Relative Income Position, Reference Groups, and Performance:

The Impact of Closeness

Markus Schaffner* Benno Torgler*†‡

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Abstract

It is generally understood that people care about their absolute income position, and several studies have in fact moved beyond this, showing that people also place considerable significance on their relative income position. However, empirical evidence about the behavioural consequences is scarce. We address this shortcoming by exploring the relative income effect in a (controlled) sporting contest environment. Specifically, we look at the pay-performance relationship by working with a large panel data set consisting of 26 NBA seasons. We explore how closeness affects positional concerns exploring in detail several potential reference groups. This allows checking of their relevance and of the scope of comparisons, a critical aspect in the literature that requires further investigation.

1 Introduction

An often-cited text by Russell (1930, pp. 68-69) points out that: "Napoleon envied Caesar, Caesar envied Alexander, and Alexander, I daresay, envied Hercules, who never existed. You cannot, therefore, get away from envy by means of success alone, for there will always be in history or legend some person even more successful than you are". The basketball legend Michael Jordan once confessed that "I wish I came in first more often"[1]. Myers (2004) reports that Alex Rodriguez's $252 million, 10-year baseball contract diminished other star players' satisfaction with their lesser, multimillion-dollar contracts. Positional concerns caused by relative judgments are common among all sorts of individuals and societies. People constantly compare themselves with their environment and care greatly about their relative position, which influences individual choices.

This shows that it is not only the absolute level of an individual's situation that is important (e.g., income), but also the relative position. Frank (1999)

*The School of Economics and Finance, Queensland University of Technology, GPO Box 2434, Brisbane, QLD 4001, Australia

†CREMA - Center for Research in Economics, Management and the Arts, Gellertstrasse 18, CH-4052 Basel, Switzerland

‡CESifo, Poschingerstrasse 5, D-81679 Munich, Germany

[1](Newsweek, 2/17/92, Vol. 119, Issue 7).

stresses that the concern about relative position is a "deep-rooted and ineradicable element in human nature" (p. 145). He also evaluates in detail several situations in which an individual's welfare depends on comparisons with others (Frank, 1991). An individual's decisions have important effects not only for himself/herself, but also for the frame of reference in which he/she and others operate. He calls such consequences positional externalities and shows how such externalities help to explain, for example, twenty-four-hour supermarkets, excessive formalism in economics, cycles of fashion and public spiritedness, muddled bureaucratic language, excessive cosmetic surgery and pressures to consume growth hormones. He concludes that "[...] the more we learn about them, the more likely it seems that actions without external effects may be the real exceptions" (p. 44). Schoolteachers sometimes ask parents not to pack special treats in children's lunches as other classmates become envious (Elster, 1991). Likewise, school uniforms help to reduce possible envy among pupils.

However, while we can observe an effect on individual choices, can we observe a relative income effect on productivity? The relative income effect has been documented in several empirical studies working mainly with attitudinal questions (Fischer & Torgler, 2007), but empirical evidence about the behavioural consequences remains scarce.

Neumark and Postlewaite (1998), for example, asked whether women's decisions to seek paid employment depend in any way on the employment or incomes of other women. They therefore investigate the question whether relative income comparisons could affect their employment decision. As a reference group they focus on women's siblings, but instead of making comparisons between sisters, they investigate whether women's employment is affected by the employment of their sisters-in-law and whether women's employment is affected by the income of their husbands relative to the income of their sisters' husbands. Their results strongly support the relevance of positional concerns.

The effects of relative position extend beyond the social and individual decision processes: It has determined that relative position affects health and important biochemical processes in the nervous system (for an overview see Frank & Sunstein, 2001). A higher relative position is correlated with better health. There is even evidence that supports the link between relative income and disease. Furthermore, some biological evidence indicates that changes in social status are correlated with physiological changes (Frank, 1985) and that status differentiation is common among various animals (Coelho, 1985). By applying this theory to a real life data set from a competitive sport environment we try to further behavioural evidence. Thus, in this study the environment of the National Basketball Association (NBA) is used as a testing ground to observe how the relative income position affects productivity in a relatively controlled environment.

In particular, we explore how closeness affects positional concerns. Pleban and Tesser (1981) stress: "The closer another is, the more likely one is to engage in comparison processes" (p. 279). We explore a large variety of reference groups in the current analysis and note that surprisingly, a detailed discussion about reference groups is missing in the economics literature.

Amiel and Cowell (1999, pp. 2-3), for example, say: "We should explicitly define the 'universe': the collection of persons or groups within which inequality comparisons are to be made [...] But as far as the third point on the list is concerned - the appropriate reference group - one is immediately struck by the lack of references in the mainstream economics literature. Why this apparent neglect of one of the main components of income distribution analysis?"

Some previous studies have provided a theoretical background with regard to comparisons and addressing the issue of a reference group (Festinger 1954). However, understanding just who is in the social reference group and what the behavioural consequences are, is an underexplored social science research question. Kulik and Ambrose (1992, p. 212) also stress: "Despite the demonstrated value of comparison theories, these theories share a common problem. Prediction of an individual's response depends on the referent used by the individual". Thus, our paper will try to reduce such a shortcoming providing behavioural evidence observing individuals' behaviour in a competitive work environment focusing on a variety of reference groups.

The second section of this paper will provide the theoretical background while also developing our key research hypothesis. Section 3 introduces the data set and discusses our main variables. Section 4 provides the empirical results and Section 5 finishes with some concluding remarks.

2 Theoretical Considerations

The basic framework of this research consists of the conjunction of the following two questions: How is a worker's productivity composed and how is this productivity then affected by the relative income position. Generally, we assume the following utility function:

$$U_i = u_i(s_i, d(s_i, \vec{s}), C(e_i)) \tag{1}$$

where s_i is the salary of the worker, $d(s_i, \vec{s})$ is the distance of the workers salary to the vector of salaries of his/her reference group $\vec{s}$ and $C(e_i)$ is the cost the worker experiences for the chosen level of effort e_i. Furthermore we assume that a workers' productivity (p_i) depends on the workers ability (a_i) and the effort (e_i) the person puts into his/her task ($p_i = a_i \cdot e_i$).

It is also assumed that while ability is a function of the person's general skills, it remains constant over time. Another basic assumption for our research is that the person alters their effort level according to his or her level of motivation in this period (m_{it}). This means that effort is a function of a worker's motivation (Equation 2). The motivation is affected by the absolute income position (s_{it}) as well as the perceived relative income position ($d(s_{it}, \vec{s}_t)$), which can be seen as an indicator of recognition.

$$e_{it} = f(m_{it}) \sim \phi s_{it} + \lambda d(s_{it}, \vec{s}_t) \tag{2}$$

When people compare their income position, it is with people close to themselves (Layard, 2003). This is usually referred to as the reference group, though it is unclear what the most accurate reference group for income comparisons is. Moreover, it is possible that more than one reference group is relevant for an individual. Thus, it is useful to explore the impact of different reference groups. Shah (1998) stresses: "Given the importance of social referents within organizations, it is astounding that the issue of the social referent has only been addressed in general term. [...] Laboratory studies examining both social comparisons and equity theories have been conducted in settings with only one available referent" (p. 253). Akerlof (1997) develops a model of social distance introducing heterogeneity to show how social interactions can produce different subgroups.

It can be assumed that workers within the same organizations have an incentive to compare themselves with co-workers. Biological research has observed species-specific interaction distances for a variety of animals. Social life is regulated by territoriality and an instinctive attachment to place (Baldassare, 1978).

In Aristotle's *Rhetoric* (book II, chapter 10), it is posited that envy is felt only towards those people who are our equals or our peers. Similarly, Francis Bacon writes in his Essays or Counsels, Civil and Moral that proximity defines the reference group as "near kinsfolks, and fellows in office, and those that have been bred together". Festinger (1954) points out that people do not generally compare themselves with the rest of the world, but with a much more specific group, typically with others they see as being similar to themselves or, in his words, "close to one's own ability" (p. 121). Closeness is often referred to a situation where a group of individuals are seen to be in a unit relation (Heider, 1958; Pleban & Tesser, 1981), such as being teammates. Homans (1961) introduces yet another facet of social comparison into the literature: and that is the dimension of exchange. The situation itself determines who would be selected for comparisons. Thus, the reference group would generally be other individuals that are involved in exchanges (e.g., teammates or players in the same basketball region). Other theorists have proposed that the feeling of inequality is a function of psychological and perceived closeness (Pritchard, 1969). This suggestion opens up the possibility of a variety of reference groups (teammates, players with the same position etc.). Interestingly, Campbell's (1978) results suggest that situational and work-related dimensions are much more critical than psychological closeness.

In general, the existence of discrepancies with respect to differing abilities and interactions leads to actions that reduce the discrepancy. Thus, we should observe behavioural consequences. Soldiers in World War II seem to have made comparisons primarily with members of their own military group (Stouffer, 1949). Interestingly, military police soldiers were more satisfied with their rate of promotion than were air corpsmen of comparable rank although military police soldiers had one of the slowest rate of promotion among all branches of services and the air corps had the most rapid rate of advancement in the entire army. Observable frustrations expressed by U.S. Air Corps soldiers during World War II are able to be explained using the relative deprivation theory. A relatively rapid promotion rate for the group leads to a frustration about their own promotion rates as other colleagues' promotions inflated expectations, inevitably resulting in disappointment.

These papers strongly influenced the reference group theory (see also Merton & Rossi, 1968; Merton, 1968). Concepts such as relative deprivation and the theory of social comparison are part of the reference group theory. Results in that area indicate that a reference group is not selected randomly. The more similar the characteristics of others to ones' self, the higher the probability that a person will choose such individuals as a reference group for comparison purposes (Rubel, 1977). The network literature stresses that structural similarity to one another leads to an increase in issue-related communication and positioning (McPherson, Smith-Lovin, & Cook, 2001). Similarity also induces a competitive orientation and a higher level of identification (Friedkin, 1993). The attractiveness of referents can also be function of information availability about potential referents (Goodman, 1977). Workers' closeness reduces information costs and the complexity of such a decision process.

Clark and Oswald (1996) show that people's reference groups are individuals with similar personal characteristics, such as gender, job and so on. Closeness is also seen to increase with physical proximity, similarity in origins, age, background etc. (Pleban & Tesser, 1981).

Thus, it can be assumed that basketball players, as in other team sports, compare themselves with other basketball players, such as team-mates or league players, due to the same work profile.

In this study we investigate whether closeness mediates a relative income effect. We therefore explore different levels of closeness. We can generally assume that the distance or closeness to all possible reference groups influence workers' motivation and therefore also their performance. We can write this concept of the relationship between performance and income distance down as:

$$p_i \leftarrow \sum_{j=0}^{n} (\lambda_j d(s_i, \vec{s}_j)) \tag{3}$$

where $\vec{s}_j$ denotes the vector of salaries for the reference group which are ordered in increasing personal distance $j = [1, 2, \ldots, n]$. With this specification we can build our main hypothesis:

HYPOTHESIS 1 *The effect of the relative income position is stronger for closer reference groups than for reference groups with a less close bond.* ($\lambda_j > \lambda_{j+1}$)

In the following section we will discuss two additional key aspects in the paper, namely *performance or productivity in relation to income* and the *relative income position* in this context.

2.1 Pay and Performance

Empirical analysis of the behavioural impact of positional concerns is hindered by the lack of useful income data. Researchers have therefore searched for environments where useful data is available. The availability of sports data has led to a growing empirical literature, testing theories in promotion tournaments with sports data where pay and performance relationships can be fairly well measured (Ehrenberg & Bognanno, 1990a, 1990b; Melton & Zorn, 2000; Orszag, 1994; Sunde, 2003; Maloney & McCormick, 2000; Torgler, Schmidt, & Frey, 2007). It is not only the availability but also the low variable errors that contribute to the use of sports data to explore the behavioural and labour question. In this paper we focus on basketball games. They are comparable to field experiments, because a match takes place in a controlled environment, where basketball players are faced with the same rules and other outside restrictions. Hence, when investigating the connection between relative income concern and performance, many factors can be controlled for. The majority of empirical evidence using sports data supports the positive impact of monetary incentives on sporting performance[2].

[2]Please see Torgler et al. (2007) for an in-depth analysis of this literature.

2.2 Relative Income Position

Economists have included interdependent preferences to allow for social comparisons, and have also stressed the relevance of the relative position (e.g. Becker, 1974; Easterlin, 1974; Scitovsky, 1976; Schelling, 1978; Pollak, 1976; Boskin & Sheshinski, 1978; Frank, 1985; Ng, 1997; Akerlof & Yellen, 1990). Other social sciences, such as social psychology, sociology or anthropology, have placed considerable emphasis on the significance of relative preferences as being fundamental to human motivation. The psychological theory of social comparison and the sociological theory of relative deprivation suggest that a person may get frustrated when his or her situation (e.g., individual earnings) falls relative to the reference group. If improvement of the situation is slower than expected, frustration can even lead to aggression (see e.g., Walker & Pettigrew, 1984).

McAdams (1992) states: "social science evidence suggests that people generally share a strong desire for social distinction, and in particular that people desire relatively high income and the goods associated with high income or status" (p. 48). Research on happiness (for example, Easterlin, 1974, 1995, 2001; Clark & Oswald, 1996; McBride, 2001; Frey & Stutzer, 2002a, 2002b; Stutzer, 2004; Layard, 2003; Luttmer, 2005; Carbonell, 2005) has stressed and found strong empirical support for the importance of the relative position. Also, laboratory experiments, using the ultimatum game, show that subjects are concerned with their relative position (Frank & Sunstein, 2001; Kirchsteiger, 1994; Fehr & Schmidt, 1999).

As an alternative strategy, some researchers have used hypothetical questions about choices between alternative states or outcomes, where the choices allow checking of relative positional concerns (Alpizar, Carlsson, & Johansson-Stenman, 2005; Johansson-Stenman, Carlsson, & Daruvala, 2002; Solnick & Hemenway, 1998; Tversky & Griffin, 1991; Zeckhauser, 1991)). Even so, many economists are still sceptical about the importance of positional concerns, arguing that in any real economic situation competition will crowd out the relative income effect[3].

However empirical evidence from field data about its behavioural relevance remains scarce. (Senik, 2005) for example provides an overview of the literature, and points out that "it is surprising that in spite of the large theoretical literature on relative income and comparison effects [...] empirical validation of this conjecture is still scarce" (p. 47).

We are going to explore the impact of the relative income position in a work environment, where positional concerns seem to be widespread. Layard (2003) points out: "[In] organisations, calm can often be maintained only by keeping peoples' salaries secret" (p. 8). Elster (1991) reports that in China, model workers spend their bonus on a good meal for everybody to avoid harassment by their colleagues. A manager keeps bonuses low because he fears the other workers and because he wants to avoid the envy of other executive officers. (Frank & Sunstein, 2001) report that surveys of employers and employees suggest that salaries depend on what employees think other people are paid and that the perception of the relative position has a large effect on their morale. Similarly,

[3] This can easily illustrated by imagining an ultimatum game where 11 proposers make their share offer to 10 responders that can pick their partner in some subsequent way. This would lead to a far more equal distribution since the proposers feel the fear of being the one left without a trading partner.

our model suggests that it also affects the effort put into their work.

3 Data and Proxy Description

This section provides a short overview of the data properties, which is followed by a detailed explanation of the proxies used for the various variables.

3.1 Data Sources and Descriptive Analysis

The data for this study is mainly derived from three different sources. As outlined above, data for sport events is usually available as event organisers and the fan community collect the data and publish it on various websites. This allows collection of a lot of data with a little effort and further validates the various sources by comparison. This does not mean the process is straight forward, as different issues for linking and properly attributing the data arises. All data are collected using web crawler techniques with low impact on the target sites' traffic, similar to the way search engines collect information about the web sites indexed.

The main data source used for this study to gain the performance measurement is **databasebasketball.com**. This site provides detailed statistics of 3597 NBA players starting from the season 1946/47 until today. It also provides overviews of yearly performance details and added information for the players such as place of birth, birthday, college, weight and height. There is a total of $N = 18500$ observations for the yearly totals. Complete measurements of all performance indicators used (see Section 3.2) are available from the season 1976/77 as the detail of recording varies beforehand. Table 6 shows the descriptive properties of this data.

The website **usatoday.com** provides salary information for 756 NBA players for the seasons 2001/02 till 2006/07 ($N = 2509$ observations). The data was initially collected by USA TODAY's reporter David DuPree. For the seasons before 2001/02, additional salary sources provide information the 1621 NBA players from 1967/68 till 1999/2000 (with gaps[4]).

The current match-up of players' name and the team played results in 1733 NBA players for the seasons 1979/80 till 2006/07 (7676 observations) using an unbalanced panel[5].

3.2 Proxy for productivity

As we have seen from the previous section various performance measurements are available for most of the players for over 50 seasons. The question that arises for this study is how to map those single measurements into a valid proxy for a player's productivity. All the measurements presented are on a per game basis, as this is the appropriate unit of payment[6]. The most basic method of

[4]We noted some variations of spellings and some faults in entering the data. So the data was cleaned and obvious outliers were excluded from the analysis. Entries for players playing for several different teams in the same season were also excluded.

[5]We did not replace missing values or impute any other data.

[6]Even though we can assume that some players on the payroll are paid on a per season basis.

observing an NBA player's productivity would be to observe the total points scored during the whole year as outlined in Equation 4.

$$p_{simple} = \frac{PTS}{game} \tag{4}$$

This measurement captures only the instant reward of the "in game" performance measurement. What is left out is the player's indirect contribution to the success of the team, but this measurement should provide a good proxy for changes in the player's effort. This measurement will be used even though it omits some factors of a player's productivity.

If one looks for a more sophisticated way to capture a player's performance, a widely used method comes with Equation 5. The basic notion of this factor is that one adds all the good things that a player can do. Notably points scored (PTS), total rebounds ($TREB$), steals (STL), blocks (BLK), and assist (AST). And then subtract the bad things (turnovers (TO), field goals missed (FGM) and free throws missed (FTM).

$$p_{nba} = \frac{(PTS + TREB + STL + BLK + AST) - (TO + FGMS + FTMS)}{game} \tag{5}$$

While this proxy gives a more in-depth picture of the player's performance, there are still some weak points about the ability to capture all important details. Primarily, it is questionable if all those indicators should be of equal weight. It is easy to see that a steal and a turnover would even each other out, as the loss in one team (turnover) is the gain for the other team (steal). But if we consider blocks or assists the question of equal weights must be posed. Although this is no perfect measurement of the player's productivity, it should provide a good indicator in a panel environment with respect to a player's change of performance.

Berri and Krautmann (2006) try to cover this topic. They stress that after points scored, the possession of the ball is the major success contributor in a basketball game. So they calculate their performance indicator (Equation 6) by adding or subtracting all the events that result in a change of possession from the points scored. Moreover they tested this formula for the marginal contribution to the winning percentage for the team. They find that all factors except free throws missed are equal in weight. This abnormality can easily be explained by the fact that there is a high chance that a free throw results in points scored.

$$p_{pos} = \frac{PTS - FGA - 0.44 \cdot FTA + TREB + STL - TO}{game} \tag{6}$$

Hence, this measurement seems to capture most of the productivity of the player. Based on the reasoning outlined beforehand, we will conduct our analysis with all three different measurements (p_{simple}, p_{nba} and p_{pos}) to see if the results remain stable.

3.3 Relative Income Position

Another important question is how to model the relative income position. The main task is to identify the relevant reference group and to find a proxy for how people perceive their relative income position. It can be argued that people will change their performance in accordance with the absolute difference to their reference group. So they would perceive their relative position through monetary differences to their reference group's average as outlined in Equation 7.

$$relSalDiff_{it} = d(salary_{it}, \vec{s}_t) = (\frac{1}{n-1} \sum_{j=0, j \neq i}^{n} salary_{jt}) - salary_{it} \quad (7)$$

where $salary_{it}$ is the salary of player i at a given time t and n is the number of players in the reference group of i. The term $(\frac{1}{n-1} \sum_{j \neq i} salary_{jt})$ represents the average salaries of the other members in the reference group. It can be argued that this purely monetary view does not effectively capture the reality. Yet this value does effectively represent the distance between the player's income position and the set of the income positions of the other players in the specific reference group. The new variable has a mean of zero for each reference group and so also for the entire sample.

3.4 Reference Groups Definitions

The final concept we have to define for our evaluation is how to model the players' reference groups. As we have previously established, people tend to compare themselves with the people that are close or similar to them. Considering the rather special markets of basketball players we can stretch this definition to some extent [7].

The broadest possible conception of the model assumes that a player compares himself to the situation within the whole NBA league (*League*). It is further assumed that the salary structure of the whole NBA is transparent to the player. He is therefore able to determine his standing. Within the dataset, is possible to narrow down potential reference groups. For the first specification it is assumed that the player only compares himself to other players within the league playing the same position (*Pos*).

Network theories suggest there are strong interactions and a high level of competition between people who occupy similar positions (Burt, 1987, 1998). It is in a player's interest to observe and interact with other players that have the same position to remain informed about the development of the others. Such interactions with similar fellows promote social comparisons. Peter Blau (1962) studies case-workers in a public welfare agency. He observes a segregation effect among people who shared a similar orientation. Judith Blau (1974) uses data from an international sample of theoretical high energy physicists and finds that homogeneity in various personal characteristics (e.g., having the same specialized interests and similar role) leads to stronger interactions. Similarity has often been related to abilities in the theory of social comparison. In other words, a player compares himself to someone close to his abilities or opinion. Under incomplete information players search for relative standing information along the ability dimension. Individuals choose to learn more about others who affect his own standing (Wilson, 1973). Further studies have extended the

[7] It is difficult to model exactly each player's social network. This study abstracts from the depths of reality and our proxies should be seen as best-of-concepts.

approach focusing on attribute similarity linked to the performance environment (Gastorf & Suls, 1978). In our context, this would mean that players have a high level of incentive to acquire information about players who are active in the same position. This promotes social comparisons and positional concern effects. Moreover, basketball players are relatively mobile which suggests that external reference groups such as players with the same position may be relevant.

From the literature on workplace comparisons we draw the conclusion that similar experience is very important. We try to capture experience in two different ways. A very crude experience indicator is age (*Age*). Since the NBA is the high end of all basketball leagues, it can be assumed that all NBA players have played since their early childhood. This obviously does not hold for all the players but it should be reasonable for the majority of the players.

The second indicator we use for experience is more data driven. Assuming that the top league is different from the leagues below we take years of experience within the NBA as a proxy for players' experience (*Exp*). While this is certainly a bad proxy for newcomers within the league who might have very diverse backgrounds, the proxy should be able to capture the differences for the more senior players. Another possible measurement for comparison might be geographical distance. The existing NBA league regions are used to model subgroups of players that have a closer relationship due to the fact that they work and live in the same region (*Region*).

On the other hand all those groups are still fairly large which induces restrictions in their personal interactions. Network research agenda suggest that geography is a basic source of closeness (McPherson et al., 2001). The likelihood of contacts increases with geographic closeness. On other hand, it takes more effort to make contact with players who are far away than those who are readily available. This also would induce a stronger positional concern effect within the same team. However, new technologies loosen such restrictions leading to curvilinear relationships between space and interactions "with very close proximity no longer being so privileged over intermediate distances but both being considerably more likely than distant relations. Geographic space also seems more important in determining the 'thickness' of a relationship (its multiplexity and the frequency of actual contact) than it does in determining the presence of a tie" (McPherson et al., 2001, p. 430).

The groups we have defined so far are rather large and anonymous. We will refer to them as high-level reference groups. If we narrow the concept to only the most personal connections and interactions, a very reasonable assumption is that the player compares himself to the other members of his team (*Team*). This addresses the problem of personal distance, but creates the problem that a team needs a heterogeneous group of players with various talents and functions. As our proxy for the relative income position becomes unreasonable for very small groups a further break down (e.g. position) at the team level is not feasible.

To compare other joint classifications we focus only on groups with more than three members and with a certain degree of homogeneity. This leaves us with region and position (*RegPos*), region and age (*RegAge*), region and experience (*RegExp*), position and age (*PosAge*) and position and experience (*PosExp*)[8].

[8]Note that age and experience are not used as a joint group as they capture the same basic concept.

Results presented by Oldham, Kulik, Stepina, and Ambrose (1986), for example, suggest that employees who used other-inside referents to evaluate compensation and job complexity tended to have a long organizational tenure, while those who had short tenure tended to use self-outside referents. Thus, it makes sense to combine experience, age with an outside reference group such as region.

Table 1 gives and overview of the reference groups in our sample.

Table 1: Summary of reference groups

Reference Group	**Groups**	**Members**	**Min.**	**Max.**
High-level reference groups:				
Pos (Position)	3	40.91	10	171
Reg (Region)	6	12.95	4	75
Age	17	10.49	1(3)	52
Exp (Experience)	16	15.02	1(3)	71
Low-level reference groups:				
Team	24	2.38	1(3)	20
RegPos	17	7.24	1(3)	34
PosAge	43	4.88	1(3)	24
RegAge	67	2.51	1(3)	15
PosExp	40	6.63	1(3)	32
RegExp	68	3.00	1(3)	16

There are now ten different notions of reference groups. To test the robustness of our design we are going to run each of these specifications separately to check if there are any major discrepancies between the models. Also note that the results from the high-level group comparisons are not directly comparable to the low-level group definitions, since the number of members in the group changes the variance of the specification.

4 Empirical Results

To test the quality of our specifications we first compare three possible regressions (pooling regression, clustered regression and fixed model) with each of our reference group models. The baseline equation for all those models is shown in Equation 8.

$$\begin{aligned} p_{it} = \beta_0 + \beta_1 relSal_{it} + \beta_2 salary_{it} \\ + \beta_3 CTRL_{it} + \beta_4 TEAMD_{it} + \beta_5 TD_t \end{aligned} \quad (8)$$

where p_{it} is the performance of player i in season t, $relSal_{it}$

The regression also contains several control variables $CTRL_{it}$ such as age, age^2, players' position in the game (center, forward, defence) and team dummy variables ($TEAMD_{it}$), as many players change their position in the field and their team over time.

Team dummy variables are included, as it can be argued that the results are driven by unobserved team characteristics that are correlated with income and performance. Team fixed effects allow us to control for such possible omitted variable bias. But estimates without team effects are also reported to go beyond a within-team focus. Similarly, the estimates include season dummies (TD_t) to control for possible differences in the players' environment.

Table 2 reports the results for the high-level reference groups, Table 3 the results for the low-level reference groups. The first simple OLS regressions with beta or standardized regression coefficients are reported, with the results revealing the relative importance of the variables used. To obtain robust standard errors in these estimations, we use the Huber/White/Sandwich estimators of standard errors. Additionally, we include in Table 2 the OLS regressions with clustered standard errors by players since this will pick up any player-specific characteristics that change over time. Similarly, we control for ability of the individual players by using fixed effects regressions in the third specification. Since the additional regressions show the stability of the model we do not report them in Table 3. It should be noted that we have tested all of our regressions with all three productivity proxies lined out in Section 3.2 and that the results remain robust. We choose to report p_{nba} since it incorporates the largest amount of factors, and is consequently more likely to capture changes in players' behaviour even though the weight of the individual factors might not be fully accurate. Since we are neither predicting nor evaluating the coefficients or marginal effects, this approach seems to be justifiable.

Table 2: The Effect of the Relative Income Position for Different High-Level Reference Groups

Dep. V.: p_{nba}	**Position**			**Region**			**Age**			**Experience**		
	OLS (beta)	Clust.	FE	OLS (beta)	Clust.	FE	OLS (beta)	Clust.	FE	OLS (beta)	Clust.	FE
SALARY												
relSal	-0.621**	-1.508*	-0.917*	-0.436**	-1.052**	-0.536**	-0.316**	-0.789**	-0.225**	-0.095**	-0.257**	-0.120*
	(-3.48)	(-2.37)	(-2.54)	(-4.71)	(-3.51)	(-2.97)	(-10.58)	(-7.79)	(-2.98)	(-4.76)	(-3.25)	(-1.99)
salary	-0.109	-0.236	-0.752*	0.101	0.219	-0.368*	0.243**	0.522**	-0.065	0.496**	1.066**	0.050
	(-0.54)	(-0.37)	(-2.07)	(0.95)	(0.71)	(-2.02)	(6.66)	(5.25)	(-0.83)	(21.19)	(15.23)	(0.80)
CTRL												
age	0.500**	0.806**	4.535**	0.514**	0.828**	4.482**	1.185**	2.024**	5.079**	0.841**	1.415**	4.782**
	(4.82)	(3.46)	(28.77)	(4.94)	(3.53)	(29.84)	(8.77)	(7.00)	(28.13)	(7.22)	(5.50)	(27.01)
age^2	-0.570**	-0.016**	-0.086**	-0.581**	-0.017**	-0.086**	-1.175**	-0.036**	-0.098**	-0.884**	-0.027**	-0.092**
	(-5.57)	(-3.98)	(-34.20)	(-5.67)	(-4.02)	(-34.31)	(-9.00)	(-7.16)	(-32.14)	(-7.83)	(-6.02)	(-31.29)
POSITION	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TEAM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SEASON	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-Test (relSal	771.12**	448.16**	28.06**	779.93**	457.79**	29.26**	781.65**	419.93**	24.47**	724.46**	425.61**	24.13**
and salary)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R-Squared	0.317	0.317	0.320	0.318	0.318	0.320	0.323	0.323	0.285	0.316	0.316	0.284
F	41.94**	29.55**	51.30**	42.40**	30.21**	51.36**	41.62**	29.10**	42.25**	39.86**	28.80**	42.18**
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Groups			1518			1518			1505			1506
N	7676	7676	7676	7676	7676	7676	7484	7484	7484	7509	7509	7509

Significance levels : †: 10% *: 5% **: 1% . *t*-statistics in parentheses

Table 3: The Effect of the Relative Income Position for Different Low-Level Reference Groups

Dep. V.: p_{nba}	**Team**	**RegPos**	**RegAge**	**PosAge**	**RegExp**	**PosExp**
	OLS (beta)	OLS (beta)	OLS (beta)	OLS (beta)	OLS (beta)	OLS (beta)
SALARY						
relSal	-0.295**	-0.188**	-0.215**	-0.116**	-0.093**	-0.057**
	(-6.91)	(-4.67)	(-9.12)	(-5.24)	(-4.97)	(-3.01)
salary	0.264**	0.385**	0.362**	0.487**	0.508**	0.548**
	(5.12)	(8.17)	(12.05)	(17.72)	(23.49)	(25.61)
CTRL						
age	0.517**	0.500**	1.049**	1.092**	0.836**	0.782**
	(4.96)	(4.82)	(7.31)	(6.11)	(6.60)	(5.57)
age^2	-0.580**	-0.570**	-1.051**	-1.108**	-0.870**	-0.827**
	(-5.64)	(-5.58)	(-7.50)	(-6.26)	(-6.97)	(-5.94)
POSITION	Yes	Yes	Yes	Yes	Yes	Yes
TEAM	Yes	Yes	Yes	Yes	Yes	Yes
SEASON	Yes	Yes	Yes	Yes	Yes	Yes
F-Test joint sig.	850.18**	773.76**	660.07**	510.11**	640.45**	478.21**
(relSal and salary)	0.000	0.000	0.000	0.000	0.000	0.000
R-Squared	0.318	0.317	0.319	0.327	0.315	0.317
F	44.16**	41.69**	36.27**	29.51**	34.23**	26.97**
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Number of Obs.	7636	7635	6850	5468	6901	5679

Significance levels : †: 10% *: 5% **: 1% . t - statistics in parentheses

The stability of the model is clearly represented in this table, and obviously declines for more narrow reference group definitions, as the number of observations drops.

To check the differences between reference groups we run the regressions with more than one reference group in the specification. Furthermore, to minimize the effects of multicollinearity we only introduce two indicators at a time. Our model then reads like Equation 9.

$$p_{it} = \beta_0 + \beta_1 relSalA_{it} + \beta_2 relSalB_{it} + \beta_3 salary_{it} + \beta_4 CTRL_{it} + \beta_5 TEAMD_{it} + \beta_6 TD_t \tag{9}$$

Where $relSalA_{it}$ and $relSalB_{it}$ are the relative salary differences using the different reference group models. The results remain robust over all the specifications previously analysed. We use beta coefficients to investigate the relative role played by different reference groups. The values for the high-level reference group are reported in Table 4, and the values for the low-level groups are reported in Table 5.

Table 4: Beta Coefficients for High-Level Reference Groups

A \ B		**Pos**	**Exp**	**Age**	**Reg**
Pos	β_1	-	-.52	-.532	-.623
	β_2	-	-.0953	-.315	-.437
(β_1/β_2)		-	5.46	1.69	1.43
Exp	β_1	-.0953	-	-.0125	-.0974
	β_2	-.52	-	-.32	-.448
(β_1/β_2)		0.18	-	0.039	0.22
Age	β_1	-.315	-.32	-	-.316
	β_2	-.532	-.0125	-	-.442
(β_1/β_2)		0.53	25.6	-	0.71
Reg	β_1	-.437	-.448	-.442	-
	β_2	-.623	-.0974	-.316	-
(β_1/β_2)		0.70	4.60	1.40	-

To facilitate the interpretation of those results we also report the ratio β_1/β_2 in both tables. These values show us the relative importance of each pair. With this pair-wise comparison we can then rank our reference group models accordingly.

Looking at Table 4 we can see that playing in the same position clearly has the strongest impact, followed by playing in the same basketball region. Thus, similar work profiles enhance a relative income effect. The distance to the same age group comes third in terms of influencing the performance. On the other hand, the comparison to players with the same experience seemed to play the lowest mediating effect on players' performance.

Inspection of the results on low-level reference groups in Table 5 highlights that the comparison to team mates has the strongest impact on performance. This is followed by the reference groups that incorporate position and age and position and region. Again, the proxies using experience as an attribute for

Table 5: Beta Coefficients for Low-Level Reference Groups

A \ B		**Team**	**PA**	**PE**	**RP**	**RA**	**RE**
Team	β_1	-	-.302	-.308	-.275	-.272	-.282
	β_2	-	-.215	-.090	-.149	-.108	-.053
(β_1/β_2)		-	1.40	3.43	1.84	2.52	5.32
PosAge	β_1	-.215	-	-.2	-.214	-.187	-.206
	β_2	-.302	-	-.053	-.19	-.071	-.033
(β_1/β_2)		0.71	-	3.78	1.12	2.62	6.34
PosExp	β_1	-.090	-.053	-	-.09	-.059	-.093
	β_2	-.308	-.2	-	-.194	-.106	.0007
(β_1/β_2)		.290	0.26	-	0.46	0.56	131.04
RegPos	β_1	-.149	-.19	-.194	-	-.158	-.18
	β_2	-.275	-.214	-.09	-	-.113	-.055
(β_1/β_2)		0.54	0.88	2.16	-	1.40	3.28
RegAge	β_1	-.108	-.071	-.106	-.113	-	-.118
	β_2	-.272	-.187	-.059	-.158	-	-.032
(β_1/β_2)		0.40	0.89	1.79	0.71	-	0.72
RegExp	β_1	-.053	-.033	.0007	-.055	-.032	-
	β_2	-.282	-.206	-.093	-.18	-.118	-
(β_1/β_2)		0.19	0.16	0.008	0.30	1.40	-

comparison have the lowest positional impact on individual performances. In sum, the results indicate that our hypothesis cannot be rejected. Closeness mediates the relative income effect quite substantially.

5 Conclusions

The aim of the paper is to explore the scope in which relative income position matters. It is highly appropriate to analyse the relevance of different reference groups. Previous literature has mainly developed and implemented one particular reference group without comparing alternative reference groups and without testing differences between potential reference groups. To reduce such a shortcoming, we analyse the hypothesis whether the relative income effect is stronger for closer reference groups than for reference groups with a less close bond. Comparing the different reference groups we were able to see that the strongest effect of positional concerns on performance is driven by similar work profiles (playing the same position) and playing with teammates (daily colleagues). On the other hand, geographical closeness, or age and experience closeness is less relevant. We also observe that more narrowly defined reference groups have a stronger impact than more loosely defined reference groups.

In general, our testing ground was the controlled and highly competitive environment of the highest professional basketball league, the NBA. We observe behavioural consequences of positional concerns at the professional level and the effects are driven by job profile closeness and personal and daily interactions. Thus, it may be useful to take into account such positional concern effects when designing company and corporation salary and incentive schemes.

The findings in regard to external reference groups (e.g., same position) might be comparable to situations of upper echelon employees or CEOs, who have a high level of information transparency and are associated with a great mobility across organizations. Moreover, workers in large companies or government organizations with different offices may react in a similar manner as players in the NBA market. In addition, similar tendencies may be observable in international environments such as academia or research centres. Finally, our results might be relevant for work environments with greater uncertainty and performance ambiguity where information seeking and social comparison behaviour is more prevalent. However, more empirical evidence that investigates to what extent such results can be generalized is required.

A Tables

Table 6: Summary statistics databasebasketball.com

Variable	N / Mean	Std. Dev.	Min.	Max.
players	3597	-	-	-
teams	37	-	-	-
seasons	60	-	1946	2006
age	26.58	3.737	18	44
weight	208.751	25.567	133	330
height	198.915	9.359	160.02	231.14
seasons in same team	3.83	3.09	1	19
total number of seasons	9.319	4.817	1	24
games played / season	52.13	26.654	1	83
minutes played / season	1281.252	971.809	1	3882
points / season	538.738	512.715	0	4029
points / game	8.588	6.277	0	50.4

Table 7: Summary of merged data

Variable	N / Mean	Std. Dev.	Min.	Max.
players	1733	-	-	-
teams	29	-	-	-
seasons	26	-	1980	2006
games played / season	58.464	23.259	1	83
minutes played / season	1440.817	933.837	1	3533
points / season	606.698	507.685	0	3041
salary	2.182	3.016	0.005	33.1
salary / game	0.052	0.166	0	6.3
salary / minute	0.004	0.015	0	0.63

Table 8: Summary performance indicators

Variable	Mean	Std. Dev.	Min.	Max.
p_{simple}	9.158	6.267	0	37.085
p_{nba}	10.251	6.553	-3	36.988
p_{pos}	3.74	3.003	-3.293	19.373

References

Akerlof, G. A. (1997). Social distance and social decisions. *Econometrica*, *65*, 1005-1027.

Akerlof, G. A., & Yellen, J. L. (1990). The fair wage-effort hypothesis and unemployment. *Quarterly Journal of Economics*, *105*, 255-283.

Alpizar, F., Carlsson, F., & Johansson-Stenman, O. (2005). How much do we care about absolute versus relative income and consumption. *Journal of Economic Behavior and Organization*, *56*, 405-421.

Amiel, Y., & Cowell, F. A. (1999). *Thinking about inequality: Personal judgment and income distributions.* Cambridge University Press.

Baldassare, M. (1978). Human spatial behavior. *Annual Reviews in Sociology*, *4*, 29-56.

Becker, G. S. (1974). A theory of social interactions. *The Journal of Political Economy*, *82*, 1063-1093.

Berri, D. J., & Krautmann, A. C. (2006). Shirking on the court: Testing for the incentive eects of guaranteed pay. *Economic Inquiry*, *44*, 536-546.

Blau. (1974). Patterns of communication among theoretical high energy physicists. *Sociometry*, *37*, 391-406.

Blau, P. M. (1962). Patterns of choice in interpersonal relations. *American Sociological Review*, *27*, 41-56.

Boskin, M. J., & Sheshinski, E. (1978). Optimal redistributive taxation when individual welfare depends upon relative income. *Quarterly Journal of Economics*, *92*, 589-601.

Burt, R. S. (1987). Social contagion and innovation: Cohesion versus structural equivalence. *American Journal of Sociology*, *92*, 1287-1335.

Burt, R. S. (1998). *Toward a structural theory of action: network models of social structure, perception, and action.* Academic Press.

Campbell, D. J. (1978). The effects of psychological closeness and type of exchange situation on perceived inequity. *Academy of Management Journal*, *21*, 307-312.

Carbonell, A. F. i. (2005). Income and well-being: an empirical analysis of the comparison income effect. *Journal of Public Economics*, *89*, 997-1019.

Clark, A. E., & Oswald, A. J. (1996). Satisfaction and comparison income. *Journal of Public Economics*, *61*, 359-381.

Coelho, P. R. P. (1985). An examination into the causes of economic growth: Status as an economic good. *Research in Law and Economics*, *7*, 89-116.

Easterlin, R. A. (1974). Does economic growth improve the human lot? some empirical evidence. In P. A. David & M. W. Reder (Eds.), (p. 89-125). New York: Academic Press.

Easterlin, R. A. (1995). Will raising the incomes of all increase the happiness of all. *Journal of Economic Behavior and Organization*, *27*, 35-47.

Easterlin, R. A. (2001). Income and happiness: Towards a unified theory. *The Economic Journal*, *111*, 465-484.

Ehrenberg, R. G., & Bognanno, M. L. (1990a). Do tournaments have incentive effects? *Journal of Political Economy*, *98*, 1307-1324.

Ehrenberg, R. G., & Bognanno, M. L. (1990b). The incentive effects of tournaments revisited: Evidence from the european pga tour. *Industrial and Labor Relations Review*, *43*, 74-88.

Elster, J. (1991). Envy in social life. In R. J. Zeckhauser (Ed.), (p. 49-82). Cambridge: MIT Press.

Fehr, E., & Schmidt, K. M. (1999). A theory of fairness, competition, and cooperation. *Quarterly Journal of Economics*, *114*, 817-868.

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

Fischer, J. A. V., & Torgler, B. (2007). *Social capital and relative income concerns: Evidence from 26 countries* [NCER Working Paper Series].

Frank, R. H. (1985). *Choosing the right pond: human behavior and the quest for status.* New York: Oxford University Press.

Frank, R. H. (1991). Positional externalities. In R. J. Zeckhauser (Ed.), (p. 25-47). Cambridge: MIT Press.

Frank, R. H. (1999). *Luxury fever: Why money fails to satisfy in a era of excess.* New York: The Free Press.

Frank, R. H., & Sunstein, C. R. (2001). Cost-benefit analysis and relative position. *University of Chicago Law Review*, *68*, 323-374.

Frey, B. S., & Stutzer, A. (2002a). *Happiness and economics: How the economy and institutions affect well-being.* Princeton University Press.

Frey, B. S., & Stutzer, A. (2002b). What can economists learn from happiness research. *Journal of Economic Literature*, *40*, 402-435.

Friedkin, N. E. (1993). Structural bases of interpersonal influence in groups: A longitudinal case study. *American Sociological Review*, *58*, 861-872.

Gastorf, J. W., & Suls, J. (1978). Performance evaluation via social comparison: Performance similarity versus related-attribute similarity. *Social Psychology*, *41*, 297-305.

Goodman, P. S. (1977). Social comparison processes in organizations. In B. Staw & G. Salancik (Eds.), (p. 97-132). Chicago: St. Clair Press.

Heider, F. (1958). *The psychology of interpersonal relations.* New York: Lawrence Erlbaum Associates.

Homans, G. C. (1961). *Social behavior: Its elementary forms.* Harcourt, Brace & World.

Johansson-Stenman, O., Carlsson, F., & Daruvala, D. (2002). Measuring future grandparents' preferences for equality and relativee standing. *The Economic Journal*, *112*, 362-383.

Kirchsteiger, G. (1994). The role of envy in ultimatum games. *Journal of Economic Behavior and Organization*, *25*, 373-89.

Kulik, C. T., & Ambrose, M. L. (1992). Personal and situational determinants of referent choice. *Academy of Management Review*, *17*, 212-237.

Layard, R. (2003). *Income and happiness: Rethinking economic policy.* London: Lecture 2, London School of Economics.

Luttmer, E. F. P. (2005). Neighbors as negatives: Relative earnings and well-being. *The Quarterly Journal of Economics*, *120*, 963-1002.

Maloney, M. T., & McCormick, R. E. (2000). The response of workers to wages in tournaments: Evidence from foot races. *Journal of Sports Economics*, *1*, 99-123.

McAdams, R. H. (1992). Relative preferences. *The Yale Law Journal*, *102*, 1-104.

McBride, M. (2001). Relative-income effects on subjective well-being in the cross-section. *Journal of Economic Behavior and Organization*, *45*, 251-278.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, *27*, 415-444.

Melton, M., & Zorn, T. S. (2000). An empirical test of tournament theory: the senior pga tour. *Managerial Finance*, *26*, 16-32.

Merton, R. K. (1968). Continuities in the theory of reference group behavior. In R. K. Merton (Ed.), (enlarged edition ed., p. 335-440). New York: The Free Press.

Merton, R. K., & Rossi, A. S. (1968). Contributions to the theory of reference group behavior. In M. R. K. (Ed.), (p. 279-334).

Myers, D. G. (2004). *Excerpted from psychology.* New York: Worth Publishers.

Neumark, D., & Postlewaite, A. (1998). Relative income concerns and the rise in married women's employment. *Journal of Public Economics*, *70*, 157-183.

Ng, Y. K. (1997). A case for happiness, cardinalism, and interpersonal comparability. *The Economic Journal*, *107*, 1848-1858.

Oldham, G. R., Kulik, C. T., Stepina, L. P., & Ambrose, M. L. (1986). Relations between situational factors and the comparative referents used by employees. *Academy of Management Journal*, *29*, 599-608.

Orszag, J. M. (1994). A new look at incentive effects and golf tournaments. *Economics Letters*, *46*, 77-88.

Pleban, R., & Tesser, A. (1981). The effects of relevance and quality of anothers performance on interpersonal closeness. *Social Psychology Quarterly*, *44*, 278-285.

Pollak, R. A. (1976). Interdependent preferences. *American Economic Review*, *66*, 309-320.

Pritchard, R. D. (1969). Equity theory: A review and critique. *Organizational Behavior and Human Performance*, *4*, 176-211.

Rubel, A. J. (1977). Limited good and social comparison: Two theories, one problem. *Ethos*, *5*, 224-238.

Russell, B. (1930). *The conquest of happiness.* London: George Allen & Unwin.

Schelling, T. C. (1978). *Micromotives and macrobehavior.* New York: WW Norton & Company.

Scitovsky, T. (1976). *The joyless economy: An inquiry into human satisfaction and consumer dissatisfaction.* New York: Oxford University Press.

Senik, C. (2005). Ambition and jealousy. income interactions in the old europe versus the new europe and the united states.

Shah, P. P. (1998). Who are employees social referents? using a network perspective to determine referent others. *Academy of Management Journal*, *41*, 249-268.

Solnick, S. J., & Hemenway, D. (1998). Is more always better?: A survey on positional concerns. *Journal of Economic Behavior and Organization*, *37*, 373-383.

Stouffer, S. A. (1949). *The american soldier.* Princeton: Princeton University Press.

Stutzer, A. (2004). The role of income aspirations in individual happiness. *Journal of Economic Behavior and Organization*, *54*, 89-109.

Sunde, U. (2003). Potential, prizes and performance: Testing tournament theory with professional tennis data. *IZA Discussion Paper Series.* (Bonn, Germany)

Torgler, B., Schmidt, S. L., & Frey, B. S. (2007). *The power of positional*

concerns: A panel analysis [School of Economics and Finance Discussion Papers and Working Papers Series].
Tversky, A., & Griffin, D. (1991). Endowment and contrast in judgments of well-being. Cambridge: MIT Press.
Walker, I., & Pettigrew, T. F. (1984). Relative deprivation theory: An overview and conceptual critique. *British Journal of Social Psychology*, *23*, 301-310.
Wilson, S. R. (1973). Ability evaluation and self-evaluation as types of social comparison. *Sociometry*, *36*, 600-607.
Zeckhauser, R. (Ed.). (1991). *Strategy and choice*. Cambridge: MIT Press.