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## Economics meets psychology: Experimental and self-reported measures of individual competitiveness

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**SCHUMPETER DISCUSSION PAPERS**

# **Economics meets Psychology: Experimental and self-reported Measures of Individual Competitiveness**

**Werner Bönte, Sandro Lombardo, Diemo Urbig**

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**BERGISCHE  
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## Economics meets Psychology:

### Experimental and self-reported Measures of Individual Competitiveness

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#### ABSTRACT

Economists and psychologists follow different approaches to measure individual competitiveness. While psychologists typically use self-reported psychometric scales, economists tend to use incentivized behavioral experiments, where subjects confronted with a specific task self-select into a competitive versus a piece-rate payment scheme. So far, both measurement approaches have remained largely isolated from one another. We discuss how these approaches are linked and based on a classroom experiment with 186 students we empirically examine the relationship between a behavioral competitiveness measure and a self-reported competitiveness scale. We find a stable positive relationship between these measures suggesting that both measures are indicators of the same underlying latent variable, which might be interpreted as a general preference to enter competitive situations. Moreover, our results suggest that the self-reported scale partly rests on motives related to personal development, whereas the behavioral measure does not reflect competitiveness motivated by personal development. Our study demonstrates how comparative studies such as ours can open up new avenues for the further development of both behavioral experiments and psychometric scales that aim at measuring individual competitiveness.

**Keywords:** Competition, Experiment, Tournament scheme, Personal Development Motive

**JEL:** C91, D03, M52

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## 1 INTRODUCTION

Competition is omnipresent in modern societies and potential heterogeneity among individuals with respect to preferences to enter competitive situations might have substantial and practically relevant consequences for economic decision-making. Reuben, Sapienza, and Zingales (2015), for instance, find that individuals having a preference to enter competitive situations earn more than less competitive individuals and are more likely to work in high-paying industries. Moreover, many experimental studies indicate that men are, on average, more competitively inclined than women (Croson & Gneezy, 2009) and this gender difference in competitiveness might partly explain gender differences in labor market outcomes (Buser, Niederle, & Oosterbeek, 2014; Flory, Leibbrandt, & List, 2015; Reuben et al., 2015). While individuals' competitiveness has only recently received greater attention in economics, related research has a tradition of more than 100 years in psychology (e.g., Deutsch, 1949; Triplett, 1898), where competitiveness is generally recognized as playing a significant role in interpersonal processes (Houston, Harris, McIntire, & Francis, 2002).

Psychological and economic studies measuring individual competitiveness, however, have remained largely isolated from one another. We believe that their distinct theoretical and methodological approaches offer fruitful opportunities to improve our understanding of competitiveness. As a first step, we focus on differences in the measurement of competitiveness. While economic research typically employs behavioral measures obtained from incentivized experiments as indicators for competitive preferences (e.g., Niederle & Vesterlund, 2007), psychological research tends to build on self-reported psychometric scales (e.g., Newby & Klein, 2014; Smither & Houston, 1992). We argue that economic and psychological measurements of individuals' competitive preferences differ substantially and in systematic ways and these differences have a meaningful interpretation. In particular, we suggest that psychological

measures more than economic measures include competitiveness that results from motives related to personal development, which is a key aspect of competitiveness in psychological research (Newby & Klein, 2014). We argue that competitiveness motivated by considerations of personal development tends to play a less important and possibly unintentionally marginalized role in economic measures of competitiveness.

To explore the relationship between different measures, we analyze data from 186 students participating in a study that included an incentivized behavioral experiment as well as self-reported psychometric scales as measures of participants' competitiveness. Based on an additional psychometric scale measuring the degree to which participants' competitiveness stems from personal development motives, we partition variation in participants' self-reported competitiveness into parts driven and parts not driven by such motives. Our subsequent analyses reveal a stable positive correlation between the economic measure of competitiveness and the psychometric scale even when controlling for potential confounds such as risk attitudes, confidence, and gender. Moreover, we can confirm that a major difference between both approaches relates to personal development motives. When focusing on self-reported competitiveness that is not motivated by personal development, the correlation between the behavioral and the self-reported measures becomes especially strong, but vanishes when focusing on the competitiveness motivated by personal development. Our results are robust with respect to a number of additional checks. Differences in relationships with basic personality traits (Big five) and participants' interest to pursue a managerial career, further validate the differences between the economic and the psychometric measurement.

The remainder of this study proceeds as follows. Section 2 outlines the economic and the psychological approach to individual competitiveness and derives hypotheses about the relationship between the respective measures. Section 3 describes the dataset, study design,

variables, and the empirical approach. Section 4 presents the results including validations and robustness checks. Section 5 provides a discussion of the findings including implications and limitations.

## **2 CONCEPTUAL BACKGROUND**

For a meaningful comparison of economic and psychological approaches to measure competitiveness, we first need to make sure that both approaches share a common conceptual ground and build on conceptualization of competitiveness that are compatible, but not necessarily identical, with both economic and psychological research. We define *competitiveness* as an individual's general tendency to select into competitive environments. In other words, *competitive individuals* are those individuals who favor competitive over non-competitive environments (Niederle & Vesterlund, 2011; Smither & Houston, 1992).

*Competitive environments* are characterized by institutions where individuals' goals are not simultaneously achievable given the sets of possible strategies. Zero-sum games and winner-takes-all situations represent examples of extremely competitive environments (Lazear, 1999). In competitive environments every attempt of individuals to get closer to their own goals makes it less likely for other individuals to achieve their goals (Deutsch, 1949; Lazear, 1999). Competitive and non-competitive environments differ in how individuals' actions and resulting performances relate to their payoffs. For instance, in tournaments and contests individuals compete for a prize that is awarded based on relative rank with respect to individuals' performances. Situations where payoffs solely depend on an individual's own performances or where an individual's rewards relate positively to increases in the performances of other individuals are considered as non-competitive environments.

Our conceptualization of competitiveness as a tendency to self-select into competitive environments differs from individuals' responses within a competitive environment (Croson & Gneezy, 2009). Within competitive environments, for instance, individuals may differ in their willingness to increase efforts in order to leverage the odds of winning. Psychological definitions of competitiveness often comprise the enjoyment of interpersonal competition, which might lead to a selection into competitive environments, as well as motivations to win and be better than others within competitive environments (e.g., Spence & Helmreich, 1983). Hypercompetitiveness, for instance, refers to both the need to compete and the need to win at any cost, including manipulation and exploitation of others across a wide range of situations (see Ryckman, Hammer, Kaczor, & Gold, 1990). As a first step into combining psychological and economic research on competitiveness, our conceptualization of individual competitiveness focuses on individuals' tendencies to enter competitive situations as a common aspect of both economic and psychological research on competitiveness.

Moreover, we need to distinguish competitiveness from individuals' tendencies to maximize own relative to others' rewards. The willingness to maximize own relative to others' rewards are studied under the headline of social value orientation in psychology (e.g., van Lange, De Bruin, Otten, & Joireman, 1997) and fairness preferences in economics (e.g., Fehr & Schmidt, 1999), and in both disciplines individuals maximizing relative rewards are considered as *competitive* individuals. The possibility to influence the distribution of rewards between oneself and others in terms of shifting rewards implies that goals of affected individuals are conflicting and that, therefore, such a situation reflects a competitive situation (Deutsch, 1949). The defining feature of competitive individuals in this research stream, however, relates to behavior within, but not to their tendencies to self-select into such environments. Consistently, Smither and Houston (1992, p. 417) conclude that a measure of such distribution-related preferences "is not as useful in

identifying competitiveness as the more general standard measures.” While indirect effects might exist, these types of preferences over rewards distributions are distinct from competitiveness defined as preference to select into competitive environments.

Maximization of expected rewards together with optimism in terms of confidence in winning or with risk loving may make individuals look as if they enjoy competitive environments (Niederle & Vesterlund, 2010). The more optimistic reward-maximizing individuals are with respect to winning competitions, the higher would be their likelihood to enter such competitive environments. Similarly, if competitive environments are more uncertain, which might result from additional uncertainty about competitors or from a larger spread of possible rewards within competitive environments (cf., Lazear, 1999), individuals avoiding uncertainty might also avoid competition. Both of these cases would not reflect unique preferences to enter competitive environments, but rather general preferences for higher rewards and for higher uncertainties. While acknowledging these characteristics to make individuals entering competitive environments, we — consistent with economic research (e.g., Niederle & Vesterlund 2007) — do not consider them as indicators of competitive individuals.

## **2.1 Economic and psychological measurements of competitiveness**

While conceptualizations of competitiveness in economics and psychology have a great deal in common, measurement approaches differ substantially. Economic approaches to measuring individual competitiveness assume that revealed behavior best approximates individuals’ unobservable preferences. Therefore, economists tend to look for field experiments (e.g., Delfgaauw, Dur, Sol, & Verbeke, 2013; Flory et al., 2015; Kosfeld & Neckermann, 2011) or natural field experiments (e.g., Blanes i Vidal & Nossol, 2011). If field experiments are not possible, economists still rely on the *revealed preference paradigm* and conduct incentivized



(laboratory) experiments to measure participants' competitiveness by observing their behavior (e.g., Gneezy, Niederle, & Rustichini, 2003; Leibbrandt, Gneezy, & List, 2013; Niederle & Vesterlund, 2007; for a review see Croson & Gneezy, 2009). Participants typically have to perform a task and choose between a competitive and a non-competitive payment scheme with the former being tournament-like and the latter being a piece-rate (e.g., Niederle & Vesterlund, 2007) or, sometimes, a flat-wage scheme (Masclot, Peterle, & Larribeau, 2015). In the tournament participants face a competitive environment in the sense of Deutsch (1949), as their goals are interdependent and not simultaneously achievable. This is not the case under a piece-rate or flat wage scheme, where payments are independent of other participants' actions. Individuals are considered as competitively inclined if they opt for the competitive tournament.

The advantage of observed real behavior carries a less salient drawback when attempting to measure general characteristics, which should characterize individuals across larger sets of different contexts. By construction, revealed behavior is an individual's response within a very concrete and often specific situation. Asking for the extent to which this observed behavior characterizes an individual more generally and across many contexts is, in fact, an instantiation of concerns of external validity. External validity, defined as "the ability to generalize from the research context to the settings that the research is intended to approximate" (Loewenstein, 1999, p. F26), is considered the largest threat to experimental research, both in psychology and economics (Berkowitz & Donnerstein, 1982; Loewenstein, 1999). Because several studies have already demonstrated that minor changes in the experimental setting can lead to substantially different outcomes regarding competitive behavior (e.g., Shurchkov, 2012; Wozniak, Harbaugh, & Mayr, 2014), there is a threat of context-specificity to the external validity of economic measurements of individuals' general competitiveness. Because existing experimental measures of competitiveness have been demonstrated to show predictive validity for real-world economic

choices, such as the choice of study programs (e.g., Buser et al., 2014), these measures have, nevertheless, demonstrated sufficient external validity.

The psychological approach to measuring individual competitiveness mostly builds on psychometric scales (see Newby & Klein, 2014; Smither & Houston, 1992). These scales are composed of items like “*I enjoy competing against others.*” (Newby & Klein, 2014) or “*I find competitive situations unpleasant*” (Smither & Houston, 1992). Respondents usually rate their agreement or disagreement with each of the items, which renders these psychometric measures reflecting self-reported competitiveness. Because the answers do not have consequences for participants, there is no incentive to tell the truth. By ensuring respondent anonymity and reducing evaluation apprehension and other measures, psychological research tries to reduce incentives to lie (Podsakoff & Organ, 1986; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Ultimately, these psychometric approaches rely on what economists refer to as “*epsilon truthfulness*”, which describes the assumption that individuals who are indifferent between lying and telling the truth, tell the truth (see Cummings, Elliott, Harrison, & Murphy, 1997). While violations of this assumption represent a threat to the validity of psychological competitiveness measurements, it is shown that these scales meaningfully predict, e.g., students’ vocational interests, such that competitive individuals are attracted to jobs involving competitive pressure (e.g., Houston, Harris, Howansky, & Houston, 2015).

There is a large diversity of psychometric scales measuring individuals’ competitiveness (see discussion by Smither & Houston, 1992, and by Newby & Klein, 2014). The Competitive-Cooperative Attitude Scale (Martin & Larsen, 1976), the Competitiveness Questionnaire (Griffin-Pierson, 1990), the Competitiveness Index (Smither & Houston, 1992) and the competition subscale of the Work and Family Orientation Scale (Helmreich & Spence, 1978) are examples of widely used psychometric scales. The heterogeneity of the psychometric scales rests, for instance,

on differences in how the scales acknowledge the above-discussed difference between selection into and behavior (or even affective responses) within competitive environments. Further heterogeneity results from contextualization of competitive preferences; while some scale relate to sports (e.g. Gill & Deeter, 1988), other scales aim at general competitiveness (e.g., Newby & Klein, 2014; Smither & Houston, 1992). Furthermore, many psychological scales for competitiveness discriminate competitive preferences with respect to the associated meanings and purposes of competition, that is, whether individuals are motivated to enter competitions, for instance, because they consider it “*as a means* of maintaining or enhancing feelings of self-worth” (Ryckman et al., 1990, p. 630, emphasis added) or “*for the purposes* of demonstrating self-competence, mastery, achievement and self-improvement” (Newby & Klein, 2014, emphasis added).

Our conceptualization of individual competitiveness is general with respect to the context and does not discriminate competitiveness with respect to the underlying motives. This conceptualization is consistent with Smither and Houston’s (1992, p. 412) operationalization of competitiveness, which builds on “items designed to identify persons who prefer competitive situations over cooperative ones”. In contrast to large parts of psychological research on competitiveness, but consistent with economics approaches to competitiveness building on the revealed preference paradigm, however, we initially focus on psychological measures of competitiveness that do not discriminate with respect to deeper motives underlying individual tendencies to enter competitions. Supporting our approach, Newby and Klein (2014, p. 880) reported factor analyses of a multitude of existing psychological competitiveness scales revealing a strong factor that they refer to as general competitiveness and that they not only conceptually qualify as superordinate dimension but also “found to discriminate between individuals that choose to enter or refrain from entering competitive activities“.

Despite economists and psychologists have very different approaches to measuring competitiveness, both measurements have their unique advantages, but also both have been demonstrated to relate to individuals' real-life decisions and, in particular, to their career choices. We, therefore, believe that — due to attempting to measure strongly related if not the same latent construct — both types of measurements are positively related, which forms the base line hypothesis for our study.

***Hypothesis 1:** There is a significant positive relationship between the behavioral measure and the self-reported measure of individual competitiveness.*

## **2.2 Motives and contexts**

To shed more light on the relationship between psychological and experimental economics measures of competitiveness, we introduce the *principle of compatibility* (see Ajzen & Fishbein, 2005). The principle of compatibility suggests that, in order to observe reasonable relationships between measures of individuals' favorable or unfavorable evaluation or appraisal of a behavior in question and related behavioral criteria, both must be defined at the same level of generality or specificity (Ajzen & Fishbein, 2005). Thus, if psychologists' possibly more attitudinal and economists' behavioral measures of competitiveness involve different levels of specificity, we may observe substantially weakened or even no relationship between these two types of measures.

As discussed above, psychometric competitiveness scales either individually or within their subscales often discriminate between different motives for why people enter or why they positively respond to competitive environments. Depending on their motives, individuals may react differently to different types of competitive environments, that is, to the extent that this

competitive environment allows the satisfaction of motives that make competition attractive to them. For instance, perceiving competition as means for demonstrating dominance and social status might drive people more into competitions with public recognition, while personal development motives might drive individuals into competitions that provide opportunities for individual feedback and learning. Combining these thoughts with the observation that experimental measurements of competitiveness typically relate to behaviors in a very specific context, we may observe a violation of the compatibility principle and, thus, a divergence of what is measured by psychological and behavioral measures. We illustrate such a case by focusing on personal development motives, which have been demonstrated to relate to psychologists' measurements of general competitiveness (Newby & Klein, 2014), and that — from our point of view — are likely to not have much potential to be satisfied within typical experimental measures of competitiveness (e.g., Niederle & Vesterlund, 2007).

Individuals motivated for competition by opportunities for personal development value competition because it helps them to improve their competence, be the best that they can be, and to judge their level of competence (Newby & Klein 2014; Ryckman, Hammer, Kaczor, & Gold, 1996). Analyzing a multitude of measures of competitiveness, Houston et al. (2002) identified two major factors underlying all these scales with one of them described as personal development, where competition is considered to improve oneself instead of being an instrument to winning over others. Moreover, pooling items from eleven competitiveness scales, Newby and Klein (2014) validated the distinction between general competitiveness and, among others, personal enhancement competitiveness, which through the reference to “self-improvement” clearly reflects personal development motives. An estimated correlation of 0.67 between general competitiveness and competitiveness motivated by personal development indicates that despite

psychometrically distinct, a substantial amount of general competitiveness is explained by personal development motives.

In contrast to the role of personal development for self-reported measures of competitiveness, personal development motives are unlikely to play an important role for explaining selection into competitive environments within economic measures of competitiveness. In typical economic measurements of competitive preferences, competition relates to short trivia quizzes, mini games like ball tossing (Leibbrandt et al., 2013), or solving simple math tasks (Gneezy et al., 2003, Niederle & Vesterlund, 2007), and often only over a very short time against randomly assigned competitors (e.g. Niederle & Vesterlund, 2007). Because these tasks are short and simple, they do not require training or specific qualifications and are, hence, applicable to a broad variety of participants. These simple tasks, however, are hardly representative for real-world competitive situations that offer opportunities for personal development, like competition at work, in sports, arts or academic environments. In these real-life settings people often qualify and develop skills over years before competing. Moreover, competition between e.g. professionals often lasts over longer periods and unlike in the experiments includes adaption and learning during the competition.

This indicates a potential violation of the compatibility principle. Individuals, whose self-reported competitiveness is substantially driven by a personal development motive, will be less attracted by the competition in an economic experiment, than individuals, whose self-reported competitiveness is driven by other motives, including pure enjoyment of competition and fun. Thus, personal development motives that contribute to individuals' competitiveness may reduce the strength of the relationship between psychometric and experimental measures of competitiveness. Distinguishing between competitiveness motivated by personal development

and competitiveness not related to such motives, the compatibility principle suggests that the former relates less strongly than the latter to the behavioral measures of competitiveness.

***Hypothesis 2:*** *The behavioral measures of competitiveness is less strongly related to self-reported competitiveness motivated by personal development than to self-reported competitiveness not motivated by personal development motives.*

By construction, general measures of competitiveness that do not discriminate between motives why individuals enter competitive environments comprise all motives for individual competitiveness. If, however, different motives lead to different relationships, then these measures are likely to display relationships that average those relationships associated with the more specific ones. We would, therefore, expect that the self-reported measure of competitiveness correlates with the experimental measure less than competitiveness not motivated by personal development but more so than competitiveness motivated by personal development.

***Hypothesis 3:*** *The relationship between the behavioral measure of competitiveness and the overall self-reported measures is larger than its relationship with the self-reported competitiveness motivated by due personal development.*

***Hypothesis 4:*** *The relationship between the behavioral measure of competitiveness and the overall self-reported measures is smaller than its relationship with the self-reported competitiveness not motivated by due personal development.*

### **3 DATA AND MEASUREMENT**

#### **3.1 Sample**

In winter term 2014/2015, we surveyed first- and second-year undergraduate students who attended an economics lecture at a German university. From the initial 283 responses received, we excluded 95 observations because of missing values in at least one of the model variables. We further excluded responses with implausible answers, which indicates lack of attention to survey directions and raises skepticism about responses to other items. Specifically, we excluded two participants who responded to the item “I already started a business (please only mark 1 *or* 7)” with anchors “1 = does not apply at all” and “7 = fully applies” by marking intermediate levels. Participants were enrolled in business and economics (70%) and related fields such as health economics (15%), a few were enrolled in a teacher program (9%), and 6% are majoring in other subjects. The average age is 23 years. Table 1 summarizes the descriptive statistics.

#### **3.2 Study design**

To study the relationship between experimental and psychological measurements of competitiveness we employed a classroom experiment embedded in a classroom survey. Although conducted in class, participation was voluntary. At the beginning of the survey, students were informed that their identities are not recorded to ensure confidentiality and that the data will be used solely for scientific purposes. Participants were not informed about the specific nature of the research. Students were informed about a possible payment of up to 20 euro.

The survey contained questions regarding competitiveness, risk-taking preferences, general self-efficacy, big five personality, and career anchors; demographic information are gathered at the end of the questionnaire. During the survey, participants were informed that at the end of the survey 30 participants would be randomly selected to participate in an experiment,



where they could earn up to 20 Euro. During the survey, participants were asked to fix their decisions for the experiment; these decisions were binding and could not be changed afterwards. To reduce problems stemming from participants' potential tendency to be self-congruent with respect to their self-reported competitiveness and their plans for their behavior in the experiment, self-reported competitiveness scales (SC and PDM) were administered *before* participants knew the content of the incentivized experiment. Because the experiment is associated with real payoffs, we believe that behavior in the experiment is less likely to be affected by earlier self-reported competitiveness than vice versa.

For the experiment, we adopted a design that was frequently used to measure competitiveness (e.g. Niederle & Vesterlund, 2007; Shurchkov, 2012). Participants had to perform a real task, which was answering 20 trivia questions on various areas of general knowledge within 5 minutes (question taken from Eberlein, Ludwig, & Nafziger, 2011). For each question participants had to choose the one correct answer out of four given options. Questions were presented on a quiz sheet and could be answered in any order. No feedback was provided during the quiz. During the survey, participants got 4 example questions, which they were asked to solve (without any incentives), to get familiar with the task and to get an impression of the level of difficulty. Then, participants had to choose between a noncompetitive compensation ("Piece-Rate") and a competitive ("Tournament") compensation for their task performance. When selecting piece-rate, participants get their payoffs according only to their own performances and receive 50 cents for every correctly answered question in the quiz. When selecting the tournament, the participants' scores are compared to the score of another randomly

matched participant; for each one, another one was randomly drawn.<sup>1</sup> The person with more correct answers (“the winner”) receives 100 cents for every correct answer. The other participant receives 0 cents. Ties were broken randomly. After the survey, we collected the paperwork with potential participants’ decisions and randomly selected 30 of them. These were asked to join the experimenter to perform their tasks; payoffs were paid according to their decisions and the randomly matches partner.

When the randomly selected participants performed the task, other participants were provided an additional survey including measures of their preferences over reward distributions and marker questions measured in the same way as the self-reported competitiveness measures but not related to the content of our survey, which could be used to identify participants’ response styles (Weijters, Cabooter, & Schillewaert, 2010). For this subsample of participants and within a robustness check we include these variables as additional controls.

To validate the hypothesized relations among different competitiveness measures we attempted to embed the competitiveness measures into their nomological network and tested their differential relationships to career orientations. We follow psychological research, which has employed the Big Five model to relate competitiveness to broad-bandwidth personality inventory (Fletcher & Nusbaum, 2008; Müller & Schwieren, 2012; Ross, Rausch, & Canada, 2003; Ryckman, Thornton, Gold, & Collier, 2011). Specifically, Ross et al. (2003) reported that different measures of competitiveness differently relate to the five-factor model of personality. To test the practical relevance of the difference between experimental and psychometric measurements of competitiveness and because both experimental and psychometric measures

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<sup>1</sup>As the whole study was conducted in class, all participants knew their potential competitors. The matching pool of competitors included only those participants, who selected the tournament. Participants were not provided any information regarding the matched competitor.

have been related to choosing more competitive careers (e.g., Bönnte & Piegeler, 2013; Buser et al., 2014; Houston et al., 2015), we included a measure of a competitive career orientation.

### **3.3 Measures of competitiveness**

#### *Behavioral measure of competitiveness (BC)*

The behavioral measure of competitiveness (BC) is reflected by participants' choices of the competitive payment scheme; a dummy variable is generated, that takes the value zero for participants choosing the non-competitive piece-rate payment and the value one for participants choosing the competitive tournament payment. Out of our sample, 56 participants (30%) chose the competitive payment in our experiment, while 130 preferred the piece-rate payment (70%).

#### *Self-reported measures of competitiveness (SC)*

General self-reported competitiveness (SC) is operationalized through a short-scale that seeks to straightforwardly cover our definition of competitiveness. We selected four items from different sources, that we consider most suitable to distinguish between individuals, who prefer more competitive situations, and individuals, who prefer less competitive situations, and which do not explicitly include reasons why individuals prefer competitive environments. We included the highest loading item from Newby and Klein's (2014) 'general competitiveness' subscale: "*I enjoy competing against others.*" We also included the highest loading reverse-coded item from Smither and Houston's (1992) emotion factor, which relates to general affective responses to competition: "*I find competitive situations unpleasant*". Moreover, we selected an item that Bönnte and Piegeler (2013) employed as single item measure within a large European survey and that is an adaption of an item from the WOFO competitiveness subscale (Helmreich & Spence, 1978): "*I like situations in which I compete with others.*" A fourth item is our attempt to create a self-

reported survey item that at a general level as closely as possible imitates the structure of the decisions made in economic experiments on competitiveness (cf., Niederle & Vesterlund, 2007): “*I prefer competing with others when pursuing a goal over pursuing the goal alone.*”<sup>2</sup> Participants responded to each item on a 7-point Likert-scale from “does not apply at all” (1) to “fully applies” (7). We employ the average score of responses to these items as our self-reported measure of competitiveness ( $\alpha= 0.78$ ).

#### *Competitiveness motivated and competitiveness not motivated by personal development*

To partition variation in self-reported competitiveness into parts that relate to personal development motives and parts that do not relate to it, we included the 4-item Personal Enhancement subscale from Newby and Klein’s (2014) Competitiveness Orientation Measure. Items include, for example, “*Competition allows me to judge my level of competence*” and “*I can improve my competence by competing.*” Participants responded to each item on a 7-point Likert-scale from “does not apply at all” (1) to “fully applies” (7). The average response to these four items forms our score for personal development motives (PDM,  $\alpha= 0.83$ ). Confirmatory factor analyses confirm that PDM is distinct from SC; the two-factorial model ( $\chi^2(19)=47.68$ , CFI=0.955, SRMR=0.047, AIC=4884.25, BIC=4964.90) fits much better than the unidimensional model ( $\chi^2(20)=90.52$ , CFI=0.889, SRMR=0.060, AIC= 4925.10, BIC = 5002.52).

Because personal development motives that trigger competitiveness should also make an individual competitive, including both SC and its potential antecedent PDM as explanatory variables would create a bad control problem (Angrist & Pischke, 2008), which complicates a

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<sup>2</sup> Note that our items focus on self-reports and avoid normative statements (e.g., “Outside the world of sports, people should compete as little as possible”, Kleinjans, 2009, p. 705), which may but do not need to relate to one’s own behavior.

meaningful interpretation of estimated coefficients. To avoid these issues, we employ residualization techniques to partition variation in competitiveness into uncorrelated parts, one that is driven by variations in personal enhancement motives and one that is not driven by it. Residualization is implemented by an ordinary least squares regression of SC with respect to PDM, i.e.  $SC = \beta \cdot PDM + \alpha + \varepsilon$  with  $\beta$  as the estimated coefficient for PDM,  $\alpha$  being the constant, and  $\varepsilon$  the error term. Variation in *competitiveness resulting from development motives* is then given by  $SC_{PDM} = \beta \cdot PDM$ . Variation in *competitiveness not resulting from development motives* is given by  $SC_{noPDM} = \alpha + \varepsilon$ . While  $SC_{PDM}$  perfectly correlates with PDM, scaling it with  $\beta$  implies that SC equals the sum of  $SC_{PDM}$  and  $SC_{noPDM}$  and that  $SC_{PDM}$  and  $SC_{noPDM}$  are perfectly uncorrelated components of SC, which permits a meaningful interpretation of both coefficients.

### **3.4 Personality: The big five**

Personality is measured by the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991). The BFI is a 25-item scale that includes 5 items each for Openness to experience ( $\alpha=0.76$ ), Conscientiousness ( $\alpha=0.76$ ), Extraversion ( $\alpha=0.89$ ), Agreeableness ( $\alpha=0.68$ ), and Neuroticism ( $\alpha=0.66$ ). We apply a German translation of the BFI that has been validated for German surveys by Gerlitz & Schupp (2005). Participants responded to each item on a 7-point Likert-scale from “does not apply at all” (1) to “fully applies” (7). The average response to the respective five items forms our score for each personality dimension.

### **3.5 Career Orientation: General Management Competence**

In order to measure the participants' intent to work in a competitive management position we employ the five-item subscale reflecting the *general management career anchor* (GM) from

Schein's Career Anchors Orientation Inventory (COI; Schein, 1990). We apply a German translation reported in Schein (2005). Due to its frequent application in industrial trainings (e.g., Kniveton, 2004) and its consideration in research on vocational behavior (e.g. Rodrigues, Guest, & Budjanovcanin, 2013), we believe this scale to be appropriate for the exploratory part of our study. A career orientation is a meaningful measure within our sample, because despite being in a very early stage of their professional career, students have typically developed a general idea about their career goals (Scherer, Adams, Carley, & Wiebe, 1989). Participants rated the importance of management related job aspects emphasized by each item on a 9-point Likert-scale from "completely unimportant" (1) to "extremely important" (9). The average response to these items forms the score for the orientation towards a general management career ( $\alpha=0.76$ ).

### **3.6 Control variables**

#### *Risk preferences*

To record individual risk preferences, we adapted an experimentally validated measurement instrument from the German Socio-Economic Panel (Dohmen et al., 2011). We asked respondents to indicate their willingness to take risk in general and related to domain-specific dimensions. Participants responded on a 7-point scale from "1 = unwilling to take risks" to "7 = very prone to take risks." Following our theoretical framework, we focus on general risk-taking and domain-specific risk-taking with respect to domains relevant in our study. Since the experiment consisted of a quiz-game, wherein participants chose between payment schemes, we include risk-taking preferences regarding games and regarding financial investments. Because we also address participants' intentions to take management jobs, we moreover included risk-taking preferences regarding their professional careers. The general risk measure is included to cover

additional aspects not reflected by the domain-specific measures. For completeness and consistency between analyses, we control for all four risk measures in our main and validation analyses.

### *Confidence*

Because we defined competitiveness independent of expectations of winning, we included related expectations as control variables. Participants were asked to forecast their own score (number of correctly answered questions in the quiz) as well the average score of all participants. Moreover, respondents had to estimate the percentage of other respondents who correctly answer more questions than they themselves do. Due to the potentially complex interplay between judgments of individual and others performances, e.g. due to anchor and framing effects, we included all three measures to control for expectation-related effects. Because these confidence measures are specific to the experimental setting, they might not sufficiently cover the effect of confidence on career choices, which we address as part of our validation analyses. We, therefore, also included General Self-Efficacy (GSE) measured by Chen, Gully, and Eden's (2001) New General Self-Efficacy Scale. Participants responded to each item on a 7-point Likert-scale from "does not apply at all" (1) to "fully applies" (7); responses to all items were averaged ( $\alpha=0.86$ ). For completeness and consistency between analyses, we control for all four confidence measures in our main and validation analyses.

### *Gender*

Previous research indicates that task stereotypes can influence the willingness to enter competition of women and men differently (Shurchkov, 2012). To control for effects of such stereotypes we include a dummy variable indicating the respondents' gender.

### **3.7 Control variables for robustness checks**

#### *Response Styles*

When multiple constructs are measured with the same method an observed correlation between these constructs can be inflated by a common method variance (Lindell & Whitney, 2001), which has been particularly highlighted for behavioral self-reports (Feldman & Lynch, 1988; Podsakoff & Organ, 1986,). While common method variance may stem from a variety of sources (Podsakoff et al., 2003), response styles have been emphasized as a particularly problematic source in questionnaires using Likert-type rating scales (Weijters et al., 2010). For a subsample of our respondents we can control for related biases and, thereby, test the robustness of our findings. To measure response styles, we follow Weijters, Schillewaert, and Geuens' (2008) recommendations for studies in which response styles are of secondary interest. We use responses to 15 items (available upon request) about economic policy, which do not relate to variables of interest in our study, to generate indicators for acquiescent response style (ARS), disacquiescent response style (DRS), extreme response style (ERS) and midpoint response style (MRS). Participants responded to these items on a 7-point Likert scale. We randomly split the 15 items into three sets of 5 items, each of which we used to calculate an indicator for each response style using the prescriptions by Baumgartner and Steenkamp (2001). We conduct confirmatory factor analysis to identify the latent response style factors ARS, DRS, ERS, MRS using the "RIRSMACS model for cross-mode style comparison" of Weijters et al. (2008, p. 415). Predicted scores for these four latent variables (ARS, DRS, ERS, and MRS) are included as controls in a robustness check.



### *Preferences over reward distributions and desire to win*

In our conceptualization, we have distinguished competitiveness from individuals' preferences over distributions of rewards, and from individuals' preferences related to behavior within competitive environments. Both economic and psychological studies demonstrate correlations between competitiveness and preferences over reward distributions (Bartling, Fehr, Maréchal, & Schunk, 2009; Smither & Houston, 1992). Furthermore, psychological research reveals positive correlations between competitiveness and scales measuring the desire to win or to dominate others (e.g., Newby & Klein, 2014). To control for confounding effect of these related though conceptually distinguished constructs, we check the robustness of our results when controlling for these preferences. For a subsample related measures are available.

To assess other-regarding preferences, we employ a public goods game and, in particular, a German translation of the "*Free Rider Experiment for the Large Class*" (Leuthold, 1993). The game is hypothetical and not incentivized. Participants have to distribute 100€ between two investments – a public good and a private good. The game has a unique dominant strategy equilibrium of full investment in the private good. The amount invested is considered as indicator of participants' other regarding preferences.

The desire to win is measured by two items from the Newby & Klein's (2014) dominant competitiveness subscale ("*I try to be the best person in the room at almost anything.*") and ("*I like to be better than others at almost everything.*") and two related items from the competitiveness subscale of Helmreich & Spence's (1978) WOFO scale ("*It annoys me when other people perform better than I do.*") and ("*It is important to me to perform better than others on a task*"). Participants responded to each item on a 7-point Likert-scale from "does not apply at all" (1) to "fully applies" (7); responses were averaged ( $\alpha=0.84$ ).

**Table 1: Summary statistics**

Variable	Obs.	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1 Behavioral Competitiveness	186	0.30	0.46	1									
2 Self-reported competitiveness (SC)	186	4.21	1.18	.32***	(.78)								
3 SC due to personal development	186	2.66	0.75	.10	.63***	(.83)							
4 SC not due to personal development	186	1.55	0.91	.33***	.77***	0	1						
<i>Personality</i>													
5 Openness to Experience	186	4.73	1.01	.23**	.13	.05	.13	(.76)					
6 Conscientiousness	186	5.12	0.97	-.10	.04	-.01	.06	.09	(.76)				
7 Extraversion	186	4.59	1.26	.22**	.24**	-.04	.34***	.20**	.15*	(.89)			
8 Agreeableness	186	5.47	0.88	-.09	-.14	-.27***	.03	.10	.26***	.11	(.68)		
9 Neuroticism	186	4.10	0.95	-.28***	-.18*	.09	-.31***	.05	-.01	-.20**	-.03	(.66)	
<i>Career anchor</i>													
10 General Management	186	5.10	1.37	.17*	.27***	.28***	.11	.06	.13	.07	-.15*	.01	(.76)
<i>Control variables</i>													
11 Risk: General	186	4.81	1.35	.24**	.19*	.18*	.10	.37***	-.05	.22**	-.11	-.17*	.21**
12 Risk: money	186	2.99	1.50	.33***	.23**	.14	.18*	.26***	-.24**	.17*	-.19*	-.13	.23**
13 Risk: job	186	4.01	1.34	.27***	.23**	.16*	.16*	.21**	-.07	.04	-.20**	-.13	.32***
14 Risk: games	186	5.44	1.68	.17*	.20**	.26***	.05	.07	-.23**	.12	-.21**	.08	.02
15 Confidence: Own expected Score	186	10.45	3.45	.37***	.21**	.16*	.14	.21**	.03	.11	-.16*	-.16*	.15*
16 Confidence: Average expected Score	186	10.74	2.71	-.03	.00	.05	-.04	.00	.21**	.13	.05	.02	.11
17 Confidence: Probability to win	186	59.12	18.25	.26***	.13	.01	.16*	.29***	.06	.14	-.10	-.09	.02
18 Confidence: GSE	186	5.37	0.75	.22**	.30***	.18*	.23**	.29***	.37***	.26***	.10	-.21**	.35***
19 Female	186	0.62	0.49	-.45***	-.27***	-.09	-.28***	-.12	.27***	-.04	.25***	.28***	-.10
<i>Control variables for robustness checks</i>													
20 Acquiescence Response Style	163	0.00	0.35	-.00	.00	.10	-.08	.05	.08	.05	.04	.20**	.01
21 Disacquiescence Response Style	163	0.00	0.22	.09	.07	.16*	-.05	.05	.10	.15	-.10	.06	-.04
22 Midpoint Response Style	163	0.00	0.08	-.02	-.04	-.20**	.12	-.09	-.09	-.05	.08	-.18*	.01
23 Extreme Response Style	163	0.00	0.16	.08	.00	.11	-.09	.09	.09	.16*	.00	.21**	-.07
24 Other-Regarding Preferences	155	40.39	31.41	.11	.02	.03	.00	-.00	-.05	.01	-.07	-.13	.17*
25 Desire to win	155	3.71	1.34	.02	.37***	.55***	.04	.04	.02	-.13	-.37***	-.20*	.44***

Notes: Cronbach's alpha reported in the diagonal in parentheses (where appropriate). Significance levels: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05.

**Table 2: Correlation between control variables**

Variable	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
<i>Control variables</i>															
11 Risk: General	1														
12 Risk: money	.41***	1													
13 Risk: job	.43***	.41***	1												
14 Risk: games	.14	.26***	.05	1											
15 Confidence: Own expected Score	.25***	.29***	.12	.18*	1										
16 Confidence: Average expected Score	.07	-.09	-.10	.04	.34***	1									
17 Confidence: Probability to win	.21**	.16*	.17*	.08	.43***	-.12	1								
18 Confidence: GSE	.40***	.23**	.21**	.03	.23**	.04	.24***	(.86)							
19 Female	-.26***	-.35***	-.26***	-.09	-.32***	.22**	-.34***	-.10	1						
<i>Control variables for robustness checks</i>															
20 Acquiescence Response Style	.13	.08	-.01	.02	.17*	.00	.05	.12	.03	(.75)					
21 Disacquiescence Response Style	.18*	.06	.05	.12	.21**	.23**	.07	.15	-.17*	-.12	(.65)				
22 Midpoint Response Style	-.18*	-.09	-.08	-.09	-.29***	-.11	-.16*	-.13	.11	-.72***	-.40***	(.59)			
23 Extreme Response Style	.22**	.12	-.06	.05	.19*	.11	.04	.17*	-.08	.75***	.44***	-.66***	(.78)		
24 Other-Regarding Preferences	.08	.12	.24**	.02	.09	.19*	.00	.06	-.14	-.09	.10	-.03	-.04	1	
25 Desire to win	.10	.13	.12	.11	.03	-.10	-.02	.13	-.18*	.18*	-.02	-.17*	-.10	.02	(.84)

Notes: Cronbach's alpha reported in the diagonal in parentheses (where appropriate). Significance levels: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05.

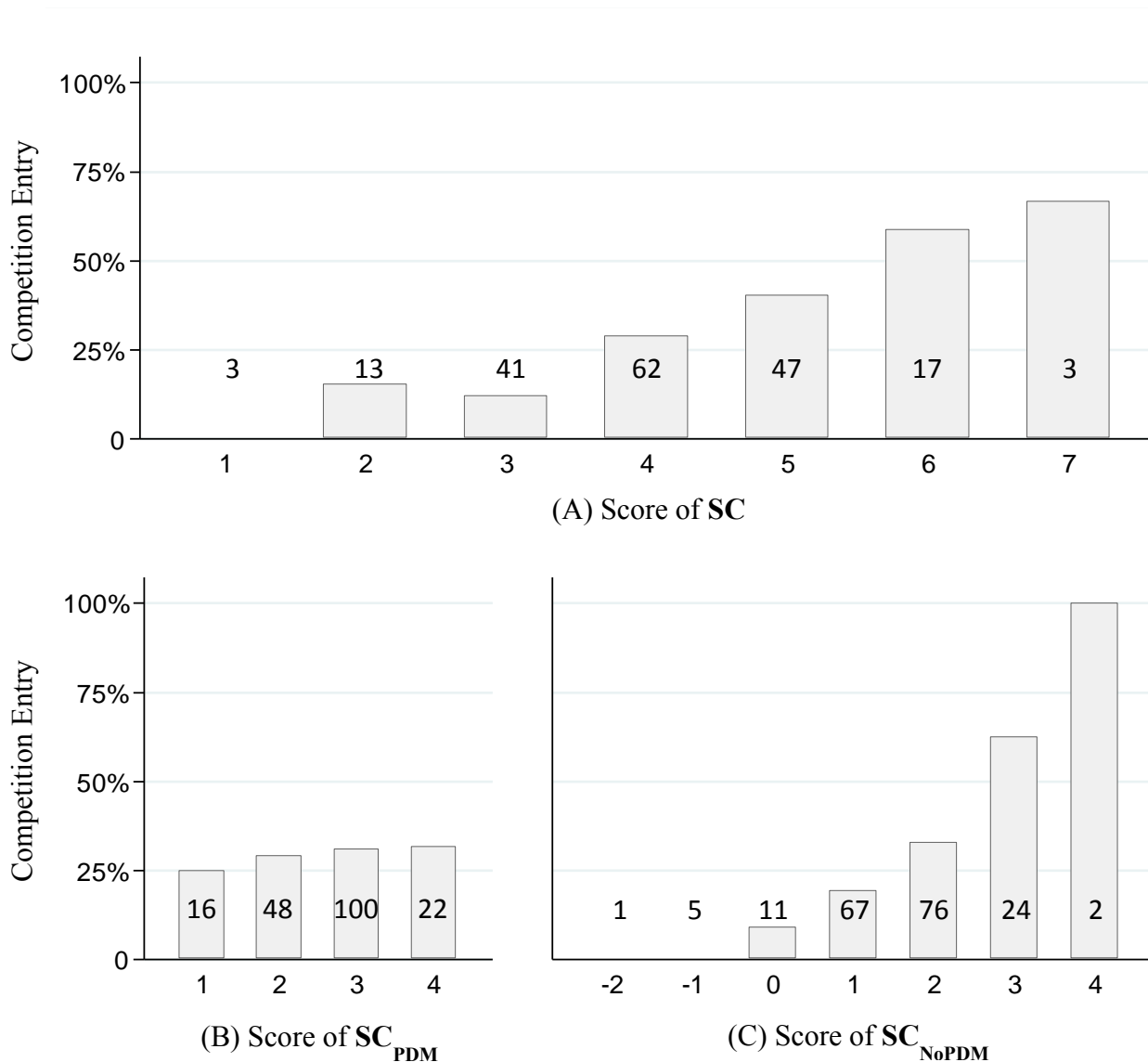
Confirmatory factor analyses demonstrate that these four items form a factor that is distinct from both our 4-item measurement of general competitiveness and the 4-item personal development scale. The fit of the three-factorial model ( $\chi^2(51)=98.17$ , CFI=0.947, SRMR=0.055, AIC=6167.22, BIC=6285.91) is much better than both two-factorial models assuming that the desire to win is either the same factor as SC ( $\chi^2(53)= 252.69$ , CFI=0.775, SRMR=0.097, AIC=6317.73, BIC=6430.34) or the same factor as SC<sub>PDM</sub> ( $\chi^2(53)= 209.83$ , CFI=0.823, SRMR=0.089, AIC=6274.88, BIC=6387.49).

#### 4 RESULTS

Table 1 provides an overview of the correlations of the different variables. We replicate the finding of previous studies that men are more likely to choose competitive pay than women (Croson & Gneezy, 2009). Both experimental and self-reported measures of competitiveness display substantial negative correlations with being female. While 56 percent of the male students chose competitive pay, only 14 percent of the female students chose competitive payment (Two-sample test of proportions:  $\text{diff}=0.56-0.14=0.42>0$ ,  $z=6.13$ ,  $p<0.001$ ). For self-reported competitiveness we observe a score of 4.61 for male students and of 3.96 for female students (Two-sample t test:  $\text{diff}=4.61-3.96=0.65>0$ ,  $t=3.83$ ,  $p<0.001$ ).

Figure 1 shows relative frequencies of participants choosing competitive payment in the experiment sorted by scores of self-reported competitiveness measures. The figure illustrates this frequency is higher among individuals with higher self-reported competitiveness scores (SC). The partitioned scores show that there is almost no increase of the share of participants choosing competitive payment with self-reported competitiveness due to personal development motives (SC<sub>PDM</sub>), while the share of participants choosing competitive payment continuously increases with self-reported competitiveness due to other motives (SC<sub>noPDM</sub>).

**Figure 1: Competition Entry and self-reported Competitiveness**



*Notes:* Relative frequency of participants selecting tournament in the experiment (competitive entry) conditional on scores of (A) self-reported competitiveness (SC), (B) self-reported competitiveness due to personal development motives ( $SC_{PDM}$ ), and (C) self-reported competitiveness due to other motives ( $SC_{NoPDM}$ ). Scores categorized in classes ( $n-0.5$ ;  $n+0.5$ ]. Number of Observations within each category provided within or above bars.

## 4.1 Analysis of correlations

To get a first impression of the relationship between the competitiveness experiment and the self-reported measures, we look at the plain binary correlations reported in Table 1. Consistent with Hypothesis 1, the behavioral measure of competitiveness displays a positive correlation with self-reported competitiveness ( $SC = 0.32, p < 0.001$ ).

The behavioral measure, however, is not and, thus, less correlated with competitiveness that is due to personal development motives ( $SC_{PDM} = 0.10, p = 0.170$ ), which is consistent with Hypothesis 3. In contrast and consistent with Hypothesis 2, the behavioral measure is more strongly correlated with competitiveness that is not due to personal development motives ( $SC_{noPDM} = 0.33, p < 0.001$ ). Because the correlations of the behavioral measure with both SC and  $SC_{noPDM}$  are almost identical, this first inspection of our data does not seem to support our Hypothesis 4 suggesting such a difference. Because potentially confounding variables, such as risk attitudes and competence perceptions (Niederle & Vesterlund, 2007) or gender effects (Shurchkov, 2012) may differently relate to the different measures of competitiveness, the simple correlations might provide biased estimates of the relationships. We therefore proceed by testing our hypotheses based on regression analyses while controlling for the potentially confounding variables.

## 4.2 Regression analyses

All our hypotheses involve a relationship of the behavioral measure of competitiveness (BC) with self-reported competitiveness (SC) or a component of it ( $SC_{PDM}$  and  $SC_{noPDM}$ ). We therefore employ logistic regression analyses with BC as dependent variables. Estimating the relationship between the behavioral and self-reported measures of competitiveness (Model 2), we

**Table 3: Logistic regression analyses of Behavioral Competitiveness on Self-reported Competitiveness**

<b>Model</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
Self-reported competitiveness (SC)		0.39* (0.20)						
SC due to personal development			0.39* (0.20)	-0.12 (0.30)		-0.16 (0.30)	-0.24 (0.34)	-0.04 (0.38)
SC not due to personal development			0.39* (0.20)	0.73** (0.26)	0.73** (0.26)		0.62* (0.29)	0.74** (0.29)
Constant	-6.14** (1.87)	-6.64*** (1.91)	-6.64*** (1.91)	-6.41*** (1.94)	-6.50*** (1.93)	-6.04** (1.89)	-8.40*** (2.32)	-6.08** (2.18)
Risk attitudes	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Confidence beliefs	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Gender	incl.	incl.	incl.	incl.	incl.	incl.	incl.	incl.
Response Styles							incl.	
Other Regarding Preferences								incl.
Desire to win								incl.
Pseudo R <sup>2</sup>	0.272	0.290	0.290	0.312	0.311	0.274	0.356	0.349
Log Likelihood (LR $\chi^2$ )	-82.81*** (61.96)	-80.76*** (66.06)	-80.76*** (66.06)	-78.33*** (70.93)	-78.41*** (70.76)	-82.66*** (62.26)	-66.25*** (73.11)	-63.90*** (68.58)
Observations	186	186	186	186	186	186	163	155

*Notes:* Model 3 is constrained such that coefficient of *SC due to personal development* equals coefficient of *SC not due to personal development*. Standard errors reported in parentheses. Significance levels: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1

observe that also with control variables included, there is still a significant relationship between these two variables. Thus, we provide support Hypothesis 1.

To test Hypotheses 2, 3 and 4 we employ the two variables resulting from variance partitioning, that is, competitiveness motivated by personal development ( $SC_{PDM}$ ) and competitiveness not motivated by such motives ( $SC_{noPDM}$ ). In a first step and by means of a constrained regression analysis, we enforce that both components have the same effect (Model 3). We see that (by definition) Model 3 equals Model 2. As a next step, we relax the constraint (Model 4) and, just as robustness checks, separately include each of the two components (Models 5 and 6). We observe that the two components of self-reported competitiveness differently relate to the behavioral measure of competitiveness:  $SC_{PDM}$  does not relate to the behavioral measurement, but  $SC_{noPDM}$  relates to the behavioral measurement. We find that within Model 4 the coefficient of  $SC_{noPDM}$  is significantly larger than the coefficient of  $SC_{PDM}$  ( $\beta_{SC_{noPDM}} - \beta_{SC_{PDM}} = 0.854 > 0$ ,  $SE = 0.445$ ,  $p = 0.0275$ ). These findings provide empirical support for Hypothesis 2. In support of Hypothesis 3, we find a significant positive difference between the coefficient of SC in Model 2 and the coefficient of  $SC_{PDM}$  in Model 4 ( $\beta_{SC} - \beta_{SC_{PDM}} = 0.512 > 0$ ,  $SE = 0.257$ ,  $p = 0.023$ ). In support of Hypothesis 4, we also find that the coefficient of SC in Model 2 is smaller than the coefficient of  $SC_{noPDM}$  in Model 4 ( $\beta_{SC_{noPDM}} - \beta_{SC} = 0.342 > 0$ ,  $SE = 0.194$ ,  $p = 0.0385$ ). Separately including  $SC_{PDM}$  or  $SC_{noPDM}$  does not change our conclusions (Models 5 and 6).

### **4.3 Robustness checks**

Analyses of multiple self-reported rating-scale based measures might be biased by common method variance (CMV), e.g. resulting from individuals varying in their response styles (Podsakoff et al., 2003; Weijters et al., 2010). In Model 7 we control for response styles using the subsample of participants, who provided these information. A generalized Hausmann test



indicates no significant changes in the coefficients of  $SC_{PDM}$  and  $SC_{noPDM}$  when controls for response styles were included ( $\chi^2(1)=1.63, p=0.444$ ).

In our conceptualization, we distinguished competitiveness from both preferences of reward distributions and the desire to win. Because both have been shown to be related to general competitiveness and to check if our conclusions are driven by related spurious effects, we ran another robustness check with the subsample where data is available for these two variables (Model 8). A generalized Hausmann test indicates no changes in the coefficients of  $SC_{PDM}$  and  $SC_{noPDM}$  when both variables were included ( $\chi^2(1)=0.18, p=0.916$ ).

In sum, it is very unlikely, that our conclusions are distorted by individual variation in response styles or by spurious effects due to preferences over reward distributions or by the willingness to win.

**Table 4: Correlation of Competitiveness with Personality and Career Goal Management (partial correlations)**

	Behavioral competitiveness	Self-reported competitiveness (SC)		
		<i>... not due to personal development</i>	<i>... in general</i>	<i>... due to personal development</i>
Openness to experience	.11	.05	.02	-.04
Conscientiousness	-.02	.06	.06	.02
Extraversion	.17*	.32***	.18*	-.12
Agreeableness	.08	.10	-.07	-.23**
Neuroticism	-.16*	-.23**	-.08	.16*
General Management	.03	-.00	.14 <sup>+</sup>	.21**

*Notes.* Partial correlations controlling for risk-preferences, confidence and gender effects. Significance levels: \*\*\*  $p<0.001$ , \*\*  $p<0.01$ , \*  $p<0.05$ , +  $p<0.1$

#### **4.4 External validity: Relationship of competitiveness with personality and career anchor**

Our analyses suggest that competitiveness motivated by personal development ( $SC_{PDM}$ ) and competitiveness not motivated by personal development ( $SC_{noPDM}$ ) differently relate to the behavioral measure of competitiveness (BC). We now proceed by testing whether these differences also relate to how the two types of competitiveness are embedded into the network of basic personality traits as well as how they relate to participants' interest in a competitive managerial career. For our analyses, we employ partial correlations, reported in Table 4, which control for possibly confounding variables such as risk attitude, confidence, and gender-related related effects.

In all of our analyses, conscientiousness does not relate to any type of competitiveness. Once controlling for confounding variables, openness to experience does not relate to any type of competitiveness, too. Thus and in contrast to suggestions relating conscientiousness to competitiveness (e.g., Caliendo, Fossen, Kritikos, & Wetter, 2014), both these traits do not seem to have robust relationships with competitiveness.

Extraversion and agreeableness display an interesting pattern. Extraversion, which indicates that people are rather sociable, gregarious and assertive, positively correlates with  $SC_{noPDM}$ , but does not correlate with  $SC_{PDM}$ . In contrast, agreeableness, which is high when people are warm, generous, trusting and altruistic, negatively correlates with  $SC_{PDM}$ , yet does not significantly correlate with  $SC_{noPDM}$ . Thus, agreeableness is associated with less competitiveness due to less agreeable individuals being less likely to go for competitive settings based on personal development motives. Extraversion, however, is associated with more competitiveness because of extraverted individuals being more likely to enter competition because of reasons not related to personal development; they may value competition as a social activity, experience pure fun with competition, or may need to dominate other people. The behavioral measure behaves

like  $SC_{noPDM}$  and is, thus, positively associated with extraversion but not negatively associated with agreeableness.

Neuroticism – which is low when people are emotionally stable, even-tempered and self-reliant – displays a special kind of correlational pattern. It positively correlates with  $SC_{PDM}$  (though only statistically significant once controlling for confounding variables, compare Tables 1 and 4) and negatively correlates with  $SC_{noPDM}$ . Thus, depending on the motives for being competitive, neuroticism can display both positive and negative relationships with competitiveness. Neuroticism encourages competitiveness for personal development, which might lead to higher competences and, thus, competition provides a way to cope with neurotic individuals' worries about own abilities. Neuroticism, however, discourages competition motivated, for example, by fun, perhaps due to neurotic individuals just fearing competition without any additional benefits from competition. Again, the behavioral measure behaves like  $SC_{noPDM}$  and, thus, is — consistent with Müller and Schwierén's (2012) findings — negatively associated with neuroticism.

Finally, we turn our attention towards the relationship of competitiveness with participants' career anchors and, in particular, with their interest in a managerial career. We observe that an interest in a managerial career is more strongly associated with  $SC_{PDM}$  than with  $SC_{noPDM}$ . In fact, once controlling for confounding variables, the latter does not show any statistically significant correlation with this career anchor. Once more, the behavioral measure behaves like  $SC_{noPDM}$  and, thus, does not display a relationship with participants' interest in a managerial career.

## **5 DISCUSSION**

Following a long tradition of a mutually fruitful exchange between economic and psychological research (e.g., Fetchenhauer et al., 2012; Simon, 1959; Van Praag, 1984), this

study aims at improving our understanding of commonalities and differences between experimental-economic and psychological measurements of individual competitiveness. We discuss how incentivized behavioral experiments as experimental economists' preferred measurement of competitiveness relate to self-reported psychometric scales, which are the dominant measurement of individual competitiveness within psychological research. While the experimental measurement builds on the *revealed preference paradigm* and thereby is rather context-specific, the self-reported scales often explicitly aim at a more general characteristic and build on the *assumption of epsilon-truthfulness*. By discussing the *compatibility principle*, which links the level of specificity of attitudinal measures (the psychological scale-based approach can be considered an attitudinal measure) to the level of specificity of observed behaviors (in our case, the behavior within experiments), we derive expectations about when both measures might be more and when they might be less correlated.

## **5.1 Implications**

While we observe a robust correlation between behavior within experiment-based and psychometric, scale-based measurements of competitiveness, the main contribution of this study is the observation that, consistent with our theorizing, the choice of the competitive payment is found to be strongly related to self-reported competitiveness that did not result from personal development motives. In contrast, we could not identify a relationship between the choice of competitive payment in our experiment and self-reported competitiveness motivated by personal development. These findings support our conjecture that participants do not perceive competition in our experiment as an opportunity for personal development. This might be because we use a relatively simple quiz task that may not offer average participants meaningful opportunities for learning and for the development of their skills and capabilities. However, our experimental setting is very similar to setups typically used in economic experiments measuring individual

competitiveness (see Croson & Gneezy, 2009). In contrast, when asking individuals to evaluate their propensity to enter competitive environments, they are likely to imagine environments that are less artificial than behavioral economists' experiments. It is likely that their answers will be driven by their personal experiences which include their organizational and vocational activities and their leisure time activities including sports, which all are full of opportunities for personal development. It is, thus, not surprising that these scale-based measurements to large extents also capture competitiveness that is motivated by seeking opportunities for personal development (e.g., Newby & Klein, 2014; Smither & Houston, 1992). Observing that the specific experimental context does not match an important motive that makes individuals seeking competitive environments, is an instantiation of a violation of the compatibility principle and a source for systematic differences between experiment-based and scale-based measures of individual competitiveness; the larger the mismatch, the smaller we expect the correlation to be. In fact, we reduced the incompatibility by excluding variation from self-reported competitiveness that is likely to result from personal development motives (by means of residualization). As expected, we find a stronger correlation between the experimental and the residualized scale-based measure of competitiveness.

Whether or not measurements of individual competitiveness should capture competitiveness motivated by personal development depends on the aim of a particular study. For some research questions, such personal development motives may be seen as confounding variable (very much like risk preferences), such that competitive individuals prefer competition even if this competition is not instrumental with respect to personal development. Other studies might consider personal development motives as an important antecedent to individuals' competitiveness. Independent of whether personal development motives are considered as driver of individuals' competitiveness, we find that personal development motives might be relevant for selection into competitive management positions, whereas our other differently motivated

competitiveness (i.e. the residualized measure) is not related to such managerial intentions. These findings might be very important when interpreting recent research linking experimental measures of individual competitiveness to career choices (e.g., Buser et al., 2014; Reuben et al., 2015) in conjunction with studies linking self-reported psychometric scales to career choices (e.g., Bönnte & Piegeler, 2013; Kleinjans, 2009). These two types of studies might capture slightly different notions of competitiveness.

Our findings are particularly important for recent studies investigating the relationship between economic measures of competitiveness and personality traits such as the Big five. Müller and Schwierén (2012), for instance, report a negative association of neuroticism with competitiveness. While replicating this finding for the experiment-based measure of competitiveness, our study highlights that this does not imply that neurotic people will generally avoid competitive environments. If competition provides opportunities for personal development, neurotic individuals may exploit competitions for exactly that reason and have higher tendency to enter such competitions. Thus, the relationship between competitiveness and personality might be highly sensitive to the specific context of a competition.

Furthermore, we are able to replicate the finding of previous studies that men are more competitively inclined than women (Croson & Gneezy, 2009). Both the experiment-based and the scale-based measure of competitiveness point to substantial gender differences. However, while we find a strong gender difference for competitiveness that is not related to personal development, we do not find a gender difference for competitiveness motivated by personal development. While prior research suggests that gender difference in competitiveness might partly explain gender differences in labor market outcomes (Buser et al., 2014; Flory et al., 2015; Reuben et al., 2015), it remains an open and relevant question, whether and to what extent occupational choice is driven by different motives of competitiveness.

Our results indicate that prior experimental studies measuring individual competitiveness presumably have measured competitiveness that does not relate to personal development motives. Future experimental studies that aim at measuring competitiveness that is also or mainly motivated by personal development need appropriate adjustments. Psychometric measures of competitiveness motivated by personal development (e.g. Newby & Klein, 2014) include items referring to feedback (e.g. *“Competition allows me to judge my level of competence”*) and learning (e.g. *“I can improve my competence by competing.”*). We therefore expect that experiments including more feedback and more learning are more likely to capture the personal development motives of competitiveness. Studying the effect of availability of feedback on competitive preferences might be an interesting extension to previous studies on feedback and competitiveness (e.g., Azmat & Iriberry, 2016; Wozniak et al., 2014). Moreover, learning opportunities might be perceived in experiments where tasks are played multiple times, or that even include long-term tasks. Further research might combine self-reported competitiveness measures with adjusted experimental settings to clarify the relationship between feedback provision, learning, and competitiveness motivated by personal development.

Finally, the stable positive relationship between the behavioral competitiveness measure and the self-reported competitiveness scale indicates that both measures are indicators of the same underlying latent variable, which might be interpreted as a general preference to enter competitive situations. Hence, scale-based measures of individual competitiveness may be viewed as an alternative to the experiment-based measures when the latter cannot be reasonably employed. Since incentivized economic experiments are difficult to implement and very costly, they are sometimes not feasible and short psychometric scales or single items measuring a general competitive preference might be employed instead. This might particularly hold for large-scale international surveys such as Flash Eurobarometer No.283 by the European Commission, which already includes a single item measure of individual competitiveness (e.g.,

Bönte & Piegeler, 2013), or for representation socio-economic panels, which also address individuals' psychological backgrounds such as risk attitudes (e.g., Dohmen et al., 2011). Research on individual competitiveness might benefit from the analysis of such representative and large-scale surveys in order to get a more comprehensive understanding of how competitive preferences are distributed across populations and cultures and how it relates to real world behavior. Our validation of the relationship between self-reported and behavioral competitiveness measures provides a valuable instrument for future research developing such surveys. However, our results also suggest that surveys aiming to distinguish between individual competitiveness driven by personal development motives and competitiveness that is not driven by such motives should also include items measuring personal development motives (e.g. Newby and Klein, 2014). In extreme cases and similar to recent developments in measuring risk preferences (e.g. Dohmen et al., 2011), one might even need to rely on single items to measure individual competitiveness (e.g. Bönte & Piegeler, 2013).

## **5.2 Limitations**

While we believe that this study makes worthwhile contributions to our understanding of measurements of individual competitiveness, we acknowledge some limitations that may provide opportunities for improvements in future studies. First, we emphasize that our analyses are limited by our specific conceptualization of competitiveness. To build on common conceptual grounds of both economic and psychological research, we defined *competitiveness* as an individual's general tendency to select into competitive environments without referring to specific motives. Since we focused on the selection into competitive environments, we neglected any preferences for specific behaviors within competitive environments, e.g. the willingness to engage in larger efforts to win competitions. While other researchers may use different or more specific conceptualizations of competitiveness depending on the aim of their studies, our



conceptualization was appropriate for a first step into a systematic comparison of the two types of measurements. Future research might follow our study and relate psychometric measures of competitiveness to behavior within competitive environments, including, for instance, motivations to increase effort in competitive compared to non-competitive environments.

A second limitation results from our focus on personal development as a specific motive to enter competitive environments. As we have discussed, personal development motives are very important in psychological studies of competitiveness and, furthermore, were an obvious candidate for studying incompatibilities between economic and psychological measures of competitiveness. An alternative motive would be, for instance, the desire to win or preferences to dominate others. The methodology used in our study can easily be applied to study the relationship between behavioral experiments and these other motives of competitiveness. We hope that by means of such comparative studies both economists and psychologists can gain a deeper understanding of the nature of individuals' competitiveness.

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