset bubbles than when information is given about the bottom performer. In Linde and Sonnemans (2012) subjects are more likely to choose a risky option when a reference subject receives a low pay-off than when the other receives a high pay-off. Bault et al (2010, 2012) show that people have different physiological reactions to the outcome of a lottery, depending on the outcome of other people's lotteries. They find a stronger reaction to social gains than to social losses. Thus, even without explicit convex monetary incentives, relative preferences could induce underperforming investment managers to behave as documented by Brown et al. (1996).

3. The Experiment

3.1. Setup of the Experiment

We design a within-subjects portfolio choice experiment where subjects have to select portfolios out of three different types of assets with either negative, positive or zero skewness.[2] Subjects can also choose whether to invest in either correlated or non-correlated outcomes within each type of asset, resulting in six types of assets in total. Each treatment lasts twelve periods and the ordering of treatments within a session is random. At the beginning of each treatment subjects are endowed with 15.000 Tokens.

Table 1 provides details on the lottery types. Each round subjects have to invest in exactly 100 assets by choosing among the six different types of assets. Each type of lottery has six equiprobable outcomes, corresponding to the outcome of a die roll. All type of assets are characterized by the same expected payoff of zero,

[2] For the sake of simplicity assets were labeled as lotteries in the instructions. We will use the terms "asset" and "lottery" interchangeably throughout the paper.

whereas the variance, skewness and correlation structure varies between asset types.

Table 1. Lottery Types.

Name	Type	Payoffs (Tokens)	SD	Skew	PT, λ=2	PT, λ=2, α=0.88
Lottery A1	Positive skew, correlated	(-15, -15, -15, -15,-15, 75)	36.7	1.79	-75	-9.2
Lottery B1	Zero skew, correlated	(-20, -20, -20, 20, 20, 20)	27.4	0	-60	-5.8
Lottery C1	Negative skew, correlated	(15, 15, 15, 15, 15, -75)	36.7	-1.79	-75	-4.7
Lottery A2	Positive skew, idiosyncratic	(-15, -15, -15, -15,-15, 75)	36.7	1.79	-75	-9.2
Lottery B2	Zero skew, idiosyncratic	(-20, -20, -20, 20, 20, 20)	27.4	0	-60	-5.8
Lottery C2	Negative skew, idiosyncratic	(15, 15, 15, 15, 15, -75)	36.7	-1.79	-75	-4.7

SD is the standard deviation. Skew is the skewness. The final two columns show the Prospect Theory value functions for a piecewise linear specification and a concave/convex specification respectively.[3]

Lotteries of type A1 and A2 are characterized by positive skewness with a large probability (p=5/6) of incurring a small loss of 15 tokens and a small probability (p=1/6) of a large gain of 75 tokens. The negatively skewed lotteries C1 and C2 are modeled as the opposite with yielding a small gain of 15 Tokens in 5 out of 6 cases and with incurring a loss of 75 Tokens with probability of 1/6. Lotteries of type B1 and B2 have zero skewness and give a 50/50 probability of either gaining or losing 20 tokens.

Each lottery has subtypes - correlated assets of Type 1 and idiosyncratic assets of Type 2. For the correlated assets (A1, B1 and C1) the payoff is the same for all

[3] For the piecewise linear specification the Prospect Theory value function corresponds to $v(x) = \begin{cases} x & x > 0 \\ 2x & x < 0 \end{cases}$. For the concave/convex specification the value function as specified by Kahneman and Tversky (1992) corresponds to $v(x) = \begin{cases} x^{0.88} & x > 0 \\ -2.25(-x)\hat{}0.88 & x < 0 \end{cases}$.

participants in the experiment that round, i.e., a common die determines the payout for all participants.[4] In contrast, the outcomes of the idiosyncratic assets (A2, B2, C2) are idiosyncratic to each subject, i.e., an individual die determines the payout for each subjects independently. Thus although one subject might, for instance, win 75 per share of A2, another subject may well lose 15 tokens.

3.2. Treatments

Within each session all subjects participate in all three treatments of twelve rounds sequentially.

INDIVIDUAL: Subjects are paid SEK (Swedish Kronor) by linear incentives according to the number of tokens they hold after period 12, divided by 100. Subjects only observe their own performance during the treatment and not that of others.

SOCIAL: Again, subjects are paid according to the number of tokens they hold after period 12, divided by 100. However during and after each round subjects are shown the token holdings of all other subjects in the experiment as well as their current rank within the experiment.

TOURNAMENT: As outlined in Table 2 final earnings in Treatment TOURNAMENT no longer depend linearly on the amount of tokens held in period 12, but rather on subjects' relative performance depending on rank.

[4] If for example the common die for lottery A1 is six in a particular round, then all subjects that invested in the lottery A1 gain 75 tokens per asset invested in.

Underperformers of rank six to ten receive zero SEK, whereas outperformers end up with 100 to 500 SEK. During and after each period subjects were able to observe the token holdings of the other subjects in the experiment like in treatment SOCIAL.

Table 2. Payouts in Treatment CONVEX.

Rank	Final Payoff (SEK)
1	500 SEK
2	400 SEK
3	300 SEK
4	200 SEK
5	100 SEK
6	0 SEK
7	0 SEK
8	0 SEK
9	0 SEK
10	0 SEK

3.3. Elicitation of Risk and Loss Aversion

After all three treatments were finished two additional tasks to elicit risk and loss aversion were administered, as well as a short questionnaire with background data on gender, age, university department, etc.

To elicit risk aversion of subjects we use a simple mechanism based on Gneezy and Potters (1997) as deployed by Charness et al (2012). For this task subjects were endowed with an additional SEK20, out of which they could invest a proportion X in a 50/50 coin flip lottery. In case the subject won the lottery she would earn 20+1.5X, which would be added to the earnings of the experiment. If the subject lost, she would earn SEK20-X. The more risk averse, the less a subject would invest in the lottery, and thus the lower X. See Table 3 for details on the loss aversion task.

Table 3. Lotteries for the loss aversion task.

Lottery	Accept	Reject
1. Heads you lose SEK20, Tails you win SEK50	○	○
2. Heads you lose SEK30, Tails you win SEK50	○	○
3. Heads you lose SEK40, Tails you win SEK50	○	○
4. Heads you lose SEK50, Tails you win SEK50	○	○
5. Heads you lose SEK60, Tails you win SEK50	○	○

To elicit loss aversion a mechanism developed by Gaechter et al (2007) was used. Before the loss aversion experiment starts it was determined which of the three treatments would be selected for payment and the outcome of the risk aversion elicitation task is determined as well. This is done such that subjects know their earnings in the experiment so far and thus experience these earnings as their current endowment. Then subjects are asked to either accept or reject a series of coin flip lotteries as outlined in Table 3. Afterwards one of the lotteries is randomly selected to determine earnings for the loss-aversion task. In case the randomly chosen lottery is rejected, the subject would earn zero SEK, regardless of the outcome of the coin flip. In case the lottery is accepted the subject would either earn SEK 50 or lose an amount X. The amount X is varied between lotteries. Assuming a simple piecewise linear loss aversion specification, the row in which a subject would switch from accepting the lottery to rejecting it would imply a loss aversion parameter λ, as outlined in Table 4.[5]

[5] In practice not all subject were consistent in their choices. Thus two measures were computed: the lambda implied by the first lottery that was rejected, and the lambda implied by the last lottery that was accepted. For subjects that only switched once these two measures would coincide. For subject that would switch more than once, the average of the two measures was taken.

Table 4. Implied lambda's for the loss aversion task.

Decision	Implied Lambda
1. Reject all lotteries.	>2.5*
2. Reject lotteries 2-5.	2.5
3. Reject lotteries 3-5.	1.66
4. Reject lottereis 4-5.	1.25
5. Only reject lottery 5.	1
6. Accept all lotteries.	<0.83**

** For subjects rejecting all lotteries we selected a lambda equal to 3.*
*** For subjects accepting all lotteries we selected a lambda equal to 0.83.*

3.4. Experimental Implementation

The experiment was programmed with z-Tree (Fischbacher, 2007) and participants were recruited with ORSEE (Greiner, 2004). Three non-incentivized trial rounds were run at the beginning of the experiment to acquaint subjects with the experimental interface.

The experimental sessions were run in June 2012 at the University of Gothenburg with bachelor- and master-students from various disciplines. We conducted seven sessions with 10 subjects each in a within-subjects design. Average earnings of subjects were 250 SEK.

4. Results

In Table 5 we report average portfolio choices for the three treatments. Over all three treatments there is a clear preference for the negatively skewed asset C. This preference is not predicted by either variance minimization or linear loss aversion, as both theories predict a preference for the asset with the lowest variance, Asset B (See Table 1). However, a specification that incorporates concavity in gains and convexity in losses in line with Prospect Theory (Kahneman and Tversky, 1979) correctly predicts the preference for negatively skewed asset. The only significant differences in average asset share across treatments that we find is for the zero skew asset B where the share is significantly smaller in the TOURNAMENT treatment than in both the SOCIAL (clustered t-test, p<0.05) and the INDIVIDUAL treatment (clustered t-test, p<0.01).

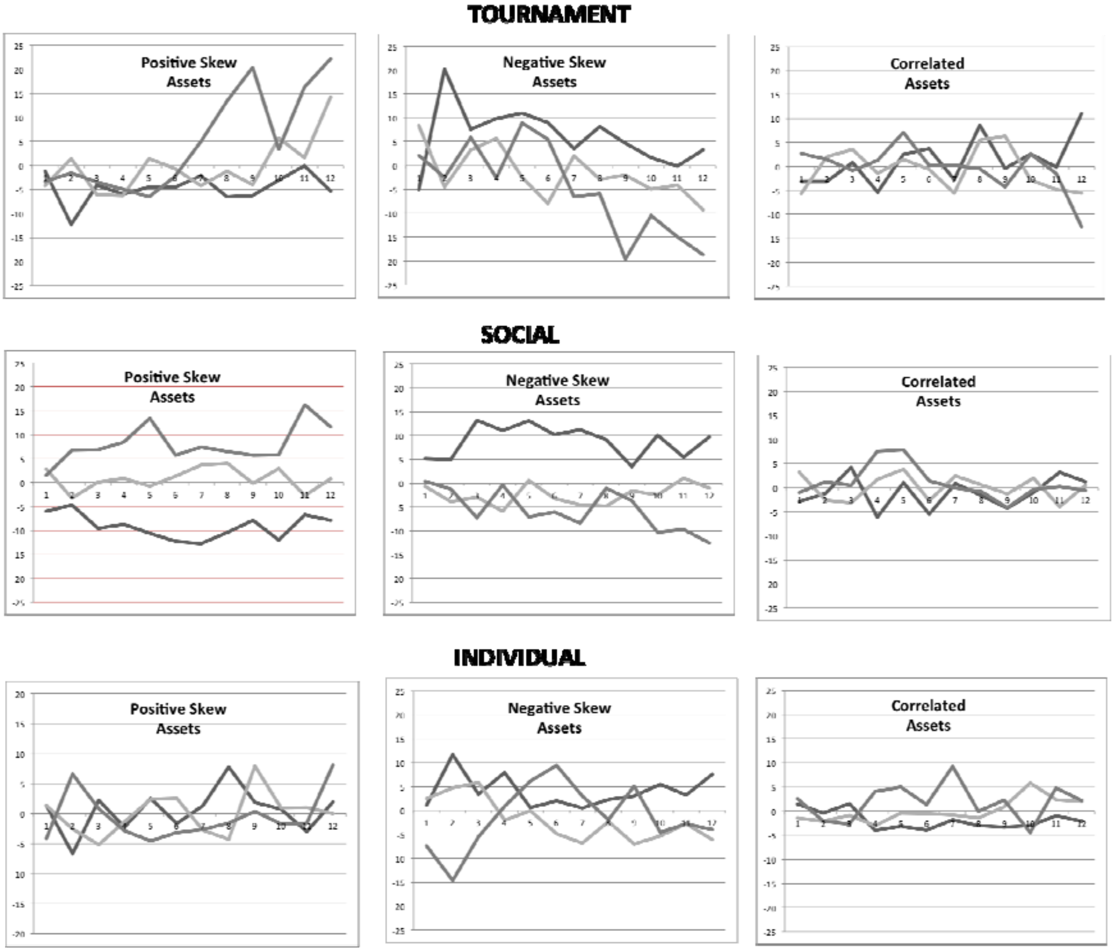
Table 5. Average portfolio shares.

Treatment	Share A (Pos Skew)	Share B (Zero Skew)	Share C (Neg Skew)	Share Type 1 (Correlated)
TOURNAMENT	20.6 (26.3)	27.6 (23.4)	51.9 (31.5)	52.2 (21.5)
SOCIAL	18.6 (21.2)	31.9 (19.6)	49.5 (26.5)	50.7 (18.9)
INDIVIDUAL	17.3 (21.1)	34.3 (23.2)	48.4 (27.5)	51.2 (20.8)

Share A is portfolio share of the positively skewed assets A1 and A2. Share B is the portfolio share of zero skewness assets B1 and B2. Share C is the portfolio share of the negatively skewed assets C1 and C2. Share Type 1 is the portfolio share of the correlated assets A1, B1 and C1. Standard deviations in parentheses.

Figure 1 provides a first overview of the question whether convex tournament incentives and relative performance feedback induce changes in portfolio choice. We display the deviations from average portfolio shares (as given in Table 6) for each of the twelve periods of the session for three groups of subjects: the top three subjects, the bottom three, and the middle four. In the TOURNAMENT treatment we can see the portfolio shares diverging in the final periods. Especially those ranked in the bottom three start shifting money out of the negatively skewed asset C into the positively skewed asset A. Only in the very last period we see a divergence in the choice for correlated and idiosyncratic assets as those at the top start to invest mainly in correlated assets, while those at the bottom put their hopes on an idiosyncratic payoff.

Figure 1. Deviation from average Asset share by rank.



The horizontal axis shows periods 1-12, the vertical axis shows the deviation from average portfolio share for that particular treatment. Thus the vertical axis is centered around zero for all asset types, even though the average asset shares are different (see table 6). The ranks are grouped by Top (Rank 1-3, Dark Gray), Middle (Rank 4-7, Light Gray), Bottom (Rank 8-10, Gray).

In the SOCIAL treatment the gap between leaders and laggards opens up almost immediately and stays consistent throughout the 12 periods. It thus seems as if the tournament incentives in the final periods in the TOURNAMENT treatment actually inhibit the distortions seen in the SOCIAL treatment already for the first periods. We could label this an "eye on the prize"-effect: the focus on the final periods diminishes other distorting influences in the intervening periods. In the TOURNAMENT treatment both monetary payoff and the social comparison are based on relative rank while in the SOCIAL treatment the monetary payoff does not depend on rank directly. Thus, subjects in the SOCIAL treatment can take bets to improve their rank without risking reduced expected payoffs. They may therefore start doing this in period 1. In the TOURNAMENT treatment, on the other hand, unsuccessful bets to improve rank, i.e., declining rank, will affect expected payoff and TOURNAMENT subjects only start to take these bets in the last periods. In the INDIVIDUAL treatment no persistent differences emerge.

In Table 6 we run regressions by regressing subject *i*'s portfolio choice in period *t* - the portfolio shares of assets A, B, and C - on rank, risk aversion, loss aversion, and a gender indicator variable. In addition, we interact our rank measure with a dummy variable for the final two periods (period 11 and 12 respectively) to test for end-of-experiment effects.[6] All measures are normalized so that coefficients can be interpreted as the effect on asset allocation associated with e.g. and increase from the lowest level of risk aversion to the highest. Loss aversion is normalized as (lambda-0.83)/2.13 and thus likewise is a measure ranging between 0 and 1. Rank is normalized as well such that the highest ranked subject has a Rank of 0 and the lowest ranked subject a rank of 1. Thus the coefficient on Rank should be interpreted as the estimated change in asset allocation associated with moving from the top rank to the lowest rank. All standard errors are clustered on subject.

The results for the TOURNAMENT treatment are consistent with the visual inspection of Figure 1. Rank has a highly significant positive effect on the share of

[6] Dummy variables for the three or four last periods generate similar but somewhat weaker results. A dummy only for the last period generate stronger results.

positively skewed assets and non-correlated assets, but only in the final periods. In those final two periods the lagging subject is expected to have a 22 percentage points higher share in the positively skewed asset and an 18 percentage points higher share in idiosyncratic assets than the leading subject. In the SOCIAL treatment the direction of the effect is similar, but just as Figure 1 indicates, the effect is persistent in all periods, not just the final ones. Finally in the INDIVIDUAL treatment, no rank effect is evident.

In Table 7 we test for treatment differences of the effect of rank. The TOURNAMENT treatment serves as baseline. We find no significant difference in the effect of rank between the TOURNAMENT and SOCIAL treatments, whereas we do find significant differences between the TOURNAMENT and INDIVIDUAL treatments. Thus, competitive social preferences appear to generate similar biases in portfolio selection and tournament incentives as explicit convex tournament incentives.

Table 6. The influence of rank on portfolio choice, by Treatment.

Panel A: Dependent variable: Share A (Positively skewed)

Treatment	TOURNAMENT		SOCIAL		INDIVIDUAL	
	(1)	(2)	(3)	(4)	(5)	6)
Rank	9.3	10.2	23.4***	17.0***	-3.9	-3.1
	(6.6)	(6.5)	(6.8)	(5.2)	(6.5)	(6.2)
Last Period	-3.8	-2.8	-4.1	-3.9	-3.9	-4.4
	(5.0)	(4.6)	(4.0)	(3.7)	(3.6)	(3.8)
Rank * Last	24.6**	22.8**	11.0	10.5	9.4	10.1
Period	(11.2)	(10.5)	(7.2)	(6.7))	(5.9)	(6.0)
Male		9.6*		1.6		5.6
		(5.0)		(4.4)		(5.1)
Risk Aversion		5.6		-4.7		0.4
		(8.3)		(5.0)		(6.0)
Loss Aversion		-18.2**		-17.6***		-22.1***
		(8.1)		(6.2)		(6.9)
Intercept	13.8***	17.0***	5.4**	18.7***	19.3***	27.8***
	(3.5)	(5.3)	(2.7)	(4.6)	(4.6)	(6.4)
R^2	0.05	0.12	0.12	0.20	0.01	0.12
N	840	840	840	840	840	840

Panel B: Dependent variable: Share C (Negatively skewed)

Treatment	TOURNAMENT		SOCIAL		INDIVIDUAL	
	(1)	(2)	(3)	(4)	(5)	6)
Rank	-11.8	-11.0	-18.6**	-12.1*	-6.1	-7.6
	(8.5)	(8.3)	(8.1)	(7.3)	(9.0)	(8.3)
Last Periods	0.1	0.9	5.5	5.6	2.8	3.4
	(5.7)	(5.2)	(4.1)	(4.0)	(4.9)	(5.1)
Rank * Last	-14.4	-12.5	-12.4*	-12.5*	-7.6	-8.7
Periods	(9.6)	(8.7)	(6.9)	(6.5)	(7.3)	(7.6)
Male		8.3		-4.0		-4.3
		(6.6)		(5.7)		(6.1)
Risk Aversion		13.1		13.0		12.1
		(10.9)		(9.3)		(9.2)
Loss Aversion		2.0		11.9		14.5***
		(9.7)		(8.5)		(9.4)
Intercept	59.6***	58.3***	60.0***	48.4***	52.0***	38.4***
	(5.9)	(8.1)	(5.2)	(7.6)	(6.4)	(8.0)
R^2	0.03	0.07	0.05	0.11	0.00	0.12
N	840	840	840	840	840	840

Table 6 (continued). The influence of rank on portfolio choice, by Treatment.

Panel C: Dependent variable: Share 1 (Correlated)

Treatment	TOURNAMENT		SOCIAL		INDIVIDUAL	
	(1)	(2)	(3)	(4)	(5)	6)
Rank	0.9	1.1	7.0	8.2*	4.3	4.0
	(5.1)	(5.0)	(5.2)	(4.8)	(4.2)	(4.1)
Last Periods	7.3**	6.8*	4.7	4.6	-0.5	-0.3
	(3.7)	(3.5)	(3.8)	(3.8)	(4.3)	(4.3)
Rank * Last	-18.8**	-18.0**	-8.6	-8.5	4.0	3.7
Periods	(8.1)	(7.8)	(6.2)	(6.3)	(7.2)	(7.2)
Male		-2.3		-6.0**		-1.4
		(3.6)		(3.0)		(4.1)
Risk Aversion		5.7		1.1		1.9
		(7.7)		(6.0)		(6.8)
Loss Aversion		1.5		3.5		9.1
		(4.7)		(6.0)		(7.7)
Intercept	52.2***	50.7***	49.6***	46.7***	48.6***	44.1***
	(3.4)	(4.8)	(3.4)	(4.0)	(2.0)	(4.2)
R^2	0.02	0.02	0.03	0.03	0.01	0.03
N	840	840	840	840	840	840

Rank, Risk Aversion and Loss Aversion are all normalized. Standard errors clustered on subject.
**** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.*

Table 7. Treatment differences in effect of rank on portfolio.

	All Periods			Period 11,12		
Dependent Variable	Share A Pos Skew (1)	Share C Neg Skew (2)	Share 1 Correlated (3)	Share A Pos Skew (4)	Share C Neg Skew (5)	Share 1 Correlated (6)
Rank	13.9**	-13.6	-2.1	31.6***	-22.8*	-16.0*
	(6.5)	(8.7)	(5.1)	(11.0)	(11.9)	(9.0)
Rank * SOCIAL	4.2	4.2	8.9	-5.8	0.4	16.8
	(8.8)	(12.2)	(7.0)	(13.7)	(15.1)	(11.4)
Rank *	-15.2*	-0.2	6.2	-22.6*	4.0	22.4**
INDIVIDUAL	(8.1)	(11.1)	(5.6)	(12.4)	(16.3)	(10.2)
Male	5.8	-5.6	-3.3	11.5**	-12.9**	-3.2
	(4.0)	(5.4)	(2.7)	(4.9)	(5.5)	(3.6)
Risk Aversion	0.4	12.6	3.0	-2.8	12.1	9.8
	(5.3)	(8.9)	(5.0)	(5.9)	(9.1)	(6.8)
Loss Aversion	-19.3***	12.0	4.5	-17.8**	11.4	5.0
	(5.8)	(8.2)	(4.7)	(7.0)	(8.4)	(5.7)
SOCIAL	-4.2	-2.3	-6.3	-5.8	3.3	-8.3
	(4.2)	(6.2)	(4.1)	(13.7)	(8.5)	(6.2)
INDIVIDUAL	5.2	-6.1	-4.4	-22.6	-0.6	-9.4
	(5.0)	(7.7)	(3.3)	(12.4)	(10.0)	(6.0)
Intercept	20.2***	52.2***	51.6***	16.2***	54.4***	54.6
	(4.9)	(7.6)	(4.4)	(6.1)	(8.2)	(5.9)
R^2	0.12	0.09	0.02	0.20	0.15	0.07
N	2520	2520	2520	420	420	420

Rank, Risk Aversion and Loss Aversion are all normalized. Standard errors clustered on subject.
**** Significant at the 1% level; ** Significant at the 5% level; * Significant at the 10% level.*

5. Discussion and Conclusion

In this paper we used laboratory portfolio choice experiments to examine whether tournament incentives induce excessive risk-taking. With tournament incentives we observed that (i) underperformers invested more in positively skewed and idiosyncratic assets towards the end of the experiments. Additionally, (ii) outperformers invested more in correlated and negatively skewed assets. However, (iii) we observed similar patterns in the treatment without tournament pecuniary incentives but where the current ranking of relative performance was displayed to the subjects. We conclude that (iv) competitive social preferences are enough to generate tournament behavior.

We think our results have two implications. The first and most important is related to the policy discussion about regulation of investment managers' incentive schemes. Our results suggest that limits on investment managers' contracts may have limited effect on their appetite for risk as long as they will be able to infer their relative performance. Due to social preferences, underperformers may take excess risks in order to increase the probability of improved social status. Similarly, outperformers may take tail risks in order to increase the probability to "stay ahead of the Joneses". By the same token it is questionable from a company perspective to provide investment managers with excessive bonus compensation contracts, since similar behavior might be observed purely by investment managers' comparison with their peers. However, the question whether this kind of behavior is desirable from a company or society perspective was not the focus of this paper.

The second implication is related to how investment managers may construct their portfolio given their current relative rank and how this may affect the financial institutions' risk exposure. The issue is not just about increasing or decreasing the portfolio volatility. Instead, by choosing positively or negatively skewed assets as well as idiosyncratic or correlated assets, investment managers can achieve the risk-profile that will increase the probability that they will improve their relative rank or to keep their top-rank. This observation has bearing on the ongoing policy discussion about how financial institutions' risk-exposure shall be measured.

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Appendix A: Experimental Instructions

We welcome you to this experimental session and kindly ask you to refrain from talking to each other for the duration of the experiment, and switch off your cell phones. If you face any difficulties, contact one of the supervisors.

First of all you should now carefully read these instructions.

The experiment consists of three main parts. Only one of the three parts will be randomly selected for final payment.

The show-up fee for this experiment is SEK50.

PART 1
The unit of account for this part of the experiment are Tokens. At the beginning of the experiment you will start with 15.000 Tokens. Every round you can either gain or loose Tokens. You gain and loose Tokens by investing in lotteries. You have to choose exactly 100 lotteries every period. The experiment lasts 12 periods.

There are three types of lotteries: type A, B and C. The outcome of a lottery is decided by throwing a (virtual) die. Thus each lottery has six possible outcomes, and each outcome is equally likely. Below are the amounts of tokens earned or lost for each possible outcome of the die throw: either landing 1, 2, 3, 4, 5 or 6.

LOTTERY A

Die throw	**1**	**2**	**3**	**4**	**5**	**6**
Earnings	-15	-15	-15	-15	-15	+75

LOTTERY B

Die throw	**1**	**2**	**3**	**4**	**5**	**6**
Earnings	-20	-20	-20	+20	+20	+20

LOTTERY C

Die throw	**1**	**2**	**3**	**4**	**5**	**6**
Earnings	-75	+15	+15	+15	+15	+15

Furthermore, for every lottery there are two sub-types:

Type I: Common die.
For lotteries A1, B1 and C1, **one common die** is thrown deciding the outcome for **ALL** participants in a certain lottery. Thus for example if the common die for lottery A1 lands at 6, everybody that has chosen a positive number of lottery A1 earns 75 Tokens per lottery.

Type II: Private die.
For lotteries A2, B2 and C2, a **different private die is thrown for each participant in each lottery**. For example your individual die might land at 6 for Lottery A2, it might be 1 for another participant and 4 for a third one.

Every round you must decide how many of each type of lottery to acquire. The total amount of lotteries must always sum up to 100.

After all participants have made their decision, the computer throws the dice. (one common one for each of the A1, B1 and C1 lotteries, and one for each participant for the A2, B2 and C2 lotteries).

For each lottery you will be informed of the outcome of the die throw, the resulting payoff of the lottery, and your total earnings for that lottery. The combined earnings for all six lotteries will determine your earnings that round.

Every round you are informed about your own earnings that round and your total earnings in the experiment so far.

[*** TOURNAMENT AND SOCIAL TREATMENTS ONLY ***]
You are also informed about the average earnings in the experiment, your rank in the earnings distribution, and the earnings of the other participants in the experiment.

[*** SOCIAL AND INDIVIDUAL TREATMENT ONLY ***]
Your earnings in this part of the experiment will depend on the amount of tokens you hold after period 12.

[*** TOURNAMENT TREATMENT ONLY ***]
Not your absolute number of Tokens, but your rank in period 12 will determine your payoff for this part of the experiment. The higher your rank, the higher your earnings

Table 1. Rank and earnings

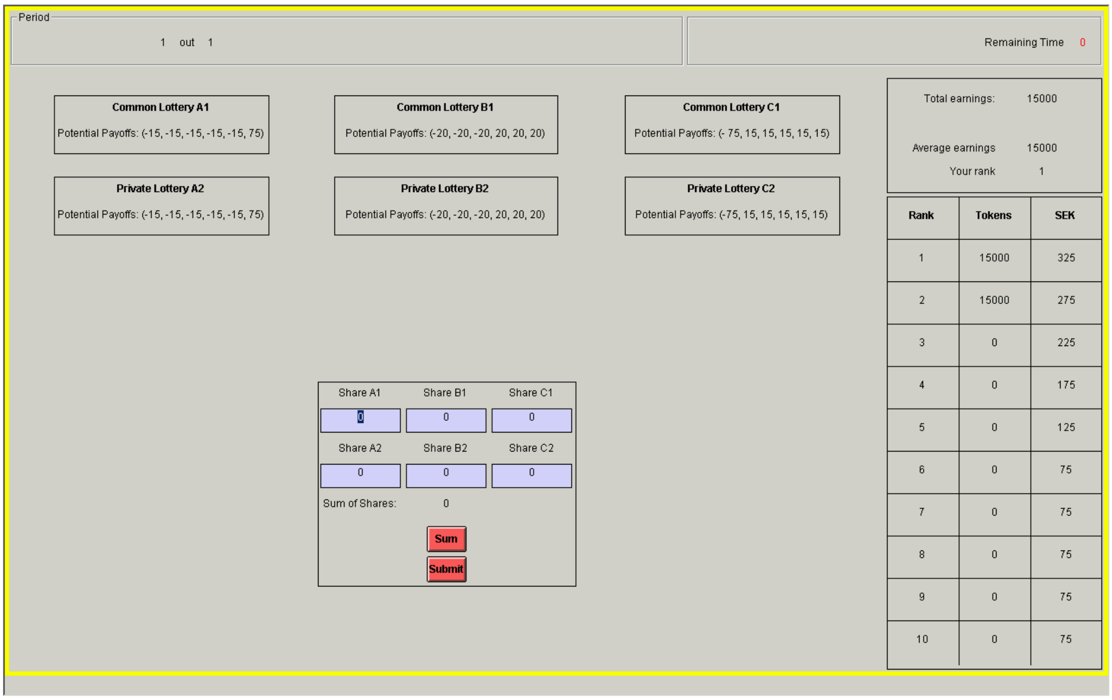
Rank	**Final Payoff (SEK)**
1	500 SEK
2	400 SEK
3	300 SEK
4	200 SEK
5	100 SEK
6	0 SEK
7	0 SEK
8	0 SEK
9	0 SEK
10	0 SEK

Thus if this part of the experiment gets selected for final payment, your earnings will consist of the show-up fee (SEK50) + (Final payoff depending on rank).

In order to get used to the program, we will start with three practice rounds that will have no effect on your final earnings.

Appendix B Screenshots

B.1 Decision Screen.



B.2 Result Screen.