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

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ABSTRACT

This study examines the relationship between economic and psychological approaches to measure individuals' competitiveness. While psychologists typically use self-reported psychometric scales, economists tend to use behavioral measures obtained from economic experiments, where subjects confronted with specific paid tasks have to select into either a competitive or a piece-rate payment scheme. Both measurement approaches have remained largely isolated from one another. We demonstrate that a standard behavioral measure and a psychometric scale of individual competitiveness are positively associated, but distinguishable with respect to the role of personal development motives. While self-reported competitiveness also emerges from personal development motives, the behavioral measure does not reflect such motives. The distinction between both measures is validated based on divergent associations with personality and interests in a competitive career.

1. Introduction

Competition is omnipresent in current societies and potential heterogeneity among individuals regarding preferences to enter competitive situations has substantial consequences, for instance, for behavior in labor markets (Buser, Niederle, & Oosterbeek, 2014; Flory, Leibbrandt, & List, 2015; Reuben, Sapienza, & Zingales, 2015). Individuals' competitiveness has only recently received greater attention in economics. Related research, however, has a tradition of more than 100 years in psychology (e.g., Deutsch, 1949; Triplett, 1898), where it is generally recognized as playing a significant role in interpersonal processes (Houston, Harris, McIntire, & Francis, 2002). While economic research typically employs behavioral measures obtained from incentivized experiments as indicators for competitive preferences (e.g., Niederle & Vesterlund, 2007), psychological research rather builds on self-reported psychometric scales (e.g., Newby & Klein, 2014; Smither & Houston, 1992). Research streams employing these different measures of individual competitiveness remained largely isolated from one another.

In this study we bring together economic and psychological research on individual competitiveness to improve the understanding of how specific behaviors are related to deeper psychological preferences and how these differences relate to different measures of competitiveness. We argue that economic and psychological measurements of individuals' competitive preferences build on common conceptual ground and are positively related, but differ systematically. While competitiveness resulting from needs to gauge or enhance own abilities is a key component of competitiveness in psychological research (Newby & Klein, 2014), it plays a less important and possibly unintentionally marginalized role in economic measures of competitiveness. To investigate the difference between economic and psychometric measures of competitiveness, we separate competitiveness driven by such personal development motives from competitiveness not driven by them (but instead driven by, for example, an intrinsic motivation for competition) and demonstrate distinct relationships with the Big Five personality dimensions and career interests.

2. Conceptual background

We define *competitiveness* as an individual's general tendency to select into competitive environments. This conceptualization of competitiveness is compatible, but not necessarily identical, with both,

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economic and psychological definitions. In both disciplines *competitive individuals* are usually seen as 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 behaviors, i.e. 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).

Our conceptualization of competitiveness as tendency to *select into* competitive environments differs from individuals' responses *within* a competitive environment (Croson & Gneezy, 2009), such as their willingness to increase efforts to leverage odds of winning. We also distinguish competitiveness from tendencies to maximize own relative to others' rewards. While individuals maximizing relative rewards are sometimes considered as *competitive* individuals (e.g., Fehr & Schmidt, 1999; van Lange, De Bruin, Otten, & Joireman, 1997), the defining feature does not relate to the selection into, but to the behavior *within* competitive environments. Finally, while risk taking or optimism in terms of confidence in winning may make individuals look as if they favor competitive environments (Gneezy, Niederle, & Rustichini, 2003), we consider them as distinct from individual competitiveness.

2.1. Economic and psychological measurements of competitiveness

Economic approaches to measuring individual competitiveness are based on the assumption that revealed behavior best approximates individuals' unobservable preferences, i.e. the *revealed preference paradigm*. Consequently, they measure participants' competitiveness by observing their behavior in incentivized experiments (e.g., Gneezy et al., 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 tournament and a non-competitive payment scheme (e.g., piece-rate or flat wage) (e.g., Niederle & Vesterlund, 2007). Measuring competitiveness through observed real behavior carries a drawback related to 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). Revealed behavior is an individual's response within a concrete and specific context.

Psychological approaches to measuring individual competitiveness mostly build on self-reported psychometric scales (e.g., Smither & Houston, 1992). These measures do not incentivize respondents to provide truthful answers and, hence, rely on what economists refer to as "*epsilon truthfulness*", the assumption that individuals indifferent between lying and telling the truth, tell the truth (see Cummings, Elliott, Harrison, & Murphy, 1997). Violations of this assumption certainly represent a threat to the validity of self-reported measures, but this disadvantage may be outweighed by the advantage of measuring competitiveness in less context-specific ways. While many psychological competitiveness scales discriminate between different *motives* for why people enter competitive environments (e.g., Newby & Klein, 2014; Ryckman, Hammer, Kaczor, & Gold, 1996), several competitiveness scales aim at measuring general competitiveness and are, thus, motive-independent (e.g., Newby & Klein, 2014; Smither & Houston, 1992).

Despite their substantial differences, economic and motive-independent psychological measurement approaches are consistent with our conceptualization of individual competitiveness as a tendency to select into competitive environments. Since economic and general psychological measures of competitiveness share such common conceptual ground, we expect them to be positively associated.

2.2. Motives and contexts

Employing Ajzen and Fishbein's (2005) *principle of compatibility*, we argue that differences in the relevance of individuals' personal development motives in economic and psychological measures of competitiveness create a meaningful difference between these measures. The principle of compatibility suggests that different measures of individuals' evaluation or appraisal of a behavior and the related observed behavior must be defined at the same level of generality or specificity to observe reasonable relationships between them (Ajzen & Fishbein, 2005). In our case, individual competitiveness is a *general tendency* to enter competitive environments, but the behavioral measure of competitiveness relates to a behavior in a *specific experimental environment* possibly not representative of other individually relevant competitive environments.

Individuals motivated for competition by opportunities for personal development seek 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 et al., 1996). As indicated by meta-analyses in psychological research, the personal development motive has emerged as one of the most important motives to enter competition in general (Houston et al., 2002; Newby & Klein, 2014). Personal development motives, however, are unlikely to play an important role for explaining selection into competitive environments within economic experiments. In typical economic measurements of competitive preferences, competition relates to trivia quizzes, mini games like ball tossing (Leibbrandt et al., 2013), or solving simple math tasks (Gneezy et al., 2003; Niederle & Vesterlund, 2007), often under time pressure against randomly assigned competitors (e.g. Niederle & Vesterlund, 2007). These simple tasks do not require training or specific qualifications and, thus, are hardly representative for competitive situations that offer opportunities for personal development, like competition at work, in sports, arts or academic environments.

Thus, despite aiming at measuring the same underlying construct, linking psychological and economic measures of competitiveness reflects 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 competitive environments in economic experiments. Distinguishing between competitiveness motivated by personal development and competitiveness not related to such motives, we thus hypothesize that the former relates less strongly than the latter to economists' behavioral measures of competitiveness. We also hypothesize that this asymmetry extends to correlations with the Big Five personality dimensions, such that measures of competitiveness not motivated by personal development show correlations similar to behavioral measures but different from measures of competitiveness motivated by personal development.

3. Method

3.1. Sample and study design

To study the relationship between psychological and economists' behavioral measurements of competitiveness we employed a survey among undergraduate students with a directly following classroom experiment. Our sample includes 186 students who are on average 23 years old and all achieved the education level required to access a university in Germany. Table 1 summarizes descriptive statistics.

At the beginning of the survey, students were informed that participation was voluntary and that their identities are not recorded to ensure confidentiality. Participants were not informed about the specific research question. During the survey, participants were informed that at the end of the survey 30 participants would be randomly selected to participate in an experiment involving decisions and performing a task, where they could earn up to 20 Euro. After describing the experiment in detail, participants were asked to fix their decisions for the experiment; these decisions were binding and could not be changed afterwards.

Table 1
Summary statistics.

Variable	Mean	S.D.	BC	SC	SC_{PDM}	SC_{noPDM}
Behavioral competitiveness (BC)	30% (piece rate = 70%)		1			
Self-reported competitiveness (SC)	4.21	1.18	0.32 ***	1		
SC motivated by personal devel. (SC_{PDM})	2.66	0.75	0.10	0.63 ***	1	
SC not motivated by personal devel. (SC_{noPDM})	1.55	0.91	0.33 ***	0.77 ***	0	1
Openness to experience	4.73	1.01	0.23 **	0.13	0.05	0.13
Conscientiousness	5.12	0.97	−0.10	0.04	−0.01	0.06
Extraversion	4.59	1.26	0.22 **	0.24 **	−0.04	0.34 ***
Agreeableness	5.47	0.88	−0.09	−0.14	−0.27 ***	0.03
Neuroticism	4.10	0.95	−0.28 ***	−0.18 *	0.09	−0.31 ***
General Management	5.10	1.37	0.17 *	0.27 ***	0.28 ***	0.11
Control variables						
Risk: General	4.81	1.35	0.24 **	0.19 *	0.18 *	0.10
Risk: Financial investments	2.99	1.50	0.33 ***	0.23 **	0.14	0.18 *
Risk: Job	4.01	1.34	0.27 ***	0.23 **	0.16 *	0.16 *
Risk: Games	5.44	1.68	0.17 *	0.20 **	0.26 ***	0.05
Confidence: Own expected score	10.45	3.45	0.37 ***	0.21 **	0.16 *	0.14
Confidence: Expected average score	10.74	2.71	−0.03	0.00	0.05	−0.04
Confidence: Probability to win	59.12	18.25	0.26 ***	0.13	0.01	0.16 *
Confidence: General self-efficacy	5.37	0.75	0.22 **	0.30 ***	0.18 *	0.23 **
Age	22.97	3.39	0.08	−0.05	−0.15 *	0.05
Female	62% (male = 38%)		−0.45 ***	−0.27 ***	−0.09	−0.28 ***

Notes: N = 186. Significance levels: *** p < 0.001, ** p < 0.01, * p < 0.05.

In the experiment, participants answered 20 trivia questions within 5 min (questions 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. The experiment took about 20 min including the payment. During the survey, participants got four example questions, which they could solve (without any incentives) to familiarize with the task. Then, participants had to choose between a non-competitive "Piece-Rate" compensation and a competitive "Tournament" compensation for their task performance. Under piece-rate, participants got their payoffs according only to their own performances and received 0.50 Euro for every correctly answered question in the quiz. In the tournament, each participant's score was compared to the score of a randomly matched competitor. If participants provided more correct answers than their respective competitor they received 1Euro per correct answer; otherwise they received no payment. Ties were broken randomly. After the survey, questionnaires were collected, 30 randomly selected participants performed the task, and were paid accordingly.

Following, e.g., Fletcher & Nusbaum, 2008, Müller & Schwieren, 2012, Ross, Rausch, & Canada, 2003, and Ryckman, Thornton, Gold, & Collier, 2011, we explore and compare the two competitiveness measures' relationships to personality. To demonstrate a practical relevance of these differences, we also explore their relationships with individuals' career orientations.

3.2. Measures of competitiveness

The *behavioral measure of competitiveness* (BC) is reflected by participants' choice of the competitive payment scheme; the dummy variable is zero for participants choosing the non-competitive piece-rate and one for choosing the competitive tournament.

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 more and less competitive individuals, and which do not explicitly include reasons why individuals prefer competitive environments: the highest-loading item from Newby and Klein's (2014) 'general competitiveness' subscale ("*I enjoy competing against others.*"), the highest-loading reverse-coded item from Smither and Houston's (1992) subscale related to general affective responses to competition ("*I find competitive situations unpleasant.*"), an adaptation of an item from Helmreich and Spence's (1978) WOFO competitiveness subscale as employed within a large European survey ("*I like situations in which I compete with others.*", Bönte & Piegeler, 2013), and a newly created item that, at a general level, focuses on settings where one's goal could also be pursued outside a competitive environment ("*I prefer competing with others when pursuing a goal over pursuing the goal alone.*"). Participants responded to each item on a scale from "does not apply at all" (1) to "fully applies" (7). The average score of responses to these items reflects our self-reported measure of competitiveness ($\alpha = 0.78$).

We measure individuals' personal development motives (PDM) with the four-item Personal Enhancement subscale from Newby and Klein's (2014) Competitiveness Orientation Measure that includes items such as: "*I can improve my competence by competing*". Participants responded on a scale from "does not apply at all" (1) to "fully applies" (7). Confirmatory factor analyses demonstrate 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 better than the unidimensional model ($\chi^2(20) = 90.52$, CFI = 0.889, SRMR = 0.060, AIC = 4925.10, BIC = 5002.52). The average response to these four items scaled with a constant factor β, which is explained below, forms our score for *competitiveness motivated by personal development* (SC_{PDM}, $\alpha = 0.83$).

We measure *competitiveness not motivated by personal development* (SC_{noPDM}) through residualizing SC_{PDM} from SC.[1] We regress PDM on

[1] Including both SC and its antecedent PDM as explanatory variables would create a bad control problem (Angrist & Pischke, 2008), which complicates a meaningful interpretation of estimated coefficients. To avoid this, we partition variation in SC into uncorrelated parts, SC_{PDM} driven by variations in personal enhancement motives and SC_{noPDM} not driven by them.

SC, i.e. $SC_i = \beta \cdot PDM_i + \alpha + \varepsilon_i$ with β as the estimated coefficient for PDM, α being the constant, and ε_i the error term. Variation in *competitiveness not motivated by personal development* is given by $SC_{noPDM} = \alpha + \varepsilon_i$. Scaling PDM with β, such that $SC_{PDM} = \beta \cdot PDM_i$, ensures that SC equals the sum of the perfectly uncorrelated components SC_{PDM} and SC_{noPDM}, which permits a meaningful interpretation and comparison of both coefficients.

3.3. Personality

To measure personality we employ the German translation (Gerlitz & Schupp, 2005) of the 25-item Big Five Inventory (BFI; John, Donahue, & Kentle, 1991) with five items for each dimension. Participants responded to each item on a scale from "does not apply at all" (1) to "fully applies" (7). Average responses to the respective five items form scores for Openness to experience ($\alpha = 0.76$), Conscientiousness ($\alpha = 0.76$), Extraversion ($\alpha = 0.89$), Agreeableness ($\alpha = 0.68$), and Neuroticism ($\alpha = 0.66$).[2]

3.4. Career orientation

We measure participants' intent to work in competitive management positions by the five-item subscale *general management career anchor* (GM) from the German translation (Schein, 2005) of Schein's Career Anchors Orientation Inventory (Schein, 1990). Participants rated the importance of management-related job aspects on a scale from "completely unimportant" (1) to "extremely important" (9). The average response forms the score for the orientation towards a general management career ($\alpha = 0.76$).

3.5. Control variables

Because competitiveness is by definition distinct from risk preferences and expectations of winning (Niederle & Vesterlund, 2007) and task stereotypes may influence womens' and mens' willingness to enter competition differently (Shurchkov, 2012), we include related variables as statistical controls. As personality and career anchors are rather context-independent, we also control for general risk preferences and performance expectations. For completeness and consistency, all our analyses include the same set of control variables reported in Table 1.

We adapted an experimentally validated measure of *risk preferences* from the German Socio-Economic Panel (Dohmen et al., 2011). On a scale from "unwilling to take risks" (1) to "very prone to take risks" (7), participants indicated their willingness to take risks related to four domains relevant in our study: games and financial investments (both because of the experiment's nature), professional career (because of addressing participants' intentions to take management jobs), and general (to cover additional aspects not reflected by the domain-specific measures).

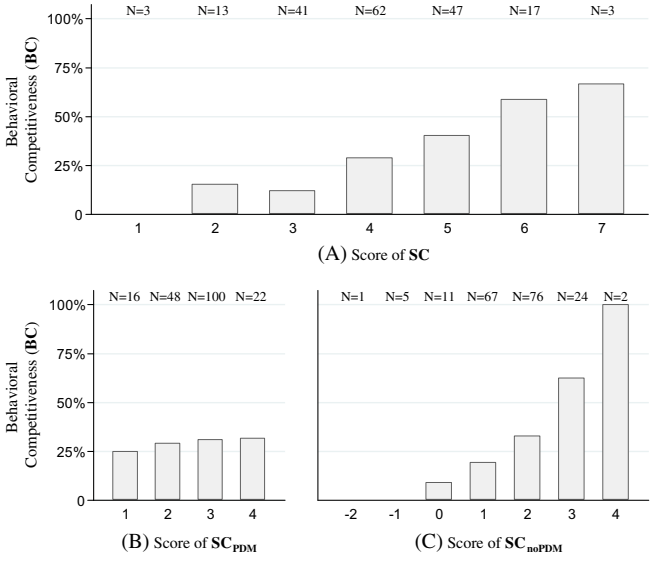
To measure *confidence*, we asked participants to forecast their own score (number of correctly answered questions) and the average score of all other participants. Participants also estimated the percentage of other participants who correctly answered more questions than they themselves do. Due to the potentially complex interplay between judgments of individual and other participants' performances, e.g. anchoring effects, we included all three measures of expectations as separate controls. To capture more general aspects of confidence we included General Self-Efficacy measured by Chen, Gully, and Eden's (2001) New General Self-Efficacy scale. Participants rated each item on a scale from "does not apply at all" (1) to "fully applies" (7); responses to all items were averaged ($\alpha = 0.86$).

We included a dummy variable indicating respondents' *gender* (female = 1) and a variable indicating their *age*.

4. Results

Fig. 1 reports shares of participants choosing competitive payment in the experiment, i.e. the behavioral competitiveness (BC), sorted by scores of self-reported competitiveness; as expected, this share is higher among individuals with higher self-reported competitiveness scores (SC). There is almost no increase in shares of participants choosing competitive payment with higher SC_{PDM}. As expected, however, the share of participants choosing competitive payment continuously increases with SC_{noPDM}.

Logistic regression analyses with the behavioral measure of competitiveness (BC) as dependent variable (see Table 2) provide more detailed insights by statistically controlling for confounding variables, such as risk preferences, confidence perceptions, and gender effects (Niederle & Vesterlund, 2007; Shurchkov, 2012). While male students and more confident individuals are more likely to select into competition, the estimated effects of risk preferences are statistically insignificant (individually and jointly tested). We observe a positive and statistically significant relationship between BC and SC (Model 2). We then split SC into SC_{PDM} and SC_{noPDM} but enforce that they have equal effects by means of a constrained regression analysis (Model 3), which by definition equals Model 2. When relaxing the constraint (Model 4), SC_{PDM} does not relate to BC, but SC_{noPDM} positively relates to BC. Consistent with our expectations, the coefficient of SC_{noPDM} is significantly larger than the coefficient of SC_{PDM} ($\beta_{SCnoPDM} - \beta_{SCPDM} = 0.829 > 0$, SE = 0.446, $p = 0.0315$). In fact, increasing SC_{noPDM} by one point on a seven-point scale doubles the odds of choosing competitive payments; the probability of such selection increases by about 13 percentage points (Table 2, last two columns). Separately including SC_{PDM} or SC_{noPDM} does not change our conclusions.



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 above bars.

Fig. 1. Behavioral and self-reported competitiveness.

[2] The relatively low Cronbach's alphas found in our sample match with those found in the study developing and validating the German items (see Gerlitz & Schupp, 2005, p.12) and are comparable with observations for other short versions of the Big Five (e.g., Rammstedt & John, 2005). These low values can be explained by the fact that a few items per personality dimension are aimed to cover a broad range of facets within each dimension (Gerlitz & Schupp, 2005).

Table 2
Logistic regressions of behavioral competitiveness on self-reported competitiveness.

Model	1	2	3	4		
	Coef.	Coef.	Coef.	Coef.	Odds ratios	Marginal effects
Self-reported competitiveness (SC)		0.43*				
		(0.20)				
SC motivated by			0.43*	−0.08	0.93	−0.01
personal development (SC_{PDM})			(0.20)	(0.31)	(0.29)	(0.05)
SC not motivated by			0.43*	0.75**	2.12**	0.13**
personal development (SC_{noPDM})			(0.20)	(0.27)	(0.57)	(0.04)
Control variables						
Risk: General	−0.06	−0.03	−0.03	0.01	1.01	0.00
	(0.19)	(0.20)	(0.20)	(0.20)	(0.20)	(0.03)
Risk: Job	0.21	0.20	0.20	0.23	1.26	0.04
	(0.17)	(0.17)	(0.17)	(0.18)	(0.22)	(0.03)
Risk: Financial investments	0.10	0.11	0.11	0.11	1.11	0.02
	(0.15)	(0.16)	(0.16)	(0.16)	(0.18)	(0.03)
Risk: Games	0.18	0.10	0.10	0.18	1.19	0.03
	(0.13)	(0.13)	(0.13)	(0.14)	(0.17)	(0.02)
Confidence: General self-efficacy	0.43	0.21	0.21	0.17	1.18	0.03
	(0.31)	(0.33)	(0.33)	(0.34)	(0.40)	(0.06)
Confidence: Own expected Score	0.20*	0.20*	0.20*	0.21**	1.23**	0.03**
	(0.08)	(0.08)	(0.08)	(0.08)	(0.10)	(0.01)
Confidence: Expected average score	−0.04	−0.05	−0.05	−0.04	0.96	−0.01
	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.02)
Confidence: Probability to win	−0.00	−0.00	−0.00	−0.00	1.00	−0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Age	0.03	0.06	0.06	0.04	1.05	0.01
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.01)
Female	−1.58***	−1.43**	−1.43**	−1.38**	0.25**	−0.25**
	(0.45)	(0.45)	(0.45)	(0.46)	(0.12)	(0.09)
Constant	−6.69**	−7.65***	−7.65***	−7.27**		
	(2.15)	(2.21)	(2.21)	(2.31)		
Pseudo R^2	0.274	0.294	0.294	0.314		
Log Likelihood	−82.67***	−80.33***	−80.33***	−78.09***		
(LR χ^2)	(62.24)	(66.91)	(66.91)	(71.41)		

Notes: N = 186. Model 3 is constrained to equalize coefficients of SC_{PDM} and SC_{noPDM}. Standard errors reported in parentheses.
Significance levels: ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$.

The divergence between SC_{noPDM} and SC_{PDM} extends to their relationships with personality (see Table 3 for partial correlations controlling for risk-preferences, confidence, gender, and age). In contrast to suggestions relating conscientiousness to competitiveness (e.g., Caliendo, Fossen, Kritikos, & Wetter, 2015), conscientiousness and openness to experience do not relate to any type of competitiveness.

Extraversion, reflecting individuals being sociable, gregarious, and assertive, positively correlates with SC_{noPDM}, which is rather consistent with results from various psychometric scales (e.g., Ross et al., 2003; Ryckman et al., 2011), but does not correlate with SC_{PDM}. In contrast, agreeableness, reflecting people being warm, generous, trusting, and altruistic, negatively correlates with SC_{PDM}, but not with SC_{noPDM}. BC and SC_{noPDM} exhibit striking similarities in their correlations patterns as they are positively associated with extraversion but not associated with agreeableness.

Neuroticism, which is low when people are emotionally stable, even-tempered, and self-reliant, displays an interesting correlational pattern. It positively correlates with SC_{PDM} and thereby mirrors results on hypercompetitive attitudes (Ross et al., 2003), but negatively with SC_{noPDM}. Again, BC behaves like SC_{noPDM} and is — consistent with Müller and Schwieren's (2012) findings — negatively associated with neuroticism. Thus, depending on the specific competition neuroticism can display both positive and negative relationships with competitiveness. Neurotic individuals might shy away from competition if they associate it with negative experiences, like stress and pressure, but may embrace competition if they associate it with positive experiences like personal development.

Finally, an interest in a managerial career is more strongly associated with SC_{PDM} than with SC_{noPDM}. Again, BC and SC_{noPDM} exhibit remarkable similarities as both do not display a relationship with participants' interest in a managerial career.

Table 3
Partial correlations of competitiveness with personality and managerial career anchor.

	Behavioral competitiveness BC	Self-reported competitiveness		
		SC_{noPDM}	SC_{PDM}	$SC = SC_{noPDM} + SC_{PDM}$
Openness to experience	0.10	0.05	0.02	0.06
Conscientiousness	−0.03	0.06	0.02	0.07
Extraversion	0.17*	0.32***	−0.12	0.18*
Agreeableness	0.07	0.11	−0.20**	−0.04
Neuroticism	−0.16*	−0.23**	0.17*	−0.08
General Management	0.03	−0.00	0.18*	0.12

Notes: N = 186. Partial correlations controlling for risk preferences, confidence, gender, and age. Significance levels: ***$p < 0.001$, ** $p < 0.01$, *$p < 0.05$.

5. Discussion

We compare economic and psychological measures of competitiveness and thereby follow a tradition of mutually fruitful exchange between economic and psychological research (e.g., Brocklebank, Lewis, & Bates, 2011; Simon, 1959). We examine how rather context-specific incentivized behavioral measures building on the *revealed preference paradigm* relate to more general self-reported psychometric scales that build on the *assumption of epsilon-truthfulness.* Consistent with expectations we find a robust positive correlation between both competitiveness measurements, but choices of competitive payments in the

experiment more strongly relate to self-reported competitiveness *not* motivated by personal development motives. Not finding a robust correlation with competitiveness motivated by personal development supports our conjecture that in our experiment, which is similar to setups typically used in economic experiments measuring competitiveness (see Croson & Gneezy, 2009), participants do not perceive competition as an opportunity for personal development. In contrast, but consistent with previous psychological studies (e.g., Newby & Klein, 2014; Smither & Houston, 1992), our scale-based measure to large extents captures competitiveness motivated by seeking opportunities for personal development, which as demonstrated by its correlation with a competitive career orientation is of potential relevance for labor market behavior. We observe striking similarities between behavioral competitiveness and self-reported competitiveness not motivated by personal development with regard to their correlations with the Big Five personality dimensions, whereas the correlation pattern of competitiveness motivated by personal development is very dissimilar. This finding further validates our distinction of types of competitiveness. It furthermore demonstrates that not only economic experiments offer well-defined environments to investigate personality (Ferguson, Heckman, & Corr, 2011), but also personality frameworks can be employed to better understand economic behavior (Müller & Schwieren, 2012).

Our findings indicate that prior experimental studies measuring individual competitiveness presumably have measured competitiveness that just weakly relates to personal development motives. Such a focus has advantages. However, if personal development motives are not considered as confounds but as essential antecedents (see discussion by Brocklebank et al., 2011), then economic studies addressing such competitiveness may need adjustments. Related psychometric measures (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 expect experiments including more feedback and learning opportunities to be more likely to capture competitiveness motivated by personal development motives than experiments without such opportunities (e.g., Wozniak, Harbaugh, & Mayr, 2014).

While we believe this study to make worthwhile contributions to our understanding of measurements of individuals' competitiveness, we acknowledge limitations implied by our specific conceptualizations. By defining *competitiveness* as an individual's general tendency to *select into* competitive environments, we neglected any preferences for specific behaviors *within* competitive environments. Moreover, we focus on personal development as a specifically important motive to enter competitive environments. Yet, the methodology used in our study can be applied to study the relationship between behavioral measurements and other motives of competitiveness, other more specific personality traits such as sensation-seeking, trait anxiety, or impulsivity, and individual facets of personality dimensions (e.g., Fletcher & Nusbaum, 2008). We hope that by means of such comparative studies both economists and psychologists can gain deeper understanding of the nature of individuals' competitiveness.

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