JOURNAL OF SMALL BUSINESS STRATEGY

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Risk-reducing options in crowdinvesting: An experimental study

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Keywords:
Crowdfunding, Crowdinvesting, Experiment, Risk-reducing, Options

ABSTRACT

Financial constraints are a striking difficulty of entrepreneurial ventures in the early stages of their development. Recently, emerging crowdinvesting platforms try to fill this finance gap by involving an anonymous crowd into the funding process. Due to high information asymmetries, platform providers and start-ups alike try their best to reduce the risk for investors. We therefore examine existing and thinkable mechanisms of option-based risk reduction in crowdinvesting. We use a 2x3x3 mixed subject design to manipulate the availability and characteristics of risk-reducing options and the project attractiveness. With 210 participants, we are able to show that the introduction of different risk-reducing options in crowdinvesting solely favors high quality projects and increases capital concentration in a market that was originally built to make start-up funding available to a broader range of capital seekers. We also suggest reasonable prices for options and prove them to be accurate relatively to each other. Further implications for theory and practice are discussed.

Introduction

Financing through the crowd is a fast-emerging alternative funding option with massive upside potential (Blohm, Leimeister, Wenzlaff, & Gebert, 2013). The number of newly launched crowdfunding platforms has risen sharply, with more than 1,200 platforms currently existing worldwide (Massolution, 2015). Crowdfunding benefits from an increasing number of Internet users, as well as from the integration of funding platforms with social networking (O'Reilly, 2007). They allow fundraisers to obtain the attention of a wide range of people through viral effects (Belleflamme, Lambert, & Schwienbacher, 2014; Thies, Wessel, & Benlian, 2016). The market is generally divided into four types of crowdfunding models: reward, equity, lending, and donation. Backers of donation-based crowdfunding do not expect a direct financial or material compensation. Reward-based projects offer a non-monetary reward to the funders (e.g. a prototype; Kraus, Richter, Brem, Cheng, & Chan, 2016b). From a (financial) investor point of view, equity- and lending-based crowdfunding models are interesting as they promise monetary compensation (Niemand, Angerer, Thies, Kraus, & Hebenstreit, 2018). In crowdlending, the compensation is an interest on the investment.

This study mainly focuses on the remaining equity model of crowdfunding, called "crowdinvesting", which can be defined as "a method of financing, whereby an entrepreneur sells a specified amount of equity or bond-like shares in a company to a group of (small) investors through an open call for funding on Internet-based platforms" (Ahlers, Cumming, Günther, & Schweizer, 2015, p. 958). This means that investors have a chance to benefit from a long-term return potential by participating in start-ups (Klöhn & Hornuf, 2012) or maturing businesses (Beck, 2014). Crowdinvesting projects are usually contracted for a number of years, so that the invested money is bound for that time. This method is often used to finance a whole new company or a specific

Journal of Small Business Strategy
2018, Vol. 28, No. 03, 1-17
ISSN: 1081-8510 (Print) 2380-1751 (Online)

APA Citation Information: Angerer, M., Niemand, T., Kraus, S., & Thies, F. (2018). Risk-reducing options in crowdinvesting: An experimental study. *Journal of Small Business Strategy, 28*(3), 1-17.

project which creates the necessity of a minimum funding limit that needs to be reached before the project is started.

Crowdinvesting represents an interesting alternative to traditional funding sources for financing business ideas, particularly for entrepreneurs (Manchanda & Muralidharan, 2014). Its popularity as funding type of choice depends very much on the jurisdiction of the crowdfunding platform. In the German-speaking countries, this is the most often used approach for funding with investment character because crowdlending is legally difficult to structure here (Angerer, Brem, Kraus, & Peter, 2017). Entrepreneurs in a start-up phase usually face challenges related to collecting the capital that is required to develop and grow their companies (Hahn & Naumann, 2014). Banks often refuse to grant loans to start-up companies because of their high credit risks and often insignificant collateral securities. Financing from venture capitalists and banks is commonly available only in the later development phases of start-ups (Robb & Robinson, 2014). Start-ups that are early in their life cycle are typically financed by the founding team's personal resources, FFF (i.e. family, friends and fools) or business angels (Bruton, Khavul, Siegel, & Wright, 2015). If not enough capital is collected, the new venture faces a funding gap (Collins & Pierrakis, 2012). Sufficient funding is vital to prevent the start-up from failing (Yallapragada & Bhuiyan, 2011). In contrast to traditional financial investments, crowdfunding is open to everyone (Blohm et al., 2013). Scholars differentiate three kinds of actors in crowdfunding: platforms, fundraisers, and investors (Tomczak & Brem, 2013). Investors on crowdinvesting platforms represent the crowd that decides to monetarily support a project. They bear a high risk and assume that they will obtain a certain return for their contribution (Ordanini, Miceli, Pizzetti, & Parasuraman, 2011). The crowd normally remains anonymous (Kshetri, 2015; Wexler, 2011). Scholars have characterized investors as being intelligent and qualified (Howe, 2008), although the specific qualifications one must have to participate as an investor have not been determined.

Investing in start-ups is a high risk investment as around 90% of all start-ups fail (Patel, 2015). Therefore, most crowdinvesting platforms implement a selection process to identify potentially successful start-up projects (Klöhn & Hornuf, 2012) to reduce the high risk of start-up financing. The perceived risk of a project plays an important role in the investment decision of potential backers, especially as information asymmetries between creators and backers are relatively high in crowdfunding (Thies, Huber, Bock, Benlian, & Kraus 2018; Wessel, Thies, & Benlian, 2017). A new mechanism to mitigate the perceived risk of an investment has recently hit the market in form of a "crowd-voting" process. Inspired by this new and selectable risk-reducing option (Rhotert & Zwinge, 2016), we therefore attempt to investigate the effectiveness of risk-reducing options in a crowdinvesting environment in the form of an experiment. As former studies are mainly concerned with quality signals as a mechanism to reduce the information asymmetries between creators and backers (Burtch, Ghose, & Wattal, 2013; Mollick, 2014; Thies et al., 2016; Wessel et al., 2017), this study draws on explicit risk-reducing options. We therefore formalize our research question as follows:

"Does the use of risk-reducing options influence the investment of crowdinvesting backers?"

The aim of this study is, on the one hand, to provide new insights of a new kind of investor protection instrument that is aimed at decreasing risk, and, on the other hand, to better understand investors' behavior in relation to risk. Thus, selectable options for reducing an investor's risk are elaborated.

Theoretical Background

Crowdinvesting

Crowdinvesting is seen as "a method of financing, whereby an entrepreneur sells a specified amount of equity or bond-like shares in a company to a group of (small) investors through an open call for funding on Internet-based platforms" (Ahlers et al., 2015, p. 958).

It is the only category of crowdfunding which includes an equity-like component (Bradford, 2012). The funding conditions of crowdinvesting are similar to those of the donation- and reward-based models. However, the types of investors who contribute to creative projects of donation- and reward-based models differ notably from new venture investors (Hemer, 2011). While there is no demographic statistics specifically on equity-crowdfunding investors yet, we know that crowdfunding investors in general are on average 39 years old, work in the innovation or finance industry, and have experience in the capital market (Klöhn & Hornuf, 2012). They may work as venture capitalists, but backers are not commonly professional investors (Beck, 2014). The crowd is thus often acting along trained investors who are bank employees, venture capitalists or business angels (Belleflamme et al., 2014; Kraus et al., 2016b). Most crowdfunding projects are limited to a certain period, usually between 30 to 90 days (Mahlstede, 2012).

Success Factors in Relation to Crowdfunding

A crowdfunding project is deemed successful if it reaches its targeted funding threshold (Bains, Wooder, & Guzman, 2014). Through examination of the U.S. crowdfunding platform Kickstarter, scholars have discovered that projects obtain the strongest funding at the beginning and end of their campaigns; the least support occurs during the middle of a campaign. However, support for crowdinvesting projects does not have the same trajectory. Instead, investments are strong at the beginning of the campaign and low at both the middle and the end. Investors tend to invest early because they want to avoid the risk of not being able to contribute once the funding limit is reached (Hornuf & Schwienbacher, 2015). Obtaining large support at the beginning has a signaling effect for potential investors (Colombo, Franzoni, & Rossi-Lamastra, 2015; Thies et al., 2016).

Risks in Crowdfunding

The main risk an investor faces is that a funded start-up will fail to pay a part or all of its obligations. Investments in the early stage of a company are extremely risky (Agrawal, Catalini, & Goldfarb, 2011); the worst case is that the start-up will go bankrupt and the investor will lose all of his invested capital. Because of information asymmetries between investors and start-ups, investors have limited possibilities to assess personal risk. Investors have no other choice than to trust the platforms and their start-up evaluation, as they do not have access to relevant data themselves (Sannajust, Roux, & Chaibi, 2014). Moreover, the problem of information asymmetry is barely regulated and naturally most start-ups cannot provide a track record from the past, which further aggravates the situation (Agrawal, Catalini, & Goldfarb, 2014). Furthermore, small investments lead to a low incentive for investors to undertake serious risk assessment (Wilson & Testoni, 2014). Investment in crowdinvesting is contracted for several years and by necessity it cannot be rapidly converted into cash (European Securities and Markets Authority, 2014). Finding an equilibrium between the interests of investors and fundraisers is considered a key challenge of crowdfunding platforms, particularly in crowdinvesting (Beck, 2014).

Perceived Risk

Perceived risk is defined as subjective uncertainty about the occurrence of negative consequences and associated losses as a result of the purchase of the product (Bauer, 1960). It is influenced by individual, product and situational determinants (Dowling & Staelin, 1994; Kuhlmann, 2006).

Risk perception has been identified as a substantial and explanatory variable in consumer buying behavior (Mitchell, 1992), as well as venture capitalist's investment decisions (Tyebjee & Bruno, 1984). The concept of perceived risk was introduced in 1960 with regards to consumer behavior research, as a person's perception of the situation influences his or her actions. Expected consequences and uncertainty are identified as the main components of perceived risk (Bauer, 1960). Consumers seldom consciously weigh probabilities and consequences (Cunningham, 1967). This means that without any perceived risk, consumers decide and act rationally. Due to the limited processing capacity, it would cognitively overwhelm people to consciously process all information. The concept of perceived risk can be best understood when consumers have set buying goals related to each purchase. The degree of risk perception corresponds to the degree to which the user realizes that he or she might not accomplish these goals (Cox, 1967).

The two-component model of uncertainty and consequences appears to be the leader in reference to validity, usability, reliability and prediction when compared to other concepts (Mitchell, 1999). Perceived risk is classified as a multidimensional concept that encompasses financial, performance, social, psychological, physical and time related risk types (Cunningham, 1967; Jacoby & Kaplan, 1972; Roselius, 1971). Risk varies across product categories including if a product is tangible (good) or intangible (service). Risk theory suggests that consumers facing perceived risk are motivated to take risk-reducing measures (Kraus, Ambos, Eggers, & Cesinger, 2015), so called 'risk-reduction strategies'. An initially perceived risk can be reduced to a residual risk by using such strategies (Pohl, 2013). More precisely, the goal of a strategy is, on the one hand to reduce the uncertainty relating to the product purchase, and on the other hand, to avoid possible negative consequences (Cox, 1967; Roselius, 1971). This is necessary, as consumers only make an adoption decision once the perceived risk has reached an acceptable level. Adoption theory describes the takeover process of an innovation of a person, from acquiring to adoption. This process involves several phases such as activating, cognitive and behavior-based phases (Bauer, 1960; Helm, 2001). Thus, risk-reducing strategies are used when the perceived risk surpasses the personally acceptable level (Dowling & Staelin, 1994). This level is different for each person. Therefore, personality characteristics (Koudstaal, Sloof, & Van Praag, 2015) such as risk, loss and ambiguity aversion influence risk perception.

Perceived Risk in Online Environments and Crowdfunding

Consumer buying behavior in an online setting is different than in an offline setting (Alba et al., 1997). In contrast to offline shopping, online channels are completely operated by information technology and therefore the users' ability to rate an investment. Physical evaluation is significantly reduced prior to making a decision. This leads to higher information asymmetries (Wells, Valacich, & Hess, 2011). Scholars have identified four factors for consideration: online trust, website property, navigation functionality and personal variables as well as general, privacy and system security (Miyazaki & Fernandez, 2001; Yoon, 2002). Furthermore, emotions are also part of a buying decision and therefore influence the perceived risk (Chaudhuri, 2006), with positive emotions leading to a lower risk associated with the product and a higher weighted value (King & Slovic, 2014).

A crowdinvesting backer must deal with three different types of risk: the funding-object risk, project-initiator risk and intermediary risk. Funding-object risks can arise with regards to the novelty of an invention and with missing comparators. Project-initiator risks occur in relation to a relative lack of reputation. Intermediary risks can include the insufficient assessment of potential projects for the platform. This study focuses on the use of risk-reducing options to reduce these risks in crowdinvesting projects.

The main risk for investors is that a funded start-up will go out of business and is unable to pay its obligations. If a start-up goes bankrupt, investors will lose all or most of their invested capital. Typically, crowdinvesting investors are willing to take risks, have an internet affinity and are open to online financial transactions. The investors' aim is to obtain a profit for their contribution and to this end they evaluate the start-ups' business ideas and projects (Beck, 2014). Risk theory states that individuals are motivated to use risk-reducing strategies if they perceive risks (Bauer, 1960; Gemünden, 1985). When the perceived risk surpasses an acceptable level, a primarily perceived risk can be reduced to an odd risk by using risk-reduction strategies (Dowling & Staelin, 1994; Pohl, 2013). The goals of these strategies are on the one hand to reduce risk created by uncertainty (risk aversion) and on the other hand to avoid possible negative consequences of an investment (loss aversion) (Cox, 1967; Roselius, 1971).

To reduce the perceived risk of investors in crowdinvesting projects, we propose different tools which we will call "options" and which have characteristics of insurances. The name is chosen because of the optional application by investors and is not related to the financial instrument *option* from the class of financial derivatives.

Experiments as Methodology to Examine Insurances

There is a large body of literature using experiments to examine how the provision of insurance changes the behavior of decision-makers and also how they use this information (Richter, Schiller, & Schlesinger, 2014). Because we will also offer insurance-like options, some of these findings might be relevant, although they stem from a different research area. That people are willing to buy insurance also in low probability cases is shown by Laury, McInnes, & Swarthout (2009) who find that people are very willing to insure against lower probability events. Hansen, Jacobsen, & Lau (2016) show that decision-makers are willing to pay even a little more than the actuarial fair value under expected utility theory. In our experiment, subjects will not be forced to buy insurance. However, Laury et al. (2009) shows that just the presence of a fairly priced insurance changes the pricing behavior of consumers. They make better informed decisions even if the insurance is not bought in the end. This highlights the need to research if the provision of risk-reducing options in crowdfunding might be influential on the willingness of people to invest.

Risk-Reducing Options

We compare three different option types. Each one is intended to hedge risks of investors in order to increase the perceived value of a project, which could lead to generally higher or relatively changed funding levels. Because different option types have different hedging abilities, we set differing prices on the different options. Note that our goal is not to compare options in respect to which one performs better. On the contrary, in lack of empirical background data, we have tried to price them in a way that one does not systematically outperform. Because the choice of prices is taken this way, we will test their relative comparability in Hypothesis I after the introduction to the option types to assure that our valuation differences are well specified.

With the option *crowd-voting*, the crowd of investors decides whether after one year the full amount stays invested or if some of the invested money (which is hold back to that day) is paid back to the investors. Studies show that a group of people (the crowd) is sometimes able to incorporate larger amounts of information into the decision-making

process as compared to an individual (Braun, 2006). However, socially subordinate group members generally have lower weighted influence in a group decision (Laux, 2003). The impact of a single vote is uncertain, is minimal and has a higher level of uncertainty as compared to individual-voting. Most people perceive it riskier to depend on the decision of others rather than on one's own decision.

With *individual-voting*, the payment of the full investment amount is also decided by a vote, similarly to crowd-voting. However, the difference is that each investor decides individually rather than making the decision as a group. In cases of uncertainty, crowd-voting is assumed to bear a higher-level of uncertainty than individual-voting due to the above-mentioned reasons. Thus, it is assumed that individual-voting has a higher option value compared to crowd-voting. Both voting options trigger advantageous interaction changes. They provide high incentives to increase investor reporting because companies need to convince the crowd (individual) to keep the full amount invested. They trigger communication between investors and finally they provide investors with the opportunity to reassess the project again later in time and therefore also assess the development.

Third, an *insurance* option is considered. In general, insurance is a risk-transfer instrument that guarantees complete or partial monetary compensation for the loss or damage caused by events outside the control of the protected party (Harrington & Niehaus, 2004). Bankruptcy insurance offers a full guarantee in the case of damages and is, apart from the insurance clauses, 100% safe and therefore has the lowest level of uncertainty among the options.

Method

Experiments

Experiments are different in comparison to other research methods (Kraus, Meier, & Niemand, 2016a). An experiment is defined as an investigation that manipulates, instead of only measuring, possible causes of participants' reply and removes, controls, or randomizes for such causes. It is crucial to identify a stable connection between variables in order to evaluate cause and effect (Patel & Fiet, 2010). By using an experimental method, it is possible to formulate causal conclusions through controlled manipulation of variables in controlled environments (Busenitz et al., 2003). The approach is complex and new. Therefore, we have to make some assumptions on price parameters, which we will also point out in a detailed description of the chosen projects and the risk-reducing options. We are aware that these assumptions need to be tested on their plausibility which we will do with an extra hypothesis. Because of the fact that two hypotheses also serve as controls if the setup is well specified, we deliberately choose to first present the methodology and afterwards the hypotheses, although this might be unusual.

Experimental Design and Measures

We employ a within-subject design which allows us to measure effects of treatment manipulations. The big advantage of within-subject studies is a reduction in error variance associated with individual differences. This allows us to isolate the effect of treatment conditions. We let the subjects go through two decisions in the main part of the experiment. Arguably the first one serves as our baseline, and the second decision as our treatment.

The experiment is structured in nine stages. Initially, all respondents are asked to be of age 18 or older (since crowdinvesting is limited to adult users only). Second, crowdinvesting is explained, and knowledge-based questions are provided. Third, scales for risk aversion (Dowling, 1986), loss aversion (Koudstaal et al., 2015), and ambiguity aversion (Holm, Opper, & Nee, 2013) had to be filled out. Fourth, an example page of what a project looks like on a crowdinvesting platform is shown to make respondents familiar with the characteristics of projects. This page contains an example project ('soccer analytics') not used in the subsequent evaluations and multiple clickable explanations of key characteristics (e.g., funding limit). Fifth, the three projects are presented in random order, with the option to click on explanations of the key characteristics. Sixth, the initial investment decision is introduced asking the respondents to allocate any investment between EUR 0 and EUR 10,000 (summed up) to the three projects. To aid with the decision-making, a comparative summary of the key characteristics for all three projects (and in the order of appearance) is depicted (see Appendix). Seventh, one of the three available options (termed crowd-vote, individual-vote, and insurance) is selected randomly and presented. The participants are told to choose for which of the three projects the option should be drawn (enabling zero to three applications). Eighth, the investment allocation is repeated as explained earlier. Respondents had the opportunity to decide whether to invest the remaining (25%) in case of the individual vote option afterwards. Ninth, the attractiveness of the three projects is assessed and a summary of the investment decisions is shown for the next five years thereby

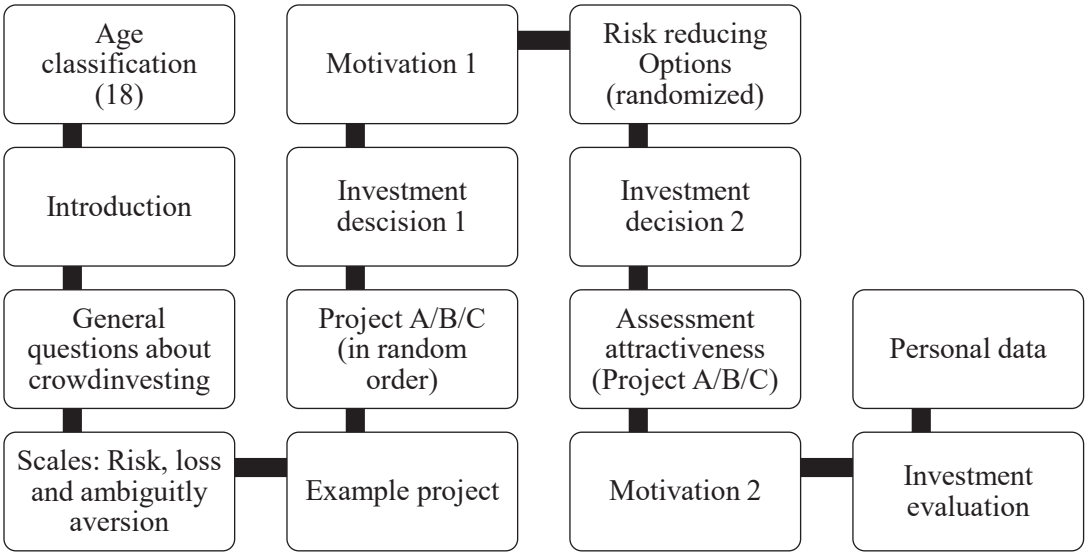

Figure 1. Procedure of the online experiment

providing a sense of realism for the decisions made. Finally, descriptive characteristics (age, gender, education, country, employment, income) are being asked for, and participants are thanked for their patience and help. Overall, the experiment has a length of about 15-20 minutes. Figure 1 summarizes the main procedure of the experiment.

Figure 2 explains the applied research design and displays the relationships between independent and dependent variables. We use a 2x3x3 mixed subject design with project as within- factor to manipulate the characteristics of "option used" (termed yes, no), the "option type" (termed crowd-voting, individual-voting, bankruptcy insurance) and the "project attractiveness level" (termed A, B, C). Since it is common for investors to choose from multiple projects on crowdinvesting platforms (e.g. Seedmatch, Companisto), we also show multiple projects in our design. Consequently, subsequent data analyses will consider project attractiveness as a random factor as well.

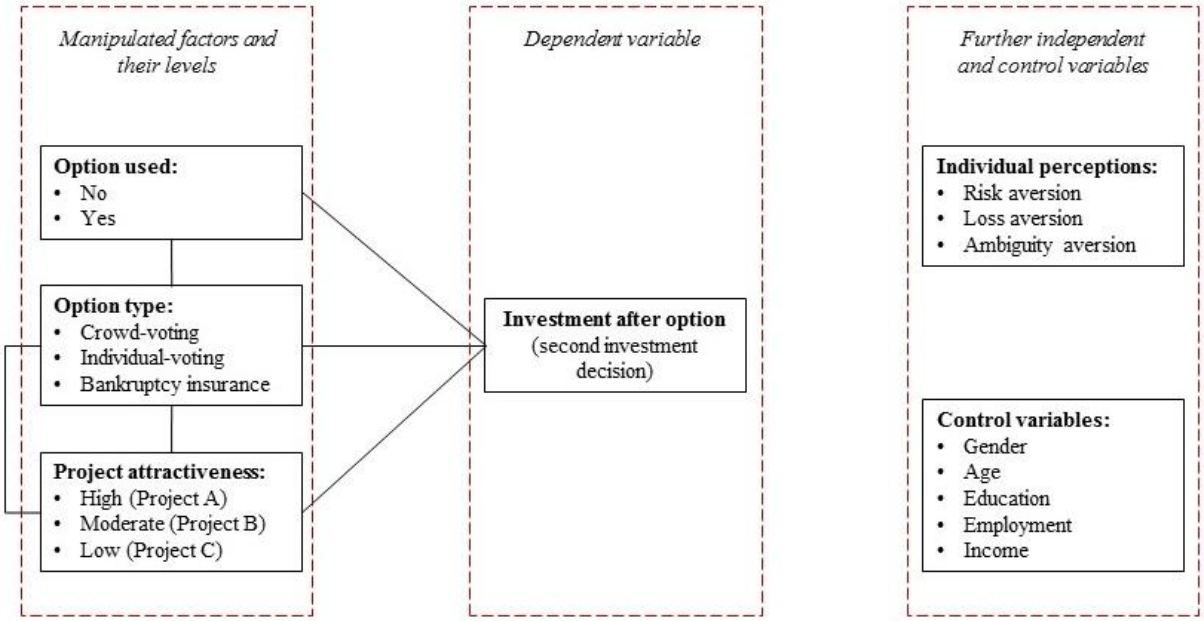

Figure 2. Conceptual framework of the research

Three different factors will be investigated on their effect on the dependent variable. The first factor is called "Option Used" and simply states whether an investor has selected a risk-reducing option or not. The second factor is termed "Option Type" and consists of three levels, crowd-voting, individual-voting and bankruptcy insurance. "Project Attractiveness" offers a visual representation of the different option types.

The term "Crowd-voting" (see Figure 3) has been recently launched on the German crowdinvesting platform *Companisto* (Rhotert & Zwinge, 2016). In this option, the crowd decides one year after the completion of the funding in a majority decision (weighted by investment shares) whether to fully invest their originally pledged amount or receive 25% of their investment back. Furthermore, if a company goes bankrupt in the first fiscal year, 25% of the

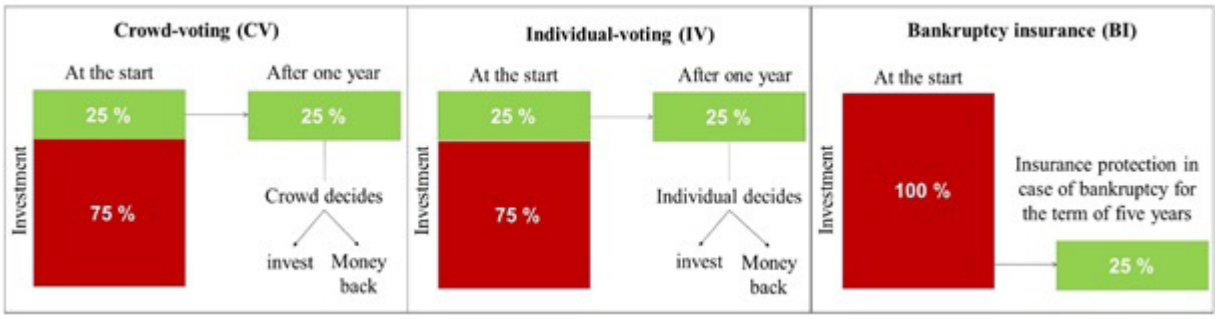

Figure 3. Comparison of the three options used in the experiment

investment is secured and will be paid back to the investor. In our setting, this option diminishes the promised return by 0.5 percentage points for the total duration of the contract. Thus, an investor receives only a return of 4.5% instead of 5% per year for his investment as a result of choosing this option, but in exchange knows that 25% of the investment is held back and therefore safe for the first year of business. A further advantage is that investors have the possibility to base their decision on the current economic development of the new venture and thereby obtain additional security. This supports the personal risk assessment and reduces their own perceived risk. Moreover, the investor does not have to completely trust the evaluation provided by the platform. However, the risk for a single investor is that the crowd could decide not to follow his favored strategy.

The second type of option is termed "individual-voting". This idea is based on the previous option with the difference that each investor can decide individually. In this vote system, the platform retains 25% of the investment for one year. After this deadline, every investor decides individually whether to obtain the 25% of the investment back or to pledge the originally planned sum. Compared to crowd-voting, an investor is able to decide independently for his or herself and therefore has full control over the investment decision. This can help to reduce the personal risk since 25% of the investment is kept safe for the first year of business. The cost of this option is 0.75% per year reducing the yearly interest rate to 4.25%. The option offers an additional choice for each investor to decide in his or her own favor. Therefore, the cost for this option is higher than for crowd-voting because an individual decision causes less uncertainty.

The last option is called "bankruptcy insurance" and is based on the classic idea of insurance. The purchase of this option secures 25% of the investment during the entire contract period in the case of bankruptcy. The promised return of 5% falls by 1.5 percentage points to 3.5% per year for the entire contract duration of five years. This option offers the highest monetary protection for investors and therefore also the most expensive option.

The third manipulated factor is called "project attractiveness". To increase the level of realism, we create three fictional projects which differ in terms of attractiveness. Measures of attractiveness include the current invested capital, an appropriate funding threshold and limit, days remaining, funding duration, number of investors, updates, and geographic proximity. Furthermore, we use two rounds of expert pre-tests to improve the three fictional projects regarding their overall realism and attractiveness. Figure 4 displays the most important data of the three created projects.

Project A: CARdata	Project B: Intelligent Power Pocket	Project C: The world within Hotel
		
CURRENT FUNDING STATUS	CURRENT FUNDING STATUS	CURRENT FUNDING STATUS
300,000	100,000	50,000
Euro invested	Euro invested	Euro invested
90,000	90,000	1,000,000
Euro funding threshold	Euro funding threshold	Euro funding threshold
780,000	780,000	3,000,000
Euro funding limit	Euro funding limit	Euro funding limit
300	300	25
Investors participating	Investors participating	Investors participating
25 of 30	5 of 60	5 of 120
Days remaining	Days remaining	Days remaining

Figure 4. Comparison of the three projects used in the experiment

Description of the projects

Projects A and B are respectively rated as highly and moderately attractive and share the same funding threshold and limit as well as number of investors. All three projects have a contract duration of five years with a fixed interest rate of 5% per year. In each case, investors receive additional profit in the case of an exit or from revenue sharing (Bradford, 2012).

The first project called CAR*data (A)* is based on a project of the German crowdinvesting platform Seedmatch (ekoio UG, 2016). This start-up provides a working prototype of a system, which allows access to the vehicle's data via an app and in the event of a fault, the system makes contact with a repair center. The project is considered very attractive for the following reasons: In the description, the high potential of its future market is projected. Furthermore, the branch software is the most attractive (most achieved funding thresholds) among crowdinvesting projects. The funding campaign has already been successful as it has overreached its funding threshold. The average investment is EUR 1,000 per backer. Twenty-five days of 30 are remaining to invest in this new venture. This means, that the project gathered EUR 300,000 during the first five days. A strong funding at the beginning indicates high attractiveness. Furthermore, CARdata informed the crowd by posts 12 times and also provides a patent for its system, trademark protection and is geographically proximate. All these factors are evaluated as highly attractive according to the available literature and the coding of Seedmatch.

The second project, called *Intelligent Power Pocket (B)*, is based on a project of the German crowdinvesting platform Companisto. This new venture offers modern wallets that have the ability to charge smartphones by simply placing them on the wallet. Moreover, the wallet can be located by an app. The project's level of attractiveness is weighted as moderate because of following determinants: The start-up has provided a prototype of its business idea. The crowdinvesting project slightly surpassed the funding threshold during the final phase. This indicates a moderate attractiveness level of this project. Investors backed the new venture with an average investment of about EUR 330, which is clearly less than the average investment by about EUR 870 per backer (based on coding of Seedmatch). The number of updates is four, the securities provided by the fundraiser include design and trademark protection and the start-up is geographically proximate. Compared to project A, the lower investment capital per investor, the nearly completed funding period, the longer duration, the fewer number of updates and the provided securities combine to make Intelligent Power Pocket less attractive. However, since they reached the funding threshold, this project has been successful and is therefore not regarded as unattractive.

The third project is called *The World Within Hotel (C)*

and is a fictional start-up. The project's level of attractiveness is constructed to appear low. The start-up would like to build a five-star hotel chain, which offers a new-room concept for their guests. Not only are the luxury suits presented in a style of a certain world region, but also the breakfast served is intended to be authentic. The world within Hotel attracted a total of EUR 50,000 with 25 investors. The successful funding of this project is unlikely relating to the funding duration and days left. The start-up has not posted any news about the development. Furthermore, no securities are provided and the start-up is situated abroad. Due to the coding of Seedmatch, tourism is the least successful branch. The longer the duration of the funding and the higher the requested funding amount, the lower is the likelihood they will reach the funding threshold (Bouncken, Komorek, & Kraus, 2015; Mahlstede, 2012). These factors, as well as the higher funding threshold and limit, make this project the least attractive of the three.

Definition of Variables

Dependent variable. The dependent variable is the second investment decision of the participants. This is because we want to measure the influence of an option compared to a benchmark situation in which such an option is not present. So subjects take a first decision without an option. Than before the second decision occurs, one of the options is presented to the subject. Based on the new situation, investors decide how to invest their capital. Therefore, the second investment decision becomes apparent when participants change their behavior due to the risk-reducing options.

Independent and control variable. Individual perception is used as a further independent variable because it could influence the investment behavior in relation to the perceived risk of investors. To investigate the individual perceptions (termed risk aversion, loss aversion, ambiguity aversion) measurement scales are included in the experiment. Each of the scales included used 10 two-lottery choices given to the participant to measure their individual perception. Risk aversion measures the degree to which the value of a fixed return (e.g. EUR 100) is higher than the value resulting from a proposition with the equal expected return obtained with risk (e.g. EUR 200 with 50% probability or EUR 0) (Dowling, 1986; Koudstaal et al., 2015). Loss aversion refers to the idea that decision-makers favor avoiding losses over obtaining gains (Kahneman & Tversky, 1979). Loss aversion indicates that losing EUR 50 will decline the value by more than the increase in value that is related with a gain of EUR 50. "Ambiguity aversion" is also known as "uncertainty aversion" and refers to the favoring of investors for risks with known chances above risks with unknown chances (Holm et al., 2013).

The other control variables used in the study (termed age, gender, education level, country, income level) are commonly used among related studies (Koudstaal et al., 2015; Steininger, Lorch, & Veit, 2014). Furthermore, they are additional factors that have the potential to affect the dependent variable. The individual perception and control variables are not part of the hypothesis, but must be measured to ensure they do not have a significant impact on the dependent variable.

Modelling Approach

To investigate the research design, a general linear mixed model (GLMM) is applied. GLMM provides a comprehensive framework to address issues for non-normal data (Bolker et al., 2009) and offers multiple ways of model comparison (Akaike Information Criterion, AIC). Further, the recently proposed general R2 for GLMM is used to extract the explained variance (Nakagawa & Schielzeth, 2013).

In this study, a repeated measurement takes place, so the data record triples (Projects A, B, C), since the same participant decides for each of the three projects. Accordingly, the cases rise from 213 to 639. The wide format data set had to be reshaped to a long (stacked) format because the project factor (A/B/C) is repeated, and therefore could possibly cause changes through presentation order. To account for that, the GLMM approach (Fox & Monette, 1992) is well suited and applied by using subjects and projects at random and using all manipulated factors as well as individual perceptions and control variables as fixed factors. We apply stepwise modelling (from easy to complex). The baseline model consists of the individual perception, control variables, and the three project types as categorical variables. Model 1 includes the baseline model plus whether an option is used. Model 2 includes the effects of the different option types. Model 3 is the final model, which comprises the previous models and is intended to show main as well as the interaction effects of the usage of an option and the project attractiveness.

Experimental Implementation

Data for this research project was gathered through an online questionnaire using simple script conditions to ran-

domize the project presentation order. The applied software to develop the online questionnaire was LimeSurvey and for the statistical data analysis the software R. The experiment was not monetary incentivized. The final sample of 210 full observations was collected within the German-speaking area of Germany, Switzerland, Austria and Liechtenstein through promotion on social media channels and private networks. It is constructed in a way that it closely reassembles the typical crowdfunding investor in terms of age and gender.

Hypotheses Development

With our first two hypotheses, we test if our model is setup correctly and well specified. To this end, we start by looking at the attractiveness levels of the three provided projects. If the experiment is specified well, subjects should invest the highest amount into project A, but also more into B than C because of the different levels of attractiveness.

Hypotheses 1. Investments are highest in project A, second highest in project B and least in project C.

Next we test whether the different types of options are valued differently by investors and, if this is the case, whether they show the relative preferences that we have tried to model in the pricing. To this end, we use the different prices of the options as a valuation mechanism. If options are valued equally, a difference in the according prices should lead to investments shifting to the option that is relatively cheaper and vice versa. Using this logic, we expect no shift in investment if two conditions are simultaneously met. First, options are indeed valued differently. Second, the difference in value corresponds to our price ranking. Based on these arguments, the following hypotheses are constructed:

Hypotheses 2A. If the option "Individual-voting" is presented this does not change the overall investment amount compared to a presentation of "crowd-voting".

Hypotheses 2B. If the option "Bankruptcy insurance" is presented this does not change the overall investment amount compared to a presentation of "crowd-voting".

Extensive literature supposes a positive relationship between quality and price. Consumers are expected to use the price as an indicator for quality, because the quality of a product is commonly not easy to detect (Niemand, Tischer, Fritzsche, & Kraus, 2015). In the case of usage of an option (option obtains selection), the price of an option (sacrifice) should indicate the benefits (quality). This is also referred to as the 'price-performance ratio'. Projects involve risks that can be hedged by options, which reduce potential losses and thus in turn increase the perceived value of a project for a risk-averse investor. If the value of a project can be increased by options, investor will contribute more willingly, assuming all other variables remain the same. We therefore hypothesize:

Hypotheses 3. Applying risk-reducing options increases the overall investment amount of projects.

The next hypothesis concerns the interaction between options and attractiveness. The offering of options reducing risks highlights that a monetary risk is involved. This might induce a more conscious risk management, which could make options a means of increasing the level of attractiveness of a project. It is assumed that investors tend to direct their investments towards safer projects. This means that if an option is purchased, projects with a low level of attractiveness receive less funding while highly attractive projects receive more money. In simpler words there is a positive relationship between price and quality. A more conscious risk management could lead to an overall lower perceived risk. Once again, it is assumed that the overall investment in less-attractive projects decreases because the price (investment) and quality (attractiveness) relationship (Dodds, Monroe, & Grewal, 1991) is not regarded as balanced. Therefore, investment in a less-attractive project will be reduced until the quality is seen as high. Based on this assumption, the following hypothesis is constructed:

Hypotheses 4. The offer of a risk-reducing option decreases the overall investment amount in less attractive projects.

Results

Sample Characteristics

The age of the participants ranges from 20 to 73. The average subject is 35 years old (M = 34.85, SD = 11.26). Typical crowdfunding investors are 39 years old (Klöhn & Hornuf, 2012). Over two-thirds of all participants are men 70.6%.

To evaluate the individual perceptions (independent variables) towards risk, we use scales (Koudstaal et al., 2015) which apply a multiple pricelist (MPL). Participants are asked to disclose their preferences for each offer to in-

dicate their switching point. As an example, for risk aversion, a 0 - 10 scale is used, where 0 stands for "not willing to take risks" and 10 for "very willing to take risks". The respective mean and variance values for the measures are for risk aversion (M = 6,38; SD = 2,87), for loss aversion (7,03; 2,21) and ambiguity aversion (4,53; 3,45). Deriving the correlation between the scales we find only risk aversion and loss aversion significantly correlated (d = .31, p < .001). Therefore, the higher a person's risk aversion, the higher the loss aversion and vice versa.

Hypothesis 1 – Project Attractiveness

Table 1 shows that participants on average invest the most in the most attractive and least risky Project A, followed by Project B and finally C, as we have expected because of the different attractiveness levels. We also determine whether there are any statistically significant differences between the means of the independent groups (A, B, C). The overall difference (ANOVA) for both investments (pre-option and past-option) are highly significant (pre-option: F (2, 639) = 48.78, p < .001 and past option: F (2, 639) = 48.75, p < .001). This indicates that the groups in the sample differ. Also a Tukey's HSD test shows that groups in the sample differ significantly (Rasch, Friese, Hofmann, & Naumann, 2014). The relative differences (Tukey HSD) are shown in Table 2.

Table 3 indicates that Project A and B for both investments are significantly different (p < .05). A and C as well as B and C show a highly significant difference (p < .001). To find out whether the investments differ between the initial and second investment, a Welch t-test is applied because there are two independent samples with unequal standard deviations (SD) in both basic populations (Auer & Rottmann, 2015).

Table 3 shows that for all projects, there is no significance (p > .05) evident between the initial and second investment. Therefore, the means (M) of the both investments do not differ.

We conclude that we can find support for Hypothesis 1 that subjects do perceive project A more attractive than project B, and that project C is the least attractive one.

Table 1
Results initial vs. second investment
The mean amount of investment and it`s standard deviation into each of the presented projects before an option is presented and after an option is presented.

	Initial investment (pre-option)		Second investment (past-option)	
Project	**M**	**SD**	**M**	**SD**
A	3,554.66	2,931.16	3,566.94	2,943.19
B	2,846.00	2,800.12	2,882.52	2,752.69
C	1,118.75	2,057.02	1,130.61	2,133.90

Table 2
Relative differences between initial and second investment
Results of the Tukey HSD test on differences between investments.

	Initial investment (pre-option)		Second investment (past-option)	
Project	**d**	**p**	**d**	**p**
A vs B	708.67	p < .05	684.42	p < .05
A vs C	2,435.91	p < .001	2,436.33	p < .001
B vs C	1,727.24	p < .001	1,751.92	p < .001

Table 3
Relative differences in initial and second investment of each project
Results of t-test of relative differences between first and second investment.

Initial vs second investment A	t(425.99) = -.04	p > .05
Initial vs second investment B	t(425.88) = -.14	p > .05
Initial vs second investment C	t(425.88) =-.14	p > .05

Hypothesis 2 – Option Price Calibration

The main model comparison in Table 4 contains four models. The Baseline model consists of the individual perception project types (A/B/C) and control variables. Model 1 includes the Baseline model plus the manipulated factors. Model 1 and 2 illustrate the main effects of whether and what option was used, and the different option types. Model 3 is the final model and comprises the previous models and shows the proposed interaction effects. In Model 3 the Akaike information criterion (AIC) as well as the Bayesian information criterion (BIC) show the lowest rate, which implies the highest quality (Burnham & Anderson, 2004). r2 shows what is explained through random and fixed effects and therefore, the higher the result the better is the model explained (Auer & Rottmann, 2015).

Option Type. We find no statistical significant effect of individual-voting and bankruptcy insurance on investment. The two results suggest that the three option types are perceived differently in their additional utility and are priced well, relatively to each other. Accordingly, hypotheses H2a and H2b can both be supported.

Hypothesis 3 and 4 – Overall Investment and Risk Awareness

Option Used. Hypothesis 1 proposed that when an option is selected, the overall investment increases. The results in Model 1 show that the overall investment is not affected when an option is selected. There is no substantial growth in investment. In the second investment decision, the participants invest slightly more compared to the initial investment. Based on these findings, Hypothesis 3 needs to be rejected.

Interaction Effects. In this study, more than two manipulated independent variables are involved. Thus, the effect of one independent variable on the dependent variable may not be the same at all levels of the other independent variable. To test the third hypothesis, the interaction between the levels of option used and the project's attractiveness is investigated. We assume that if an option is selected, the overall amount of investment in the less attractive projects decreases. Regarding the choices of the investors, 35% decided consistently over all three project types, to use a risk-reducing option when making their investment decision. The overall main effect of option used (Model 1: estimate = 233.54, $p > .1$) indicates no increase of investment after options are introduced. But, looking at the interaction effects in Model 3 both, Project B and C show negative coefficient for their respective interaction terms, meaning that less attractive projects suffer from the availability of options. Based on these findings, Hypothesis 4 can be confirmed.

Discussion and Conclusion

In crowdinvesting, the main incentive for investors is to obtain a certain return for their contribution. In most cases, investors bear a high risk of losing their investment (Ordanini, et al., 2011). This study contributes new insights on the behavior of crowdinvesting investors by adding risk-reducing strategies (by means of an option type) to decrease the perceived risk and increase the attractiveness of a project in order to enhance the chance of receiving pledges of potential investors.

We provide evidence that our experiment is calibrated well in terms of project attractiveness and pricing of the risk-reducing options. Investors consistently invest more in the projects that are set up to be more attractive which we also prove statistically in the analysis of Hypothesis 1. In our second hypothesis we test simultaneously if the options are experienced differently in their value to the investor and if our pricing of the options is accurate. We show that the options indeed are valued differently and can conclude that the type of option does matter to investors as they do differ in their cost.

Generally, we find no effect from offering of risk-reducing options on the sum of total investments. We therefore looked at the differential effects for different option types and attractiveness levels of projects.

We also show that when options are offered, a shift from less attractive projects to the most attractive project happens. The offered options obviously highlight the riskiness of the projects per se and lead to higher risk awareness. This induces investors to concentrate even more on the very attractive projects. Platforms must be cautious to not undermine the original idea of crowdinvesting, which is to provide financing to a variety of different projects. The introduction of risk-reducing options might do more harm than good.

Our experiment is a first step into evaluating the influence of options in crowdfunding. We argue that our setting seems well fitted as the objective attractiveness of projects is subjectively perceived equally by the participants in our study. As a side result of Hypothesis 2, we show that our pricing of the options relative to each other also seems well adjusted. We encourage further modifications of the

Table 4
LLM with random effects

			Baseline			Model 1			Model 2			Model 3		
Role	**Variable**	**Level**	**Coeff.**	**p**	**SE**	**Coeff.**	**p**	**SE**	**Coeff.**	**p**	**SE**	**Estimate**	**p**	**SE**
Intercept	Intercept		4.773,55	***	1.336,14	4.627,98	**	1.336,96	4.568,81	**	1.334,43	4.194,52	**	1.340,67
Main effects manipulations	Option Used	Used				233,54		173,52	209,83		173,25	1.272,02	**	416,11
	Option Type	Individual vote							209,44		198,32	209,44		198,32
		Insurance							394,13		205,31	394,13		205,31
	Project	B	-649,83	*	302,72	-649,83	*	302,72	-649,83	*	302,72	-147,76		372,48
		C	-2.458,93	***	269,31	-2.458,93	***	269,31	-2.458,93	***	269,31	-1.929,82	***	329,71
Interaction effects manipulations	Option Used * Project	Used * B										-1.424,81	***	627,48
		Used * C										-1.501,54	**	555,43
Individual perceptions	Risk Aversion		-45,84		30,90	-47,82		30,86	-44,28		30,77	-44,28		1.340,67
	Loss aversion		12,75		40,80	15,79		40,78	14,43		40,76	14,43		30,77
	Ambiguity Aversion		-25,05		24,92	-20,35		25,13	-18,46		25,17	-18,46		40,76
Control variables	Gender							YES						
	Age							YES						
	Education							YES						
	Employment Status							YES						
	Income							YES						
Model	AIC		11.362,71		11.350,81	11.326,66		11.294,09						
	BIC		11.503,68		11.496,12	11.480,67		11.456,77						
	R^2 (marginal)[1]		0,16		0,16	0,16		0,18						
	Largest GVIF		1.50 (age)		1.50 (age)	1.51 (age)		2.54 (Option used)						

Linear mixed model with random effects for subject and project. Repeated measure data for $N = 210$ (630). p: *** = ,001; ** = 0,01; * = 0,05; else > 0,05. Estimate: unstandardized fixed effect. SE: Standard error for estimate. Contrast categories for base: Not used (Option used), Crowd vote (Option type), A (Project), Male (Gender), Professional practice (Education), Trainee (Employment), < 50,000 € (Income). GVIF: Generalized Variance Inflation Factor. 1: R^2 is calculated from Nakagawa, and Schielzeth (2013).

approach to especially look deeper into the motivations of investors to take options.

Overall, our study provides insights into the effects of risk-reducing options in crowdinvesting. Our central finding is that seemingly less attractive projects suffer from the introduction of risk-reducing option, independent of their type, leading to more concentrated funding. Motivated by the introduction of such options in practice, we showed that varying kinds of option types are valued discriminatively by investors. Furthermore, we showed that less attractive projects see a decline in investments, after options are introduced. Therefore, several implications can be drawn from this study. First, crowdfunding platform providers should be aware that the introduction of options might hurt project creators that offer riskier investment opportunities. Still, the introduction could also serve as a motivator for creators to enhance their project proposals, and discourage creators of less attractive projects to enter the market. Implication for the project creator are likewise important. Joining a crowdfunding platform that offers risk-reducing options is only attractive for projects that offer a high level of attractiveness. Project creators that offer very risky project should consider alternative platforms that do not offer risk-reducing options for their investor, in order to avoid discrimination.

Even though this study offers contributions to research and practice, some limitations should be acknowledged when interpreting the results. Still, we believe most limitations offer avenues for future research. First, caution is advised when conclusions are drawn from a single study. As the crowdfunding industry is particularly young and highly dynamic, new methods and features such as options are constantly evolving and should be thoroughly examined. Consequently, the observed effects of risk-reducing options for crowdinvesting might not be directly transferable to other funding models. Secondly, we only assessed three types of options. Other forms of risk-reducing mechanisms should therefore be considered in future studies. Third, in an experimental study, a number of biases could influence the results. Such could be a hypothetical bias because subjects did not really invest money and therefore were not really exposed to potential consequences. Second, we might be vulnerable to a self-selection bias, meaning that only subjects with a natural interest could have chosen to participate and use their time to do the experiment. However, we are confident that with the fully automated online approach we have chosen we can avoid an experimenter bias, a guinea pig effect or trust problems.

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Appendix
Summary statistics of subjects and their decisions

Variable	Distribution
Age	20-29: 46.7% (100)
	30-39: 19.2% (41)
	40-49: 19.6% (42)
	50-59: 9.8% (21)
	60+: 3.3% (6)
Gender	Female: 71.4% (150)
	Male: 28.6% (60)
Education	Vocational training: 23.8% (50)
	School leaving examination: 12.9% (27)
	Bachelor's degree: 33.8% (71)
	Master's degree: 24.8% (52)
	PhD: 4.8% (10)
Country	Austria: 14.8% (31)
	Switzerland: 66.2% (139)
	Germany: 13.3% (28)
	Liechtenstein: 5.7% (12)
Annual income	Less than EUR 50,000: 28.1% (59)
	EUR 50,000-EUR 74,999: 19.5% (41)
	EUR 75,000-EUR 99,999: 19.5% (41)
	EUR 100,000-EUR 124,999: 14.6% (31)
	EUR 125,000-EUR 149,999: 6.2% (13)
	EUR 150,000-EUR 174,999: 5.7% (12)
	EUR 175,000-EUR 199,999: 1.4% (3)
	EUR 200,000 and more: 4.8% (10)
Options chosen per project (chosen/not chosen)	Crowd-voting: 12.4% (26) / 21.4% (45)
	Individual-voting: 11.0% (23) / 23.8% (50)
	Bankruptcy insurance: 12.4% (26) / 19.0% (40)
	(same for all projects)