

Urbig, Diemo

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## A short measure of four types of personal optimism: ability, rivalry, chance, and social support (ARCS)

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# JENA ECONOMIC RESEARCH PAPERS



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## **A Short Measure of Four Types of Personal Optimism: Ability, Rivalry, Chance, and Social Support (ARCS)**

by

**Diemo Urbig**

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Friedrich Schiller University Jena  
Carl-Zeiss-Str. 3  
D-07743 Jena  
[www.uni-jena.de](http://www.uni-jena.de)

Max Planck Institute of Economics  
Kahlaische Str. 10  
D-07745 Jena  
[www.econ.mpg.de](http://www.econ.mpg.de)

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## **A Short Measure of Four Types of Personal Optimism: Ability, Rivalry, Chance, and Social Support (ARCS)**

March 2008

**Diemo Urbig**

Humboldt-Universität zu Berlin & Max Planck Institute of Economics

### **Abstract**

Self-efficacy, which can be defined as optimism about one's own ability to exercise required actions, has received a lot of attention in research on entrepreneurs' and managers' decision making. This attention led to the development of corresponding measurement instruments. However, there is no equivalent measure of the more general personal optimism that jointly captures on equivalent bases abilities and other sources of uncertainty, which one might be more or less optimistic about. I develop a measurement instrument of four dimensions of personal optimism: ability optimism (self-efficacy), rivalry optimism (being better than others), chance optimism (being a lucky devil or fearing of bad-luck), and social support optimism (others help and support me and are trustworthy). Correlations between subscales are intuitive and backed by theory. I replicate corresponding results from previous studies that used different measures, e.g. life-orientation (LOT-R), self-efficacy (NGSE), and social optimism at the societal level from the POSO scale. This new personal optimism measurement instrument is very much like the life-orientation test (LOT-R), but it provides more insights regarding the structure of optimism. Whenever self-efficacy or control beliefs are of interest, the ARCS or ACS scales should be used to control for complementary world beliefs. I also illustrate the special role of one item in NGSE, which in contrast to all other NGSE items refers to a comparative instead of an absolute judgment.

JEL-classification: Economic Psychology does not have JEL codes (articles for this field, e.g. from Journal of Economic Psychology do not have JEL codes in EconPapers database)

Keywords: personal optimism, social optimism, chance optimism, self-efficacy

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Contact: Diemo Urbig, Max Planck Institute of Economics, Entrepreneurship, Growth and Public Policy, Kahlaische Straße 10, 07745 Jena, Germany; Email: [urbig@econ.mpg.de](mailto:urbig@econ.mpg.de)

## INTRODUCTION

Consider entrepreneurs or managers evaluating an uncertain business opportunity. Despite they may all have the same knowledge; some will probably evaluate the opportunity more optimistically than others. Studies on opportunity evaluation (Simon, Houghton, & Aquino, 2000; Keh, Foo, & Lim, 2002) as well as literature on decision-making under uncertainty (Tversky and Kahneman, 1992; Kilka and Weber, 2001) and more specifically literature on the theory of planned behaviour (Ajzen 1991; Ajzen, 2002) do support this and report that people, entrepreneurs as well as students and most other people, tend to a more positive evaluation when they believe to have more control over the outcome. Control beliefs can be related to a person's own ability to execute a required behaviour, i.e. self-efficacy beliefs, or related to beliefs that their own behaviour almost completely determines the final outcome (Bandura 1998, Rotter 1966, Ajzen 2002). The later beliefs are considered as control beliefs in a more narrow sense.

Both, beliefs and distortions of these beliefs have been discussed in the literature on entrepreneurial decision-making (Markman, Balkin, & Baron, 2002; Krueger and Brazeal, 1994; Shaver and Scott, 1991), but also on managerial and employees' decision-making (e.g., Chen, Goddard, & Casper, 2004). Empirical studies have revealed that self-efficacy does distinguish entrepreneurs from managers (Chen, Greene, & Crick, 1998) and inventors from innovators who started a business (Markman et al., 2002). Furthermore, students as well as managers and entrepreneurs do evaluate business opportunities more positively the more they believe that their own behaviour determines their outcomes (Simon et al, 2000, Keh et al., 2002, Wu and Knott, 2006). However, theory predicts a moderation effect (Ajzen and Fishbein, 2005): People who believe that the outcomes depend on one's own activities do only become more optimistic if they also believe they are able to exert the required activities. While theory predicts this effect, it has rarely been investigated in entrepreneurial contexts as well as in the more general theory of

planned behavior (Ajzen, 2002; Ajzen and Fishbein, 2005). In entrepreneurial contexts, we only know of Chen et al. (2004), who report about such an interaction effect with respect to the dependency of self-efficacy and work-related self-efficacy. As such, there is a gap in research on situations, where people believe that their outcomes are not solely or mostly driven by own activities. In such situations, beliefs about other sources of uncertainty become relevant. If one believes in being a lucky devil, then an optimistic judgment might still be the result. Being not very optimistic about external sources of success will likewise result in less positive evaluations of the same business opportunity. Such beliefs about the nature of external sources of uncertainty are complementary to self-efficacy and they dominate one's evaluation of a business opportunity in those cases where outcomes are perceived as being significantly dependent on external determinants. However, empirical studies on decision-making have rarely accounted for such beliefs. Furthermore, I have not yet seen a measurement instrument for such beliefs. Simon et al. (2000) have measured optimism about future developments and have not found any impact on opportunity evaluation; but, in their discussion section they explicitly argue that this should only be accepted with reservations regarding the measurement instrument. Their measurement instrument was related to a general optimism including the development of the overall economy; a more personal optimism would probably be appropriate. Including self-efficacy and optimism regarding other sources of uncertainty into such studies on control beliefs would probably result in further insight on perception of risk in general.

Given the insights by Levenson and Miller (1976), we know that external determinants of one's own success should not be treated as a single source, but that one should at least distinguish between powerful others, people who may intentionally influence my life, and chance, where the outcome is pure chance and not intentionally determined by others. The external uncertainty can be rooted in a dependency on influential people or be rooted in pure chance like throwing a dice.

Acceptance and coping with these types of uncertainty are likely to be qualitatively different. For instance, powerful others might be dealt with via social networking while random events might be carefully investigated via extensive information search to uncover potential dependencies of the uncertain event. Considering this difference, we end up with three potential sources of uncertainty: abilities, powerful others (social environment), and pure chance. While people may have a general tendency to be more or less optimistic regarding these different sources of uncertainty, control beliefs finally determine which of these sources is more or less relevant. Being convinced that one's own abilities are the only source of uncertainty increases the importance of beliefs about one's own abilities, while believing in the power of others or in the power of chance increases the importance of beliefs about others respectively about pure chance.

Translating the idea of powerful others into the economic world leads to two general types of powerful others. Powerful others can be those in the social network of an economic actor who can provide support or hinder the focal actor. Being optimistic about these powerful others implies that one tends to believe that others are cooperative and helpful and tend more to providing support than to interfere. However, powerful others can also be strong competitors, who exert their influence indirectly via competition in markets or other institutions. Optimism regarding such powerful competitors is optimism regarding rivalry and it is mirrored by beliefs that others are not as good as they need to be to represent a strong competitive threat. Rivalry optimism is based on a comparative judgment of one's own versus others' abilities. It is thus related to internal sources (one's own ability) as well as external sources (others' abilities). Given these insights we might extend Miller and Levenson's (1976) conceptualization and introduce rivalry as an additional source of uncertainty, which is closely related to internal sources, i.e. own abilities, but additionally related to powerful others' abilities. Recent work by Moore and Healy (in press) shows that people might be unrealistically optimistic regarding their

abilities but can at the same time think to be worse than others. These results further highlight that ability optimism and rivalry optimism should be distinguished.

While Levenson and Miller (1976) developed a measurement instrument for control beliefs related to their three sources of uncertainty, I am not aware of contributions to management and entrepreneurship literature that develop a comparable measurement of personal optimism related to the three respectively four different sources of uncertainty. Given the work by Levenson and Miller (1976) and the literature on control beliefs in general, we can measure people's beliefs about what rules the world, but we cannot measure whether or not they are optimistic regarding those elements that rule the world. Some work in psychology could be considered, e.g. the POSO-E item battery (Personal Optimism, Social Optimism, Self-Efficacy Optimism) developed by Schweizer and Koch (2001) or the collection of scales used by Karademas (2006). However, these measurement instruments have their respective weaknesses. Either they contain too many items to be useful as a measure for a variable that one just want to control for in a survey, e.g. 42 items for the POSO-E scale, they do not capture the idea of rivalry optimism, or the collection of scales was developed independently and have not been shown to distinguish the constructs sufficiently well, like in the case of Karademas (2006).

Observing the lack of a brief and consistent scale system addressing these different components of personal optimism at an equivalent level, this study aims at developing such a measurement instrument capturing the above-mentioned components: ability optimism, social optimism including social support and rivalry, and chance optimism. We therefore develop a 16-item scale of personal optimism covering four subscales, namely ability optimism, rivalry optimism, chance optimism, and social support optimism. These terms make the acronym ARCS. We show that all four subscales of our personal optimism are distinct from optimism regarding the general development of the economy and society. We furthermore show that

general personal optimism as measured by the life-orientation test by Scheier et al. (1994) is almost equally related to all four dimensions of our personal optimism. We replicate previous findings based on different measurement instruments. As a minor result we report on a weak item of the self-efficacy measure developed by Chen, Gully, & Eden (2001). The ARCS scale system can also be used in its reduced form ACS, where rivalry optimism is excluded. In this form our measurement instrument can easily be combined with the measurement instrument for control beliefs (IPC) developed by Levenson and Miller (1976).

The potential applications of our personal optimism scale ARCS are surveys addressed to entrepreneurs and managers, where – in contrast to students – the length of questionnaire is a crucial attribute that can decide about participating or not. We emphasize the small number of items, which lends this instrument to be used in surveys where one just want to control for these variables and, thus, does not want to use the major number of items for measuring these variables.

The paper continues with a brief discussion of related work. I then describe the design of my study. The analysis section derives the four subscales for measuring personal optimism regarding abilities, social support, rivalry, and chance. In the fourth section I discuss correlations between these subscales as well as between the subscales and other variables. A discussion of the central contributions and also of limitations concludes the paper.

## **RELATED WORK**

The work that gets closest to my research question are studies by Schweizer and Koch (2001), who extend earlier work by Schweizer and Schneider (1997), and the work by Karademas (2006). Schweizer and Koch (2001) develop an item battery to measure three elements of optimism: (1) self-efficacy optimism, (2) personal general optimism, and (3) social optimism. At



the first glance it seems to almost perfectly mirror the three dimensions that I want to look at for the case that social support and rivalry optimism are summarized as social optimism. However, I see two problems. First, Schweizer and Koch's social optimism on one hand and their self-efficacy and personal optimism at the other hand are specified at completely different levels. While the latter two are specified at a personal level, social optimism is oriented towards the whole society. Social optimism consists of items like "Our children will have a better life", "The mankind will fully destroy their environment", or "The global economy will decline". This is very similar to some studies in entrepreneurial and managerial decision-making, e.g. Simon et al. (2000), who measured general optimism in a study on the drivers of evaluation of business opportunities, and Wally and Baum (1994), who measured the same in the context of strategic decision-making. Simon et al (2000) as well as Wally and Baum (1994) used the following three items: "I feel the economy will expand next year", "I usually expect improvement in my life and the economy", and "I feel my performance will improve next year". While the latter is a more future oriented self-efficacy, the former two are at the level of Schweizer and Koch's social optimism. I agree with the discussion by Simon et al. (2002) that this measurement instrument, which is directed at a societal or general life level, is rather weak when evaluating activities with respect to one's own individual chances for success. It needs to be improved if one wants to understand personal optimism's impact on entrepreneurial or managerial decisions. Besides the level of analysis, Schweizer and Koch's social optimism subscale contains 24 items and is thereby much longer than the self-efficacy and personal optimism subscales. Perhaps due to similar issues, Karademas (2006), who investigated the mediation effect of personal optimism, did not use the original social optimism scale by Schweizer and Koch (2001), but used another two-dimensional social support measure more related to the individual situation (daily emotional support and daily instrumental support). Despite Karademas (2006) uses a measurement

instrument for a kind of social optimism that is oriented towards the individual situation, he does not consider rivalry optimism as another element of social optimism. In this study I thus aim at developing an own social optimism scale that equally addresses social support optimism as well as rivalry optimism.

Karademas (2006) investigates the relationship between personal optimism, social support, and self-efficacy. He developed his own self-efficacy measure adapted to his own research interests, but he also used the personal optimism scale by Schweizer and Koch (2001) and social support scales developed by Doeglas et al. (1996). However, his measurement instruments were selected separately and he did not test to what extent they measure different constructs (at least, this is not reported). Karademas (2006) claims that personal optimism is a mediator for self-efficacy and social support. Similarly, Schweizer and Koch (2001) argue that self-efficacy is a component of personal optimism. Schweizer and Koch (2001) therefore conclude that personal optimism is very likely to be difficult to distinguish from self-efficacy and therefore accept rather high between-construct correlations. However, Karademas' work shows that just a small proportion of personal optimism can be explained by self-efficacy optimism and social support optimism. The error variance remaining after accounting for self-efficacy and social support remains at a rather high level, i.e. 0.8. Building on the insights by Leveson and Miller (1976) we would also argue that also optimism regarding general chance should be separately included. If one's life is neither controlled by one's own abilities nor by powerful others, then pure luck and bad-luck rule the world. Thus, it might matter a lot whether or not one sees oneself as a lucky devil or as an unlucky person. Furthermore, while Karademas (2006) considers social support, our previous discussion illustrated that powerful others can also be powerful competitors. Therefore, we argue that a measurement of four dimensions of optimism,

ability optimism, rivalry optimism, chance optimism, and social support optimism specified and measured at an equivalent level is necessary for further research.

Altogether, we have not seen so far a short consistent measurement instrument for personal optimism that distinguishes the four different dimensions of personal optimism. I report about the development of such a system of survey questions. My specific goal is a small set of survey questions with clearly distinguished subscales representing ability optimism (self-efficacy), chance optimism, and social optimism including rivalry as well as social support optimism. However, because there is no clear evidence on whether or not rivalry optimism is part of a more general social optimism or part of ability optimism, this study also gives first evidence on this question.

## DESIGN

To develop the four scales I selected items across all necessary domains: ability optimism (self-efficacy), social optimism including rivalry and social support optimism, and chance optimism. For selecting items for the ability optimism I incorporated all eight items (AO01 to AO08) from the New General Self-Efficacy (NGSE) scale developed by Chen et al. (2001), which has shown slight advantages over other self-efficacy scales (Scherbaum, Cohen-Charash, and Kern, 2006), and I added 3 additional items. These additional items consist of a statement directly evaluating one's own abilities (item AO09), of one item on outcome expectation conditioned on the case that only abilities matter (item AO10), and of an item on whether or not one needs support from others (item AO11). For selecting the items for chance optimism I start with the 6 items (CO01 to CO06) from the revised life-orientation test (LOT-R) by Scheier et al. (1994), which is also interpreted as personal optimism. Additionally, I sampled 6 items, which focus more explicitly on chance and luck, e.g. "When my success depends on luck, then I do

often better than others would expect” (item CO11). For social optimism I sampled 14 new items and did not use a previously developed scale. I include cooperative situations, e.g. “Other people typically have my best interest at heart” (item SO07), as well as competitive situations, e.g. “One can never rely on deals with rivals” (item SO14) and “I am typically pessimistic when I evaluate my success chances in competitions” (item SO13). Altogether there are 37 items that form the basis of our study.

I also included the social optimism scale by Schweizer and Koch (2001). This serves two goals. First I am able to study the discriminant validity of our personal social optimism items. Furthermore, these additional 24 items add heterogeneity to the content of the survey, such that the specific nature of the other 37 items is a slightly covered. I also added four items that are based on Haghghat (2007), who suggests these four items for measuring social desirability<sup>1</sup>, i.e. the tendency that socially desired answers are given. I added an additional item addressing the revelation of information.

All 66 items were completely mixed and presented on three pages with 20 to 25 items on each page. The survey was titled “Your view to the world in 66 statements”. We used German translations<sup>2</sup> and the responses are on 5 point Likert scales ranging from fully agree to completely disagree. Participants for a pre-test were sampled at the Department of Computer Science at Humboldt-Universität zu Berlin, Germany. The final study was done with students in two lectures at the School of Business and Economics at the same university. In one lecture the survey was distributed and filled out at the beginning and in one lecture at the end of the lecture. I

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<sup>1</sup> Due to size restrictions we did not include the more established but nevertheless much longer scale by Crowne and Marlowe (1960).

<sup>2</sup> NGSE was independently translated by Erik Monsen (English native speaker) with his colleagues at the Max Planck Institute of Economic in Jena and by Diemo Urbig and Julia Stauf (German native speaker) at the Humboldt-Universität zu Berlin. Both translations were finally jointly merged into the translation reported in appendix 1. LOT-R was also translated by this group of people, translation reported in appendix 1. Appendix 2 lists all German items used in the study. The social optimism scale by Schweizer and Koch (2001) is only available in German on direct request from Schweizer and Koch.

have got 175 valid responses with 53% men and 47% women; average age is 23 years with 90% between 20 and 28 years; on average they have completed 4.75 semesters of their study; 46% have completed less than 5 semesters (beginners, average age 22 years, 31% women, on average 2.7 semesters) and 54% more than 4 semesters (advanced students, average age 24 years, 48% women, on average 6.5 semesters). Some respondents did not answer several items; I excluded them as necessary. For each subscale there are 170 participants available who answered all related items. Items like those regarding the society's ability to deal with the drug problem from the POSO-E scale had the highest number of missing values (9 missing values for one of these questions). For this scale we thus have only 158 valid responses.

### ANALYSIS

We start our analysis with factor analyses of each of the three major domains, ability, chance, and social optimism including rivalry and social support optimism (results are reported in Table 1). These analyses allow cleaning each of these domains independently and make the interpretation of resulting factors of a joint factor analysis of all domains easier. Especially we will check whether or not rivalry optimism and social support optimism are sufficiently distinct to replace social optimism by the two sub domains, rivalry and social support optimism. With this procedure we furthermore keep the sample size per item ratios sufficiently high, i.e. above 10. Only the analysis for society-oriented social optimism (SOSO) hits a ratio of just 6.58; however, this analysis is just for validation. I first use *common factor analyses* with *oblique rotation* because I want to identify latent constructs that are based on theoretical considerations and do expect that these constructs are strongly correlated within the single domains (Hair, Black, Babin, Anderson, & Tatham, 2006). The interpretation of factors and selection of items for sum scores is based on the pattern matrix, because it reveals the unique contribution of a variable to a

factor excluding the between-factor correlations (Hair et al., 2006), but I also check the factor structure matrix, which gives the full correlation of variables with factors, to avoid obscure groupings of variables that may happen when solely focussing on the pattern matrix (Nunally and Bernstein, 1994). To test whether the independently selected items also separate well when combined together, I then run a common factor analysis for all selected items. To further test robustness I run a principal component analysis with orthogonal rotation. If it results in the same factors, then I can conclude that given the data, the factors do not only represent best the common variance but that they also represent best the overall variance including the unique and error variance that was excluded from the analyses before. However, given that – as we will see – some factors are highly correlated, it is worth testing whether the same factors appear when explicitly looking for independent factor. Therefore I utilize an orthogonal rotation for the principal component analysis. Finally I run a confirmatory factor analysis to explicitly test the measurement model.

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Insert Table 1 about here  
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For ability optimism, which mainly reflects self-efficacy and which is built on NGSE, the common factor analysis yields two factors with eigenvalues above one. The first factor exceeds the second significantly, 4.137 compared to 1.308. Comparing loadings of variables on these two factors, items AO07 and AO11 are definitely distinguished because they load much more on the second than on the first factor. Both items mirror an *ability judgement relative to others*, while the other items reflect an *absolute ability judgement*. The two top loading items AO01 and AO03 are very similar and seem to dominate this factor. A further confirmatory factor analysis revealed that the errors of these two questions are highly correlated. We therefore exclude AO01. Except

AO01 we select the four variables with largest factor loadings, i.e. AO01, AO03, AO04 (all above .657). These items also have the largest unique loadings.

We have interpreted two items of ability optimism (AO07 and AO11) as ability judgments relative to others. We therefore include these items into our social optimism analysis, because also social optimism with respect to competition includes such relative judgments. The common factor analysis delivers five factors with eigenvalues above 1 (3.209, 2.183, 1.559, 1.375, 1.053). The first factor describes a *general optimism regarding support by others*. The second factor including ability optimism item AO7 describes the *threat by potential competition*, a relative ability judgment. While the second factor describes the fact that one does not feel threatened by competitors, the fourth factor describes whether or not competition improves one's own performance, i.e. as an incentive to be better. These two factors are strongly linked as can be seen from the structure matrix values where items SO12 and SO13 load high on both factors. Factors two and four could thus form a general attitude towards competition or *rivalry optimism*. The third factor describes the *attitude towards group work*, specifically whether group work is considered as beneficial. Because group work is not our focus we do not consider these items further. The fifth factor includes the ability optimism item AO11 describing that support does not hurt but that one does not need it and SO05 describing that one does not rely on others' support.

First of all, the analysis shows that social support optimism needs to be distinguished from rivalry optimism. I therefore keep two factors for social optimism. As social support optimism I keep the variables that load highest on the first factor, i.e. SO03, SO06, SO07 and SO14 (factor loadings above 0.513). With respect to unique loadings item SO04 outperforms SO06; however, SO06 better reflects the social support concept. We furthermore keep those items with largest loadings on factor two as rivalry optimism (SO11, SO12, SO13 and AO07). Item SO12 does not load above 0.4 on this second factor; it loads significantly higher on a separate but related factor.

Because we do not have that many items on rivalry optimism, we need to keep this item, but have to treat this factor cautiously.

For chance optimism, the common factor analysis delivers four factors with eigenvalues above one with one factor being really dominant with an eigenvalue of 3.733, which is way beyond the second with 1.345, third with 1.256 and a fourth with 1.020. With loadings above 0.35 the original items of LOT-R have relatively high loadings on all four factors; on three factors they load with more than 0.496. The first factor collects items that describe general optimism, e.g. “Overall, I expect more good things to happen to me than bad”. Factor 2 is very interesting because it clusters around those items that focus on chance and luck in contrast to more general optimism items. The distinction between factor 1 and factor 2 indicates that indeed specific chance optimism differs from general optimism, which could include many different sources of optimism but does not focus on chance optimism sufficiently well. Thus, factor two seems to focus better on optimism regarding random events. I therefore select those items with largest loadings on factor two for the chance optimism subscale, i.e. items CO05, CO09, CO11, and CO12 (loadings above .472). These are also those items with highest unique factor loadings.

Our analysis resulted in four four-item subscales. To test whether these subscales also separate from each other well, we run three different types of factor analysis jointly on all four subscales. Table 2 provides results from a common factor analysis with oblique rotation reporting full factor loadings and unique factor loadings, and a principal component analysis with orthogonal rotation reporting the rotated factor loadings.

In both analyses there are four factors with eigenvalues above one. The factors load as expected. For unique factor loadings, all items except SO12 are above the larger of these two thresholds. In principal component analysis we observe that factors load on their respective



factors with more than 0.5 and thus way above the thresholds often used as a rule of thumb. Furthermore, 56.5% of variance is explained by these four factors. These results are very promising for our four subscales. However, there are two larger cross loadings between ability and rivalry optimism, i.e. SO13 and AO02. The close relation is intuitive because relative ability judgments are strongly related to ability judgments. There are also three slightly smaller cross loadings between social optimism and chance optimism with values between 0.40 and 0.48. Both subscales represent external sources of uncertainty and are thus be somewhat related. Despite cross loadings, all factors load highest on their respective factor. When testing with a principal component analysis with orthogonal rotation we see that the cross loading are sufficiently small and the four subscales are clearly distinguished also when including unique as well as error variance into the analysis. Our factor structure generally meets the condition that variables should load on their corresponding factors with more than 0.4 to 0.45 for sample sizes between 150 and 200 with the assumption of a significance of 0.05 and a power of 80 percent (Hair et al., 2006, p. 128).

I continue with a confirmatory factor analysis using AMOS 6. Figure 1 plots the results. All standardized weights are above 0.43. Measures of goodness of fit ( $\chi^2=137.6$ ,  $df=98$ ,  $CFI=0.937$ ,  $SRMR=0.0560$ ,  $RMSEA=0.049$  with 90% interval between 0.028 and 0.067) indicate a good fit. However, while RMSEA and SRMR meet the most conservative criteria that we have found, i.e.  $RMSEA<0.06$  and  $SRMR<0.08$ , CFI does not exceed the most conservative threshold of 0.95 that we have found in Hair et al. (2006, p. 753) and Hu and Bentler (1999). A possible reason is the rivalry optimism. Item SO12 for rivalry optimism was a weak item in the initial common factor analysis for social optimism and weak in the common factor analysis of all selected items. Rivalry optimism is also the factor among all four factors with smallest average weights in the confirmatory factor analysis, i.e. R:0.563, S:0.575, C:0.594, and A:0.694).

Furthermore, to improve the model AMOS suggested several error correlations related to rivalry optimism items, i.e. SO11 with AO07, SO13 with CO09, and SO13 with CO11. Including the error correlations we get a better fit (see Figure 3) with  $\chi^2=112.5$ ,  $df=95$ ,  $CFI=0.972$ ,  $SRMR=0.0535$ , and  $RMSEA=0.033$  with 90% interval between 0.000 and 0.055. Altogether these results indicate a rather good fit for the four-factor model with some potential for improvements in the subscale on rivalry optimism. I therefore run a confirmatory factor analysis for three factors excluding rivalry optimism (see Figure 2). The criteria for the goodness of fit including the most conservative criteria indicate a very good fit, i.e.  $\chi^2=61.0$ ,  $df=51$ ,  $CFI=0.978$ ,  $SRMR=0.0491$ , and  $RMSEA=0.034$  with 90% interval between 0.000 and 0.063. If one does not feel comfortable with the four-factor solution (ARCS), one could exclude the rivalry optimism and stick to the three-factor solution (ACS). While ARCS meets criteria that are typically used, ACS meets the most conservative criteria for goodness of fit that we have found.

## VALIDATION

To validate the new ARCS scale system let us look at the correlations between the ARCS subscales, between the subscales and the original self-efficacy scale, the life-orientation test, and the social optimism at the societal level SOSO (see Table 3).

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Insert Table 3 about here  
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### Correlation between subscales of ARCS

Ability and rivalry optimism correlate more with each other than with the other two subscales,  $r=0.544$ . This is no surprise because both involve a judgement of own abilities, either absolute or relative. This relatively strong correlation could be the reason why Item AO07,

which relates to a relative ability judgment, survived in the NGSE scale by Chen et al. (2001), where most except this item do not refer to such comparative judgments. Our ARCS scale distinguishes between these two types of judgments.

While ability and rivalry optimism are at least partially related to internal aspects of the world, both, chance and social support optimism are related to external aspects. Indeed, the latter two also correlated more with each other than with the other two subscales,  $r=0.433$ . However, all correlations between subscales are below .55 and correlations between internal and external aspects are all below .35. The correlations between distinguished subscales are thus reasonable and can be traced back to theory. These observations reveal some discriminant validity for our four subscales. The larger correlation within external and internal sources provides some convergent validity.

#### **Correlation of ARCS with NGSE**

The original scale on self-efficacy NGSE correlates almost perfectly ( $r=0.952$ ) with our subscale on ability optimism, which does not come as surprise as it is a subset of the items of the original scale. The correlation between the selected items and those items that are not selected for our ability optimism scale is 0.919. Altogether we can conclude that we do not lose much information due to the reduction of the number of items. While there are only weak correlations of NGSE with chance and social optimism ( $r<.35$ ) there is a medium correlation of self-efficacy with rivalry optimism ( $r=.631$ ). This is very intuitive due to the relation between ability and rivalry optimism; those who believe to be better than others should also tend to believe that they are good in an absolute sense. The correlations with NGSE thus also provide some convergent as well as discriminant validity.

### **Correlation of ARCS with LOT-R**

Considering the correlations of our subscales with the life-orientation test (LOT-R) by Scheier et al. (1994), one can observe medium correlations with coefficients around 0.5 for ability and rivalry optimism and around 0.6 for social support and chance optimism.<sup>3</sup> Thereby we replicate a finding by Schweizer and Koch (2001) who, based on different measurement instruments, report that the correlation coefficient between self-efficacy optimism and personal optimism is .51. Schweizer and Koch (2001) argue that this is a result of self-efficacy being a component of personal optimism. Following this argument, our results strongly indicate that LOT-R captures an overall optimism including the four types of optimism that we differentiate.<sup>4</sup> This hint gets even stronger when considering the correlation between the sum score of all our four scales and the life-orientation test. The sum score correlates more with the life-orientation test than the single subscales, i.e. correlation coefficient is above .73 independent of whether or not item CO05 is excluded from LOT-R. Our ARCS optimism score thus correlates strongly with LOT-R, but provides much more insights regarding the structure of optimism. These observations provide some convergent validity for the ARCS scale on personal optimism as well as some predictive validity for ability optimism.

### **Correlation of ARCS with SOSO**

I also included the social optimism scale by Schweizer and Koch (2001). This social optimism scale is somewhat connected to optimism used by Wally and Baum (1994) and by Simon et al. (2000). These scales are oriented towards expectations about the future development of the whole society or economy; we therefore abbreviate it with SOSO. It is an interesting observation that all subscales (as well as NGSE and LOT-R) correlate between .2 and .3 with SOSO. The personal social optimism correlates only with .207. Personal social optimism is thus

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<sup>3</sup> We also report the correlation with LOT-R when we exclude item CO05, which is also used in the chance optimism subscale. The correlation with chance optimism decreases but the three other subscales remain between 0.5 and 0.6.

<sup>4</sup> In fact, when we include the LOT-R items into the factor analysis, then they load on different subscales.

not more correlated with social optimism at the societal level than self-efficacy or chance optimism. Thus, our subscales related to social optimism seem to better fit into the conceptualization than the social optimism as suggested by Schweizer and Koch (2001). This is some discriminant validity for our ARCS subscales.

We find further predictive validity for the self-efficacy subscale. Schweizer and Koch (2001) report a correlation coefficient of .20 between self-efficacy optimism and social optimism. Our data show a correlation of 0.211 between self-efficacy of SOSO, which is at a similar level. Furthermore, the sum score of all four ARCS subscales correlated more with SOSO than each single dimensions. SOSO is thus more related to general optimism than to any of the four subscales. The weak correlation between personal optimism and society-oriented optimism could be an explanation why the society-oriented optimism does not show a significant effect on opportunity evaluation in the study by Simon et al. (2000).

In general, our results suggest that the societal-level social optimism either depends on all types of optimism or depends on a more fundamental optimism, which all differentiated types of optimism build on. The new short scale system on personal optimism captures four dimensions of life-orientation. The subscales replicate several findings of other authors measured with different instruments. We thus consider that our very short subscales are valid to an extent that enables further research with these scales.

## **DISCUSSION AND CONCLUSION**

In this paper a scale system for personal optimism is developed that captures four clearly distinct dimensions of personal optimism, namely ability optimism (self-efficacy), rivalry optimism, social support optimism, and chance optimism. It is abbreviated with ARCS. In

contrast to previous research, all subscales are specified at the personal level and joint factor analyses have shown that subscales separate sufficiently well.

### **Limitations**

There are some aspects of this study that need further clarification. First, I briefly discuss the two step approach, where I run common factor analyses for each dimension and finally run it on the full scale system. Second I discuss Cronbach's alphas of the scales and subscales. Thirdly, a specific characteristic of LOT-R is discussed. The limitation section ends with suggesting further work on rivalry optimism.

The analysis consists of two steps, a structure that is not quite common in the literature on scale development. I first did separate exploratory analyses on each of the hypothesized dimensions. Doing this I keep the focus on cleaning the subscales related to single dimensions' instead of focussing on distinguishing the different dimensions from each other. Furthermore, I keep the sample size per variable ratios above 10 instead of below 5 for running the analysis on all 37 variables. Except one item, i.e. AO01, I selected all items due to their appropriateness to measure the single dimension. The fact that nevertheless the dimensions separate well is a strong indicator that the distinction of the four dimensions based on the four subscale is not an artefact of a selection process aiming at distinguishing four dimensions, but that one is confronted with clearly distinguishable dimensions. The dimensions remain stable when switching from common factor analysis that focuses on shared variance to principal component analysis with orthogonal rotation that considers the whole variance including unique and error variance and aims at producing independent factors.

Traditional work on scale development focussed a lot on Cronbach's alpha as a criterion for internal consistency. However, recent work refined criteria on scale development and report that Cronbach's alpha is a rather weak criterion (Cortina, 1993). Nevertheless, Table 3 reports

these alpha values as well. For the ARCS subscales the alphas are above .653. These values suggest these subscales for further exploratory research (Hair et al., 2006:139). This point gets support by the fact that even the established often used 6-item LOT-R falls down to 0.665 at a similar level where the 4-item subscales score as well. Compared to this alpha of a 6-item scale, the alphas of the 4-item subscales are rather good. Cronbach's alpha for the whole scale system is 0.819, which is just below the value of NGSE with .846. However, knowing that ARCS consists of four dimensions, this value is not very insightful. Due to the results based on more recent theories on scale development, I still believe that the ARCS scale system is reliable and – as the correlations demonstrate – also valid.

I used items from LOT-R. For these six items several studies have found a bipolar structure such that positively framed items load on one and negatively framed items on another factor (see Scheier et al., 1994, and Rauch et al., 2007). Spector, Katwyk, Brannick, & Chen (1997) discuss such a bipolar structure as artificial factors resulting from specific response patterns. Recently it has been suggested that the positive items of LOT-R do correlate with social desirability and that the negative items are less susceptible to that (Rauch et al., 2007, Vautier et al., 2003). An indeed testing correlation of the full sum score in comparison to the positive items with social desirability<sup>5</sup> reveals that the latter correlation is small ( $r=0.167$ ) but significant ( $p=.012$ ) while the first is not significant at all. Interestingly, for the ARCS scale system and especially for the shorter ACS scale system one does not need to control for such error correlations to reach a good fit, which suggests that even if those effects might be present, they are sufficiently small. The error correlations that improved the model fit for ARCS do not follow the positive vs. negative items pattern.

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<sup>5</sup> Using a common factor analysis of the five items sampled for social desirability but also on the four items initially suggested by Haghghat (2007) reveal that these four respectively five items did not form a factor, e.g. zero correlation between item SD1 and the sum of items SD3 and SD4. I therefore use the strongest component, i.e. SD2, SD3, and SD4 as an indicator of social desirability.

In the analysis section there was already a discussion of small weaknesses of the rivalry optimism. For exploratory research ARCS should be used. Given recent research showing that people might be unrealistically optimistic regarding one's own abilities but pessimistic regarding their relative performance when being compared with others, but also that people might be unrealistically pessimistic with respect to their own performance but optimistic regarding comparative judgments, the distinction between rivalry optimism and self-efficacy needs further research. Improvements in this dimension are thus subject to further research.

### **Contributions**

Besides developing a sound scale system for personal optimism, I showed that one item from the original NGSE scale, i.e. "Compared to other people, I can do most tasks very well", is distinguished from the other items. It refers to a judgement relative to other people while all other items refer to an absolute judgment. This distinction gets especially emphasized as this item survived in our scale system, but in the rivalry optimism subscale. I therefore recommend removing or exchanging this single item from the NGSE scale. An alternative would be to extend NGSE to account appropriately for comparative judgments; a single item does not seem to be appropriate compared to 7 items related to absolute judgments. The combination of the ability optimism and rivalry optimism subscales could be a good candidate. However, as discussed earlier, there are already empirical results (e.g. Moore and Healy, in press) showing that these two constructs might evolve independently.

The ARCS optimism scale is closely related to LOT-R, but it provides more insights into the structure of personal optimism. I claim that for most purposes where LOT-R could be used, also ARCS can be used to gain more insights into the structure of optimism. An interesting question for future research is whether control beliefs moderate the dependency between ARCS



and LOT-R. When answering LOT-R respondents have their own mindset that determines which component of optimism gets more relevant. In fact, I believe that control beliefs, which describe the perceived influences of different sources of uncertainty on the final outcomes, moderate the dependency between ARCS optimism and LOT-R, which might be considered as a general personal optimism. This hypothesis is subject to future research.

Excluding the rivalry subscale and using only the remaining three subscales (ACS) results in a model with a very good fit and it matches very well to the conceptualisation of control by Levenson and Miller (1976). Levenson and Miller (1976) distinguish control beliefs for internality, powerful others, and chance (IPC). These dimensions correspond to ability optimism (internal), social support optimism (powerful others), and chance optimism (chance). While Levenson and Miller measure how much people believe a specific source, i.e. internal sources, powerful others, and pure chance, affect own progress in life, ACS world beliefs describe to what extent these sources support (more optimistic) or hinder (less optimistic) one's progress in life once they get into control. A joint analysis of ACS optimism and IPC control beliefs is from my point of view a promising path for future research.

Given the small number of items, 16 for ARCS respectively 12 for ACS, this measurement instrument is especially useful for surveys where the number of items is a crucial aspect, e.g. field surveys with entrepreneurs or managers. I believe that this 16-item respectively 12-item measurement instrument can provide a lot of interesting insights into the system of world beliefs and belief distortions of managers and entrepreneurs. Whenever self-efficacy or control beliefs are of interest, the ARCS or ACS scales should be used to control for complementary world beliefs.

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TABLE 1

Factor analyses separately for each of the three dimensions and selected items.

| Item          |       | factor 1             | factor 2             | factor 3           | factor 4             | factor 5             | A | R | C | S |
|---------------|-------|----------------------|----------------------|--------------------|----------------------|----------------------|---|---|---|---|
| AO01          | SE    | <b>.768 (.849)</b>   | -.188 (-.371)        | -                  | -                    | -                    |   |   |   |   |
| AO02          | SE    | <b>.657 (.628)</b>   | .274 (.138)          | -                  | -                    | -                    | X |   |   |   |
| AO03          | SE    | <b>.730 (.802)</b>   | -.159 (-.333)        | -                  | -                    | -                    | X |   |   |   |
| AO04          | SE    | <b>.706 (.703)</b>   | .164 (.012)          | -                  | -                    | -                    | X |   |   |   |
| AO05          | SE    | <b>.708 (.710)</b>   | .144 (-.010)         | -                  | -                    | -                    | X |   |   |   |
| AO06          | SE    | <b>.553 (.532)</b>   | .209 (.094)          | -                  | -                    | -                    |   |   |   |   |
| AO07          | SE    | .411 (.315)          | <b>.514 (.446)</b>   | -                  | -                    | -                    |   |   |   |   |
| AO08          | SE    | <b>.654 (.619)</b>   | .292 (.158)          | -                  | -                    | -                    |   |   |   |   |
| AO09          |       | <b>.589 (.503)</b>   | <b>.507 (.398)</b>   | -                  | -                    | -                    |   |   |   |   |
| AO10          |       | .552 (.492)          | .387 (.280)          | -                  | -                    | -                    |   |   |   |   |
| AO11          |       | .037 (-.023)         | .274 (.279)          | -                  | -                    | -                    |   |   |   |   |
| Var expl. (%) |       | 37.609 %             | 6.830 %              |                    |                      |                      |   |   |   |   |
| SO01          |       | .200 (.186)          | .050 (-.132)         | <b>.845 (.859)</b> | -.034 (-.056)        | .025 (-.124)         |   |   |   |   |
| SO02          |       | -.445 (-.386)        | .096 (.106)          | .050 (.073)        | .105 (.049)          | -.339 (-.158)        |   |   |   |   |
| SO03          |       | <b>.602 (.463)</b>   | .279 (.256)          | .177 (.082)        | -.129 (.000)         | .426 (.257)          |   |   |   | X |
| SO04          |       | <b>-.487 (-.494)</b> | .074 (.126)          | .000 (.019)        | .119 (.074)          | -.227 (.009)         |   |   |   |   |
| SO05          |       | -.432 (-.094)        | -.048 (-.129)        | -.028 (.040)       | .203 (.077)          | <b>-.776 (-.743)</b> |   |   |   |   |
| SO06          |       | <b>.513 (.412)</b>   | .222 (.172)          | .373 (.300)        | .000 (.097)          | .330 (.173)          |   |   |   | X |
| SO07          |       | <b>.524 (.539)</b>   | .202 (.144)          | .259 (.190)        | .105 (.188)          | .153 (-.045)         |   |   |   | X |
| SO08          |       | -.130 (-.122)        | .126 (.111)          | .223 (.216)        | .123 (.114)          | -.120 (-.051)        |   |   |   |   |
| SO09          |       | .075 (-.037)         | -.011 (-.085)        | <b>.453 (.463)</b> | -.127 (-.131)        | .186 (.150)          |   |   |   |   |
| SO10          |       | -.216 (-.104)        | -.098 (.032)         | -.026 (-.032)      | <b>.821 (.810)</b>   | -.171 (-.017)        |   |   |   |   |
| SO11          |       | .056 (.012)          | <b>.619 (.607)</b>   | .112 (.013)        | -.113 (-.027)        | -.101 (-.033)        | X |   |   |   |
| SO12          |       | -.079 (-.186)        | .397 (.297)          | .196 (.171)        | <b>-.602 (-.588)</b> | -.056 (-.024)        | X |   |   |   |
| SO13          |       | -.264 (-.205)        | <b>-.574 (-.487)</b> | -.121 (-.033)      | .453 (.366)          | .007 (.081)          | X |   |   |   |
| SO14          |       | <b>-.514 (-.470)</b> | -.104 (-.074)        | .033 (.088)        | .169 (.085)          | -.274 (-.077)        |   |   |   | X |
| AO07          | SE    | .023 (-.026)         | <b>.615 (.638)</b>   | -.031 (-.134)      | -.105 (-.013)        | -.094 (.003)         | X |   |   |   |
| AO11          |       | -.222 (.036)         | .202 (.112)          | -.055 (-.041)      | -.020 (-.080)        | <b>-.636 (-.646)</b> |   |   |   |   |
| Var expl. (%) |       | 16.677 %             | 10.242 %             | 6.770 %            | 5.419 %              | 2.925 %              |   |   |   |   |
| CO01          | LOT-R | .210 (.031)          | -.242 (-.154)        | .151 (.086)        | <b>-.496 (-.453)</b> | -                    |   |   |   |   |
| CO02          | LOT-R | -.436 (-.341)        | .392 (.248)          | .366 (.361)        | -.015 (-.084)        | -                    |   |   |   |   |
| CO03          | LOT-R | <b>.791 (.821)</b>   | -.245 (.188)         | .069 (.029)        | -.419 (-.253)        | -                    |   |   |   |   |
| CO04          | LOT-R | -.477 (-.292)        | .486 (.330)          | .346 (.372)        | .203 (.134)          | -                    |   |   |   |   |
| CO05          | LOT-R | -.314 (-.031)        | <b>.580 (.552)</b>   | .005 (.025)        | .179 (.088)          | -                    |   |   | X |   |
| CO06          | LOT-R | <b>.533 (.447)</b>   | -.388 (-.173)        | -.017 (-.026)      | -.147 (-.018)        | -                    |   |   |   |   |
| CO07          |       | <b>.680 (.663)</b>   | -.400 (-.105)        | .155 (.168)        | -.047 (.148)         | -                    |   |   |   |   |
| CO08          |       | .111 (.090)          | -.068 (-.013)        | .328 (.320)        | -.119 (-.052)        | -                    |   |   |   |   |
| CO09          |       | -.274 (.108)         | <b>.681 (.699)</b>   | -.066 (-.028)      | .298 (.208)          | -                    |   |   | X |   |
| CO10          |       | <b>.580 (.470)</b>   | -.303 (-.005)        | .078 (.010)        | -.573 (-.461)        | -                    |   |   |   |   |
| CO11          |       | .295 (.089)          | <b>-.472 (-.424)</b> | <b>.469 (.463)</b> | -.153 (.000)         | -                    |   |   | X |   |
| CO12          |       | -.428 (-.195)        | <b>.661 (.606)</b>   | .017 (-.006)       | -.096 (-.239)        | -                    |   |   | X |   |
| Var expl. (%) |       | 26.754 %             | 6.743 %              | 5.619 %            | 3.518 %              |                      |   |   |   |   |

Common factor analysis with oblique rotation, cells with unique loading from pattern matrix (value in parentheses) below 0.3 are suppressed, those above 0.4 are bold.

**TABLE 2**

**Principal axis analysis with oblique rotation and principal component analysis with orthogonal rotation of the four ARCS subscales**

| Item text<br>(German translations were used)  | Item | Orig. Scale | Ability A   |              |              | Rivalry R    |              |              | Chance C     |              |              | Social S     |              |              |       |  |  |        |  |  |       |  |  |       |  |  |
|---|------|-------------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|-------|--|--|--------|--|--|-------|--|--|-------|--|--|
|   |      |             | UPAF        | PAF          | PC           | UPAF         | PAF          | PC           | UPAF         | PAF          | PC           | UPAF         | PAF          | PC           |       |  |  |        |  |  |       |  |  |       |  |  |
| When facing difficult tasks, I am certain that I will accomplish them.                                      | AO02 | SE          | <b>.481</b> | <b>.640</b>  | <b>.616</b>  | -.270        | <b>-.502</b> | .381         | -.004        | -.262        | -.095        | .104         | .300         | .169         |       |  |  |        |  |  |       |  |  |       |  |  |
| In general, I think that I can obtain outcomes that are important to me.                                    | AO03 | SE          | <b>.754</b> | <b>.731</b>  | <b>.807</b>  | .052         | -.291        | .069         | -.008        | -.242        | -.118        | -.006        | .242         | .052         |       |  |  |        |  |  |       |  |  |       |  |  |
| I believe I can succeed at most any endeavor to which I set my mind.  | AO04 | SE          | <b>.642</b> | <b>.720</b>  | <b>.731</b>  | -.073        | -.392        | .198         | -.120        | -.353        | -.219        | .016         | .291         | .101         |       |  |  |        |  |  |       |  |  |       |  |  |
| I will be able to successfully overcome many challenges.  | AO05 | SE          | <b>.683</b> | <b>.713</b>  | <b>.774</b>  | -.071        | -.371        | .168         | .108         | -.172        | .017         | .099         | .289         | .168         |       |  |  |        |  |  |       |  |  |       |  |  |
| When I enter into a competition, my rivals are often worse off than I am.                                   | SO11 |             | -.010       | .329         | .159         | <b>-.719</b> | <b>-.713</b> | <b>.769</b>  | .065         | -.124        | .016         | .104         | .161         | .127         |       |  |  |        |  |  |       |  |  |       |  |  |
| Competition brings out the best in me.  | SO12 |             | .123        | .283         | .175         | -.381        | <b>-.442</b> | <b>.576</b>  | -.117        | -.170        | -.162        | -.156        | -.018        | -.186        |       |  |  |        |  |  |       |  |  |       |  |  |
| When evaluating my chances for success in a competition with others, I tend to be pessimistic. <sup>i</sup> | SO13 |             | -.316       | <b>-.578</b> | <b>-.466</b> | <b>.407</b>  | <b>.590</b>  | <b>-.528</b> | .128         | .361         | .199         | -.105        | -.315        | -.197        |       |  |  |        |  |  |       |  |  |       |  |  |
| Compared to other people, I can do most tasks very well.  | AO07 | SE          | .019        | .296         | .112         | <b>-.589</b> | <b>-.601</b> | <b>.740</b>  | .009         | -.135        | .007         | .037         | .112         | .104         |       |  |  |        |  |  |       |  |  |       |  |  |
| I rarely count on good things happening to me. <sup>i</sup>   | CO05 | LOT-R       | -.286       | <b>-.414</b> | -.363        | -.137        | .114         | .046         | <b>.591</b>  | <b>.652</b>  | <b>.680</b>  | .010         | -.320        | -.095        |       |  |  |        |  |  |       |  |  |       |  |  |
| I never rely on luck. <sup>i</sup>  | CO09 |             | .088        | -.161        | -.014        | -.059        | .056         | .021         | <b>.617</b>  | <b>.671</b>  | <b>.733</b>  | -.223        | <b>-.450</b> | -.293        |       |  |  |        |  |  |       |  |  |       |  |  |
| When my success depends on luck, then I do often better than others would expect.                           | CO11 |             | -.068       | .192         | -.006        | -.193        | -.273        | .300         | <b>-.551</b> | <b>-.558</b> | <b>-.721</b> | -.026        | .211         | -.024        |       |  |  |        |  |  |       |  |  |       |  |  |
| Nothing ventured, nothing gained. <sup>i</sup>  | CO12 |             | -.056       | -.272        | -.153        | -.012        | .134         | -.031        | <b>.448</b>  | <b>.560</b>  | <b>.593</b>  | -.225        | <b>-.434</b> | -.317        |       |  |  |        |  |  |       |  |  |       |  |  |
| I am always optimistic regarding support from others.   | SO03 |             | .007        | .295         | .146         | -.034        | -.156        | .075         | -.204        | <b>-.477</b> | -.382        | <b>.619</b>  | <b>.712</b>  | <b>.657</b>  |       |  |  |        |  |  |       |  |  |       |  |  |
| In general, I expect that more people will support than hinder me.  | SO06 |             | -.002       | -.158        | -.020        | .020         | .078         | -.070        | .034         | .212         | .048         | <b>-.408</b> | <b>-.426</b> | <b>-.636</b> |       |  |  |        |  |  |       |  |  |       |  |  |
| Other people generally have my best interests at heart.   | SO07 |             | .009        | .222         | .098         | -.037        | -.109        | .061         | .054         | -.231        | -.086        | <b>.644</b>  | <b>.628</b>  | <b>.730</b>  |       |  |  |        |  |  |       |  |  |       |  |  |
| One can never rely on deals with rivals. <sup>i</sup>   | SO14 |             | .124        | .299         | .233         | .042         | -.090        | -.035        | -.046        | -.307        | -.184        | <b>.537</b>  | <b>.593</b>  | <b>.637</b>  |       |  |  |        |  |  |       |  |  |       |  |  |
| Var expl. (%)   |      |             | 26.064      |              |              | 29.412       |              |              | 4.080        |              |              | 7.169        |              |              | 9.064 |  |  | 12.583 |  |  | 3.680 |  |  | 7.746 |  |  |

UPAF – unique factor loading in PAF from pattern matrix (left cell, suppressed if below 0.35),

PAF – full factor loadings in PAF (middle cell, suppressed if below .4)

PCA – factor loadings in PCA (right cell, suppressed if below .4)

<sup>i</sup> marks an inversely coded item

**TABLE 2 (selected values)**

**Principal axis analysis with oblique rotation and principal component analysis with orthogonal rotation of the four ARCS subscales**

| Item text<br>(German translations<br>were used)   | Item | Orig.<br>Scale | Ability A |       |        | Rivalry R |       |       | Chance C |       |       | Social S |       |       |       |
|---|------|----------------|-----------|-------|--------|-----------|-------|-------|----------|-------|-------|----------|-------|-------|-------|
|   |      |                | UPAF      | PAF   | PC     | UPAF      | PAF   | PC    | UPAF     | PAF   | PC    | UPAF     | PAF   | PC    |       |
| When facing difficult tasks, I am certain that I will accomplish them.                                      | AO02 | SE             | .481      | .640  | .616   |           | -.502 |       |          |       |       |          |       |       |       |
| In general, I think that I can obtain outcomes that are important to me.                                    | AO03 | SE             | .754      | .731  | .807   |           |       |       |          |       |       |          |       |       |       |
| I believe I can succeed at most any endeavor to which I set my mind.  | AO04 | SE             | .642      | .720  | .731   |           |       |       |          |       |       |          |       |       |       |
| I will be able to successfully overcome many challenges.  | AO05 | SE             | .683      | .713  | .774   |           |       |       |          |       |       |          |       |       |       |
| When I enter into a competition, my rivals are often worse off than I am.                                   | SO11 |                |           |       |        |           | -.719 | -.713 | .769     |       |       |          |       |       |       |
| Competition brings out the best in me.  | SO12 |                |           |       |        |           | -.381 | -.442 | .576     |       |       |          |       |       |       |
| When evaluating my chances for success in a competition with others, I tend to be pessimistic. <sup>i</sup> | SO13 |                |           | -.578 | -.466  | .407      | .590  | -.528 |          |       |       |          |       |       |       |
| Compared to other people, I can do most tasks very well.  | AO07 | SE             |           |       |        |           | -.589 | -.601 | .740     |       |       |          |       |       |       |
| I rarely count on good things happening to me. <sup>i</sup>   | CO05 | LOT-R          |           | -.414 |        |           |       |       |          | .591  | .652  | .680     |       |       |       |
| I never rely on luck. <sup>i</sup>  | CO09 |                |           |       |        |           |       |       |          | .617  | .671  | .733     |       | -.450 |       |
| When my success depends on luck, then I do often better than others would expect.                           | CO11 |                |           |       |        |           |       |       |          | -.551 | -.558 | -.721    |       |       |       |
| Nothing ventured, nothing gained. <sup>i</sup>  | CO12 |                |           |       |        |           |       |       |          | .448  | .560  | .593     |       | -.434 |       |
| I am always optimistic regarding support from others.   | SO03 |                |           |       |        |           |       |       |          |       | -.477 |          | .619  | .712  | .657  |
| In general, I expect that more people will support than hinder me.  | SO06 |                |           |       |        |           |       |       |          |       |       |          | -.408 | -.426 | -.636 |
| Other people generally have my best interests at heart.   | SO07 |                |           |       |        |           |       |       |          |       |       |          | .644  | .628  | .730  |
| One can never rely on deals with rivals. <sup>i</sup>   | SO14 |                |           |       |        |           |       |       |          |       |       |          | .537  | .593  | .637  |
| Var expl. (%)   |      |                |           |       | 29.412 |           |       | 7.169 |          |       |       | 12.583   |       |       | 7.746 |

UPAF – unique factor loading in PAF from pattern matrix (left cell, suppressed if below 0.35),

PAF – full factor loadings in PAF (middle cell, suppressed if below .4)

PCA – factor loadings in PCA (right cell, suppressed if below .4)

<sup>i</sup> marks an inversely coded item

**TABLE 3**  
**Correlations and Cronbach's alphas**

|                           | <b>A</b>          | <b>R</b>          | <b>C</b>          | <b>S</b>          | <b>ACS</b>          | <b>ARCS</b>         | <b>NGSE</b>       | <b>LOT-R</b> <sup>4</sup> | <b>SOSO</b>           |
|---------------------------|-------------------|-------------------|-------------------|-------------------|---------------------|---------------------|-------------------|---------------------------|-----------------------|
| <i>Items</i>              | 4                 | 4                 | 4                 | 4                 | 12                  | 16                  | 8                 | 6                         | 24                    |
| <b>A</b>                  | .787 <sup>1</sup> |                   |                   |                   |                     |                     |                   |                           |                       |
| <b>R</b>                  | .544              | .661 <sup>1</sup> |                   |                   |                     |                     |                   |                           |                       |
| <b>C</b>                  | .328              | .254              | .685 <sup>1</sup> |                   |                     |                     |                   |                           |                       |
| <b>S</b>                  | .318              | .228              | .433              | .653 <sup>1</sup> |                     |                     |                   |                           |                       |
| <b>ACS</b>                |                   | .449              |                   |                   | .793 <sup>1,2</sup> |                     |                   |                           |                       |
| <b>ARCS</b>               |                   |                   |                   |                   |                     | .819 <sup>1,2</sup> |                   |                           |                       |
| <b>NGSE</b>               | .952              | .631              | .299              | .336              | .691                | .764                | .846 <sup>1</sup> |                           |                       |
| <b>LOT-R</b>              | .512              | .499              | .613              | .606              | .762                | .781                | .531              | .665 <sup>1</sup>         |                       |
| <b>LOT-R</b> <sup>3</sup> | .524              | .522              | .472              | .585              | .692                | .730                | .547              | .962                      |                       |
| <b>SOSO</b>               | .211              | .312              | .261              | .207              | .297                | .342                | .217              | .332                      | .861 <sup>1,2,4</sup> |

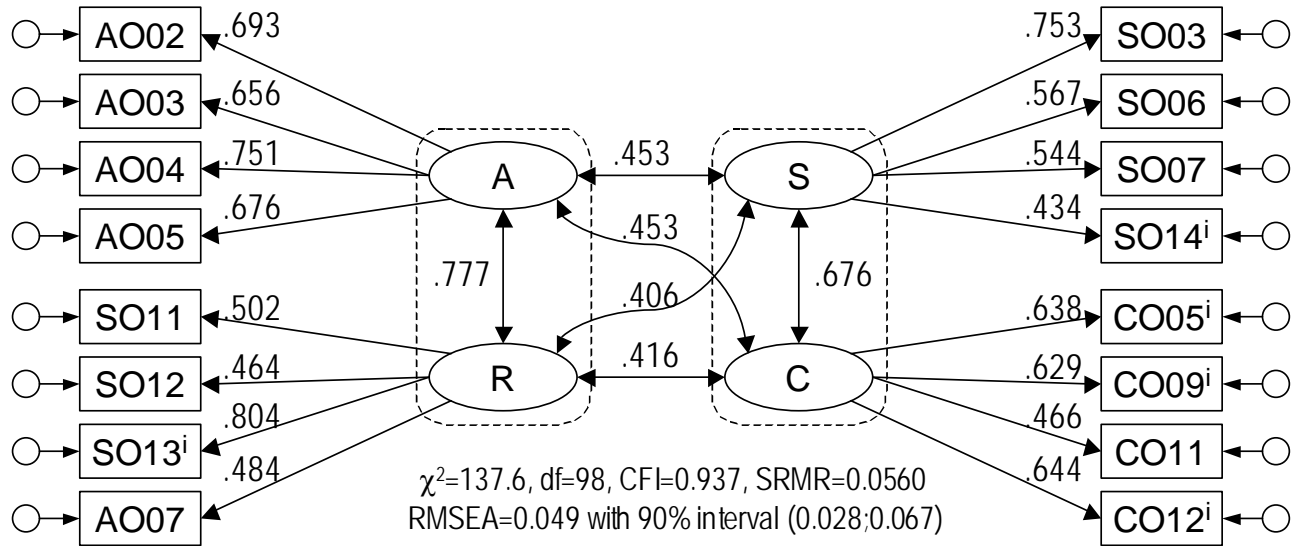
(All correlations are significant at level  $p < .01$ )

- <sup>1</sup> Cells at the diagonal contain Cronbach's alphas for the corresponding set of items.
- <sup>2</sup> Item set consists of multiple factors. Cronbach's alpha should be interpreted carefully due to multidimensionality (see Cortina 1993).
- <sup>3</sup> Item CO05 excluded because it is also contained in C; the number in parentheses is the value for all items of the LOT-R scale.
- <sup>4</sup> A common factor analysis resulted in 7 factors with eigenvalues above 1.0, more precisely one with an eigenvalue of 6.1 and six with values between 2.1 and 1.1. Cronbach's alpha is therefore very much driven by the number of items involved and should be interpreted carefully due to multidimensionality (see Cortina 1993).

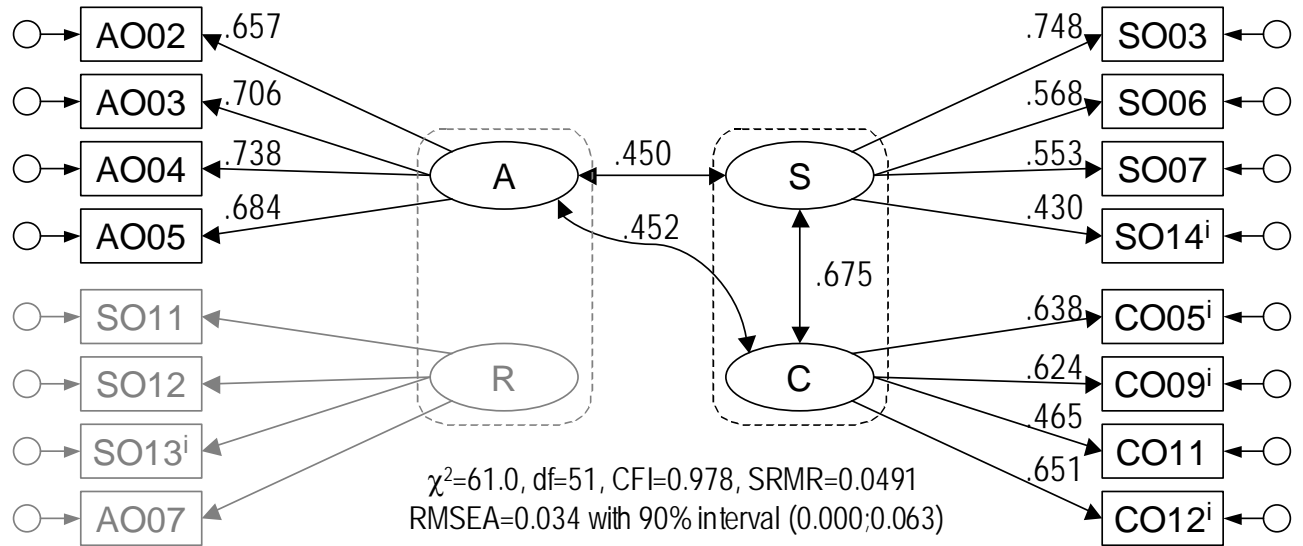


**Figure 1**

**Structural model for ARCS**

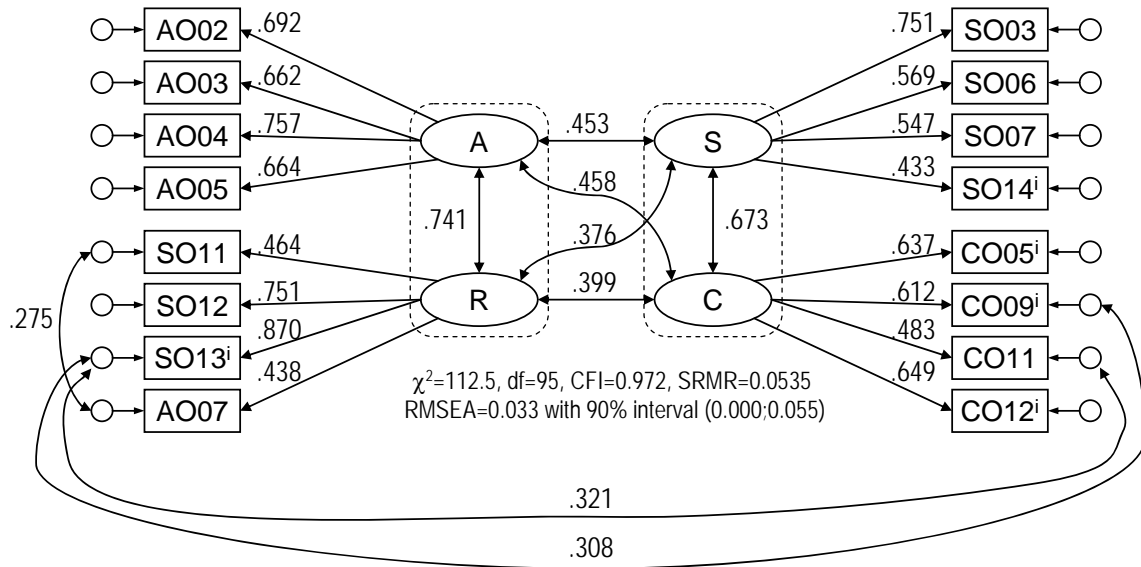


**Figure 2**  
**Structural model for ACS**



**Figure 3**

**Structural model for ARCS with error correlations**



## APPENDIX 1

## German translations of NGSE and LOT-R

| <b>NGSE</b>  |  |
|--|--|
| <b>German</b>  | <b>English (Chen et al., 2001)</b>                                       |
| Ich werde die meisten meiner selbst gesetzten Ziele erreichen können.                            | I will be able to achieve most of the goals that I have set for myself.  |
| Wenn ich vor einer schwierigen Aufgabe stehe, bin ich mir sicher, dass ich sie bewältigen werde. | When facing difficult tasks, I am certain that I will accomplish them.   |
| Im Allgemeinen denke ich, dass ich alle Ziele erreichen kann, die für mich wichtig sind.         | In general, I think that I can obtain outcomes that are important to me. |
| Ich glaube, dass ich bei allem, was ich vorhabe, Erfolg haben kann.                              | I believe I can succeed at most any endeavor to which I set my mind.     |
| Ich werde viele Herausforderungen erfolgreich bestehen.  | I will be able to successfully overcome many challenges.                 |
| Ich bin mir sicher, dass ich viele verschiedene Aufgaben effektiv erledigen kann.                | I am confident that I can perform effectively on many different tasks.   |
| Im Vergleich zu anderen kann ich die meisten Aufgaben sehr gut erfüllen.                         | Compared to other people, I can do most tasks very well.                 |
| Auch wenn es hart auf hart kommt, kann ich gute Leistungen erbringen.                            | Even when things are tough, I can perform quite well.                    |
| <b>LOT-R</b>   |  |
| <b>German</b>  | <b>English (Scheier et al., 1994)</b>                                    |
| In unsicheren Zeiten erwarte ich üblicherweise das Beste.  | In uncertain times, I usually expect the best.                           |
| Wenn bei mir etwas schief gehen kann, dann tut es das auch.                                      | If something can go wrong for me, it will.                               |
| Ich bin immer optimistisch bezüglich meiner Zukunft.   | I'm always optimistic about my future.                                   |
| Ich erwarte fast nie, dass die Dinge so laufen, wie ich es möchte.                               | I hardly ever expect things to go my way.                                |
| Ich verlasse mich sehr selten darauf, dass mir gute Dinge widerfahren.                           | I rarely count on good things happening to me.                           |
| Insgesamt erwarte ich, dass mir mehr gute als schlechte Dinge widerfahren.                       | Overall, I expect more good things to happen to me than bad.             |

NGSE was independently translated by Erik Monsen (English native speaker) with his colleagues at the Max Planck Institute of Economic in Jena and by Diemo Urbig and Julia Stauf (German native speaker) at the Humboldt-Universität zu Berlin. Both translations were finally jointly merged into the translation reported here. LOT-R was also translated by this group of people.

## APPENDIX 2

## List of all items used in the study (German)

| ID   | P <sup>1</sup> | Text   | ID     | P <sup>1</sup> | Text   |
|------|----------------|--|--------|----------------|--|
| SD01 | 15             | Wenn ich Leute treffe, lächle ich sie meistens erst einmal an.   | CO04   | 55             | Ich erwarte fast nie, dass die Dinge so laufen, wie ich es möchte.                                   |
| SD02 | 57             | Das, was ich anderen rate, das setze ich auch selbst um.   | CO05   | 22             | Ich verlasse mich sehr selten darauf, dass mir gute Dinge widerfahren.                               |
| SD03 | 38             | Wenn ich etwas verspreche, dann halte ich es auch, selbst wenn es sehr unangenehm für mich wird.   | CO06   | 48             | Insgesamt erwarte ich, dass mir mehr gute als schlechte Dinge widerfahren.                           |
| SD04 | 7              | Ich würde andere nie anlügen.  | CO07   | 3              | Das Schicksal meint es gut mit mir.  |
| SD05 | 21             | Es gibt viele Dinge, die ich unter keinen Umständen jemandem - nicht einmal meinem engsten Vertrauen oder dem Beichtvater - anvertrauen würde. | CO08   | 1              | Glück winkt nur dem Tüchtigen.   |
| AO01 | 17             | Ich werde die meisten meiner selbst gesetzten Ziele erreichen können.  | CO09   | 36             | Auf Glück würde ich mich nie verlassen.  |
| AO02 | 39             | Wenn ich vor einer schwierigen Aufgabe stehe, bin ich mir sicher, dass ich sie bewältigen werde.   | CO10   | 42             | Ich sehe immer die positiven Seiten der Dinge.   |
| AO03 | 10             | Im Allgemeinen denke ich, dass ich alle Ziele erreichen kann, die für mich wichtig sind.   | CO11   | 8              | Wenn ich auf den Zufall angewiesen bin, dann klappt es meist besser als andere es vermuten würden.   |
| AO04 | 45             | Ich glaube, dass ich bei allem, was ich vorhabe, Erfolg haben kann.  | CO12   | 16             | Nur wer etwas wagt, der gewinnt auch.  |
| AO05 | 26             | Ich werde viele Herausforderungen erfolgreich bestehen.  | SOSO01 | 60             | In Zukunft wird man mit den Bodenschätzen schonender umgehen.  |
| AO06 | 33             | Ich bin mir sicher, dass ich viele verschiedene Aufgaben effektiv erledigen kann.  | SOSO02 | 14             | Die Menschen haben aus den Fehlern der Vergangenheit nichts gelernt.                                 |
| AO07 | 59             | Im Vergleich zu anderen kann ich die meisten Aufgaben sehr gut erfüllen.   | SOSO03 | 43             | Die Renten sind auch für kommende Generationen sicher  |
| AO08 | 64             | Auch wenn es hart auf hart kommt, kann ich gute Leistungen erbringen.  | SOSO04 | 27             | Der wissenschaftliche Fortschritt wird uns eine segensreiche Zukunft bescheren.                      |
| AO09 | 61             | Ich bin von meinen eigenen Fähigkeiten überzeugt.  | SOSO05 | 5              | Der Lebensstandard wird weiter steigen.  |
| AO10 | 50             | Wenn es nur auf mein Können ankommt, dann werde ich Erfolg haben.  | SOSO06 | 29             | Die Menschen sind durch die Erfahrungen der Vergangenheit klüger geworden                            |
| AO11 | 51             | Unterstützung schadet zwar nicht, aber ich bin nie auf Hilfe angewiesen.   | SOSO07 | 62             | Brutalität und Gewalt werden eher zunehmen.  |
| SO01 | 66             | Wenn ich mit anderen zusammenarbeite, dann ist das immer ein Gewinn.   | SOSO08 | 63             | Die Lebensqualität wird besser werden.   |
| SO02 | 4              | Wenn andere mich behindern können, dann tun sie das meistens auch.   | SOSO09 | 54             | Unsere Nachkommen werden es gut haben.   |
| SO03 | 34             | Ich bin immer optimistisch bezüglich der Unterstützung durch andere.   | SOSO10 | 2              | Man wird das Drogenproblem in den Griff bekommen.  |
| SO04 | 6              | Ich erwarte nie, dass andere so mit mir zusammenarbeiten, wie ich es erwarte.  | SOSO11 | 30             | Die globale wirtschaftliche Entwicklung wird in Zukunft immer ungünstiger verlaufen.                 |
| SO05 | 11             | Ich verlasse mich nie darauf, dass andere mich unterstützen.   | SOSO12 | 53             | Zukünftig werden Gewalttaten unter den Menschen abnehmen.  |
| SO06 | 47             | Insgesamt erwarte ich, dass mich mehr Leute unterstützen als behindern.  | SOSO13 | 58             | Die Menschen werden rücksichtsvoller werden.   |
| SO07 | 31             | Andere Menschen meinen es meistens gut mit mir.  | SOSO14 | 35             | Nachfolgende Generationen blicken in eine düstere Zukunft.   |
| SO08 | 28             | Nur wenn ich selbst gut bin, werde ich von anderen unterstützt.  | SOSO15 | 12             | Den Gipfel des Wohlstands haben wir bald überschritten.  |
| SO09 | 37             | Selbst wenn ich sehr gut bin, in einer Gruppe werde ich meistens noch besser sein.   | SOSO16 | 9              | Die Lebensverhältnisse werden sich verschlechtern.   |
| SO10 | 13             | Es schadet mir immer, wenn ich Konkurrenz habe.  | SOSO17 | 41             | Das Drogenproblem wird sich verschlimmern.   |
| SO11 | 56             | Wenn ich mich auf einen Wettbewerb einlasse, dann haben die anderen meist die schlechteren Karten.   | SOSO18 | 19             | Die Rohstoffvorräte der Welt werden ohne Rücksicht auf nachfolgende Generationen ausgebeutet werden. |
| SO12 | 52             | Wettbewerb bringt mich dazu besser zu werden.  | SOSO19 | 24             | Ich glaube, dass der Umweltzerstörung Einhalt geboten wird.  |
| SO13 | 44             | Bei der Einschätzung meiner Erfolgchancen im Wettbewerb mit anderen, bin ich eher pessimistisch.   | SOSO20 | 32             | Die Spannungen zwischen Deutschen und Ausländern werden zunehmen.                                    |
| SO14 | 25             | Auf Absprachen mit Konkurrenten kann man sich nie verlassen.   | SOSO21 | 65             | Die Altersversorgung der jungen Menschen in Deutschland ist unsicher.                                |
| CO01 | 20             | In unsicheren Zeiten erwarte ich üblicherweise das Beste.  | SOSO22 | 46             | Die Kriminalitätsrate wird immer weiter ansteigen.   |
| CO02 | 49             | Wenn bei mir etwas schief gehen kann, dann tut es das auch.  | SOSO23 | 18             | Die Menschheit wird die Umwelt zugrunde richten.   |
| CO03 | 40             | Ich bin immer optimistisch bezüglich meiner Zukunft.   | SOSO24 | 23             | Das Verhältnis von Ausländern und Deutschen wird sich verbessern.                                    |

<sup>1</sup> Position of items in the questionnaire