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# The Virtue Ethics Hypothesis: Is there a nexus between virtues and well-being?\*

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## Abstract

Why do some people behave pro-socially while others do not? Using an experimental design based on Konow and Earley (JPubE, 2008), I investigate a reason already proposed by Aristotle in his *Nicomachean Ethics*: He claims that there is a nexus between virtues and well-being and that enduring well-being cannot be achieved by hedonic pleasures and material affluence, but only by virtuous behavior. In order to analyze this hypothesis, I use a within-subject design. Initially, participants answer an elaborated well-being questionnaire and then play six different cooperation games. I examine two questions in connection with the Aristotelian idea: First, do more virtuously behaving subjects report on average higher well-being? Second, if the answer is affirmative, what is the underlying causal relationship? I find a favorable correlation between well-being and virtuous behavior and examine different hypotheses about what leads to virtuous behavior: My experimental data is mostly in line with the hypothesis that virtuous behavior is both a long-run cause as well as a short effect of a specific type of long-run well-being, called *eudaimonic well-being*. To this extent, I find evidence in favor of a nexus between virtues and well-being.

*JEL classification:* C91; D64; D03

*Keywords:* Happiness, Other-regarding preferences, Experimental Economics

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# 1 Introduction

In experimental economics, social preferences have received a lot of attention. Many people seem not only to be motivated by material self-interest but also by the material payoffs of others. In laboratory experiments, many participants for example share their initial endowment with others, trust and cooperate with each other or punish free-riders (e.g. dictator game, trust game and public goods game). This kind of pro-social behavior has been used to analyze among other things charity giving, the provision of public goods and the emergence of efficiency wages (see e.g. Karlan and List 2007; Fehr et al. 1993). Although there is some dispute about to what extent experimental results about social preferences can be generalized to the field (see e.g. Levitt and List 2007; Camerer 2011), it is claimed that a country's economic prosperity depends on the willingness of its citizens to behave pro-socially. In political science for example, social capital theory has argued that different levels of trust in societies explain differences in economic prosperity across countries (see e.g. Banfield 1958; Fukuyama 1995; Knack and Keefer 1997). More recently, economists have confirmed that there is indeed a causal effect of trust on growth (see Tabellini 2008, Algan and Cahuc 2010). The social capital literature argues that trust is a key ingredient in almost any commercial transaction and that the development of a successful market economy depends on the evolution of trust. But trust of course can only develop, if people expect others to cooperate. Cooperation however remains fragile, if free-riding behavior is not sufficiently punished.

A common and arguably not unsurprising finding of the experimental literature is that we observe heterogeneity in pro-social behavior (see e.g. Fischbacher et al. 2001; Bohnet et al. 2006): Some people trust, others do not, some people cooperate, others do not etc. This naturally leads to the following question: Why do some people give, trust, cooperate and punish unfair behavior while others do not? And, if one knows the answer, how can the fraction of pro-socially behaving citizens in a society be increased? So far, the literature does not provide conclusive answers to these two questions. In this paper, I will analyze one particular explanation for this kind of heterogeneity that we may call the *Virtue Ethics Hypothesis (VEH)*. This hypothesis has first been proposed by Aristotle (1987) in his *Nichomachean Ethics* and is nowadays at the center of *virtue ethics*, one branch of normative ethics besides Kantianism and consequentialism (see e.g. Anscombe 1958; Foot 1978). Aristotle claims that there is a nexus<sup>1</sup> between *long-run* (or *enduring*) well-being and virtues and suggests that well-being arises from a life of virtue and not from the pleasure derived from material affluence. Although this clearly suggests one causal

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<sup>1</sup>I will use the words *nexus* and *relationship/correlation* as synonyms. The only reason not just to use the more simple expression *relationship* is that in the philosophical literature the term *nexus* is used in connection with well-being and virtues.

direction, causality could of course also go the other way, namely, higher long-run well-being could also lead to more virtuous behavior. The crucial point is that the VEH claims that long-run well-being and virtuous behavior are decisively connected, either via one or both ways of causality. In line with this idea, the degree of ethical maturity (defined as an individual's insight into the relationship of virtuous behavior and well-being) decides whether a person behaves virtuously or not. Mature people know that virtuous behavior increases their well-being whereas less mature people are unaware of this insight.

I will analyze this Virtue Ethics Hypothesis based upon an experimental design of Konow and Earley (2008) (henceforth KE). The authors (p. 2) examine a related question, the so-called *hedonistic paradox*: This means that "the person who seeks pleasure for him- or herself will not find it, but the person who helps others will." Crucially however, KE interpret this paradox not in the sense that there is general connection between well-being and virtuous behavior (as suggested by the VEH) but they focus more narrowly on the relationship of generosity and well-being. Hence, they combine a dictator game with an extensive well-being questionnaire including several well-being measures. They find a favorable relationship between long-run well-being and generosity in the dictator game. Importantly however, the non-strategic structure of the dictator game surely provides a suitable setting to measure generosity but it (deliberately) excludes any kind of reciprocal interactions that play a key role in typical economic interactions. Hence, the first contribution of my paper is to extend KE's design from generosity to other patterns of virtuous behavior: I will basically focus on those aspects of pro-social behavior already introduced before: trust, cooperation (positive reciprocity) and punishment of unfair behavior (negative reciprocity).

I use a within-subject design, in which subjects first answer several well-being questions and then play six different cooperation games measuring different aspects of virtues behavior (or pro-social behavior). The well-being questionnaire has two main features. First, it covers both long-run as well as short-run well-being. Second, it covers two different well-being concepts, eudaimonic vs. hedonic well-being, which will be explained in detail in the next section. I use the following games: dictator game, sequential prisoners' dilemma, mini-ultimatum game, joy-of-destruction game and two third-party punishment games. These games provide subjects with the opportunity to trust and to behave positively or negatively reciprocal and show spiteful/antisocial preferences. Additionally, the games distinguish between second-party (mini-ultimatum game) and third-party punishment. Hence, a second contribution of my paper is to analyze in more detail under which circumstances punishment of unfair behavior can be seen as personally beneficial in the sense that it increases or decrease the punisher's well-being.

So far, the literature (see e.g. Herrmann et al. 2008, Abbink et al. 2010) has mainly discussed whether punishment is socially beneficial, that is whether punishment increases overall (monetary) efficiency. However, socially beneficial punishment might still not be desirable if the people's associated loss in well-being offsets monetary gains.

In line with KE, I am first of all interested in the following question: Do more virtuously behaving people report on average greater well-being? That is, do those experimental participants who give more, trust more, cooperate more and punish unfair behavior more strongly report on average greater well-being? If the answer is affirmative, a natural question is what kind of causal relationship underlies this finding. For this purpose, I analyze to what extent my data is in line with several competing hypotheses about what leads to virtuous behavior. For these hypotheses, the two different well-being concepts as well as short-run and long-run well-being measures asked by the questionnaire are utilized. The question is whether long-run or short-run well-being, whether hedonic or eudaimonic well-being are decisively connected with virtues behavior and which is the direction of causality.

Results suggest that there are favorable correlations between generosity, trust, positive reciprocity (cooperation) and long-run well-being measures. Correlations between generosity, trust, positive reciprocity and short-run well-being are much more limited. In line with KE, the experimental evidence is most strongly in line with the hypothesis that virtuous behavior is both a long-run cause as well as a short cause of a specific type of long-run well-being, called *eudaimonic well-being*. To this extent, evidence for a nexus between virtues and (eudaimonic) well-being is found. Aristotele's main insight into the relationship between well-being and virtuous behavior seems to be right.

As pointed out, for negative reciprocity (punishment), my design distinguishes between second and third-party punishment and hence varies the extent to which punishment can be seen as altruistic. In line with expectations, a connection with long-run well-being is only found for (expensive and) fairly altruistic third-party punishment. In the ultimatum game however, well-being and the rejection of unfair offers are (if at all) negatively correlated. As outlined earlier, we might hence not only distinguish between socially beneficial and socially non-beneficial punishment but also between personally beneficial and non-beneficial punishment: In my setting, punishment seems only to be personally beneficial in terms of increased well-being in some settings (third-party punishment with high costs) whereas this is not the case in other settings (second-party punishment).

My paper is related to an increasing experimental literature combining laboratory experiments and happiness research (see e.g. Charness and Grosskopf 2001; Ifcher and Zarghamee

2011). In connection with virtuous or pro-social behavior, nearly all existing experimental studies besides KE have focused on the relationship of pro-social behavior and short-run well-being or mood, whereas the Virtue Ethics Hypothesis focuses on the connection with long-run well-being. Asking short-run well-being questions, Bosman and Winden (2002) look at the power-to-take game, Kirchsteiger et al. (2006) consider the gift exchange game, Becchetti and Antoni (2010) analyze the trust game and Konow (2010) looks at the dictator game. Overall, this evidence supports the view that short-run well-being or emotions can play a role in virtuous behavior, although the evidence is not overwhelming and probably most strongest for non-virtuous or anti-social behavior. Additionally, neuroeconomic studies support the view that emotions play a role by analyzing people's brain activity: It finds that certain brain activities cause (or are at least related to) pro-social behavior (see Fehr et al. 2005; de Quervain et al. 2004; Kosfeld et al. 2005; Knoch et al. 2006). These results are obviously interesting in themselves. They help us to understand why people behave in a certain manner. But they do not provide us with a straightforward explanation why people differ in their behavior, that is, why some people show a particular brain activity and others do not, or why some people are driven by certain emotions and others are not. Additionally, there is a literature in psychology that relates pro-social behavior in cooperation games and personality traits (see Kurzban and Houser 2001; Hirsch and Peterson 2009; Fleming and Zizzo 2011; Volk et al. 2011). However, these studies have unfortunately not received great attention in economics so far. Finally, there are some empirical economic papers that try to investigate whether a nexus between virtues and well-being exists (see James 2011; Guven 2011). These studies found evidence in favor of such a nexus. One problem of such empirical studies however is, that they basically have to rely on survey questions regarding virtuous behavior. A major advantage of the experimental approach is that it provides reliable data on ethical behavior. In my experiment, ethical behavior is incentivized and hence comes at a cost. Additionally, in typical surveys, only one well-being concept is used. In contrast, in my well-being questionnaires two different well-being approaches are used.

The structure of the paper is as follows. Section 2 provides some background information regarding happiness research and the measurement of well-being. Section 3 provides the experimental design. Section 4 presents the results and Section 5 concludes.

## **2 Background: Well-Being**

The economics of happiness have developed to a large and diversified field. In the following, I will first focus on the distinction between two different well-being approaches that are used in my questionnaire: Hedonic and eudaimonic well-being. Afterwards, I will provide the reader

with a eudaimonic interpretation of the Virtue Ethics Hypothesis. For more general topics within this literature the reader is referred to respective survey articles and books: e.g. Frey and Stutzer, 2002; Diener and Seligman, 2004; Easterlin, 2002; Layard, 2005; and Frey, 2008. Measures of well-being such as subjective well-being (SWB) have not been readily accepted by economists, who traditionally rely on observing people's actions rather than their answers to questionnaires. However, there is ample evidence showing that self-reported measures correlate with other observable variables in a plausible way. Di Tella and MacCulloch (2006) provide an overview regarding questions about the meaning and validity of happiness measures.

## 2.1 Eudaimonic versus Hedonic Well-Being

In happiness research two main competing approaches regarding well-being have emerged: Hedonic and eudaimonic well-being. Ryan and Deci (2001) (and also KE) provide an excellent overview of the two different research traditions. Most importantly, the two approaches differ in their perception of what well-being really is about. The *hedonic school* (see e.g. Kahneman et al. 1999; Layard 2005) follows a distinct empirical approach and focuses on well-being in the form of *happiness* - that is, well-being is defined in terms of the antagonism of pleasure versus pain. This means that well-being is considered as an outcome variable typically measured by subjective well-being (SWB): People rate their well-being by themselves according to their own standards. The *eudaimonic school* (see e.g. Ryff 1989; Ryff and Singer 2008) is more theoretical. It examines well-being in form of *eudaimonia*, which arises from a process of human growth and self-fulfillment. Basically, this school does not consider well-being so much as an outcome variable, but tries to theoretically establish criteria for well-being and looks to what extent people match these criteria. Eudaimonic well-being can be measured by psychological well-being (PWB): The idea of this concept is that psychological scales define criteria for the fully-functioning individual "living a life rich in purpose and meaning" (Ryff and Singer, 2008, p.1).

Philosophically the eudaimonic concept goes back to Aristotle and his idea of *eudaimonia* ("human flourishing"). Compared to the hedonic approach the eudaimonic approach is much more diverse. To further clarify the differences of the two approaches, I want to consider two consistent features that connect different contributions of the eudaimonic literature that have been outlined by KE (p.7): First, in the eudaimonic tradition lower and higher needs and desires are distinguishable (e.g. need for food, monetary pleasures versus positive relations): The literature actually assumes that there are objectively valid needs rooted in human nature the realization of which is essential to human growth, whereas this is not the case for some only

subjectively felt needs (Ryan and Deci, 2001; Maslow, 1968; and Fromm, 1981). The hedonic approach instead does not a priori distinguish between different types of needs. Especially, it does not make the distinction between objectively valid needs and only subjectively felt needs. It just asks how pleasurable the fulfillment of a need is. Second, the eudaimonic analysis is process, not outcome orientated. That is, human beings should progress according to their psychological needs and their individual-specific potentials (Maslow (1968) called this process self-actualization). Realizing one's potentials is important, not a particular outcome per se. The hedonic analysis is not necessarily opposed to the view that self-fulfillment might make you happy. But its clear focus is on whether or not you feel pleasure, due to self-fulfillment or anything else.

Summing it up, the most important difference between SWB (hedonic approach) and PWB (eudaimonic approach) is that the former approach relies on people's own perception of well-being whereas the eudaimonic approach defines criteria for well-being. Or in the words of Diener et al. (1998, p.33-34) who support the hedonic school (and its measure SWB): "Subjective well-being pays more attention to people's values, emotions, and evaluations, and does not grant complete hegemony to the external judgments of behavioral experts." Although this statement might naturally seem compelling for many economists, parallelizing for example the principle of consumer sovereignty, the question which approach is more productive remains an empirical one. In the next section, I will present a eudaimonic framework in which hedonic well-being (or its measure SWB) arises as a favorable by-product of eudaimonic well-being (or its measure PWB). In KE's analysis this framework has shown quite some predictive power.

## **2.2 Eudaimonic Interpretation of the Virtue Ethics Hypothesis**

KE (p. 7) suggest two other consistent features of the different contributions of the eudaimonic literature: First, SWB (as the measure of hedonic well-being) is only seen as a favorable by-product of PWB (as the measure of eudaimonic well-being). In this sense, eudaimonia can then be seen as the SWB generated by PWB or in other words: Eudaimonia is well-being generated by a conduct of life that satisfies human psychological needs. Second, this literature argues that only certain kinds of attitudes and behavior are considered to foster PWB. Aristotle would argue that long-run well-being (PWB) only arises from a life of virtue. A more modern interpretation is provided by Sheldon and Kassner (1995): The authors distinguish between intrinsic and extrinsic goals (self-acceptance, affiliation and community feeling versus financial success, popularity and attractiveness). People following the former goals are found to report higher values of PWB and SWB.



In order to formalize these ideas, KE provide an economic interpretation of PWB using a framework of Graham and Oswald (2010) who introduce the stock-flow concept into the happiness literature. In KE’s interpretation of this model, people have a *stock* of psychological well-being (PWB). We may think of this stock as a set of personality characteristics to which one can only add via certain behavior. This stock of PWB then produces a *flow* of psychological resources which can be used for two purposes: First, these resources can be used to generate pleasure (hedonic happiness - SWB); second, they can be used to invest in the stock of PWB via specific behavior, especially virtuous behavior. In the steady-state of the model, a higher stock of PWB results in higher average return in happiness (SWB). Figure 1 illustrates this concept.

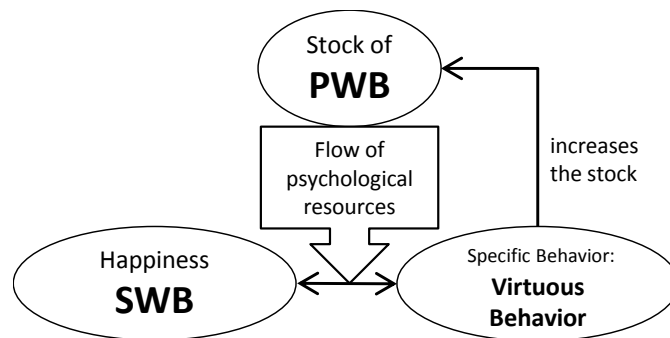


Figure 1: Stock flow concept of well-being

For a better understanding of the model, consider the following example: We have two individuals, one with a high and one with a low stock of PWB. Both individuals want to avoid pain and ensure themselves a minimum level of pleasure. They are in the following situation: In the second stage of a (one-shot) sequential prisoner’s dilemma, defecting yields a higher material payoff than cooperating. An individual with low PWB has on average only very little psychological resources. In order to ensure a minimum level of pleasure, this person basically has to use every opportunity to generate happiness (SWB) and hence defects because of the higher material payoff. An individual with high PWB has on average plenty of psychological resources. Therefore this person can use the situation to invest in his or her stock of PWB by cooperating instead of defecting.

Probably the reader should not take the model too literally. Strictly speaking, it would suggest that e.g. helping others is not directly rewarding in itself because such behavior would first of all only increase the level PWB, and hence only indirectly lead to more hedonic happiness (SWB). Anecdotal evidence might on the contrary suggest, that many people for example try to help the poor because helping others as such makes them happy. Nonetheless, the term *virtuous behavior* seems to suggest that there is a trade-off between your own and other people’s well-being. The model captures this trade-off in the strictest way: Either you behave virtuously

or you are happy. And if you behave virtuously, you will only get happy in the long-run. Probably it is noteworthy, that this kind of strict interpretation might be especially suitable for my laboratory setting because participants do not to whom they behave kindly.

Considering the two different approaches of well-being and their relationship towards each other, we have come to what can be called a eudaimonic interpretation of the Virtue Ethics Hypothesis (VEH). That is, a VEH in which eudaimonic well-being (or its measure PWB) plays the key role and not hedonic well-being (or its measure SWB). In this sense, the core implication of the model is the following: Virtuous behavior is a *long-run* cause of PWB, and a *short-run* effect of it. That is, continuous virtuous behavior results in a high level of PWB. And subsequently, a high level of PWB provides the necessary psychological resources for behaving virtuously (and to produce hedonic happiness).

Is there any evidence in favor of this model so far? Positive psychology seems to provide evidence for the claim that virtuous behavior is a long-run cause of PWB: Performing acts of kindness is a long-run cause of PWB (Sheldon and Lyubomirsky 2006; Lyubomirsky et al. 2005; Lyubomirsky et al. 2011; Seligman et al. 2005). However, virtuous behavior as pro-social behavior in laboratory experiments can be interpreted as some form of kind behavior, at least if giving, trusting and cooperating is considered. For punishment of course, this is not so clear. The crucial question seems to be to what extent punishing others can be considered as an act of kindness rather than an act of mere retaliation or revenge. In my design, I distinguish between second-party and third-party punishment. Retaliation may play an important role in second-party punishment. However, the motives for third-party punishment might be different: Punishing unfair behavior as an uninvolved third party may be considered as an act of kindness towards the player who is hit by unfair behavior. I will discuss this difference in more detail in the section about the experimental hypothesis.

To sum it up, the eudaimonic interpretation of the VEH, introduced in this section, will be my major hypothesis concerning the relationship of virtuous behavior and well-being. As outlined in this section, this hypothesis postulates both lines of causality. However, unlike psychologists, I will not perform a longitudinal study. Hence, I will focus on the aspect whether virtuous appears to be a short effect of a high level of PWB. That is, participants enter the laboratory with a level of PWB that is fixed in the short-run. I am then interested in whether subjects higher in PWB have a higher probability to behave virtuously. I think it seems plausible to suggest both lines of causality and to phrase my hypotheses in line with one particular direction of causality suggested by the outlined stock flow concept. Nonetheless it is important to note that long-run well-being cannot be experimentally varied easily and hence there is no exogenous variation in

long-run well-being in my data. This means that a possible finding that virtuous behavior seems to be a short-run effect of PWB could also fully be driven by the fact that virtuous behavior is a long-run cause of PWB, as shown by psychologists. Importantly however, in this case there is still a crucial connection between virtuous behavior and long-run well-being.

### 3 Experimental Design

In order to analyze the relationship between virtues and well-being, I implemented an experiment in which subjects first answered a extensive well-being questionnaire with more than 100 questions and then played six cooperation games. Additionally, participants answered questions on their instantaneous mood after the first game, after the second game and after the last game. At the end, they made decisions about simple lotteries (risk elicitation) and completed a follow-up questionnaire. Each participant had to answer the well-being questionnaire and had to play each game exactly once. All parts of the experiment were computerized. The first four games are two-player games. In the last two games, three players interact with each other. In games with more than one role, participants made decisions for all roles. When appropriate, the strategy-method is used.

Each of the six games was presented separately in a different section of the experiment. Instructions were displayed on screen, and for the more complicated games, additional control questions were provided. The experiment only continued when everybody had understood the game and had solved the control questions. Participants did not receive any feedback until the end of the game. They had to make their decisions without any information about other players' choices. I am not interested in the interaction of players, but in individual choices and their relationship with well-being measures.

#### 3.1 The Well-Being Questionnaire

Before playing the games, subjects answer the extensive well-being questionnaire that contains all the well-being measures used by KE (plus one additional measure). The questionnaire's basic structure is the following: It asks questions about hedonic and eudaimonic well-being and distinguishes between long-run and short-run well-being. It consists of ten measures of subjective well-being (SWB - hedonic approach) and three measures of psychological well-being (PWB - eudaimonic approach). SWB has basically two components: an affective and a cognitive-evaluative component. Additionally, we can distinguish between long-run and short-run SWB. In contrast, PWB is considered as a (long-run) personality trait that is fixed in the short-run.<sup>2</sup>

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<sup>2</sup>The appendix contains all items upon which these measures are based.

For long-run SWB, there are seven measures: An overall happiness question (OH: "Overall, how would you describe yourself") measures the cognitive-evaluative component on a nine-point scale (ranging from "extremely unhappy" to "extremely happy"). Additionally, there are two similar questions about the "highest" (HH) and the "lowest" (LH) happiness level subjects have experienced. To measure the long-run affective SWB component, four instruments are used: the Positive and Negative Affect Schedule (PAS and NAS) by Watson et al. (1988) and the five positive affect (PA) and negative affect (NA) items by Bradburn (1969). Short-run SWB is measured by two instruments: A single now happiness question (NH: "Right now, how would you describe yourself"), which measures the cognitive-evaluative component, and the Mood Index (MI) by Batson et al. (1988), which measures short-run affect or mood. NH and MI are measured at the very beginning, after the first, after the second, and after the last game. By subtracting the score of NH/MI at one point in time from the score of NH/MI at an earlier point in time, I will examine the change in current happiness (NHD) and the change in mood (MID) caused by a behavioral choice in the DG and the SPD. The last SWB instrument measures cognitive life satisfaction (Diener et al. 1985 - SWL).

PWB is measured by only three scales. Following KE, I use the Self-Actualization Index (SAI) by Jones and Crandall (1986) and the Scales of Psychological Well-Being (SPWB) by Ryff (1989). More precisely for the later measure, I use an index (PWBI) as KE do.<sup>3</sup> Additionally, I implement the Social Well-Being Scale (SoWB) by Keyes (1998). Broadly speaking, PWB tries to measure whether an individual is fully functioning and living a life with purpose and meaning as outlined in Section 2. KE's measures of PWB (SPWB and SAI) mainly focus on psychological functioning as a private phenomenon. Out of the six dimensions of the SPWB for example only two are more or less related to the social dimension of life.<sup>4</sup> The SoWB however directly tries to evaluate to what extent an individual is flourishing in a society. It (Keyes 1998, p. 122-123) tries for example to evaluate to what extent people feel integrated in society, believe that they are "a vital member of [their] society" or to what extent people are hopeful about the future of society. I extended KE's measure of PWB by SoWB because I think that the social dimension of life is a very important dimension of a deeply satisfying life and that individuals are naturally embedded in social structures and communities.<sup>5</sup>

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<sup>3</sup>Ryff's Scales of Psychological Well-Being consist of six separate scales. In the abbreviated version which I use, each scale is only measured by three items. As KE outline, these items were rather chosen for conceptual breadth than for reliability. In order to increase reliability, one can construct an index of SPWB by choosing only the item with the highest average inter-item correlation per scale. For more details see KE's footnote 23.

<sup>4</sup>The SPWB has the following six dimensions: Self-acceptance, autonomy, purpose in life, personal growth, environmental mastery and positive relations with others. Although the first four dimensions also have connections with the social aspect of life, they are mainly a private phenomenon. The last two dimensions are more explicitly related to the social aspect of life.

<sup>5</sup>The question remains whether it is reasonable to include SoWB as a measure of PWB from a psychological view point? In the psychological literature, the term PWB is often used more restrictively in line with Ryff

The last part of the well-being questionnaire is the Marlowe-Crowne (MC) social desirability scale, which is used as a control for social desirability. This scale is especially important in my setting because unlike KE I only use a *single* but not a *double-blind* procedure. In a double-blind procedure, neither the other subject nor the experimenter would know individual answers and decisions. With six different games played such a procedure is however not reasonably accomplishable. This means that in my design the experimenter is potentially able to uncover subjects' decisions and answers to well-being questions which might bias subjects' behavior. In the results section, I will give some remarks how this procedural change may effect outcomes.

In the follow-up questionnaire, subjects had to answer demographic questions (including items about income and expenditures) and to what extent they understood the experiment. Especially, subjects could indicate how sure they were on 1-to-9 scale that they succeed in answering the well-being questionnaire truly. Additionally, I collected a measure of cognitive ability: the cognitive reflection test (CRT) introduced by Frederick (2005). This quick test only consists of three questions. It does not measure cognitive ability per se, but distinguishes quick, impulsive decision makers from more reflective decision makers. Every question of the CRT has an intuitive answer that is incorrect. Although very short, Frederick shows that the cognitive reflection test relates well to more complex measures of cognitive ability.<sup>6</sup>

### 3.2 The Experimental Games

After completing the well-being questionnaire, subjects play different games. The following four games are used: a dictator game (henceforth DG), a sequential prisoner's dilemma (SPD), a joy-of-destruction game (JOD-G) and a mini-ultimatum game (Mini-UG). Games five (SPD-P) and six (DG-P) are a variant of the first two games with an additional punishment stage. These games were chosen in order to extend the analysis of KE from generosity (measured by the dictator game) to economically more important behavioral patterns such as trust, (conditional) cooperation and punishment (positive and negative reciprocity).

My DG is a standard variant of the game. The dictator has an endowment of 20€ and can

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(1989), that is, psychological functioning is measured by Ryff's six dimension and it is mainly treated as a private phenomenon. However, this literature also uses the term in a much broader meaning just following the general idea of a fully functioning person (see Brown and Ryan, 2003). In this line, I will keep KE's notation of PWB and treat Social well-being (SoWB) as a measure of PWB because I believe that human beings as a social animals cannot fully function without flourishing socially. Someone who understands PWB only in terms of Ryff (1989) may also call my well-being measures just eudaimonic well-being.

<sup>6</sup>For all measures, I used German versions when available and carefully translated measures when not: For Bradburn's Positive Affect (PA) and Negative Affect (NA) items, I used the translation by Becker (1982); for the Positive Affect (PAS) and Negative Affect (NAS) Schedules, I used the translation by Krohne et al. (1996); for the Satisfaction with Life Scale (SWL), I used the translation by Schumacher et al. (2003); for the Marlowe-Crown Social Desirability Scale (MC), I used the translation by Lück and Timaeus (1969); for the cognitive reflection test (CRT), I used the translation by Oechssler et al. (2009). All other measures were translated by myself.

Game	Label	Measure for ...
Dictator game	DG	generosity, altruism
Sequential prisoner's dilemma	SPD	trust and cooperation
Mini-ultimatum game	Mini-UG	second-party punishment
Joy-of-destruction game	JOD-G	spite
SPD with punishment	SPD-P	third-party punishment (low cost)
DG with punishment	DG-P	third-party punishment (high cost)

Table 1: Summary of Games

send 0€, 2€, ... , 20€ to the recipient who has an initial endowment of 0€ and who has to accept any choice the dictator makes . Unlike in KE's experimental design, each subject makes a decision in the role of the dictator. Additionally, I do not use a double-blind procedure (like KE) because of the five additional games. The DG is implemented to measure generosity (altruism) and to replicate the results of KE.

For the SPD, I use a version proposed by Burks et al. (2010). One player moves first, the other player second. Both player are initially allocated with 10€. The first mover can only make a binary decision: choose an amount  $s_1 \in \{0€, 10€\}$  to send to second mover. The second mover observes this action and chooses an amount  $s_2 \in \{0€, 2€, 4€, 6€, 8€, 10€\}$  to send back to the first mover. Any amount send by the first or the second mover is doubled by the experimenter. This gives the following payoffs:  $\pi_i = 10€ - s_i + 2 * s_j$ , for  $i, j \in \{1, 2\}$  and  $i \neq j$ . If both movers send nothing, both will receive 10€ as final payoff. If both movers send 10€, both will end up with 20€. In this situation however, the second mover has an incentive to defect. If the first mover sends 10€ and the second mover sends nothing, the first mover gets nothing and the second mover gets 30€. The first mover should anticipate this behavior and send nothing.

Decisions in the SPD measure trust and cooperation (positive reciprocity). I will classify a first mover sending his endowment as a person who trusts. In my experiment, second movers have to make two decisions, one for the case that the first mover sends money and one for the case that the first mover does not send money. I will apply the classification for second movers used by Burks et al. (2010). There are three "pure" types: Second movers who always return 0€, independent of the first mover's choice, are classified as pure *free-riders*. Second movers who choose the most cooperative action available (always return 10€) are classified as pure *unconditional cooperators*. Second movers who exactly return what has been send to them by the first mover (0€ and 10€) are classified as pure *conditional cooperators*. For subjects not behaving as a pure types, the Euclidean distance between his or her decision and the decision of each of the pure type is calculated. The subject is then assigned to the least distant type

category.

My variant of the JOD-G is adapted from Abbink and Sadrieh (2009) and Abbink and Herrmann (2011). The game structure is the following: Two players have an endowment of 11 €. Both players make a simultaneous decision to reduce the other player's payoff by 0 €, 1 €, 2 €, 3 €, 4 €, or 5 €. This reduction is without any cost for the person who imposes it. With a probability of  $\frac{1}{3}$  however, these choices of the subjects are not implemented. In this case, nature reduces both players' payoff by 0 €, 1 €, 2 €, 3 €, 4 €, or 5 € with equal probability. The crucial design feature of the game is that subjects are not informed whether their partner or nature reduced their income. This means that subjects can burn money and hide behind nature. The JOD-G measures spiteful preferences. If a player chooses to reduce the other player's payoff (with a nonzero amount), he or she is classified as subject with spiteful preferences.

The Mini-UG is adapted from Bolton et al. (2005) and Falk et al. (2003). It has a sequential two stage structure. In the first stage, the proposer has to make a proposal on how to divide a pie of 20 €. However, the proposer is restricted to two choices: In the first proposal, the proposer gets 18 € and the responder gets 2 €. The second proposal is the equal split. In the second stage, the responder can either accept or reject the proposer's proposal. If the responder accepts, the proposal is implemented. In case of rejection, both player get 0 €. In my experiment, subjects make a decision in both roles, and in the role of the responder two decisions are made conditional on the proposer's choice. I am mainly interested in the responder's decision for the case that the proposer chose the unequal split. A subject who rejects such an unequal split will be classified as a person punishing unfair behavior (in a second-party punishment setting).

The SPD-P is adapted from Hoff et al. (2011). Its basic structure is similar to my SPD. However, a third party is added that has the opportunity to punish the behavior of the second mover. Figure 2 shows the game tree of the SPD-P and the players' payoff. The first mover can either send money or keep it. The second mover then has the same binary choice between sending money back or keeping it. Afterwards, the third mover has the opportunity to punish the second mover. There are three crucial aspects about this punishment opportunity: First, I implement punishment as third-party punishment, this means an uninvolved third party has the opportunity to punish. Second, punishment is relatively cheap: The second mover only has to invest 1 € to reduce the second mover's payoff by 5 €. Third, the design distinguishes between altruistic and antisocial punishment: The second mover can punish both a free-riding and a cooperating second mover. Subjects make decisions in all roles, and my interest is in the punishment decision of the third player. I classify a subject who punishes defectors as an individual punishing unfair behavior (in third-party punishment setting with fairly low costs).

A subject punishing cooperators would be classified as an antisocial punisher.

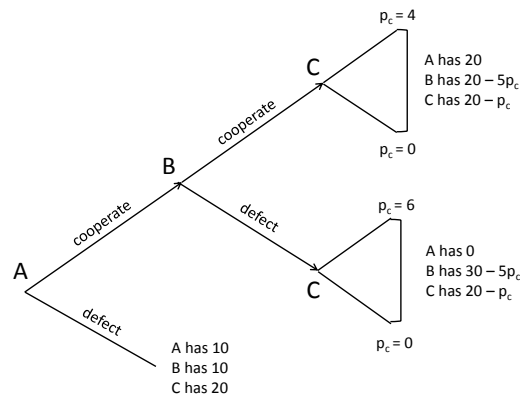


Figure 2: Sequential Prisoner's Dilemma with (third-party) Punishment

The DG-P modifies my DG and implements a third-party punishment opportunity. Initially, the first player has 15 €, the second player has 5 € and the third player has 20 €. The first player then can send either 0 €, 2.5 € or 5 € to the second player. Whereas the second player has no choice to make, the third player then has the opportunity to punish the first player, either with 1 €, 2 €, 3 €, 4 €, or 5 €. The crucial aspect about this punishment opportunity is that it is rather costly: Investing 1 € in punishment only reduces the first players payoff by 1 €. Subjects make decisions in all roles. The DG-P measures negative reciprocity and a subject punishing first players who do not share equally will be classified as an individual punishing unfair behavior (in a third-party punishment setting with high costs).<sup>7</sup>

To sum it up, six games are implemented. The DG is implemented in order to replicate KE's results. Decisions in the SPD measure trust and cooperation. Decisions in the JOD-G measure spiteful preferences. The Mini-UG, the SPD-P and the DG-P are implemented in order to measure punishment. These three games differ in the following way: Punishment in the Mini-UG is second-party punishment whereas punishment in the SPD-P and DG-P is third-party punishment. In the SPD-P punishment is relatively cheap whereas it is relatively expensive in the DG-P.

After making decisions for all six games, subjects risk preferences are elicited using simple lottery choices similar to Holt and Laury (2002). I will use these risk preferences as a control variable in my analysis of the relationship of trusting behavior and well-being. Finally, subjects complete a follow-up questionnaire eliciting demographic variables (e.g. sex, age, religion) and subject's material well-being: Own monthly expenditures (MWB1) and parents' income (MWB2).

<sup>7</sup>Because of the high costs of punishment, payoff-differences between the first and the third player cannot be increased by punishing. Hence, antisocial punishment should not be expected.



### 3.3 Experimental Procedures

The experiments were conducted at the University of Mannheim in Spring 2012. I run seven sessions with 8 to 18 subjects in each session. In total 102 subjects participated. The experimental software was developed in z-Tree (Fischbacher, 2007). For recruitment, ORSEE was used (Greiner, 2004). Out of many possible sequences the following two were implemented: DG, SPD, JOY-G, Mini-UG, SPD-P, DG-P and SPD, DG, JOY-D, Mini-UG, SPD-P, DG-P. I choose these sequences in order to analyze whether it makes a difference if the DG or the SPD is played first. In general, I did not detect any significant difference in the subjects' behavior in the games and hence I will pool the data for most of the further analysis. For payment, one of the six games was selected randomly and types in the selected game were also randomly chosen. Additionally, participants received 6 EUR for completing the well-being questionnaire and the payment resulting from their lottery choice. Sessions lasted about 90 minutes and the average earnings were 24 €.

### 3.4 Experimental Hypotheses

For the case that I find favorable correlations between well-being measures and virtuous behavior, this section proposes different explanation about the underlying causality. The experimental hypotheses are very similar to those of KE. They are only modified to the extent that they suit not only the dictator game setting but also the other games. Furthermore, an additional hypothesis regarding cognitive ability is proposed. Figure 3 summarizes the five different hypotheses and lists the variables used to test them. First, I will outline these hypotheses. Afterwards, I will provide some additional remarks regarding my punishment settings.<sup>8</sup>

#### Virtuousness Hypothesis

One explanation for a favorable correlation between well-being and virtuous behavior is that virtuous behavior causes well-being. However not in the sense that repeated acts of virtuous behavior increase the stock of PWB, but that people behave virtuously because they immediately feel better. This means that virtuous behavior directly increases short-run happiness/SWB.<sup>9</sup> For practical reasons, we can only test this hypothesis for trust and cooperation measured by the

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<sup>8</sup>In my hypotheses, I already omit the hypothesized relationship between spiteful preferences/antisocial punishment and well-being measures because results show that I am unable to detect levels of spiteful preferences that are fruitful for statistical analysis. In general, I would interpret spiteful preferences and antisocial punishment as non-virtuous behavior. Hence, e.g. the relationship between well-being measures and spiteful preferences should be negative.

<sup>9</sup>Based on the remarks of Section 2, The term *happiness* is used in connection with the hedonic approach and its measure SWB not with the eudaimonic approach and its measure PWB.

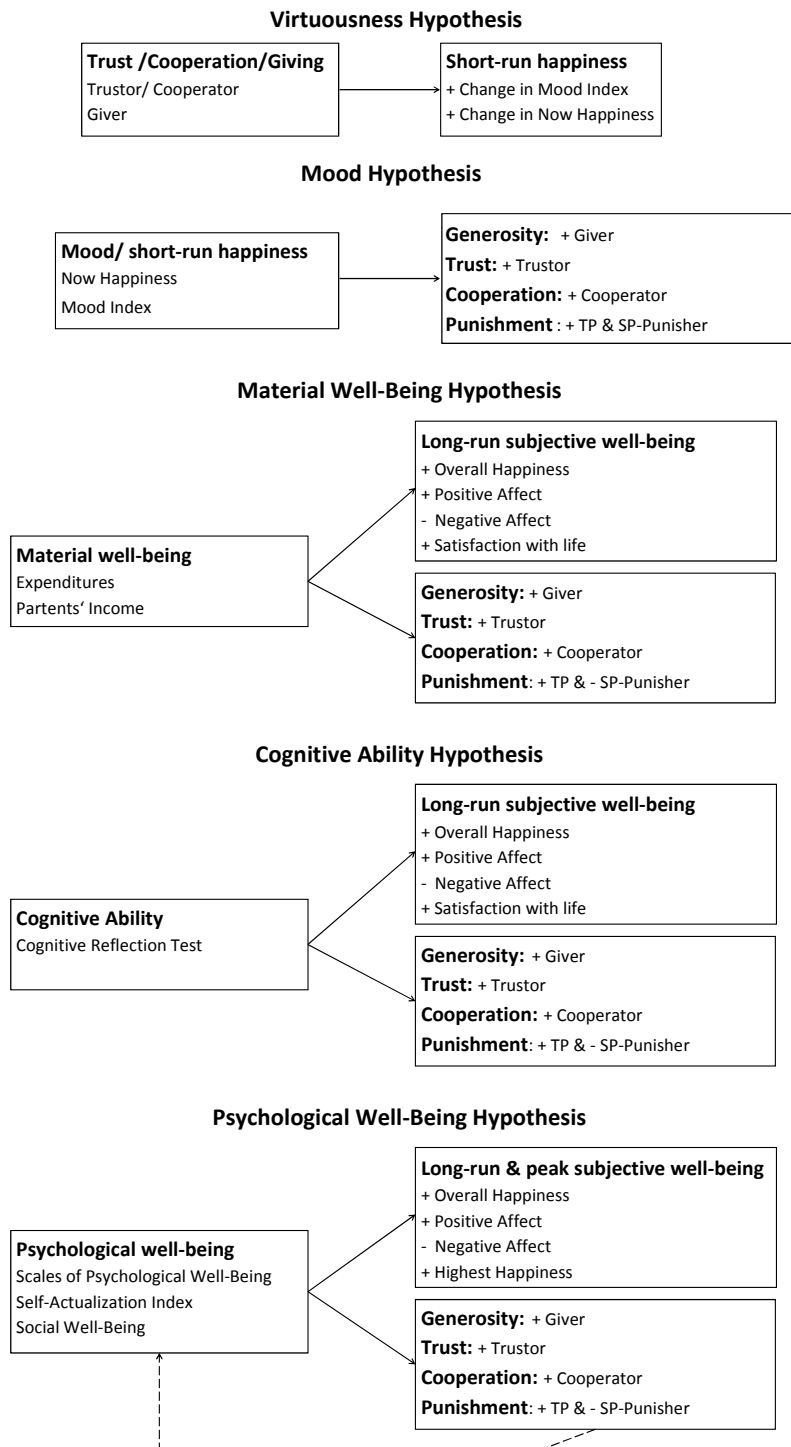


Figure 3: Summary of Hypotheses

SPD (and as a replication of KE for giving measured by the DG).<sup>10</sup> If this hypothesis is right, subjects who trust and cooperate (give) in the SPD (DG) should report higher Now Happiness (NH) and a higher Mood Index (MI) directly after the game than those subjects who distrust and free-ride. More precisely, subjects who trust and cooperate should score higher in the Now Happiness Difference (NHD) and in the Mood Index Difference (MID).<sup>11</sup> This hypothesis is consistent with warm-glow explanations of giving (Andreoni 1989; Andreoni 1990).<sup>12</sup>

### **Mood Hypothesis**

This explanation reverses the causality of the previous one. People act on emotions and those who feel good behave more virtuously. Therefore, the Mood hypothesis claims that subjects reporting a higher mood/short-run happiness (MI and NH) just before they make a decision should be more likely to behave virtuously.<sup>13</sup>

### **Material Well-Being Hypothesis**

The next hypothesis claims that both hedonic happiness (long-run SWB) and virtuous behavior are caused by a third factor, namely material well-being. The Material Well-Being (MWB) hypothesis claims that greater MWB leads to higher long-run SWB. Assuming that virtuous behavior is a normal good, higher MWB should therefore also lead to a higher probability of virtuous behavior and stronger virtuous behavior (higher gifts, larger amount sent in the SPD).

### **Cognitive Ability Hypothesis**

This hypothesis claims that another third factor causes hedonic happiness (long-run SWB) and virtuous behavior: namely cognitive ability measured by the cognitive reflection test. The cognitive ability hypothesis claims that higher cognitive ability (CA) leads to higher long-run SWB and to more virtuous behavior. The underlying argument of this hypothesis is that more intelligent people have greater resources to cope with life circumstances and might hence be

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<sup>10</sup>Asking short-run happiness questions more than four times might have reduced the quality of answers because subjects might have getting bored by the questions.

<sup>11</sup>However, a possible selection bias might occur: Virtuous subjects might gain from behaving virtuously whereas non-virtuous subjects might gain from behaving non-virtuously. And hence, even if we observe no difference between virtuously and non-virtuously behaving subjects, behaving virtuously might still increase happiness. KE run a control treatment to account for this problem. I do not implement such a control treatment. Importantly, I observe a difference between virtuously and non-virtuously behaving subjects, at least in the SPD.

<sup>12</sup>KE also note that this hypothesis might be consistent with correlations between cooperation/trust and giving and long-run SWB. This is the case if we assume that current cooperation/giving is representative of past patterns of such behavior and that happiness benefits accumulate to improve long-run SWB. However, only evidence about Now Happiness and the Mood Index can be seen as specific evidence for this hypothesis.

<sup>13</sup>For the later analysis, I will use those NH and MI-answers given most closely to the relevant game. KE call this hypothesis *Happiness Hypothesis* instead of *Mood Hypothesis*.

happier. Additionally, higher cognitive ability may lead to greater maturity (in line with the PWB hypothesis) and hence a higher probability of pro-social behavior.

### **Psychological Well-Being Hypothesis**

My main hypothesis is the eudaimonic interpretation of the Virtue Ethics Hypothesis (VEH) described in Section 2. Following KE, I name the hypothesis after the measure of eudaimonic well-being *PWB*. The outlined stock flow model of well-being states that repeated acts of virtuous behavior contribute to PWB in the long run. My experiment however is not a longitudinal study. For this reason, I analyze the short-run implication of the model: Subjects enter the experiment with their fixed "stock" of PWB and the model claims that virtuous behavior is a short-run effect of a high stock of PWB. In the model's steady state, such a high stock of PWB ensures enough psychological resources to generate a high level of hedonic happiness (SWB). Therefore, we have to examine whether subjects with higher PWB also report greater long-run subjective well-being (that is higher overall happiness, higher positive affect, lower negative affect and greater highest happiness<sup>14</sup>) and whether more of these subjects behave virtuously. As outlined earlier, the formulated line of causality seems plausible and is consistent with the stock flow model. Nonetheless, my experiment does not experimentally vary long-run well-being. Hence, I can not exclude that the short-run implication is really driven by the long-run effect that repeated acts of virtuous behavior increase the level of PWB. In Figure 3, the dotted arrow indicates this line of causality.

Additionally, I will also check a slightly modified version of the PWB Hypothesis as a robustness check that reverses the causality between PWB and SWB. The model outlined in Section 2 could be wrong. Not PWB, but long-run SWB could cause virtuous behavior (and PWB), although there are no theoretical arguments why this should be the case. I will call this hypothesis the subjective well-being hypothesis. Both the psychological well-being hypothesis and the subjective well-being hypothesis should result in the same correlations between PWB, virtuous behavior, and SWB. However, a stronger relationship between virtuous behavior and SWB (PWB) would be evidence in favor of the SWB (PWB)-Hypothesis.

Another important point of the PWB hypothesis is the following: So far, I presented every hypothesis in terms of the probability to behave virtuously or not (e.g. giving vs. not giving in the DG). For the MWB hypothesis and Happiness hypothesis there is no reason not to assume that the larger probability of behaving virtuously results in stronger virtuous behavior (e.g. larger gifts). For the PWB hypothesis however, the psychological literature (Lyubomirsky

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<sup>14</sup>Highest happiness is included in the list following KE. The idea behind this is that people striving for self-fulfillment should experience higher peaks in happiness.

et al., 2005; Lyubomirsky et al., 2011; Sheldon and Lyubomirsky, 2006) suggests that not the size of a kind act matters but the frequency with which it is performed. In line with KE, the PWB hypothesis does not claim that subjects with higher PWB make larger gifts or send higher amounts in the SPD. What matters is sending something, not how much is sent.

### **Third-Party (TP) versus Second-Party (SP) Punishment**

All hypotheses suggest some kind of relationship between well-being and virtuous behavior. But can punishment of unfair behavior be seen as virtuous, as pro-social behavior? In order to evaluate this, three different punishment settings are used: the Mini-UG, the SPD-P and the DG-P. As outlined before, these three settings mainly differ from each other in the following way: In the first game (Mini-UG), rejection or punishment of unfair offers is done by an involved second party. In the other two games (SPD-P and DG-P), punishment is done by an uninvolved third party. This party does not suffer monetary losses from the behavior of a defector. Additionally, punishment costs are high in DG-P and low in SPD-P.

For second-party (SP) punishment in the Mini-UG, at least two behavioral forces might be relevant in motivating punishment. First, subjects behavior might be driven by their negative emotions caused by unfair offers. They are angry and retaliate unfair offers by rejecting them and causing a severe monetary loss for the proposer. Second, subjects are not so much driven by emotions but feel (morally) obliged to punish violations of fairness norms even at own monetary costs. The second behavioral force might be especially relevant in situations in which strengthening fairness norms via costly punishing potentially results in higher monetary payoffs for the punisher (as in a repeated public good game). My Mini-UG however is one shot and hence there is no opportunity for subjects rejecting unfair offers to gain monetarily by their punishment. Neuroeconomic findings support the idea that emotions play a key role in rejecting unfair offers in the dictator game (see e.g. Sanfey et al., 2003; van 't Wout et al., 2006).<sup>15</sup>

In contrast to the Mini-UG, the punishing subject is not directly affected by unfair behavior in the third-party (TP) punishment setting. Hence, the aspect of retaliation should not play a too important role. Instead, I hypothesize that punishing is mainly driven by a social norm that unfair behavior has to be punished. In addition, punishing a defector can be interpreted as an act of kindness towards the negatively affected second party that is unable to punish by itself.

Hence, my conjecture regarding the relationship of punishment and well-being is the following: In the TP punishment setting, punishment of unfair behavior is a kind of virtuous behavior

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<sup>15</sup>In the Mini-UG, the strategy method is used. Therefore, I could not ask subjects for their emotions right after receiving an unfair offer. Nonetheless, even in my case expected emotions may still guide the responder's decision. Hence, I can still examine whether subjects' short-run or long-run affective SWB has an influence on the decision in the Mini-UG.

such as giving, trusting and cooperating. Hence, there should be a positive relationship between well-being and TP punishment. SP punishment however is more an act of retaliation or non-virtuous behavior. Hence, I conjecture a negative relationship between SP punishment and well-being. The difference in punishment costs (DG-P: low/ SPD-P: high) should enable me to discriminate between those subjects who only comply to social norms when complying is fairly cheap and those subjects who have fully internalized the norm. Hence, the positive relationship between TP punishment and well-being should be more pronounced when punishing is fairly costly.<sup>16</sup>

## 4 Results and Analysis

In this section, I first provide an instrument check, that is, whether behavioral results in my games are in line with findings in the literature. Then, I analyze how well-being and virtuous behavior are related. Afterwards, I examine the five different hypotheses regarding the causal relationship between well-being and virtuous behavior.

### 4.1 Check of Instruments

Before looking at well-being, I first check whether the games I analyze below generate similar behavioral results than in previous studies. Only when the instruments work fine, I can be sure that my analysis of the relationship between well-being and virtuous behavior is relevant.

In the DG, 61% of subjects gave whereas 39% were nongivers. The average gift is about 4,50€ (roughly 23% of the endowment). This is very similar to KE's result (40% nongivers, average gift: 23% of the endowment) and also fits the literature well.<sup>17</sup>

In the SPD, 64% of the subjects trusted in the role of the first mover. As second movers, 72% of the subjects are classified as conditional cooperators, 5% as unconditional cooperators and 23% as free-riders. These numbers are comparable to my benchmark Burks et al. (2010) (55% trust, 59% conditional cooperators, 4% unconditional cooperators, 35% free-riders in the self-selected student sample). However, the percentage of conditional cooperators is fairly high. Nonetheless, in the self-selected non-students sample of Burks et al. (2010), conditional and unconditional cooperators sum up to comparable 79%.

In the JOY-G, only 5% of subjects showed spiteful preferences and destroy part of their partners endowment. This is considerably less than the 26% in the benchmark study of Abbink

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<sup>16</sup>Additionally, in the SPD-P it can not be excluded that at least some subjects only punish others because they want to increase the payoff difference to the punished player not because they follow a social norm. With a one-to-one punishment technology in the DG-P, this motivation cannot play a role.

<sup>17</sup>39% nongivers are indeed a fairly high result for a non-double-blind setting. However, playing both roles may have an effect of *reduced responsibility* for the partner as has been shown by Burks et al. (2003).

and Herrmann (2011). Playing the DG and the SPD before the JOY-G, might explain the very low level of spiteful preferences: Subjects knew that the experiment is about cooperative behavior. In the following analysis, I will skip the JOY-G because the number of subjects showing spiteful preferences seems too small for fruitful statistical analysis.<sup>18</sup>

In the Mini-UG, 53% of subjects rejected the unfair offer. This percentage is in line with the results of Bolton et al. (2005) and Falk et al. (2003) (41% and 44% rejection). In the SPD-P, about 50% punished free-riders whereas only 3% punished cooperators. That is, we observe a high level of altruistic punishment but a negligible level of anti-social punishment which is in line with the very low level of spiteful preference in the JOY-G. In the DG-P, about 25% punished dictators who did not share equally.<sup>19</sup>

Results are roughly in line with Fehr and Fischbacher (2004): Especially a high-cost punishment technology (in the DG-P) is related to lower rates of punishment compared to a low-cost technology (in the SPD-P).

In sum, my design replicates the conventional literature results in most cases: Therefore, I conclude that the analyzed games provide reasonable measures for giving, trusting and cooperating. Additionally, the Mini-UG, the SPD-P and the DG-P provide a useful measure of SP-punishment and (altruistic) TP-punishment. Only the relationship between spiteful preferences/anti-social punishment and well-being can not be analyzed properly with my results. In the case of cooperation, I will focus in the following analysis on two groups: free-riders and cooperators. The reader may bear in mind that the overwhelming fraction of these cooperators are conditional cooperators.

## 4.2 Virtuous behavior and well-being

Are well-being measures also in line with results in the literature? Table 1 shows the Spearman-rank correlation coefficients (and  $p$ -values) for subjective and psychological well-being measures.<sup>20</sup> For this table, we also state the often reported Affect Balance Scale (ABS). It is gained by subtracting NA from PA. All correlations have the expected sign. Out of 91 correlations, 72 are significant at the 5% level. In comparison, in KE's analysis only five out of 91 correlations were not significant. However, taking into account that I only use a single-blind instead of a double-blind procedure, the correlations are still fairly good. Overall, I conclude that well-

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<sup>18</sup>In addition, it is not so clear whether all of the 5% who show spiteful preferences really act spitefully or whether some of them are just confused or make a mistake.

<sup>19</sup>Additionally, 37% percent punished dictators who gave nothing at all. In the following analysis, I will however focus on those subjects punishing dictators not sharing equally. Those subjects are the most strictest one in following the social norm of punishing unfair behavior.

<sup>20</sup>Now Happiness (NH) and Mood Index (MI) refer in this table to the first measurement of these variables in overall well-being questionnaire at the beginning of the experiment.

Table 1  
Spearman correlation matrix for subjective and psychological well-being measures (correlations with coefficients and p-values)

	OH	PA	NA	ABS	PAS	NAS	NH1	M11	HH	LH	SWL	PWBI	SAI
Overall Happiness (OH)	0,07												
Bradburn's positive affect (PA)	0,457												
Bradburn's negative affect (NA)	-0,20	0,09											
Affect Balance Scale (ABS)	0,16	0,69	-0,76										
Positive Affect Schedule (PAS)	0,39	0,43	-0,24	0,44									
Negative Affect Schedule (NAS)	0,000	0,000	0,015	0,000	-0,21								
Now Happiness (NH)	0,172	0,021	0,42	0,45	0,037	-0,24							
Mood Index (MI)	0,35	0,26	-0,12	0,25	0,25	0,016	0,64						
Highest Happiness (HH)	0,38	0,29	-0,26	0,37	0,38	-0,31	0,000	0,45					
Lowest Happiness (LH)	0,40	0,51	-0,09	0,39	0,40	-0,13	0,000	0,000	0,32				
Satisfaction with Life (SWL)	0,28	0,15	-0,42	0,42	0,25	-0,45	0,34	0,51	0,001	0,19			
Psych. Well-Being Index (PWBI)	0,51	0,13	-0,16	0,20	0,29	-0,25	0,33	0,27	0,33	0,059			
Self-Actualization Index (SAI)	0,000	0,187	0,114	0,040	0,004	0,010	0,001	0,005	0,001	0,22	0,56		
Social Well-Being (SoWB)	0,45	0,28	-0,09	0,24	0,46	-0,31	0,22	0,37	0,28	0,22	0,000	0,44	
	0,000	0,004	0,369	0,014	0,000	0,002	0,025	0,000	0,004	0,029	0,000	0,000	0,48
	0,16	0,16	-0,30	0,32	0,32	-0,43	0,10	0,11	0,11	0,24	0,32	0,44	0,48
	0,114	0,112	0,002	0,001	0,001	0,000	0,327	0,293	0,264	0,014	0,001	0,000	0,48
	0,32	0,20	-0,12	0,22	0,31	-0,30	0,15	0,23	0,22	0,23	0,25	0,46	0,48
	0,001	0,048	0,249	0,028	0,002	0,002	0,127	0,021	0,023	0,022	0,010	0,000	0,000

n=102

Table 2  
Spearman correlation matrix for SWB and PWBI with MC social desirability scale, material well-being, cognitive ability (coefficients and p-values)

	OH	PA	NA	ABS	PAS	NAS	NH1	M11	HH	LH	SWL	PWBI	SAI	SoWB
Marlowe-Crowne scale (MC)	0,13	0,12	-0,26	0,27	0,33	-0,36	0,17	0,21	0,15	0,28	0,15	0,33	0,42	0,24
Monthly expenditures	0,187	0,217	0,009	0,006	0,001	0,000	0,090	0,032	0,142	0,004	0,142	0,001	0,000	0,014
Parents' income	0,27	-0,10	-0,10	0,02	0,24	0,04	0,02	0,13	0,05	0,05	0,19	0,17	0,22	0,06
Cognitive Ability (CRT)	0,006	0,342	0,324	0,872	0,016	0,711	0,846	0,190	0,587	0,643	0,062	0,079	0,029	0,572
	0,17	0,14	0,06	0,04	0,15	-0,07	0,14	0,10	0,24	-0,10	0,38	0,20	-0,02	-0,02
	0,085	0,172	0,555	0,675	0,135	0,482	0,166	0,338	0,015	0,333	0,000	0,049	0,873	0,868
	0,11	0,19	-0,01	0,14	0,03	-0,01	-0,08	-0,04	0,00	-0,12	0,06	0,09	0,02	-0,04
	0,291	0,059	0,957	0,166	0,736	0,937	0,421	0,721	0,979	0,218	0,573	0,379	0,808	0,716

n=102



being measures show reasonable correlation results and are in line with expectations from the literature. The measure with the highest amount of non-significant correlations is Bradburn's Negative Affect (NA): For this measure, only seven out of thirteen correlations are significant.

Table 2 summarizes the Spearman-rank correlation of SWB and PWB measures with the Marlowe-Crowne social desirability scale (MC), the two material well-being measures, and cognitive ability (CRT). Nine out of fourteen SWB and PWB measures significantly correlate with the MC scale (at the 5% level). For PWB, correlations seem especially strong. Compared to KE's result, correlations (at least for PWB) are slightly higher indicating that social desirability may have a higher influence in my analysis than in a double-blind setting. However, correlations are typically still weaker than those of SWB (and PWB) measures with one another. Unlike in KE's result, the two material well-being (MWB) variables also significantly correlate with some well-being measures. This is however only the case for three out of fourteen well-being measures for each MWB measure. Additionally, for no well-being measures both material well-being measures significantly correlate together. Cognitive ability, measured by the cognitive reflection test, does not show significant correlations with well-being measures as would be expected by the happiness literature. Overall, observed correlations with MC seem reasonable and indicate that social desirability plays a more important role in a single blind than in a double blind setting. Hence in my analysis, well-being measures seem to be more affected than in KE's analysis.

Before analyzing my hypotheses in detail, I will start with summary results providing an overview of the relationship between virtuous behavior and well-being. Tables 3a and 3b provide a first summary of this relationship. Table 3a provides the mean scores on well-being measures of those who behaved virtuously in the DG and in SPD and those who did not. For the DG, I compare the mean score on well-being measures of subjects who gave nothing (Nongivers) with those who gave something (Givers). For the SPD, I first compare subjects who did not send any money in the role of the first mover (Nontrustors) with those who did send their endowment (Trustors). Then, I compare the mean score on well-being measures of those classified as Free-riders with those classified as Cooperators.<sup>21</sup>

The comparison of Givers and Nongivers is basically a replication of KE (in a single-blind setting). KE's main result is that there is a strong connection between psychological well-being and giving and a weaker connection between subjective well-being and giving. Although my results replicate this basic pattern, the connection of well-being measures and giving seems to be overall weaker in my data. For subjective well-being, only the Positive Affect Schedule (PAS)

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<sup>21</sup>As outlined earlier, the classification as a cooperator means that the subject has either been classified as an unconditional cooperator or as a conditional cooperator. Cooperators are mainly conditional cooperators. Out of 79 cooperators 74 subjects are conditional and 5 subjects are unconditional cooperators. Using only conditional cooperators and free-riders for my analysis, does not qualitatively change the results.

Table 3a

## Well-being for the Dictator Game (DG) and the Sequential Prisoners' Dilemma (SPD)

Well-being measures	1) DG			2) SPD - first move			3) SPD - second move		
	Nongivers	Givers	p-value %SD	Nontrustors	Trustors	p-value %SD	Free-riders	Cooperators	p-value %SD
<i>Subjective well-being</i>									
Long-run happiness									
Overall Happiness (OH)	6.21	6.44	0.15	6.05	6.52	0.02 **	6.39	6.34	0.57
Bradburn's Positive Affect (PA)	3.49	3.51	0.47	3.41	3.55	0.29	3.09	3.62	0.04 **
Bradburn's Negative Affect (NA)	1.72	2.03	0.87	1.78	1.98	0.76	1.52	2.03	0.94
Positive Affect Schedule (PAS)	32.54	34.44	0.06 *	32.46	34.43	0.05 *	32.70	34.01	0.17
Negative Affect Schedule (NAS)	21.69	22.14	0.61	23.76	20.95	0.04 **	22.09	21.94	0.47
Highest/ lowest happiness									
Highest Happiness (HH)	7.26	7.59	0.08 *	7.27	7.57	0.10	7.35	7.49	0.29
Lowest Happiness (LH)	3.67	3.41	0.80	3.35	3.60	0.20	3.91	3.39	0.93
Short-run happiness									
Now Happiness (NH)	5.41	5.59	0.26	5.59	5.65	0.43	5.61	5.63	0.47
Mood Index (MI)	39.41	40.63	0.29	41.43	39.66	0.79	41.83	39.86	0.78
Now Happiness Difference (NHD)	0.00	0.10	0.35	-0.16	0.06	0.16	-0.43	0.10	0.02 **
Mood Index Difference (MID)	-1.26	-0.94	0.42	-3.00	0.37	0.02 **	-5.48	0.49	0.00 **
Life satisfaction									
Satisfaction With Life (SWL)	23.92	24.41	0.33	23.89	24.42	0.32	24.57	24.13	0.63
<i>Psychological well-being</i>									
PWB Index (PWBI)	27.46	28.67	0.07 *	27.16	28.80	0.02 **	28.00	28.27	0.39
Self-Actualization Index (SAI)	41.54	43.98	0.01 **	41.51	43.92	0.01 **	40.78	43.71	0.01 **
Social Well-Being (SoWB)	58.03	61.98	0.01 **	56.57	62.69	0.00 **	55.43	61.94	0.00 **
<i>Material well-being</i>									
Monthly expenditures	595.00	688.33	0.07 *	613.51	674.92	0.17	622.17	661.52	0.30
Parents' income	2.85	3.38	0.06 *	3.03	3.26	0.25	3.04	3.22	0.34
<i>Cognitive ability</i>									
Cognitive Reflection Test (CRT)	1.33	1.76	0.03 **	1.59	1.60	0.49	1.30	1.68	0.08 *
N	39	63		37	65		23	79	

Notes: \*\* indicates significance at the 10%/5% level according to one-tail t-tests of the null hypothesis that subjects behaving virtuously are better off than non-virtuous subjects (e.g. that they have higher positive affect, lower negative affect, higher income, etc.). n=102

and Highest Happiness (HH) are (marginally) significantly higher for Givers than for Nongivers. This means for long-run SWB only one measure is significantly different between Givers and Nongivers. A noteworthy aspect is however, that the different scales measure different aspects of long-run SWB (OH: cognition vs. PA/PAS: positive affect vs. NA/NAS: negative affect) or they measure the same aspect in a different way (e.g. PA vs. PAS). If for all measures the difference between Givers and Nongivers were significant, this would indicate a fairly strong relationship between long-run SWB and giving. If however, only a few scales are significant and the other scales are just insignificant (but not significant for the reversed relationship), this can still be counted as evidence in favor of a weak relationship between some aspects of SWB and virtuous behavior. Summing it up, there is only very weak (if at all any) evidence for a positive relationship between giving and long-run SWB. At least the insignificant measures do not provide significant evidence against the hypothesis of a positive relationship between SWB and virtuous behavior.<sup>22</sup> .

For mood or short-run happiness (NH, MI), Givers and Nongivers do not have statistically different mean values. Givers and Nongivers also do not experience a statistically distinguishable change in short-run happiness/ mood due to giving or not giving as indicated by the Now Happiness Difference (NHD) and the Mood Index Difference (MID). The most cognitive-evaluative component of SWB, Satisfaction with Life (SWL), also does not (statistically) differ between Givers and Nongivers. PWB however is greater for Givers for all three measures. These results are in line with KE's finding. Unlike KE, I find however that Givers also have higher material well-being (higher monthly expenditures and higher parent's income) than Nongivers with marginal significant. Additionally, Givers performed better in the cognitive reflection test. However, these last results are at least not robust across games as will become clear below. In sum, my DG analysis replicates crucial findings of KE: a very weak relationship (if any at all) of long-run SWB and virtuous behavior, no relationship between short-run SWB and virtuous behavior and a stronger relationship between PWB and virtuous behavior. However overall, the relationship between well-being and giving seems weaker than in KE's study. One explanation might be that the single blind procedure increases motives of social desirability which biases results.

The basic patterns observed for SWB and PWB in DG can also be observed in the SPD: Potentially a weak connection between SWB and trust/cooperation and a stronger connection between PWB and trust/cooperation: Subjects who trust score higher on Overall Happiness (HH), the Positive Affect Schedule (PAS), and they score lower on the Negative Affect Schedule

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<sup>22</sup>This means that one-tail t-tests of the null hypothesis that Givers are worse of than Nongivers would not result in significant results.

(NAS), as expected. Again the other SWB variables do not provide evidence against a positive relationship between trusting and well-being. For PWB, all three measures indicate significantly that Trustors experienced higher well-being. For the second mover decisions, Cooperators only scored higher on Bradburn's Positive Affect and for two out of three measures of psychological well-being. As for giving, the two short-run SWB measures, Now Happiness (NH) and the Mood Index (MI), are statistically not different between the two groups. However, Free-riders and Nontrustors seem to experience a decrease in their mood (MID) (and Free-riders also in their Now Happiness - NHD) due to their non-virtuous behavior. Material well-being does not differ across groups whereas cognitive ability is higher for cooperators but not for those who trust.

Well-being data often has a very small variance and hence comparing mean scores might underestimate the magnitude of the differences. Therefore, the column *% SD* indicates how big the difference between those who show virtuous behavior and those who do not is in percent of the standard deviation. For statistically significant results, mean differences are equal to 29% to 75% of a standard deviation. This means, differences are non-negligible. KE (p. 19) offer some example to what such differences are comparable. Among others, being unemployed or not, or being one of Forbes superrich leads to comparable differences in well-being measures.

Table 3b presents the same information as Table 3 for the Mini-UG, the SPD-P and the DG-P. The mean comparisons are made between subjects rejecting an unfair offer (Mini-UG) or punishing unfair behavior (Punisher - SPD-P and DG-P) and subjects accepting an unfair offer and not punishing unfair behavior (Nonpunisher). For the DG-P, I focus on those subjects who punish dictators who do not share equally. I hypothesize that these subjects have internalized a social fairness norm to the largest degree. Results are similar but slightly weaker when also those subjects are considered who punish dictators who give nothing at all. As a reminder, for second-party punishment in the Mini-UG, I conjectured a negative relation with well-being, for third-party punishment I conjectured a positive relation.

For the Mini-UG, rejecting subjects receive significantly lower scores in Bradburns' Positive Affect (PA), in the Positive Affect Schedule (PAS) and in satisfaction with Life (SWL). In addition, they score higher in the Negative Affect Schedule (NAS) with marginal significance. For PWB, the Index of PWB (PWBI) shows lower values for subjects rejecting unfair offers. Note however, that although the other measures do not confirm the expected relationship, they do not provide evidence against this relationship. For the SPD-P, the result is rather mixed. Only two measures are marginally significant. This result becomes stronger at least for PWB in the DG-P: Two out of three PWB measures are significant and the last measure (PWBI) is

Table 3b

Well-being measures	1) Mini-UG				2) SPD-P				3) DG-P			
	Accept	Reject	p-value	% SD	Nonpunisher	Punisher	p-value	% SD	Nonpunisher	Punisher	p-value	% SD
	(SPD-P)	(SPD-P)	(SPD-P)	(SPD-P)	(DG-P)	(DG-P)	(DG-P)	(DG-P)	(DG-P)	(DG-P)	(DG-P)	(DG-P)
<i>Subjective well-being</i>												
Long-run happiness												
Overall Happiness (OH)	6,35	6,35	0,50	0%	6,36	6,35	0,52	1%	6,35	6,36	0,49	1%
Bradburn's Positive Affect (PA)	3,79	3,24	0,01 **	44%	3,46	3,54	0,38	6%	3,47	3,60	0,33	10%
Bradburn's Negative Affect (NA)	1,81	2,00	0,25	14%	1,76	2,06	0,86	22%	1,95	1,80	0,32	11%
Positive Affect Schedule (PAS)	35,33	32,28	0,00 **	52%	32,84	34,56	0,07 *	29%	33,16	35,44	0,05 **	39%
Negative Affect Schedule (NAS)	20,73	23,07	0,06 *	31%	21,06	22,85	0,88	24%	21,95	22,04	0,52	1%
Highest/ lowest happiness												
Highest Happiness (HH)	7,58	7,35	0,15	20%	7,38	7,54	0,24	14%	7,42	7,60	0,24	16%
Lowest Happiness (LH)	3,46	3,56	0,63	7%	3,72	3,31	0,92	28%	3,51	3,52	0,48	1%
Short-run happiness												
Now Happiness (NH)	5,71	5,44	0,18	19%	5,66	5,48	0,74	13%	5,61	5,44	0,70	12%
Mood Index (MI)	40,10	38,39	0,20	17%	39,48	38,92	0,61	5%	39,30	38,88	0,57	4%
Life satisfaction												
Satisfaction With Life (SWL)	25,00	23,54	0,09 *	27%	24,20	24,25	0,48	1%	24,13	24,52	0,38	7%
<i>Psychological well-being</i>												
PWB Index (PWBI)	28,90	27,59	0,05 **	33%	28,24	28,17	0,53	2%	27,92	29,08	0,10	30%
Self-Actualization Index (SAI)	43,42	42,72	0,26	13%	42,72	43,37	0,27	12%	42,21	45,64	0,00 **	64%
Social Well-Being (SoWB)	61,25	59,78	0,20	16%	59,10	61,79	0,07 *	30%	59,77	62,64	0,08 *	32%
<i>Material well-being</i>												
Monthly expenditures	652,60	652,69	0,50	0%	670,50	635,48	0,71	11%	644,29	678,40	0,32	11%
Parents' income	3,46	2,93	0,06 *	31%	3,30	3,06	0,76	14%	3,16	3,24	0,42	5%
<i>Cognitive ability</i>												
Cognitive Reflection Test (CRT)	1,67	1,54	0,28	12%	1,66	1,54	0,71	11%	1,62	1,52	0,65	9%
N	48	54			50	52			77	25		

Notes: \*/\*\* indicates significance at the 10%/5% level according to one-tail t-tests of the null hypothesis that subjects behaving virtuously (not rejecting and punishing free-riders) are better off than non-virtuous subjects (e.g. That they have higher positive affect, lower negative affect, higher income, etc.). n=102

at the border of becoming marginally significant. Additionally, punishing subjects score higher in the Positive Affect Schedule (PAS). No other variable provides evidence against the expected relationship. In sum, the data seems to indicate that there is a shift from punishing in the Mini-UG to punishing in a third-party environment. In the Mini-UG, there seems to be a weak negative relationship between well-being and rejecting unfair offers, at least for the affective component of long-run SWB. In the third-party punishment setting with high costs, a weak positive relationship can be observed, at least for the measures of PWB. Further analysis below will show how robust this shift really is.

As KE, I will skip Bradburn's Negative Affect (NA) from further analysis. As outlined earlier, this measure has the least amount of significant correlations with other well-being variables. Its performance in our analysis is rather poor. This is also true for KE's analysis in which the relationship between the other long-run SWB measures and giving is nearly always significant. In their analysis, KE suggest that NA finding could be an artifact (see KE's footnote 25 for details).

In order to further analyze the relationship between well-being and virtuous behavior, I follow the analysis of KE. The authors validate their results using multivariate regressions, especially ordered logit. Because well-being measures are highly correlated with each others, KE run regressions for each well-being measure separately to avoid the problem of multicollinearity. In these regressions, one well-being is treated as dependent variable that is explained by a Giver dummy and controls. I deviate from this analysis in two important ways. First, I include additional demographic control variables which are missing in KE's analysis. Second, I aggregate well-being measures. This is done for two purposes: First, it facilitates the exposition of results for all six games a lot. Second, overall in my data the relationship between well-being and virtuous behavior is weaker than in KE's analysis. Hence, I am not so much interested in which single variable correlates with virtuous behavior, but whether the different well-being concepts show such a correlation or not when controls are included and aggregate measures of different well-being measures are used.

The aggregation of well-being measures is done in the following way: SWB consists of two components: an affective part and a cognitive-evaluative part. In the psychological literature, these different components are usually measured separately. However, sometimes an overall long-run SWB score is calculated (see Diener 2008; Keyes et al. 2002). I follow Keyes et al. (2002) in calculating an aggregate *long-run SWB* score which gives equal weight to both components. For this purpose, I use Overall Happiness (OH), the Positive Affect Schedule (PAS) and Negative Affect Schedule (reversely scored). I do not use Bradburn's Positive and Negative Affect (PA/NA)

for my aggregate score because of the problems of NA discussed earlier. For short-run happiness, Now Happiness (NH) and the Mood Index (MI) are used for an aggregated *short-run SWB* score ensuring again that both components (affective and cognitive evaluative) of SWB have equal weights. The same is done for the change in for the *Change in short-run SWB*. Additionally, Highest and Lowest Happiness (HH and LH) are summed up to *Highest/Lowest Happiness* and for PWB, all three measures are aggregated giving equal weight to each individual measure.<sup>23</sup>

Table 4a-b provide a summary of ordered logit results. The depended variables are listed in the first column. The other columns report the coefficient (and *p*-values) for different dummies of virtuous behavior. Because both well-being measures and different types of virtuous behavior are highly correlated among each other, for each dependent variable and for each dummy of virtuous behavior a separate regression is run. Hence, every coefficient represents a single regression. In Table 4a, these regressions include only basic controls replicating KE's analysis: parents' income (MWB1) and Monthly's Expenditures (MWB2), the Marlowe-Crone scale (MC), a dummy for the sequence of games, a dummy whether subjects performed good or bad in the cognitive reflection test (CRT) and subject's level of confidence for truly answering well-being questions expressed in the follow-up questionnaire. Table 4b presents the same analysis with an extended set of controls. Besides the controls of Table 4a, additional demographic controls are included for which the literature has shown that they potentially have an impact on well-being (age, age squared, sex, religion, health dummy, partnership dummy, ethnicity dummy).

A drawback of the aggregate well-being measures is that the regression coefficients (or potentially odds-ratio not shown in the table) can not be easily interpreted as for single well-being measures because they refer to an aggregated and weighted measure. Looking however at the *p*-values, the overall picture seems to support the analysis of Table 3a-b. For giving, trusting and cooperating, only (aggregate) PWB is robustly correlated with virtuous behavior across games and different controls. (Aggregate) SWB is only correlated with trusting, potentially reflecting the results of Table 3a. For (aggregate) short-run SWB no dummy is significant. However, for both control settings, the Change in short-run SWB is significantly correlated with cooperating.

Looking at the three punishment settings, only the relationship between (aggregate) PWB and punishing in the DG-P (TP punishment with high costs) is significant. In contrast to Table 3a-b, long-run SWB is not related with rejecting in the Mini-UG. A potential reason for this missing relationship is that aggregate long-run SWB includes both components of SWB (cognitive-evaluative and affective). Already Table 3b shows that there is only a negative rela-

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<sup>23</sup>All aggregations account if necessary for different item numbers and different scales by dividing each measure by the number of items and the highest scale number before summing different measures up. For PWB a factor analysis of PWB measures results in one factor with weights that are very similar to equal weights.

Table 4a

Summary of ordered logit results coefficients for all games with similar controls as in KE

Dependent variable/ Well-being measure	Giver Dummy p-value	Trustor Dummy p-value	Cooperator Dummy p-value	Rejector Dummy p-value	Punisher Dummy (SPD-P) p-value	Punisher Dummy (DG-P) p-value
<i>Subjective well-being</i>						
Long-run happiness						
long-run SWB	-0.10	0.98 <b>0.01</b> **	0.31	0.44	-0.37	0.30
Highest/ lowest happiness						
Highest/Lowest Happiness	-0.29	0.44	0.20	0.61	0.02	0.95
Short-run happiness						
short-run SWB	0.11	0.76	-0.37	0.32	-0.24	0.50
Change in short-run SWB	0.19	0.61	0.39	0.29	1.19 <b>0.01</b> **	-0.27
Life satisfaction						
Satisfaction With Life (SWL)	0.02	0.95	-0.04	0.92	-0.28	0.44
			-0.06	0.89	0.11	0.76
<i>Psychological well-being</i>						
PWB	0.70	<b>0.07</b> *	0.83	<b>0.03</b> **	-0.36	0.32
			1.25	<b>0.00</b> **	0.36	0.32

Notes: \*/\*\* indicate significance at 10/5% level; n=102

Table 4b

Summary of ordered logit results coefficients for all games with full set of controls

Dependent variable/ Well-being measure	Giver Dummy p-value	Trustor Dummy p-value	Cooperator Dummy p-value	Rejector Dummy p-value	Punisher Dummy (SPD-Punisher Dummy (DG-P) p-value	Punisher Dummy (DG-P) p-value
<i>Subjective well-being</i>						
Long-run happiness						
long-run SWB	-0.03	0.94	0.89	<b>0.03</b> **	0.18	0.69
Highest/ lowest happiness						
Highest/Lowest Happiness	-0.08	0.83	0.36	0.38	-0.36	0.44
Short-run happiness						
short-run SWB	0.09	0.81	-0.37	0.36	-0.04	0.92
Change in short-run SWB	0.24	0.55	0.44	0.26	1.21 <b>0.01</b> **	-0.36
Life satisfaction						
Satisfaction With Life (SWL)	0.13	0.74	-0.11	0.78	-0.33	0.38
			-0.08	0.87	0.07	0.85
<i>Psychological well-being</i>						
PWB	0.69	<b>0.09</b> *	0.73	<b>0.07</b> *	-0.39	0.28
			1.26	<b>0.01</b> **	0.31	0.40

Notes: \*/\*\* indicate significance at 10/5% level; n=102



relationship between rejecting and the affective component of long-run SWB. This means that my regression analysis provide no evidence that there is a negative relationship between punishing and well-being. This potentially indicates that different behavioral forces (selfish retaliation and altruistic punishment of norm violation) drive punishing behavior in the Mini-UG. Nevertheless, the regression analysis still provides evidence that there is a shift from punishing in the Mini-UG and the DG-P, only in the last setting a positive relationship with aggregate PWB arises similar to the other settings of virtuous behavior.

### **4.3 Analysis of hypotheses**

Overall, my analysis so far confirms that is a fairly robust connection between PWB and virtuous behavior. There is also some evidence in favor of a weak relationship between SWB and virtuous behavior which is however quite limited, especially if the regression analysis is considered. Compared to KE, the single blindness of my design may create an additional source of disturbance such that I am not able to observe KE's stronger correlations. Nonetheless, as will become clear in this subsection, my result still provide evidence for the eudaimonic interpretation of the Virtue Ethics Hypothesis. However, I will first start with the Trust/Cooperation Hypothesis.

#### **4.3.1 Virtuousness Hypothesis**

This hypothesis states that people behave virtuously in order to feel good. This should on average result in a positive change in current happiness and mood of subjects behaving virtuously, or in other words, subjects behaving virtuously should on average report a higher Now Happiness Difference (NHD) and a higher Mood Index Difference (MID) than those who do not behave virtuously. Due to practical constraints, I can only test this hypothesis for the behavior in the DG and the SPD. For the DG, my results replicate KE's findings: As indicated in Table 3, Givers stated a mean happiness and mood improvement that is smaller than those of Nongivers, but this difference is not significant. This result is confirmed by the regression analysis of Table 4a (Change in short-run SWB). For the SPD however, subjects, who trust or cooperate, experience a higher happiness and mood improvement than those who do not trust and free-ride. More precisely, their happiness and mood improvement is very small, but those who do not trust or cooperate experience a substantial decrease in their mood. Table 4a supports these results for the case of cooperating.

To clarify why there is a difference between the DG and the SPD, Table 5 provides additional analysis. A crucial aspect, not discussed so far, is that Now Happiness (NH) and the Mood Index

Table 5  
Now Happiness and Mood Index Difference

1) Dictator Game				
Sequence		Nongivers	Givers	T-Test
Pooled	NHD	0.00	0.10	0.35
	MID	-1.26	-0.94	0.42
DG-SPD	NHD	0.20	0.18	0.52
	MID	-1.00	-1.82	0.62
SPD-DG	NHD	-0.21	0.00	0.23
	MID	-1.53	0.10	<b>0.10</b>

2) Sequential Prisoners' Dilemma				
Sequence		Nontrustors	Trustors	T-Test
Pooled	NHD	-0.16	0.06	0.16
	MID	-3.00	0.37	<b>0.02</b>
SPD-DG	NHD	0.00	-0.03	0.54
	MID	-2.06	-1.97	0.49
DG-SPD	NHD	-0.32	0.14	<b>0.07</b>
	MID	-3.89	2.37	<b>0.00</b>

3) Sequential Prisoners' Dilemma				
Sequence		Free-riders	Cooperators	T-Test
Pooled	NHD	-0.43	0.10	<b>0.02</b>
	MID	-5.48	0.49	<b>0.00</b>
SPD-DG	NHD	-0.22	0.03	0.28
	MID	-6.67	-0.92	<b>0.03</b>
DG-SPD	NHD	-0.57	0.18	<b>0.01</b>
	MID	-4.71	1.88	<b>0.00</b>

4) Sequential Prisoners' Dilemma				
Sequence		Nontrustors & Free-riders	Trustor or Cooperator	T-Test
Pooled	NHD	-0.42	0.07	<b>0.04</b>
	MID	-5.95	0.31	<b>0.00</b>
SPD-DG	NHD	0.00	-0.02	0.52
	MID	-6.29	-1.27	<b>0.07</b>
DG-SPD	NHD	-0.67	0.17	<b>0.01</b>
	MID	-5.75	1.86	<b>0.00</b>

Notes: The T-Test section provides *p*-values according to one tail t-tests of the null hypothesis that subjects who behave virtuously experience a higher NHD and MID.

(MI) were asked directly before and after the SPD. This means that subjects made both decisions as first and second mover in the SPD before answering these well-being questions again. I hence cannot clearly distinguish whether trusting or cooperating leads to a difference in the NHD and MID. However, the Cooperator dummy performs better than the Trustor dummy in Table 4a. The reason why this is the case can be seen from Table 5. This table presents the Now Happiness Difference (NHD) and the Mood Index Difference (MID) for 1) Givers and Nongivers, 2) for Trustors and Nontrustors, 3) for Cooperators and Free-Riders, and 4) for those who either trusted or cooperated versus those who did not behave virtuously at all. Additionally, the table presents the data separately for the two different sequences (DG-SPD vs. SPD-DG) I employed.

However looking first at the pooled data for the SPD, we see that the NHD and MID are very similar for Trustors, Cooperators and subjects who trust or cooperate (forth column). On

the contrary, Nontrustors experience a decrease in happiness and mood but this decrease is not as big as for Free-riders or subjects who are both Free-riders and Nontrustors (third column). A plausible explanation for this result is the following: Only 64% of subjects trusted, but 77% of subjects cooperated. Most subjects who trusted also cooperated (61 out of 65), but more people who cooperated did not trust (18 out of 79). Hence, many of the Nontrustors cooperated (18 out of 37). However, out of the Free-riders a smaller proportion trusted (4 out of 23). This means most Free-riders did not behave virtuously at all which is the reason why Free-riders and those who are both Free-riders and Nontrustors suffer from a similar decrease in current happiness and mood.

There are two plausible mechanisms which I cannot distinguish: Either not behaving virtuously at all makes people unhappy or free-riding has much worse effects than not trusting. However, I basically only observe free-riding subjects who also do not trust. A possible reasoning for the first line of argument is provided by Becchetti and Antoni (2010). They observe that in a standard trust game only trustors experience gains in short-run happiness but not trustees because only trustors have a total payoff enhancing power. In my SPD, sent money is doubled for both the first and the second mover. Not using this efficiency enhancing power in both possible situations might decrease short-run happiness. They may feel guilty because of not fulfilling the expectations of the other player (see Charness and Dufwenberg, 2006). However, it might still be true that free-riding itself would make people unhappy because returning a favor (cooperating) could be considered to be a social norm whereas trusting is not considered such a norm. This would make not cooperating more harmful for well-being than not trusting.

Table 5 additionally presents the NHD and the MID separately for the two different sequences (DG-SPD vs. SPD-DG) I employed. For the SPD, the difference in the NID and the MID between virtuously and non-virtuously behaving subjects is more pronounced when the SPD is played as a second game. In the DG-SPD sequence, Trustors and Cooperators seem to experience a higher NID/MID than in the SPD-DG sequence. One plausible explanation for this observation is that playing the DG first highlights the efficiency enhancing feature of the SPD leading to an increase in happiness and mood as observed by Becchetti and Antoni (2010). For the DG, I observe a marginally significant difference between Nongivers and Givers when the SPD is played first. One - fairly speculative - explanation might be that playing a game with potentially high payoffs first increases average payoff expectations. Givers may be aware of this and experience a mood increase when meeting the expectations of others (and avoiding guilt) by giving in the DG. The same might be true for Nongivers in the other direction.

Overall, evidence for the cooperation hypothesis is mixed. In the DG, it seems not to be

important. In the SPD however, non-virtuously behaving subjects seem to experience a mood decrease. Hence, the hypothesis' predictive power might only be valid in specific game settings.

### 4.3.2 Mood Hypothesis

The next hypothesis reverses the causality of the former hypothesis: Mood or short-run happiness causes virtuous behavior. More precisely, subjects scoring high in Now Happiness (NH) and in the Mood Index (MI) should give, trust, cooperate and punish more (as a third party). Summary statistics depicted in Table 3a and 3b provide no support for this hypothesis. The same is true for the regression analysis of Table 4. An additional test is provided by Table 6a. In this table, I split subjects at the median value for NH and MI (and other variables). For every game, I then test whether the proportion of people giving, trusting etc. is higher for those scoring above the median. Only for the Mini-UG this test is reversed. For both variables, NH and MI, in all six settings, there is only one significant result: For high NH subjects, the fraction of cooperators is significantly higher than for low NH subjects. This result is further corroborated by Table 6b (appendix). Instead of fractions, this table looks at mean values (mean gift, mean amount sent, mean amount of punishment) in those settings in which such an analysis is possible. For all four situations, again only the mean amount sent in SPD by high NH/MI subjects is significantly higher than the amount sent by low NH/MI subjects. Overall, support for this hypothesis is very weak. Only in one setting (second mover in SPD) and by one type of analysis (median split of well-being measures), I find a significant result.

### 4.3.3 Material Well-Being Hypothesis

This hypothesis states that material well-being (MWB) is the tertiary causal factor of both virtuous behavior and well-being. Regarding the MWB-virtuousness relationship, Table 3a and 3b only provide weak support for the DG and the Mini-UG: Givers have higher monthly expenditures (MWB1) and state higher parents' income (MWB2). Additionally, subjects rejecting unfair offers report lower parent's income. These results are only partly supported by the analysis of Table 6. Subjects with higher material well-being are more likely to give, but the difference to those subjects low in MWB is not significant. Out of 20 tests provided by Table 6 and 6b only one is significant at a conventional level: Subjects reporting lower parents' income (MWB2) are more likely to reject an unfair offer in the Mini-UG. However, this relationship is not corroborated with subjects' monthly expenditures (MWB1). Overall, there is only very limited support for the MWB-virtuousness relationship.

Regarding the MWB-Happiness relationship, Table 2 provides a first indication that a weak

Table 6

Proportion tests of those who score high and low on different scales

	Mood Hypothesis		MWB Hypothesis		CRT Hypothesis	PWB Hypothesis		
	NH	MI	MWB1	MWB2	CRT	PWBI	SAI	SoWB
<b>Giver (DG)</b>								
High	59.5%	67.3%	65.6%	64.5%	68.5%	65.5%	69.8%	67.9%
Low	72.2%	56.0%	55.3%	57.5%	54.2%	56.8%	53.1%	54.3%
<i>p</i> -value	0.84	0.12	0.15	0.24	<b>0.07</b>	0.19	<b>0.04</b>	<b>0.08</b>
<b>Trustor (SPD)</b>								
High	63.5%	61.2%	64.1%	59.7%	63.0%	72.4%	71.7%	78.6%
Low	64.0%	66.0%	63.2%	70.0%	64.6%	52.3%	55.1%	45.7%
<i>p</i> -value	0.52	0.69	0.46	0.86	0.57	<b>0.02</b>	<b>0.04</b>	<b>0.00</b>
<b>Cooperator (SPD)</b>								
High	83.6%	82.4%	76.6%	75.8%	83.3%	79.3%	86.8%	89.3%
Low	70.2%	72.5%	78.9%	80.0%	70.8%	75.0%	67.3%	63.0%
<i>p</i> -value	<b>0.05</b>	0.12	0.61	0.69	<b>0.07</b>	0.30	<b>0.01</b>	<b>0.00</b>
<b>Reject (Mini-UG)</b>								
High	50.9%	49.0%	54.7%	45.2%	51.9%	46.6%	50.9%	51.8%
Low	55.3%	56.9%	50.0%	65.0%	54.2%	61.4%	55.1%	54.3%
<i>p</i> -value	0.33	0.21	0.68	<b>0.03</b>	0.41	<b>0.07</b>	0.34	0.40
<b>Punisher (SPD-P)</b>								
High	49.1%	51.0%	50.0%	48.4%	46.3%	51.7%	50.9%	53.6%
Low	53.2%	51.0%	52.6%	55.0%	56.3%	50.0%	51.0%	47.8%
<i>p</i> -value	0.66	0.50	0.60	0.74	0.84	0.43	0.50	0.28
<b>Punisher (DG-P)</b>								
High	27.3%	25.5%	25.0%	22.6%	24.1%	29.3%	35.8%	32.1%
Low	21.3%	23.5%	23.7%	27.5%	25.0%	18.2%	12.2%	15.2%
<i>p</i> -value	0.24	0.41	0.44	0.71	0.54	<b>0.10</b>	<b>0.00</b>	<b>0.02</b>

Note: For each variable (e.g. NH), subjects are split into those who score at or above the median in terms of that variable (High) and those who are below the median (Low). For every variable the High/Low row shows the percentage of subjects giving, trusting, cooperating etc. in each group. *p*-values are provided by one-tail z-tests of the hypothesis that the percentage of the High group exceed the percentage of the Low group. Only for the Mini-UG these one-tailed z-tests test the reverse hypothesis. Compare KE (Table 6).

relationship might exist. Focusing on long-run happiness/SWB and Satisfaction with Life, four correlations are significant at the 5% level. Table 7 further analyzes this relationship analogous to Table 6: subjects are split up at the median value of the two material well-being measures and mean values of the relevant hedonic happiness measures (OH, PA, PAS, NAS, and SWL) are reported separately for high and low MWB subjects. Unlike KE, who find no significant difference at all, differences between high and low subjects are (at least weakly) significant in six out of ten cases. For OH, PAS, and SWL differences are significant for both material well-being measures. In general, a positive relationship between income, especially relative income (Easterlin 1974), and hedonic happiness is not an unusual finding in the literature. A possible reason why I am able to detect such a relationship, whereas KE are not, could be the sample size: KE have only 48 observations compared to 102 observations in my experiment. Additionally, KE only have undergraduate subjects whereas I do not restrict my sample only to undergraduates. In

Table 7  
Results on hedonic happiness and material well-being/ cognitive ability

		Mean scores				
		OH	PA	PAS	NAS	SWL
<b>MWB measure</b>						
Monthly Expenditures	High	6.56	3.42	34.47	21.88	24.88
	Low	6.00	3.63	32.45	22.13	23.13
	<i>p</i> -value	<b>0.01</b>	0.79	<b>0.05</b>	0.43	<b>0.06</b>
Parents' Income	High	6.48	3.63	34.53	21.81	25.55
	Low	6.15	3.30	32.45	22.23	22.18
	<i>p</i> -value	<b>0.08</b>	0.10	<b>0.04</b>	0.39	<b>0.00</b>
<b>Cognitive Ability</b>						
Cognitive Reflection Test	High	6.48	3.65	34.28	21.63	24.65
	Low	6.21	3.33	33.08	22.35	23.75
	<i>p</i> -value	0.12	0.11	0.16	0.32	0.21

Note: Subjects are split into those who score at or above the median MWB/ CRT and those who are below. For each group mean values of different SWB measures (OH, PA, PAS, NAS, SWL) are reported. Additionally, *p-values* for a one-tail t-test of the null hypothesis that the High SWB group is better than the Low group are reported. Compare KE (Table 7).

sum, I find no conclusive support that material well-being causes virtuous behavior. Nonetheless, a favourable correlation between hedonic well-being and material well-being seems to exist.

#### 4.3.4 Cognitive Ability Hypothesis

Is cognitive ability the tertiary causal factor of both virtuous behavior and happiness? Regarding the relationship of cognitive ability and virtuous behavior, Table 3a and 3b only support a positive relationship for giving in the DG and cooperating in the SPD. This relationship is corroborated by Table 6 (with marginal significance). Subjects with high values in the cognitive reflection test are more likely to give and to cooperate. However, this group does not provide a higher mean gift or a higher mean amount sent (Table 6b - appendix). One explanation for my results may be the following: As outlined earlier, the Cognitive Reflection Test (CRT) does not measure cognitive ability per se, but tests whether an individual follows an intuitive (but incorrect) answer or is able to resist this easy solution to the problem. In other words, the CRT measures impulse control. Behaving virtuously may partly reflect a comparable problem. Behaving non-virtuously, may be an easy (but incorrect) answer in maximizing own happiness. In this line, behaving virtuously may be interpreted as forgoing a short-run advantage to increase long-run well-being.

Regarding the relationship between cognitive ability and happiness, Table 2 provides no initial support for our hypothesis. This is corroborated by Table 7. Subjects scoring higher in the CRT are on average happier and these difference are not too far away from being significant, but none is even marginally significant at a conventional level. We might interpret this result

Table 8  
Results on subjective and psychological well-being

		Mean scores				
		OH	PA	PAS	NAS	HH
<b>PWB measure</b>						
Index of PWB	High	6.69	3.83	35.78	20.66	7.69
	Low	5.91	3.07	31.00	23.70	7.16
	<i>p</i> -value	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.02</b>	<b>0.01</b>
Self-Actualization Index (SAI)	High	6.47	3.66	34.92	19.64	7.53
	Low	6.22	3.33	32.41	24.49	7.39
	<i>p</i> -value	0.14	<b>0.09</b>	<b>0.02</b>	<b>0.00</b>	0.27
Social Well-Being (SoWB)	High	6.64	3.70	35.02	20.89	7.73
	Low	6.00	3.26	32.13	23.28	7.13
	<i>p</i> -value	<b>0.00</b>	<b>0.04</b>	<b>0.01</b>	<b>0.06</b>	<b>0.00</b>

Note: Subjects are split into those who score at or above the median of different PWB measures and those who are below. For each group mean values of different SWB measures (OH, PA, PAS, NAS, SWL) are reported. Additionally, *p-values* for a one-tail t-test of the null hypothesis that the High PWB group is better than the Low group are reported. Compare KE (Table 8).

in line with the general finding in the literature that IQ and happiness are related but only to a very small extent (Argyle, 1999). With my sample size, I might not be able to statistically detect this comparatively weak relationship. Overall, there is some evidence that cognitive ability and virtuous behavior are moderately related, at least in some settings. However, I do not find statistically robust evidence of relationship between cognitive ability and happiness.

#### 4.3.5 Psychological Well-Being Hypothesis

Table 3 and Table 4 have shown that there is a fairly robust relationship between virtuous behavior and PWB. Although this relationship seems to be not as strong as in KE's analysis, it remains the statistically most significant and robust relationship in my analysis. Additional evidence comes from Table 6. Do those who score higher in PWB measures have a higher probability to behave virtuously? For giving, trusting and cooperating subjects scoring high in any of the three PWB measures have a higher likelihood of behaving virtuously. This difference between high PWB and low PWB subjects is always significant for the SAI and for SoWB. In the SPD for example, 86.8% of high SAI subjects are classified as cooperators whereas only 63.0% of low SAI subjects are. Regarding the question of punishment, we find that for the DG-P the probability of high PWB subjects to be a punisher is significantly higher than for low PWB subjects (for all three measures of PWB), e.g. High SAI subjects have a probability of behaving virtuously of 35.8% whereas Low SAI subjects have a probability of 12.2%. For the Mini-UG and the hypothesized reverse relationship, only the PWB is (marginally) significant.

Regarding the PWB-SWB relationship, Table 8 presents results analogous to those of Table 6 and 7. For all three PWB measures, subjects scoring high in these measures have a higher (average) value for the relevant SWB measures (OH, PA, PAS, NAS, HH). These differences are

significant in 13 out of 15 cases.

In general, the observed PWB-virtuousness relationship and the PWB-SWB relationship are consistent with the PWB hypothesis. Additionally, these relationships seem to be robust across different ways of analysis (Table 3, 4, 6, 8) and for different settings of virtuous behavior (giving, trusting, cooperating, and third-party punishment with high costs). The general observation that the PWB-virtuousness relationship is fairly robust whereas the SWB-virtuousness relationship seems to be fairly weak (if it exists at all) is also in line with PWB hypothesis. This hypothesis states that PWB directly causes (long-run) SWB and (short-run) virtuous behavior. The indirect relationship between SWB and virtuousness should be much weaker. Nonetheless, we might hypothesize that long-run SWB (instead of PWB) causes both virtuousness and PWB (and call this the SWB hypothesis). The weakness of the SWB-virtuousness relation provides evidence against this hypothesis. Nonetheless in line with KE, I will provide a more formal test. If the SWB Hypothesis is correct, all the covariance between virtuous behavior and PWB should operate through SWB. If we regress PWB on SWB, adding a dummy for virtuous behavior should not improve the explanatory power of the regression. Adding e.g. the giver dummy to a regression of SWB on PWB instead, should increase the goodness-of-fit. If on the other hand the PWB Hypothesis is correct, the predictions are reversed: Adding the dummies to a regression of PWB on SWB should increase explanatory power whereas adding the dummies to a regression of SWB on PWB should not.

Table 9 presents results for likelihood ratio tests that adding dummies of virtuous behavior significantly increases the goodness-of-fit measure for these ordered logit regression. For giving, trusting and cooperating, the table presents the likelihood ratio and  $p$ -values for regressions of PWB measures on SWB measures and for regressions of SWB measures on PWB measures. In every case, I focus here on those two PWB and those two SWB with the lowest  $p$ -value in Table 3. The table differentiates between the control variable MWB1 in columns 3 and 4 and MWB2 in columns 5 and 6. Overall for regressions of SWB measure on PWB measures, we observe that adding a dummy of virtuous behavior does not increase goodness-of-fit significantly in any of the 24 regressions. However, if we regress PWB measures on SWB measures, adding a dummy of virtuous behavior increases goodness-of-fit in 18 out of 24 cases (with at least marginal significance). Again, results are not as clear as in KE's analysis, but also my data seems much more in favor of the PWB hypothesis than of the SWB hypothesis.



Table 9

Goodness-of-fit tests for the addition of a dummy of virtuous behavior

Dependent measure	Independent variable	Expenditures (MWB 1)		Parents' Income (MWB 2)	
		LR	<i>p</i> -value	LR	<i>p</i> -value
<b>Giver dummy</b>					
Self-Actualization Index (SAI)	OH	4.23	<b>0.04</b>	5.47	<b>0.02</b>
	PAS	3.59	<b>0.06</b>	4.64	<b>0.03</b>
Social Well-Being (SoWB)	OH	4.36	<b>0.04</b>	4.65	<b>0.03</b>
	PAS	3.78	<b>0.05</b>	4.11	<b>0.04</b>
Overall Happiness (OH)	SAI	0.03	0.85	0.03	0.86
	SoWB	0.05	0.82	0.03	0.87
Positive Affect Schedule (PAS)	SAI	0.67	0.41	0.80	0.37
	SoWB	0.76	0.38	1.17	0.28
<b>Trust dummy</b>					
Self-Actualization Index (SAI)	OH	1.67	0.20	2.10	0.15
	NAS	1.83	0.18	2.87	<b>0.09</b>
Social Well-Being (SoWB)	OH	7.38	<b>0.01</b>	7.36	<b>0.01</b>
	NAS	7.05	<b>0.01</b>	7.18	<b>0.01</b>
Overall Happiness	SAI	2.11	0.15	2.16	0.14
	SoWB	0.32	0.57	0.52	0.47
Negative Affect Schedule (NAS)	SAI	0.91	0.34	0.65	0.42
	SoWB	0.62	0.43	0.60	0.44
<b>Cooperation dummy</b>					
Self-Actualization Index (SAI)	PA	1.87	0.17	2.73	<b>0.10</b>
	PAS	1.62	0.20	2.39	0.12
Social Well-Being (SoWB)	PA	7.92	<b>0.00</b>	8.20	<b>0.00</b>
	PAS	7.13	<b>0.01</b>	7.16	<b>0.01</b>
Bradburn's Positive Affect (PA)	SAI	0.01	0.94	0.03	0.86
	SoWB	0.25	0.62	0.37	0.54
Positive Affect Schedule (PAS)	SAI	0.74	0.39	0.75	0.39
	SoWB	0.74	0.39	0.75	0.39

Notes: LR denotes the likelihood ratio. Besides MWB measures, regressions include the Marlowe-Crone scale, CRT, a sequence dummy and the confidence-scale about truing answering well-being questions.

#### 4.3.6 Third-Party (TP) versus Second-Party (SP) Punishment

I hypothesized that there is a crucial distinction between second-party punishment in the Mini-UG and third-party punishment in the SPD-P and the DG-P. In the Mini-UG the punishment party is directly affected by the unfair behavior of the other party whereas this is not the case in the SPD-P and the DG-P. Moreover, in the DG-P punishment costs are higher than in the SPD-P. If at all, we should find a relationship between PWB and punishment in this setting.

As outlined before, Table 3b suggest that punishment in the Mini-UG is negatively related to long-run affect (although this relationship is not robust to including controls as done in Table 4). In line with expectations, Table 3b suggests that punishment in the DG-P is positively related to PWB. This relationship is confirmed by Table 6 and Table 4. Punishment in the SPD-P seems to be somewhere in between the Mini-UG and the SPD-P. Overall, I interpret my experimental evidence in the following way: The motivational forces behind punishing in the DG-P seem to be

(positively) related to PWB. In this setting, we may interpret punishment as an act of kindness. The motivational forces behind punishing in the Mini-UG seem not be related to PWB. Instead, there is at least some evidence that these forces are negatively related to the long-run affective component of SWB. This would be in line with findings in the literature that emotions play a major role in rejections in the ultimatum game. What at least can be said it that in the Mini-UG punishment cannot be considered as an act of kindness increasing well-being.

Summing it up, the situation is more diverse than in KE's analysis: There is some evidence that virtuous behavior in some settings (SPD) may increase short-run happiness and mood. However, this is not the case for the DG, as already found by KE. In my setting, mood or short-run happiness seems not to increase the probability of virtuous behavior. Additionally, my data does not allow the conclusion that material well-being and cognitive ability are the tertiary cause of virtuous behavior. However, there is some evidence of a weak correlation of income and subjective well-being. Overall, my experimental data is mostly in line with PWB Hypothesis which states that virtuous behavior is both a short-run effect and a long-run cause of psychological well-being. In my experiment, data is in line with the hypothesis that PWB is the primary cause of virtuous behavior and hedonic happiness. Thus supporting the main result of KE. To this extent, we can argue that there seems to be nexus between long-run well-being and virtuous behavior. More precisely, there is a nexus between virtuous behavior and eudaimonic well-being (or its measure PWB) supporting a eudaimonic interpretation of the Virtue Ethics Hypothesis.

## 5 Conclusion

Is there a nexus between well-being and virtuous behavior? For a hedonic interpretation of well-being, I find some evidence that some measures of subjective well-being are positively related to virtuous behavior. In my analysis this relationship has however not proven to be very robust to additional checks and controls. My results show however that there seems to be a clear positive relationship between psychological well-being and virtuousness. Well-being interpreted in a eudaimonic way is robustly related to virtuous behavior measured by giving, trusting and cooperating in suitable economic games. My data is mostly in line with the hypothesis that virtuous behavior is both a long-run cause as well as a short effect of eudaimonic well-being. To this extent, there is a nexus between virtuous behavior and (eudaimonic) well-being supporting a eudaimonic interpretation of the Virtue Ethics Hypothesis. Hence, well-being and virtuous behavior are connected with each other to the extent that we think about well-being not just in

terms of pleasure and pain (as the hedonic well-being approach does) but in terms of whether people have something like a purpose in life or whether they are striving for self-fulfillment. This nexus also provides us with an explanation why some people behave virtuously and others do not. Subjects' individual's insight in the relationship of virtuous behavior and well-being, or in other words, their ethical maturity decides whether a person behaves virtuously or not. Mature people know that virtuous behavior increases their well-being whereas less mature people are unaware of this insight. And the degree of this maturity is not just solemnly determined by subjects' cognitive ability. My results also questions the primary focus of economists on subjective well-being when working on happiness. In my view, subjective well-being is a very important measure. However, my analysis shows that psychological well-being can be a very useful complement for measuring well-being.

Regarding punishment of unfair behavior, my analysis suggests that this kind of negative reciprocity can be considered as a virtuous act which increases psychological well-being. Whether this however is the case, seems to depend on the setting in which defectors are punished. When a directly involved second party punishes unfair behavior, this punishment might be motivated by emotional forces that do not lead to higher happiness. This reflects in a way the biblical demand "to turn the other cheek" if someone slaps you on your right cheek. Punishment however provided by an uninvolved third party (at high costs) seems to be driven by motivational forces in line with the eudaimonic idea of an individual striving for human growth and self-fulfillment. Hence, punishment cannot only differ to what extent it is socially beneficial or not but to what extent it is personally beneficial in terms of well-being or not.

How can the fraction of pro-socially behaving citizens in a society be increased? To the extent that we consider behavioral patterns such as altruism, trust, (conditional) cooperation and punishing of unfair behavior as an important ingredient or even as a precondition of economic prosperity (as outlined in the instruction), my analysis provides a hint that those factors guiding us to (eudaimonic) well-being may also lead us to a flourishing society, especially if we assume both lines of causality between eudaimonic well-being and virtuous behavior. As already pointed out by KE, there are non-material benefits of policies that promote volunteerism, charitable donations, service education, community involvement, etc. Not taking these benefits into account, may deteriorate both individual well-being and economic prosperity.

## A Appendix: Tables

Table 6b  
Difference in means of those who score high and low on different scales

	Happiness Hypothesis		MWB-Hypothesis		CRT-Hypothesis	PWB Hypothesis		
	NH	MI	MWB1	MWB2	CRT	PWBI	SAI	SoWB
<b>Giving (DG)</b>								
High	4.24	5.04	4.66	4.97	4.93	4.76	5.47	4.93
Low	5.89	4.00	4.32	3.85	4.08	4.23	3.51	4.04
<i>p</i> -value	0.93	0.12	0.35	0.10	0.17	0.27	<b>0.01</b>	0.16
<b>Cooperation (SPD)</b>								
High	8.36	8.04	7.16	7.00	7.52	7.66	8.30	8.50
Low	6.30	6.78	7.84	8.05	7.29	7.09	6.45	6.09
<i>p</i> -value	<b>0.01</b>	<b>0.08</b>	0.77	0.88	0.40	0.26	<b>0.02</b>	<b>0.00</b>
<b>Punishment (SPD-P)</b>								
High	2.22	2.36	2.27	2.20	2.04	2.35	2.45	2.36
Low	2.06	1.93	1.93	2.06	2.27	1.88	1.82	1.89
<i>p</i> -value	0.38	0.19	0.25	0.39	0.68	0.17	<b>0.10</b>	0.17
<b>Punishment (DG-P)</b>								
High	0.67	0.69	0.75	0.65	0.80	0.83	1.09	0.89
Low	0.66	0.65	0.53	0.70	0.52	0.45	0.20	0.39
<i>p</i> -value	0.48	0.44	0.21	0.58	0.15	<b>0.09</b>	<b>0.00</b>	<b>0.03</b>

Note: For each variable (e.g. NH), subjects are split into those who score at or above the median in terms of that variable (High) and those who are below the median (Low). For every variable the High/Low row shows the mean gift/ mean amount sent/ mean amount of punishment for each group. *p*-values are provided by one-tail *t*-tests of the hypothesis that the mean value of the High group exceed the mean value of the Low group. Compare KE (Table 6).

## B Appendix: Additional Analysis

In this section, I will provide two pieces of additional analysis. First, I will have a closer look at those subjects who give in the DG and trust and cooperate in the SPD. Second, I will extend the analysis of Table 6 by using quartiles instead of the median in order to divide subjects into different groups.

### B.1 Most virtuous subjects

When there is a relationship between well-being and virtuous behavior, this relationship should be especially pronounced for those subjects who behave virtuously across different settings. In the following, I will look at those subjects who give in the DG and trust and cooperate in SPD simultaneously.

Table 10a

Well-being for subjects who give, trust and cooperate

Well-being measures	1) DG and SPD		p-value	% SD
	Mixed behavior	Giver/Trustor/Coop.		
<i>Subjective well-being</i>				
Long-run happiness				
Overall Happiness (OH)	6.22	6.51	0.10	25%
Bradburn's Positive Affect (PA)	3.49	3.51	0.47	2%
Positive Affect Schedule (PAS)	32.73	34.87	0.03 **	36%
Negative Affect Schedule (NAS)	23.04	20.72	0.06 *	31%
Highest/ lowest happiness				
Highest Happiness (HH)	7.33	7.62	0.10 *	26%
Lowest Happiness (LH)	3.47	3.55	0.39	6%
Short-run happiness				
Now Happiness (NH)	5.45	5.62	0.27	12%
Mood Index (MI)	40.29	42.06	0.21	16%
Life satisfaction				
Satisfaction With Life (SWL)	23.96	24.53	0.30	10%
<i>Psychological well-being</i>				
PWB Index (PWB I)	27.36	29.19	0.01 **	47%
Self-Actualization Index (SAI)	41.65	44.68	0.00 **	57%
Social Well-Being (SoWB)	58.31	63.00	0.00 **	52%
<i>Material well-being</i>				
Monthly expenditures	601.45	712.55	0.04 **	36%
Parents' income	3.02	3.36	0.16	20%
<i>Cognitive ability</i>				
Cognitive Reflection Test (CRT)	1.51	1.70	0.19	17%
N	55	47		

Notes: \*/\*\* indicates significance at the 10%/5% level according to one-tail t-tests of the null hypothesis that subjects behaving virtuously are better off than non-virtuous subjects (e.g. That they have higher positive affect, lower negative effect, higher income, etc.), n=102

Table 10a presents results in line with Table 3: It compares the mean value of those who give, trust and cooperate with the mean value of those who do not act virtuously at all or only in one or two settings. Most importantly, the difference in means is highly significant for all three PWB measures. Additionally, there is (at least a marginally) significant difference for the Positive Affect Schedule (PAS), the Negative Affect Schedule (NAS) and Highest Happiness (HH). Overall Happiness (OH) is on the edge of being marginally significant. Overall, these values are probably the strongest evidence for a weak relationship between SWB and virtuous behavior. However, as the next table will show, these results are not robust for including control variables.

Table 10b presents results in line with Table 4: A summary of ordered logit results for a GiTrCo dummy (Giver, Trustor, Cooperator) is provided. The second column uses comparable controls as in KE in line with Table 4a, the third column also uses additional demographic controls in line with Table 4b. As indicated above,

Table 10b  
Summary of ordered logit results coefficients for the dummy that subjects give, trust and cooperate (GiTrCo Dummy)

Dependent variable/ Well-being measure	GiTrCo Dummy		GiTrCo Dummy (full set of controls)	
	<i>p</i> -value		<i>p</i> -value	
<i>Subjective well-being</i>				
Long-run happiness				
long-run SWB	0.43	0.23	0.46	0.24
Highest/ lowest happiness				
Highest/Lowest Happiness	-0.10	0.78	0.05	0.89
Short-run happiness				
short-run SWB	0.01	0.97	-0.07	0.86
Change in short-run SWB	0.48	0.18	0.60	0.11
Life satisfaction				
Satisfaction With Life (SWL)	-0.03	0.93	-0.04	0.92
<i>Psychological well-being</i>				
PWB	0.89	<b>0.02 **</b>	0.78	<b>0.04 **</b>

Notes: \*/\*\* indicate significance at 10/5% level; n=102

the SWB-virtuousness relationship is not robust for including control variables. However, the dummy remains significant for aggregate PWB for both control settings. Hence, experimental evidence for most virtuous subjects is broadly in line with expectations. Only the PWB hypothesis is clearly supported by the data. Overall, this additional analysis provides further support that a nexus between virtuous behavior and eudaimonic well-being exists.

## B.2 Terciles and Quartiles of Well-Being Measures

Table 6 provided an analysis whether those who score above the median for a specific well-being measure are more likely to behave virtuously. Table 11a and 11b extend this analysis by looking at terciles and quartiles of well-being measures instead of a deviation by the median. Table 11a divides subjects into four groups relating to the different well-being measures (NH, MI, MWB1, MWB2, CRT, PWBI, SAI, SoWB): Very High (VH) subjects score at or above the 75%-quantil, Medium High (MH) subjects score at or above the 50%-quantil, but below the 75%-quantil, and so on. Besides the percentage of subjects who behave virtuously across different settings, Table 11a also provides proportion tests whether the percentage of the Very High group is significantly different from the other groups.

The first general observation we can make after looking at the table is that the general pattern of Table 6 that only the PWB Hypothesis is valid across different settings is affirmed. Hence, I will focus on this hypothesis in my further remarks. In line with this hypothesis, I would expect that subjects in higher quartiles should have a higher probability of behaving virtuously, at least in those games in which a PWB-virtuousness relationship has occurred earlier (DG, SPD, DG-P). For giving, trusting, cooperating and punishing in the DG-P, the most robust observation is that unsurprisingly those in the highest quartile have a significantly higher probability of behaving virtuously than those in the lowest quartile. Differences from the highest quartile to the second lowest quartile are sometimes significant.<sup>24</sup> What is the overall message from Table 11a? The general pattern (at least for the DG, the SPD and the DG-P) seems to be that the percentage of those who behave virtuously is rising the higher the quartile is. However, there are several deviations from this pattern. Interestingly, there are e.g. more people trusting in the second highest quartile of the SAI and the SoWB than in the highest quartile. The same is true for cooperating and the SoWB although these differences are not significant. For the DG, the SPD and the DG-P, there is however only one observation that the second lowest quartile has a lower percentage of virtuously

<sup>24</sup>Comparing quartiles reduces the number of observations resulting in higher differences needed for significance.

Table 11a

Proportion tests of those who score very high/ medium high/ medium low and very low on different scales

	Happiness Hypothesis		MWB Hypothesis		CRT Hypothesis	PWB Hypothesis		
	NH	MI	MWB1	MWB2	CRT	PWBI	SAI	SoWB
<b>Giver (DG)</b>								
Very High (VH)	70.0%	59.0%	72.0%	66.0%	72.0%	73.0%	73.0%	70.0%
Medium High (MH)	57.0%	76.0%	62.0%	62.0%	64.0%	59.0%	67.0%	66.0%
Medium Low (ML)	53.0%	54.0%	65.0%	68.0%	62.0%	60.0%	57.0%	68.0%
Very Low (VL)	72.0%	58.0%	40.0%	48.0%	45.0%	50.0%	47.0%	42.0%
VH > MH ( $p$ -value)	0.15	0.90	0.19	0.38	0.25	0.14	0.31	0.35
VH > ML ( $p$ -value)	<b>0.08</b>	0.35	0.31	0.58	0.20	0.15	0.10	0.43
VH > VL ( $p$ -value)	0.55	0.47	<b>0.02</b>	<b>0.08</b>	<b>0.03</b>	<b>0.07</b>	<b>0.04</b>	<b>0.02</b>
<b>Trust (SPD)</b>								
Very High (VH)	70.0%	63.0%	68.0%	68.0%	66.0%	81.0%	69.0%	74.0%
Medium High (MH)	56.0%	57.0%	62.0%	43.0%	60.0%	66.0%	74.0%	83.0%
Medium Low (ML)	67.0%	64.0%	70.0%	74.0%	65.0%	57.0%	67.0%	59.0%
Very Low (VL)	57.0%	72.0%	53.0%	67.0%	64.0%	43.0%	37.0%	33.0%
VH > MH ( $p$ -value)	0.14	0.32	0.30	<b>0.03</b>	0.34	0.10	0.65	0.79
VH > ML ( $p$ -value)	0.38	0.54	0.55	0.66	0.50	<b>0.03</b>	0.42	0.13
VH > VL ( $p$ -value)	0.20	0.76	0.18	0.45	0.44	<b>0.01</b>	<b>0.02</b>	<b>0.00</b>
<b>Cooperation</b>								
Very High (VH)	74.0%	70.0%	84.0%	83.0%	79.0%	85.0%	88.0%	89.0%
Medium High (MH)	88.0%	83.0%	72.0%	62.0%	88.0%	75.0%	85.0%	90.0%
Medium Low (ML)	78.0%	71.0%	83.0%	79.0%	77.0%	77.0%	70.0%	68.0%
Very Low (VL)	64.0%	88.0%	73.0%	81.0%	64.0%	71.0%	63.0%	58.0%
VH > MH ( $p$ -value)	0.90	0.84	0.13	<b>0.03</b>	0.80	0.18	0.36	0.54
VH > ML ( $p$ -value)	0.63	0.53	0.45	0.36	0.42	0.23	<b>0.05</b>	<b>0.04</b>
VH > VL ( $p$ -value)	0.26	0.94	0.21	0.42	0.11	0.16	<b>0.02</b>	<b>0.01</b>
<b>Reject (Mini-UG)</b>								
Very High (VH)	47.0%	45.0%	44.0%	46.0%	48.0%	42.0%	46.0%	52.0%
Medium High (MH)	56.0%	55.0%	62.0%	43.0%	56.0%	50.0%	56.0%	52.0%
Medium Low (ML)	54.0%	57.0%	48.0%	63.0%	50.0%	57.0%	63.0%	50.0%
Very Low (VL)	58.0%	57.0%	53.0%	67.0%	59.0%	71.0%	42.0%	58.0%
VH < MH ( $p$ -value)	0.25	0.25	<b>0.08</b>	0.60	0.29	0.28	0.25	0.50
VH < ML ( $p$ -value)	0.30	0.18	0.40	0.11	0.45	0.14	0.10	0.55
VH < VL ( $p$ -value)	0.22	0.20	0.28	<b>0.06</b>	0.22	<b>0.04</b>	0.61	0.32
<b>Punish (SPD-P)</b>								
Very High (VH)	53.0%	48.0%	40.0%	49.0%	52.0%	42.0%	54.0%	67.0%
Medium High (MH)	44.0%	55.0%	56.0%	48.0%	40.0%	59.0%	48.0%	41.0%
Medium Low (ML)	50.0%	47.0%	52.0%	63.0%	58.0%	50.0%	60.0%	59.0%
Very Low (VL)	58.0%	57.0%	53.0%	48.0%	55.0%	50.0%	37.0%	38.0%
VH > MH ( $p$ -value)	0.25	0.67	0.90	0.47	0.19	0.90	0.34	<b>0.03</b>
VH > ML ( $p$ -value)	0.40	0.45	0.80	0.85	0.67	0.72	0.68	0.29
VH > VL ( $p$ -value)	0.62	0.73	0.79	0.47	0.58	0.68	0.13	<b>0.02</b>
<b>Punish (DG-P)</b>								
Very High (VH)	30.0%	24.0%	20.0%	27.0%	24.0%	31.0%	46.0%	37.0%
Medium High (MH)	24.0%	27.0%	28.0%	14.0%	24.0%	28.0%	26.0%	28.0%
Medium Low (ML)	14.0%	23.0%	22.0%	37.0%	19.0%	20.0%	10.0%	18.0%
Very Low (VL)	32.0%	24.0%	27.0%	19.0%	32.0%	14.0%	16.0%	13.0%
VH > MH ( $p$ -value)	0.31	0.60	0.77	0.13	0.50	0.41	<b>0.06</b>	0.22
VH > ML ( $p$ -value)	<b>0.08</b>	0.47	0.56	0.78	0.33	0.18	<b>0.00</b>	<b>0.07</b>
VH > VL ( $p$ -value)	0.55	0.49	0.69	0.25	0.73	0.13	<b>0.02</b>	<b>0.02</b>

Note: For each variable (e.g. NH), subjects are split into those who score at or above the 75%-quantil, at or above the 50%-quantil but below the 75% quantil, and so on. For every variable the Very High/ Medium High/ Medium Low/ Very Low row shows the percentage of subjects giving, trusting, cooperating etc. in each group.  $p$ -values are provided by one-tail  $z$ -tests of the hypothesis that the percentage of the Very High group exceed the percentage of the Medium High/ Medium Low/ Very Low group. Only for the Mini-UG, these one-tailed  $z$ -tests test the reverse hypothesis. Compare KE (Table 6).

behaving subjects than the lowest quartile (DG-P and SAI). I interpret this as an indication that scoring in PWB measures strongly below the average (lowest quartile) significantly reduces the probability of virtuous behavior.

Table 11b provides a similar analysis by using terciles instead of quartiles. I will again focus on the PWB hypothesis and giving, trusting, cooperating and punishing in DG-P. For this focus, the highest tercile always has a higher percentage of virtuously behaving subjects (than a lower tercile) but for one exception (Trust and SoWB). For the lower and the middle tercile however, I do not always observe a higher percentage in the middle tercile, especially for punishing in the DG-P. Regarding the relationship of well-being measures and virtuous

Table 12b

Proportion tests of those who score high and low on different scales

	Happiness Hypothesis		MWB Hypothesis		CRT Hypothesis	PWB Hypothesis		
	NH	MI	MWB1	MWB2	CRT	PWBI	SAI	SoWB
<b>Giver (DG)</b>								
High	64.0%	61.0%	69.0%	66.0%	69.0%	74.0%	71.0%	74.0%
Medium	53.0%	62.0%	67.0%	65.0%	62.0%	51.0%	65.0%	57.0%
Low	72.0%	63.0%	47.0%	48.0%	45.0%	58.0%	47.0%	53.0%
High > Medium ( <i>p</i> -value)	0.16	0.55	0.41	0.47	0.27	<b>0.02</b>	0.28	<b>0.06</b>
High > Low ( <i>p</i> -value)	0.74	0.56	<b>0.03</b>	<b>0.08</b>	<b>0.03</b>	<b>0.08</b>	<b>0.02</b>	<b>0.04</b>
Medium > Low ( <i>p</i> -value)	0.91	0.51	<b>0.05</b>	<b>0.09</b>	0.13	0.69	<b>0.07</b>	0.39
<b>Trust (SPD)</b>								
High	66.0%	61.0%	62.0%	68.0%	63.0%	77.0%	71.0%	71.0%
Medium	65.0%	68.0%	76.0%	57.0%	65.0%	57.0%	68.0%	76.0%
Low	56.0%	63.0%	53.0%	67.0%	64.0%	54.0%	50.0%	40.0%
High > Medium ( <i>p</i> -value)	0.45	0.73	0.90	0.16	0.58	<b>0.03</b>	0.36	0.66
High > Low ( <i>p</i> -value)	0.22	0.56	0.25	0.45	0.52	<b>0.03</b>	<b>0.04</b>	<b>0.01</b>
Medium > Low ( <i>p</i> -value)	0.26	0.33	<b>0.03</b>	0.76	0.45	0.41	<b>0.07</b>	<b>0.00</b>
<b>Cooperation (SPD)</b>								
High	82.0%	76.0%	79.0%	83.0%	83.0%	82.0%	91.0%	91.0%
Medium	76.0%	81.0%	79.0%	70.0%	77.0%	76.0%	70.0%	78.0%
Low	67.0%	75.0%	73.0%	81.0%	64.0%	73.0%	70.0%	60.0%
High > Medium ( <i>p</i> -value)	0.27	0.71	0.47	<b>0.08</b>	0.25	0.25	<b>0.01</b>	<b>0.06</b>
High > Low ( <i>p</i> -value)	<b>0.09</b>	0.47	0.27	0.42	<b>0.03</b>	0.19	<b>0.01</b>	<b>0.00</b>
Medium > Low ( <i>p</i> -value)	0.22	0.27	0.31	0.82	0.16	0.41	0.49	<b>0.05</b>
<b>Reject (Mini-UG)</b>								
High	46.0%	48.0%	54.0%	46.0%	52.0%	38.0%	46.0%	46.0%
Medium	62.0%	54.0%	55.0%	53.0%	50.0%	59.0%	59.0%	57.0%
Low	56.0%	56.0%	50.0%	67.0%	59.0%	65.0%	53.0%	57.0%
High < Medium ( <i>p</i> -value)	<b>0.08</b>	0.32	0.48	0.29	0.56	<b>0.03</b>	0.12	0.17
High < Low ( <i>p</i> -value)	0.24	0.27	0.62	<b>0.06</b>	0.28	<b>0.02</b>	0.27	0.19
Medium < Low ( <i>p</i> -value)	0.67	0.43	0.64	0.14	0.26	0.32	0.69	0.50
<b>Punish (SPD-P)</b>								
High	46.0%	52.0%	44.0%	49.0%	46.0%	54.0%	54.0%	63.0%
Medium	53.0%	46.0%	61.0%	55.0%	58.0%	43.0%	59.0%	43.0%
Low	61.0%	56.0%	50.0%	48.0%	55.0%	58.0%	37.0%	47.0%
High > Medium ( <i>p</i> -value)	0.73	0.32	0.92	0.71	0.83	0.18	0.67	<b>0.05</b>
High > Low ( <i>p</i> -value)	0.86	0.65	0.70	0.47	0.74	0.62	<b>0.08</b>	0.10
Medium > Low ( <i>p</i> -value)	0.71	0.80	0.20	0.29	0.41	0.87	<b>0.03</b>	0.61
<b>Punish (DG-P)</b>								
High	22.0%	24.0%	26.0%	27.0%	24.0%	33.0%	43.0%	37.0%
Medium	24.0%	27.0%	24.0%	25.0%	19.0%	16.0%	16.0%	14.0%
Low	33.0%	22.0%	23.0%	19.0%	32.0%	23.0%	13.0%	23.0%
High > Medium ( <i>p</i> -value)	0.57	0.60	0.45	0.43	0.31	<b>0.04</b>	<b>0.01</b>	<b>0.01</b>
High > Low ( <i>p</i> -value)	0.83	0.41	0.41	0.25	0.76	0.19	<b>0.00</b>	0.11
Medium > Low ( <i>p</i> -value)	0.78	0.31	0.47	0.30	0.84	0.75	0.37	0.85

Note: For each variable (e.g. NH), subjects are split into those who score at or above the highest tercile, at or above the central tercile but below the highest one, and so on. For every variable the High/ Medium/ Low row shows the percentage of subjects giving, trusting, cooperating etc. in each group. *p*-values are provided by one-tail z-tests of the hypothesis that the percentage of the High group exceed the percentage of the Medium or Low group and that the percentage of the Medium group exceed the percentage of the Low group. Only for the Mini-UG, these one-

behavior, I interpret these results, also in relation with the analysis of Table 11a, in the following way: Scoring clearly above the median in a PWB measure (higher tercile) increases the probability of virtuous behavior, but scoring very high (highest quartile) in these measure may increase this probability only to a small degree, if at all. This seems however not to be true for scoring low in PWB measures. The differences from the second lowest to the lowest quartile seem to suggest that experiencing really low psychological well-being still has a negative effect on virtuous behavior.



## C Items on Well-Being Measures

This section presents the items used in my well-being questionnaire. Nearly all items are also used by KE, only the Social Well-Being (SoWB) Scale is added.

### Single-Item Happiness Questions (OH, HH LH, NH)

A 9-point-scale ranging from "extremely unhappy" to "extremely happy" is used:

- **OH:** *Overall*, how would you describe yourself?
- **HH:** Over the past week, what is the *highest* level you experienced?
- **LH:** Over the past week, what is the *lowest* level you experienced?
- **NH:** *Right now*, how would you describe yourself?

### Batson, et al.s (1988) Mood Index (MI)

On a 9-point-scale, subjects have to express their current mood for several pairs of adjectives

- **Mood items:** bad mood-good mood, sad-happy, depressed-elated, dissatisfied-satisfied, gloomy-cheerful, displeased-pleased, sorrowful-joyful
- **Fillers:** nervous-calm, tense-relaxed, uncomfortable-comfortable, apathetic-caring, lethargic-energetic, unconfident-confident, unresponsive-emotional, passive-active

### Ryffs (1995) Scales of Psychological Well-Being (SPWB)

A 6-point-scale ranging from "strongly disagree" to "strongly agree" is used:

1. I tend to be influenced by people with strong opinions.\*
2. In general, I feel I am in charge of the situation in which I live.
3. I think it is important to have new experiences that challenge how you think about yourself and the world.
4. Maintaining close relationships has been difficult and frustrating for me.\*
5. I live life one day at a time and dont really think about the future.\*
6. When I look at the story of my life, I am pleased with how things have turned out.
7. I have confidence in my opinions, even if they are contrary to the general consensus.|
8. The demands of everyday life often get me down.\*
9. For me, life has been a continuous process of learning, changing and growth.|
10. People would describe me as a giving person, willing to share my time with others.
11. Some people wander aimlessly through life, but I am not one of them.|
12. I like most aspects of my personality.
13. I judge myself by what I think is important, not by the values of what others think is important.
14. I am quite good at managing the many responsibilities of my daily life.|
15. I gave up trying to make a big improvements or changes in my life a long time ago.\*
16. I have not experienced many warm and trusting relationships with others.\*|
17. I sometimes feel as if Ive done all there is to do in life.\*
18. In many ways, I feel disappointed about my achievements in life.\*|

\* indicates reverse scored items. | indicates items selected for Index of PWB (PWBI)

## **Watson, Clark and Tellegens (1988) Positive Affect (PAS) and Negative Affect (NAS) Schedules**

Subjects use a 5-point-scale ranging from "very slightly or not at all" to "extremely" to indicate to what extent they feel the way the words suggest:

- **PAS items:** interested, alert, excited, inspired, strong, determined, attentive, active, enthusiastic, proud
- **NAS items:** irritable, distressed, ashamed, upset, nervous, guilty, scared, jittery, hostile, afraid

## **Bradburns (1969) Positive Affect (PA) and Negative Affect (NA) Scales**

Subjects have to answer with "YES" or "No" for each item: **PA** items:

- Pleased about having accomplished something?
- That things were going your way?
- Proud because someone complimented you on something you had done?
- Particularly excited or interested in something?
- On top of the world?

**NA** items:

- Depressed or very unhappy?
- Very lonely or remote from other people?
- Upset because someone criticized you?
- So restless that you couldnt sit long in a chair?
- Bored?

## **Jones and Crandalls (1986) Self-Actualization Index (SAI)**

A 4-point-scale ranging from "disagree" to "agree" is used:

1. I do not feel ashamed of any of my emotions.
2. I feel I must do what others expect me to do.\*
3. I believe that people are essentially good and can be trusted.
4. I feel free to be angry at those I love.
5. It is always necessary that others approve of what I do.\*
6. I dont accept my own weaknesses.\*
7. I can like people without having to approve of them.
8. I fear failure.\*
9. I avoid attempts to analyze and simplify complex domains.\*
10. It is better to be yourself than to be popular.
11. I have no mission in life to which I feel especially dedicated.\*
12. I can express my feelings even when they may result in undesirable consequences.
13. I do not feel responsible to help anybody.\*
14. I am bothered by fears of being inadequate.\*
15. I am loved because I give love.

\* indicates reverse-scored items.

### **Diener, et al.s (1985) Satisfaction with Life Scale (SWL)**

A 7-point-scale ranging from "strongly disagree" to "strongly agree" is used:

1. In most ways my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far I have gotten the important things I want in life.
5. If I could live my life over, I would change almost nothing.

### **Keyes' (1998) Social Well-Being (SoWB)**

A 6-point-scale ranging from "strongly disagree" to "strongly agree" is used:

1. The world is too complex for me.\*
2. I don't feel I belong to anything I'd call a community.\*
3. People who do a favor expect nothing in return.
4. I have something valuable to give to the world.
5. The world is becoming a better place for everyone.
6. I feel close to other people in my community.
7. My daily activities do not produce anything worthwhile for my community.\*
8. I cannot make sense of what's going on in the world.\*
9. Society has stopped making progress.
10. People do not care about other people's problems.\*
11. My community is a source of comfort.
12. I find it easy to predict what will happen next in society.
13. Society isn't improving for people like me.\*
14. I believe that people are kind.
15. I nothing important to contribute to society.\*

\* indicates reverse-scored items.

## D Instructions

This section presents the translated instructions used for the SPD to give an impression how subjects were introduced to the games. Instructions for other games were similar. For the SPD, the SPD-P and the DG-P, subjects had to answer additional control questions.

### Instructions [SPD]

In this section of the experiment the **situation** is as follows:

Person A and Person B both have an endowment of 10 EUR at the beginning and they have to decide how to use their endowment. Both can either keep their money or send it to the other person. If money is sent, this money is doubled by the computer.

### The Details:

This section of the experiment consists of two consecutive stages: In the **first stage**, Person A has two alternatives: sending **0 EUR** or **10 EUR** to Person B. In doing so, sent money is doubled. This decision determines how much money Person B has at the beginning of the second stage. Two cases:

1. If A sends **10 EUR**, this amount is doubled. Because B already owns 10 EUR, B has 30 EUR in total now (and A has 0 EUR).
2. If A sends **0 EUR**, B does not get any additional money and owns his or her initial endowment of 10 EUR (as A does).

In the **second stage**, Person B has the following six different alternatives: sending **0, 2, 4, 6, 8 or 10 EUR** back to Person A. The amount that B chooses is again doubled. Person B can make his or her decision conditional on A's choice.

In **case 1**), Person B owns 30 EUR at the beginning of the second stage whereas B owns 10 EUR in case 2). For calculating B's final payoff one still has to subtract the amount sent by B. Because the amount sent by B is also doubled, A can earn between **0 and 20 EUR** in this stage. In case 2), Person A gets an additional 10 EUR from stage 1, in case 1) A gets no additional money.

### Two examples:

1. A sends **10 EUR**. Hence for a start, B has 30 EUR. If B also sends **10 EUR**, B would finally earn 20 EUR, as would A. If B on the contrary sends 0 EUR, B would finally earn 30 EUR and A 0 EUR.
2. A sends **0 EUR**. Hence for a start, B has 0 EUR. If B also sends **0 EUR**, B would finally earn 10 EUR, as would A. If B on the contrary sends 10 EUR, B would finally earn 0 EUR and A 30 EUR.

Mathematically we can express these **payoffs** as follows:

For **Person A**: 10 EUR - transfer to B + 2 \* transfer from B

For **Person B**: 10 EUR - transfer to A + 2 \* transfer from A

For further calculations, you can use the implemented payoff calculator

### Your decisions:

In the following, you will have to decide in the role of Person A as well as in the role of Person B. As a Person B, you will to make a decision for both possible alternatives of Person A (0 EUR vs. 10 EUR). If the computer chooses this section for payment, the computer will match you with another participant. Additionally, it will be randomly determined who will take which role. For your payment, only your decision in this role (either as Person A or B) will be important.

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