

**Energy Investment Decision-Making Under Uncertainty:
The Influence of Behavioral and Social Effects**

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The President:

Prof. Dr. Thomas Bieger

[H]ow do people make decisions when the conditions for the economists' global rationality are not met (or even when they are)

– remains an active frontier of research even today.

– **Herbert A. Simon (1996: 371)**

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Nina Hampl

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Abstract

Governments throughout the world are seeking to generate more of their domestic power from renewable energy sources with the common goal of decreasing both carbon emissions and the dependence on limited fossil fuels. Making the transition to a clean and renewable energy system will require not only public engagement, but also significant financial investment from the private sector. For various reasons, including the volatile price of oil, ongoing technological developments, and uncertainty related to public policy, there is considerable uncertainty surrounding these investments. Evidence from the industry and research shows that a better understanding of the preferences and behavior of investors under conditions of increased uncertainty is needed to increase private funding. This doctoral thesis thus considers the perspectives of investors and investigates behavioral and social effects in clean energy investment decision-making, focusing on three different financial market contexts and corresponding types of investors: venture capital (*first paper*), public equity markets (*second paper*), and project finance (*third paper*). The results show that investors across all three financial market sectors are prone to the influence of behavioral (e.g. corporate brands in stock markets) or social effects (e.g. actions of industry peers in venture capital and wind energy “megaprojects”) in the course of their investment-related decisions in this context of high uncertainty. Each of the three papers reveals what mechanisms – in addition to purely rational risk-return considerations – those who seek funding for renewable energy endeavors must take into account to increase their chance of acquiring (new) capital. Gaining insight into investors’ decision-making processes is also essential for policymakers who are seeking to develop measures that fit the requirements and needs of the relevant capital market sector and investor. Overall, stakeholders can use the findings of this thesis to help close the gap between the supply and demand of capital in the clean energy domain and thus to aid in and accelerate the global transition to a sustainable energy system.

Keywords: Renewable energies, Uncertainty, Investment decision-making, Behavioral finance, Venture capital, Public equity markets, Project finance, Conjoint analysis

Zusammenfassung

Regierungen weltweit sind bemüht, den Anteil der Stromproduktion aus erneuerbaren Energiequellen zu erhöhen, mit dem gemeinsamen Ziel, die CO₂-Emissionen und die Abhängigkeit von endlichen fossilen Energieträgern zu reduzieren. Der Übergang zu einem sauberen und erneuerbaren Energiesystem bedarf nicht nur das Engagement der öffentlichen Hand, sondern auch beträchtliche Investitionen vom privaten Sektor. Aus verschiedenen Gründen, wie die Volatilität des Ölpreises, permanente technologische Entwicklungen und Unsicherheiten in Bezug auf politische Rahmenbedingungen, sind Investitionen in diesen Bereich mit erheblicher Unsicherheit behaftet. Anhaltspunkte aus Praxis und Forschung zeigen, dass ein besseres Verständnis von Investorenpräferenzen und -verhalten unter gesteigerter Unsicherheit nötig ist, um den Anteil privater Finanzierung zu erhöhen. Die vorliegende Doktorarbeit nimmt eine Investorenperspektive ein und untersucht verhaltenswissenschaftliche und soziale Effekte auf Investitionsentscheidungen im Bereich der erneuerbaren Energien mit Fokus auf drei verschiedene Kontexte des Kapitalmarktes und entsprechende Typen von Investoren: Venture Capital (Risikokapital; *erster Artikel*), Aktienmarkt (*zweiter Artikel*) und Projektfinanzierung (*dritter Artikel*). Die Ergebnisse zeigen, dass im Kontext hoher Unsicherheit Investoren aller drei Sektoren des Finanzmarkts verhaltenswissenschaftlichen (z.B. der Einfluss von Unternehmensmarken auf Aktienmärkte) oder sozialen Einflüssen (z.B. Handlungen von anderen Akteuren in der Venture Capital-Branche und in „Megaprojekten“ im Windenergiesektor) im Zuge ihrer Investitionsentscheidungen unterliegen. Jeder der drei wissenschaftlichen Artikel zeigt, welche Mechanismen Finanzierungssuchende für erneuerbare Energien-Vorhaben neben rein rationalen Risiko-Rendite-Abwägungen berücksichtigen müssen, um die Erfolgchance einer Kapitalakquise zu erhöhen. Einblicke in den Entscheidungsprozess von Investoren zu erhalten, ist ebenso für politische Entscheidungsträger wichtig, die danach streben, Massnahmen zu entwickeln, die die Anforderungen und Bedürfnisse des betreffenden Kapitalmarktes und dessen Marktteilnehmern erfüllen. Allgemein betrachtet können verschiedene Interessensgruppen auf den Ergebnissen dieser Doktorarbeit aufbauen, um die Lücke zwischen der Bereitstellung und der Nachfrage von Kapital im Bereich der erneuerbaren Energien zu schliessen und den globalen Übergang zu einem nachhaltigen Energiesystem zu unterstützen und zu beschleunigen.

Schlagwörter: Erneuerbare Energien, Unsicherheit, Investitionsentscheidung, Behavioral Finance, Venture Capital, Aktienmärkte, Projektfinanzierung, Conjoint-analyse

Introductory Chapter¹

Background and Problem Statement

[R]isk perceptions [...] can become the most significant barriers to investment, even for renewable energy technologies that are cost-competitive with conventional energy-supply options.

– Sonntag-O'Brien and Usher (2004: 3)

Reducing dependence on fossil fuels and mitigating climate change are important policy objectives for countries throughout the world. One way to contribute to the achievement of these objectives lies in accelerating the deployment of renewable energy resources. This requires substantial financial investment from both the public and private sectors. According to the International Energy Agency (IEA), the transition from reliance on fossil fuels to power production from renewable energy will require about \$3.6 trillion in additional investments² over the next two decades (IEA, 2008). For numerous reasons, including the volatile price of oil, ongoing technological developments, and uncertainty related to public policy, there is considerable uncertainty surrounding these investments. The fact that renewable energy companies are often relatively young adds additional uncertainty for investors, which is a lack of information about historic financial performance. According to the United Nations Environmental Programme's (UNEP) annual report on global trends in sustainable energy financing, however, total new investment in renewable energy has grown from \$220 billion in 2010 to around \$275 billion in 2011³ – a total increase of around 17 percent (UNEP, 2012). Considering the global financial crisis that marked those years, that is quite a high number, but it is nevertheless only a fraction of what

¹ Please note that if specific reference is made to the papers, they are referred to as *first paper* (Hampl, Wuebker, and Wüstenhagen, 2012), *second paper* (Hampl, 2012), and *third paper* (Hampl and Wüstenhagen, 2012), respectively; several sentences of this chapter are drawn from the *first, second, and third paper* of this doctoral thesis without explicit citation.

² The total estimates of \$9.3 trillion, also including \$5.7 trillion for energy efficiency, correspond to 0.6% of the world GDP per year (IEA, 2008).

³ Compared to 2004 with a total spending of \$39 billion global new investment grew enormously by more than six times till 2011; between 2007 and 2011 total new investment increased by 93% (UNEP, 2012).

will be required to achieve the goals that have been set for clean energy⁴ deployment and carbon emission levels.

An as yet unsolved problem that is the subject of lively debate among both public policymakers and scholars within this field is thus how to decrease the high degree of uncertainty that is associated with renewable energy investment to encourage monetary investment in this market sector (IEA, 2007; Sonntag-O'Brian and Usher, 2004; UNEP, 2009). Practitioners and scholars have focused specifically on the role that public policy plays in increasing investment levels, which, in light of the huge impact that public policy instruments such as subsidies, market-based incentives, taxes, and binding goals (e.g. for reducing emissions or increasing the use of renewable energy sources) can have on investors' willingness to invest in that field, is justifiable. Governmental support has the capacity to promote and facilitate the growth of renewable energy markets, but it can just as easily negatively affect private investment through, for example, failure to set clear goals or by putting stop-and-go policies in place (IEA, 2007; Mitchell, Bauknecht, and Connor, 2006). The negative impact of policy risk on private investment in terms of economic (e.g. financial incentives such as feed-in tariffs) and non-economic (e.g. legal security, duration of the administrative process to get a renewable energy project permitted) barriers has been shown in different geographical contexts such as emerging economies (IWÖ-HSG, 2010), Europe (Breukers and Wolsink, 2007; Lüthi and Prässler, 2011; Lüthi and Wüstenhagen, 2012) and the U.S. (Barradale, 2010; Lüthi and Prässler, 2011; Mormann, 2012).

An examination of the impact of policy risk reveals how immensely sensitive investors are to changes in the degree of overall risk and/or uncertainty surrounding an investment domain or specific investment target. Examining investors' reactions to changes in public policy is nevertheless only one possible angle from which to study investor behavior in that field. Another approach would be to investigate how investors react to different behavioral or social effects in the market. The host of studies from the behavioral finance literature that provide empirically influence of psychological factors on investment decisions in general and especially under conditions of uncertainty (e.g. Barberis and Thaler, 2003; Kahneman, 2003; Kahneman and Tversky, 1979; Shiller, 2003; Simon, 1955) lay the foundation for this

⁴ The term "clean energy", as used in this doctoral thesis, refers solely to "renewable energy" and does not include other carbon-free energy technologies, such as nuclear power or fossil-fuel-based generation of power via carbon-capturing.

viewpoint. Different studies have already shown behavioral effects in renewable energy investments. Chassot, Hampl, and Wüstenhagen (2011) provide empirical evidence suggesting that venture capitalists' underinvestment in renewable energy deals can be explained by a policy aversion bias. Lüdeke-Freund and Loock (2011) show that banks' financing decisions of large-scale photovoltaic projects is prone to a "debt for brands" bias related to the photovoltaic modules that are implemented in the project. Masini and Menichetti (2012) reveal that aside from a preference for policy instruments, a priori beliefs, and attitudes towards technological factors impact investors' likelihood to involve themselves financially in renewable energy projects.

Building on this past research on the subject of behavioral effects on renewable energy investments, this doctoral thesis seeks to broaden the discussion in two specific ways: (1) through the examination of social effects on the decision whether to invest in this domain, which may stem from the actions of others within the investment sector (*first and third paper*); and (2) by examining behavioral and social influences in other sectors of the capital market and thus for other types of investors, such as individual (private) investors in public equity markets (*second paper*) and investors or banks engaged in very large-scale renewable energy projects (so-called "megaprojects") (*third paper*).

Focus and Objectives

The previous section has shown how important it is to learn more about the preferences and behavior of people within the investment sector under conditions of increased uncertainty if the gap is to be closed between the demand and supply of capital in the clean energy domain. A deeper look into clean energy financing reveals that investment is needed along the whole financing process or continuum, from the research and development of technologies and the scale-up of manufacturing all the way to market roll-out and asset expansion. Each of these has its own distinct set of characteristics with regard to financial risk and return, and each relies on different sources for obtaining the necessary funding. This doctoral thesis focuses specifically on three different sectors of the capital market: venture capital, public equity markets and project finance (asset finance through private equity and debt capital). It takes the perspectives of investors engaged in these financial markets and investigates behavioral and social effects in clean energy investment decision-making. Gaining further insight into investors' decision-making processes is essential to developing

measures that generate mechanisms that “pull” rather than “push” and are tailored to the requirements and needs of the relevant capital market sector and investor. Figure 1 depicts both the corporate financing continuum for renewable energy and the focus of this thesis.

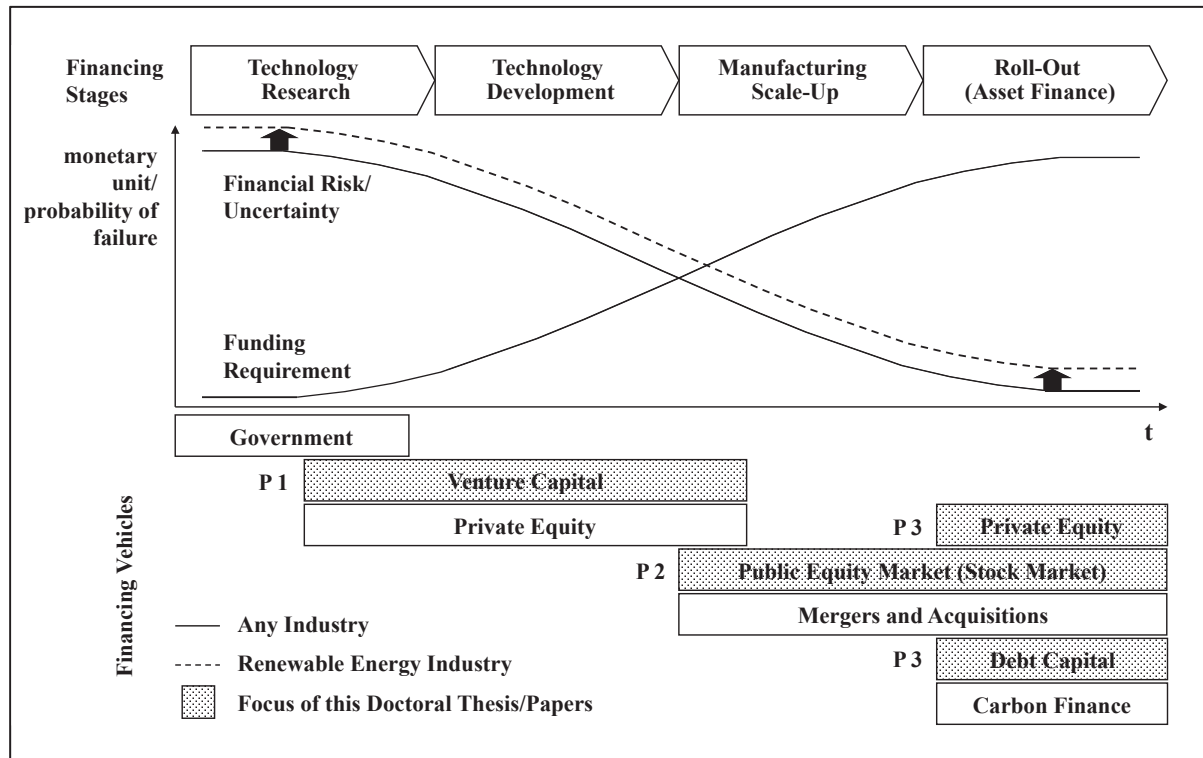


Figure 1. Renewable energy financing continuum⁵ (adapted from UNEP, 2012)

Each of the three research papers that follow contributes to the overall objective of this thesis while also having a distinct focus that corresponds to the characteristics of the particular capital market domain and types of investors.

The *first paper* specifically focuses on venture capital investments in clean energy start-ups – a financial market environment that by its very nature involves a high amount of financial risk. Previous research has revealed that social networks play an important role across the venture capital cycle – in other words, in an investment climate characterized by a high degree of uncertainty. However, social influences were always examined separately. Therefore, the objective of this paper is to improve our understanding of how social networks influence the decision-making process through

⁵ This financing continuum is basically a generic framework and could be applied to any specific industry but is here adapted to the needs of the renewable energy sector.

the conducting of a joint test for the influence of personal ties and status hierarchies on venture capital decision-making. Focusing specifically on the clean energy industry domain as a sector in which the degree of uncertainty is even higher due to e.g. regulatory risk, the paper explores the informal social systems that emerge to coordinate exchanges in such uncertain and competitive environments.

The *second paper* investigates the behavioral influence of corporate brands on individual investors' decisions whether to invest in public equity markets. The empirical study whose findings this paper cites focuses specifically on the importance of the corporate brand relative to other prominent stock investment criteria, such as growth in earnings, management or price development. Further, the effect of corporate brands is examined in the context of two industry sectors that differ in their level of maturity and thus their level of uncertainty, the utilities and the solar photovoltaic industry. This study is also intended as a contribution to the body of literature on familiarity-related effects on capital markets (e.g. Huberman, 2001; Grullon, Kanatas, and Weston, 2004) and generates findings that should be of great interest to corporate branding, marketing, communications, and investor relations professionals in the energy sector with respect to the impact of corporate brands on capital markets as a means of awakening interest within the investor community and thus of boosting the bottom line in that field.

The *third paper's* objective is to provide insights into investor acceptance of wind power megaprojects and to investigate how, aside from "hard" risk and return factors, it is influenced by behavioral and social effects. Further, this paper addresses the question of how megaproject managers can positively influence and manage investor acceptance. This paper develops a conceptual model of investor acceptance of wind power megaprojects and its management based on insights from literature on behavioral finance, social acceptance of wind power projects, megaproject management, and stakeholder management.

Table 1 below summarizes the research objectives of the three contributions that together form this doctoral thesis. It also provides an overview of each of the papers' theoretical foundation and underlying methodology, which the authors will delve into in further detail in the subchapters that follow. The table below also contains information on the current status of each respective research paper with regard to publication.

Table 1. Overview of research papers that make up this doctoral thesis

| No. | Author(s) | Title | Focus and Objective(s) | Theoretical Foundation | Methodology | Publication Status |
|-----|---|---|--|---|---|---|
| 1 | Hampf Nina ^a , Wuebker Robert ^b , and Wüstenhagen Rolf ^{b,c} | The Strength of Strong Ties in an Emerging Industry: A Joint Test for the Effects of Status Hierarchies and Personal Ties in Venture Capitalist Decision-Making | Improve our understanding of how different social effects influence decision- making of venture investors in an emerging industry (clean energy) and thus in an environment of high uncertainty | Social network theory | Conjoint analysis (adaptive choice- based conjoint (ACBC)) | Under second revision with <i>Strategic Entrepreneurship Journal</i> (SEJ) |
| 2 | Hampf Nina ^a | Invest in What You Know: An Experimental Approach to Investigating the Influence of Corporate Brands on Individual Investors' Decisions | Investigates the behavioral influence of corporate brands on the investment decision of individual investors in public equity markets in two different energy industry contexts of varying level of uncertainty | Behavioral finance (specifically literature related to familiarity effects), consumer behavior/ branding | Interviews, focus group, conjoint analysis (ratings- based conjoint approach) | Under review at <i>The Journal of Behavioral Finance</i> |
| 3 | Hampf Nina ^a , Wüstenhagen Rolf ^{b,d} | Management of Investor Acceptance in Wind Power Megaprojects: A Conceptual Perspective | Provides conceptual insights into how behavioral and social factors influence investor acceptance of wind power megaprojects | Behavioral finance, (mega)project management | Conceptual paper | Accepted for publication in the special issue on “Megaproject Management” in <i>Organization, Technology & Management in Construction</i> (OTMC) |

^a Institute for Economy and the Environment, University of St. Gallen, Switzerland.^b Department of Management, David Eccles School of Business, University of Utah, UT, United States.^c Authors contributed equally to the research paper.^d First author is main author of the research paper.

Theoretical Foundation⁶

Uncertainty Versus Risk

Investors typically decide on their financial engagements through a process of carefully weighting risks and returns. Frameworks and mathematical models have been developed to support investors in the decision-making process. These frameworks and models mostly assume conditions of risk, i.e. decision-makers are able to assign objective probabilities to a range of known future events or outcomes by applying a mathematical or statistical perspective (Knight, 1921). For various reasons related either to the specific industry or subindustry (e.g. clean energy industry as an emerging industry, which additionally involves regulatory risk) or to the type of investment (e.g. megaprojects), investors are often faced with conditions of uncertainty where future events or outcomes are not known or if they are known decision-makers are only able to assign subjective probabilities to future events or outcomes based on “expectations grounded in historical practice” or, in the case that events or outcomes are not known due to lacking data, the social construction of the future with “little or no relation to the past or the present” (Sanderson, 2012: 435). The literature makes it clear that individuals behave differently depending on whether risk or uncertainty is involved in the decision-making process (e.g. Folta, 2007). In the context of uncertainty in particular, research indicates that decision-makers more frequently apply heuristics and are more prone to cognitive biases that are products of, among other things, behavioral or social influences (Kahneman, Slovic, and Tversky, 1982; Tversky and Kahneman, 1974).

Behavioral and Social Effects in Investment Decision-Making Under Uncertainty

Modern financial theory provides a solid understanding of how investors react to uncertainty. These theoretical frameworks are based on the assumption that investors are completely rational and always act to maximize their (subjective) expected utility measured in terms of risk and return (Savage, 1954; von Neumann and Morgenstern, 1944). Rational investors are also assumed to be risk-averse, i.e. the total utility of an investor increases with an increase in return and decreases with an increase in the level

⁶ This is only a short summary of the main literature streams that are the basis for each of the three papers. Each paper additionally focuses on other theoretical fields that are relevant in the specific context. Please refer to the particular paper for more details.

of risk (Slovic, 2001). Under the efficient market hypothesis non-financial criteria are ignored (Lea, Tarpay, and Webley, 1987). In light of modern financial theory's rigid assumptions and portrayal of capital markets as "black boxes", it would appear to be an important foundation of this thesis, but cannot provide a direct source of insight into the identified behavioral and social effects that the efficient market hypothesis fails to address.

The existing research on the subject of behavioral finance, on the other hand, offers a different perspective. According to it, human analytical capabilities are constrained ("bounded rationality") and people use simple heuristics rather than complex mathematical models to weigh different risk and return measures when making decisions (Barberis and Thaler, 2003; Kahneman, 2003; Kahneman and Tversky, 1979; Shiller, 2003; Simon, 1955). The authors postulate that in addition to rational factors, behavioral factors also influence information processing and financial decision-making. Behavioral factors and emotions play a crucial role in the human decision-making process – especially in situations in which information is spread asymmetrically and uncertainty reigns with regard to future events (Jordan and Kaas, 2002). Scholars from this school of thought have provided empirical evidence that behavioral finance phenomena influence investors' decision-making processes in a variety of domains.

Various scholars within the field of venture capital have made important contributions to reaching a better understanding of how cognitive biases influence investment decision-making (e.g. Franke *et al.*, 2006; Zacharakis and Meyer, 1998; Zacharakis and Shepherd, 2001). Scholars have also demonstrated a particular interest in investigating the effects of networks on venture financing; hence various studies emerged that investigate the entrepreneur-investor social ties and capital provision (Shane and Cable, 2002), and the relationship between entrepreneurs and investors (Landström *et al.*, 1998; Sapienza, 1992; Sapienza and Korsgaard, 1996). The majority of studies (a notable exception being Shane and Cable, 2002), however, focus on outcomes that are not related to the financing decision. The findings of Shane and Cable (2002) suggest that direct network ties influence investment decision-making through the transfer of information, a process in which investors exploit their social connections to obtain private information. In a venture capital context, direct ties develop through various forms of cooperation between industry actors. Venture capital firms routinely cooperate by referring deals and people to each other, arranging funding through investment syndicates, providing introductions, and sharing resources such as in-house research or findings from due diligence activities. These social ties

have been shown to help people overcome the information-related problems that typically plague early-stage venture finance.

In the context of public market investments, scholars have shown in the past that behavioral factors in general (e.g. Baker, Hargrove, and Haslem, 1977; Baker and Nofsinger, 2002; Barber, Heath, and Odean, 2003; Barber and Odean, 2000a, b, 2001, 2002, 2008; Odean, 1998, 1999) and in particular familiarity affect individual investors' decision-making in several contexts; this influence manifests itself, for example, in stronger preferences for domestic stocks (Coval and Moskowitz, 1999; French and Poterba, 1991; Grinblatt and Keloharju, 2001; Huberman, 2001; Wang, Keller, and Siegrist, 2011), employer stocks (Benartzi, 2001; Huberman, 2001) or stocks from companies whose products the investors purchase (Aspara, Nyman, and Tikkanen, 2008; Aspara and Tikkanen, 2008; Frieder and Subrahmanyam, 2005; Schoenbachler, Gordon, and Aurand, 2004). In general, these studies show that familiarity with the investment products in question moderates the perceived risk associated with those products (Wang *et al.*, 2011). This, in turn, makes investment more likely.

Methodology

The *first and second papers* of this thesis are both empirical in nature and have a similar underlying methodology: namely, utilizing conjoint analysis to investigate the relative importance of different investment criteria. The *third paper* constitutes a theoretical contribution; it offers a conceptual model of behavioral and social influences on investors' willingness to invest in megaprojects in the renewable energy domain. The remainder of this subchapter will focus specifically on characteristics of conjoint analysis as the main methodological approach of this thesis.

The conjoint analysis approach is composed of two distinct stages. In the first, qualitative phase, the attributes and attribute levels of the conjoint experiment are defined; this is typically done through expert interviews and review of the literature. The *first and second papers* both thoroughly review the literature to derive the factors that play the most important role in the decision-making process in the specific investment domain. The *second paper* also utilized a focus group and conducted interviews in order to obtain further information on behavior related to investment and the decision-making process of the target group to triangulate the findings from literature. In addition to these attributes, the behavioral and social factors under investigation are included in the conjoint design to measure their importance relative

to the other traditional investment criteria. The second stage consists of a quantitative web-based survey that was conducted among representatives from the specific target group.

Due to the numerous advantages that conjoint analysis has over other methods for studying the decision-making process, it has already been applied in several financial contexts, such as project finance (IWÖ-HSG, 2010; Lüdeke-Freund and Loock, 2011; Lüthi and Prässler, 2011; Lüthi and Wüstenhagen, 2012), private equity and debt capital in general (Loock, 2012; Masini and Menichetti, 2012), venture capital (Franke *et al.*, 2006; Muzyka, Birley, and Leleux, 1996; Riquelme and Rickards, 1992; Shepherd, 1999; Shepherd, Zacharakis, and Baron, 2003; Zacharakis, McMullen, and Shepherd, 2007), informal investing (Landström, 1998), and individual stock market investors (Clark-Murphy and Soutar, 2004). Table 2 below summarizes the main characteristics and findings of the studies mentioned using conjoint analysis in investment decision-making domains.

Table 2. Overview of conjoint analysis studies in finance and investment-related contexts

| Author(s) | Research Domain/Objective(s) | Type of Conjoint Design/Sample^a |
|---------------------------------|--|---|
| Lüthi and Wüstenhagen (2012) | Examine the influence of policy risk on photovoltaic project developers' location decisions | <ul style="list-style-type: none"> • Adaptive conjoint design (5 attributes) • 63 respondents from across Europe (project developers) |
| Loock (2012) | Identify the business models investment managers in the renewable energy domain prefer to invest in | <ul style="list-style-type: none"> • Choice-based conjoint design (10 choice tasks, 5 attributes) • 38 respondents, mainly from across Europe and the U.S. (all types of investors) |
| Masini and Menichetti (2012) | Investigate policy-related and behavioral effects on investors' decisions and on the relationship between renewable energy investments and portfolio performance | <ul style="list-style-type: none"> • Adaptive conjoint design (5 attributes) • 93 respondents from across Europe (all types of investors) |
| Lüdeke-Freund and Loock (2011) | Identify the photovoltaic project configurations banks prefer to finance | <ul style="list-style-type: none"> • Adaptive choice-based conjoint design (6 attributes) • 43 respondents from Germany (banks) |
| Lüthi and Prässler (2011) | Examine the influence of policy risk on wind project developers' location decisions | <ul style="list-style-type: none"> • Adaptive choice-based conjoint design (6 attributes) • 119 respondents from across Europe and the U.S. (project developers) |
| IWÖ-HSG (2010) | Investigate the influence of policy risk on investment decisions in photovoltaic and wind projects in developing and emerging countries | <ul style="list-style-type: none"> • Adaptive choice-based conjoint design (8 attributes) • 122 respondents from across the world (all types of investors in project finance) |
| Zacharakis <i>et al.</i> (2007) | Examine the influence of economic institutions on venture capitalists' (VCs') decision policies across countries | <ul style="list-style-type: none"> • Ratings-based conjoint design (50 profiles, 8 attributes) • 119 respondents (31 U.S., 49 Korean, and 39 Chinese VCs) |
| Franke <i>et al.</i> (2006) | Analyze biases that arise from similarities between VC and members of the venture team | <ul style="list-style-type: none"> • Ratings-based conjoint design (18 profiles, 7 attributes) • 51 respondents from 26 VC firms in Munich, Berlin and Vienna |
| Clark-Murphy and Soutar (2004) | Investigate the factors that influence individual investors in decisions related to the purchase of shares | <ul style="list-style-type: none"> • Adaptive conjoint design (11 attributes) • 361 respondents from Australian Shareholders Association (ASA) |
| Shepherd (1999)/ | <ul style="list-style-type: none"> • Investigate whether VCs' assessment policies of new | <ul style="list-style-type: none"> • Ratings-based conjoint design (39 profiles, 8 attributes) |

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- Shepherd *et al.* (2003) venture survival are consistent with those that derive from the strategy literature
- Analyze whether more experience leads to better decision-making
- 66 respondents from 47 VC firms in Australia
- Landström (1998) Describe and explain decision-making criteria used by informal investors when assessing new investment proposals
- Pairwise trade-off of criteria; rankings-based (study conducted in Sweden):
 - General decision-making: 51 trade-off tasks, 34 criteria, 22 respondents
 - Leadership decision-making: 35 criteria, 22 respondents
- Muzyka *et al.* (1996) Identify key factors used by European VCs in evaluating potential investments
- Pairwise trade-off of criteria; rankings-based (53 trade-off tasks, 35 criteria)
 - 73 respondents from across Europe (VCs)
- Riquelme and Rickards (1992) Create insight into screening and evaluation steps in the VC investment decision process
- Ratings-based conjoint design (27 profiles, 8 attributes, 6 VCs)
 - Evaluate application of conjoint analysis in VC decision-making
 - Hybrid conjoint design; combination of direct ordering of attributes and rating of attribute levels and full-profile rating (10 profiles, 8 attributes, 7 VCs)
 - Self-explicated model; direct ordering of attributes and rating of attribute levels (8 attributes, 1 VC)
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^a Conjoint can be applied in two different ways: full-profile (total number of attributes are shown per profile), trade-off (selected attributes are ranked against each other). Choice-based – including adaptive choice-based conjoint – and ratings-based conjoint designs typically use full-profiles; adaptive conjoint designs normally apply trade-offs (Baier and Bruschn, 2009).

Conjoint methodology allows the decision-making process to be partitioned into underlying response preferences for particular attributes. It is this feature that has made conjoint analysis a popular research method in different fields since its introduction in mathematical psychology (Luce and Tukey, 1964); it enables researchers to answer questions crucial to the domain (Green and Rao, 1971). Conjoint analysis uses an indirect questioning method by applying a “decompositional” approach to study decision-making processes (Green and Srinivasan, 1990). The preferences, i.e. average part-worth and relative importance weights of each of the attributes (independent variables) are derived from the decisions (dependent variable) made in the choice tasks (Green and Rao, 1971; Green and Srinivasan, 1990; Louviere *et al.*, 2003; Louviere *et al.*, 2008; McFadden, 1986).

In particular, the format of indirect questioning gives this method an advantage over simply asking respondents to rate separate decision-making criteria according to their preferences. Previous studies have revealed that individuals may be biased with regard to their own behavior and thus may avoid discussing potential mistakes or non-rational behavior, and/or may even lack an understanding of their own decision-making processes (Golden, 1992; Zacharakis and Meyer, 1998).

In conjoint analysis, different approaches are in particular distinguished with respect to (1) the type of the dependent variable (e.g. choice-based conjoint, which produces a discrete dependent variable; ratings-based conjoint lead to a metric dependent variable) and thus the part-worth estimation model (logistic regression versus OLS) and (2) the process and number of different parts or phases of the survey (e.g. just one part, where individuals have to choose between or individually rate different alternatives; and adaptive conjoint approaches that typically involve several parts with varying instructions). The two empirical papers – i.e. papers one and two – take different conjoint approaches.

The *first paper* used Adaptive Choice-Based Conjoint (ACBC)⁷ as the latest and current “state-of-the-art”-method developed by Sawtooth Software⁸. This method is very similar to a traditional choice-based conjoint design that entails engaging respondents in choice tasks and asking them to choose the most favorable of a set of alternatives. ACBC collects the preference data in an interactive mode that is designed to make the choice tasks more appealing and engaging. Further, it consists of three

⁷ For a detailed description of the ACBC approach please refer to Sawtooth Software (2009) or the *first paper* of this doctoral thesis.

⁸ Sawtooth Software products were used for both the questionnaire design/setup and the statistical analysis of the choice data or ratings.

different parts, which increases the information that each respondent is able to provide and allows individual part-worth utilities to be estimated via sparse and incomplete data. Sawtooth Software developed this new method in response to calls that arose in various publications (e.g. Green, Krieger, and Wind, 2001; Netzer *et al.*, 2008) for improvements in conjoint measurement.

The *second paper* applies a traditional ratings-based conjoint analysis (Sawtooth Software refers to it as CVA – Conjoint Value Analysis) that entailed asking respondents to rate individual stock market offerings. This conjoint approach was chosen based on qualitative interviews with representatives of the target group and a pre-study, which showed that the individual rating of investment opportunities corresponds much better to the actual decision-making situation of individual investors on the stock market. Both papers apply a hierarchical Bayes approach to estimate the part-worth utilities. Please refer to the *first paper* for a detailed description of this estimation procedure.

Conceptual Framework

Figure 2 below shows the overall conceptual framework, which constitutes the foundations of all three papers of this doctoral thesis. This model illustrates the relationship of a set of independent variables, i.e. the behavioral and/or social attributes as the main variable under investigation, and various other risk factors and return factors to the decision to invest (dependent variable). Other factors are treated as moderators (demographic variables in particular) that are assumed to either decrease or increase the effect of the behavioral and/or social variables on the decision whether to invest. The research papers in this thesis operationalize these variables in different ways and do not necessarily examine all the variables that are depicted in this framework. The paragraphs that follow show how each of the papers translates this model to its specific context and research domain.

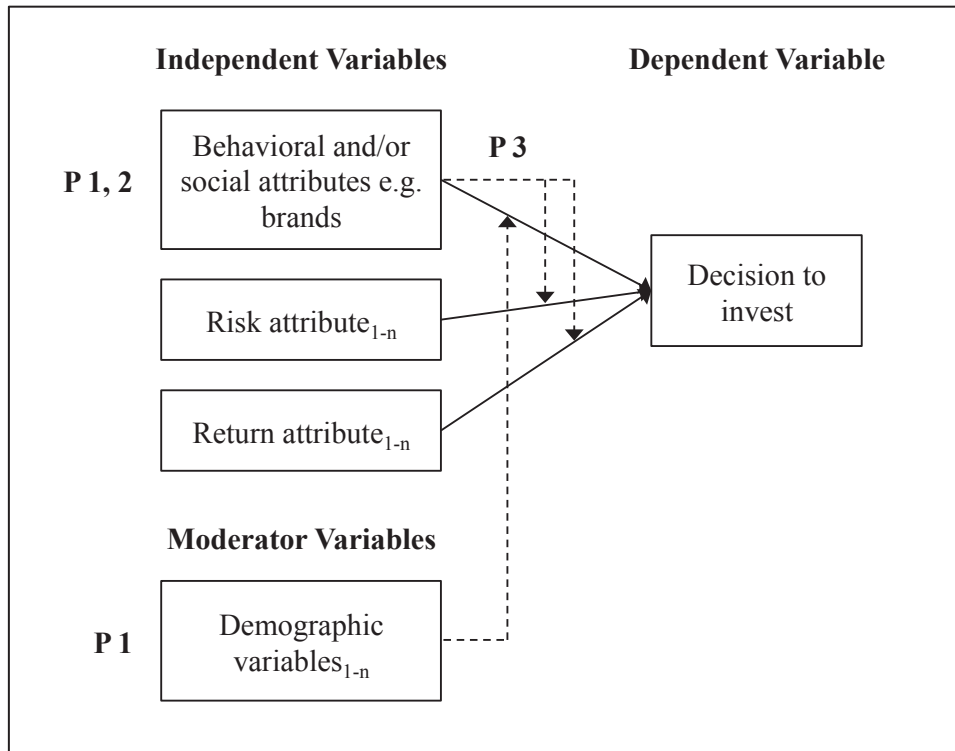


Figure 2. Overall conceptual framework

In the *first paper*, the independent variables relate to the investment decision-making criteria of venture capitalists and are operationalized as follows: lead investor (Social Attribute 1 under investigation; existing corporate brands as well as one fictitious company are named), deal source (Social Attribute 2 under investigation), return potential (upside potential of the investment), technological maturity (of product), founder experience, and regulatory exposure (presence and extent of regulatory risk). Each independent variable is described on four different levels (please see Table 1 of the *first paper*). The “decision to further investigate the deal” was chosen as dependent variable (discrete variable). The study also investigates the influence of two moderator variables (P 1 in the figure above), such as geographic density (continent of firm location) and the investment experience of the respondent (in years). This paper examines the direct influence of social factors on the dependent variable (P 1 in the figure above).

The *second paper* operationalizes the independent variables as risk and return criteria in stock market investments, paying particular attention to the characteristics of individual investors. The behavioral variable under investigation is the corporate brand of the company behind the stock offering. Actual brands are used in order to make the experiment as realistic as possible. Further risk/return factors included in the

conjoint experiment as independent variables are the management of the company, the earnings outlook (next five years), the price-earnings-ratio, whether or not dividends are issued, and price development over the past 12 months. Each independent variable was varied at two levels: a positive and a negative state. This contribution investigates the direct influence of a behavioral factor on the dependent variable (P 2 in the figure above).

The *third paper* is conceptual in nature and does not operationalize the variables with the aim of testing the relationships among them empirically. It nevertheless proposes different “macro” (e.g. related to policy, social acceptance) risk factors and “micro” (e.g. related to market, technology, completion of construction) risk factors that are relevant in the context of financing renewable energy projects as independent variables that influence “the decision to invest in a wind energy megaproject”. The paper specifically investigates social effects in the investment decision-making process, whereas these variables are treated as moderating factors that affect expectations regarding return, the perception of risk, and the decision whether to invest (P 3 in the figure above).

Overall Findings and Conclusions

All three of the papers that make up this doctoral thesis show that investors across three financial market sectors are subject either empirically or conceptually to behavioral (e.g. by corporate brands in stock markets) or social effects (e.g. the actions of industry peers in venture capital and wind energy “megaprojects”) when making investment decisions in highly uncertain environments such as the renewable energies domain. The individual findings of each of the papers are as follows, respectively:

The *first paper* reports from a sample of 86 venture capital investors from the U.S. and Europe who each performed 3,132 choice tasks in an ACBC conjoint experiment. The study investigated how social networks influence investment decisions jointly testing for the influence of status hierarchies and personal ties in a context of high uncertainty (deals in the clean energy domain). This study, which is the first to examine these mechanisms, shows that both direct and indirect connections within networks measurably influence the decision-making process in venture capital investment. In the context of high uncertainty, however, personal ties – specifically, whether or not the deal came from a trusted referral in the investor’s network – are more important than the reputation of the other investors who are involved in the deal.

These findings are in line with those of various scholars in this field (e.g. Shane and Cable, 2002). Further, the results indicate that personal ties wield a greater influence in the densely networked U.S. venture capital industry than among the European respondents in the sample. They also reveal that investment experience has a U-shaped relation to the importance of strong personal ties, with the effect being strongest among inexperienced and highly experienced venture capitalists. The light that this study sheds on what is most important to venture capitalists, particularly in the context of an emerging industry, is of great import for entrepreneurs who are seeking to obtain funding for their ventures.

The aim of the *second paper* is to further our understanding of the corporate brand's importance relative to other investment-related factors in stock purchase decisions, specifically under the condition of high uncertainty. Its findings derive from a ratings-based conjoint experiment that involved 1,044 experimental investment decisions made by 87 individual investors from Austria, Germany, and Switzerland. This study builds on previous research in this area (Aspara and Tikkanen, 2011; Barber and Odean, 2008; Frieder and Subrahmanyam, 2005; Huberman, 2001; Grullon et al., 2004) and is in line with these scholars' findings that (1) corporate brands indeed influence the investment-related decisions of individual investors and (2) familiar brands are more influential than lesser-known brands. This effect holds true for both of the industry contexts that this study investigates: the photovoltaic industry (high uncertainty) and the utilities industry (low uncertainty). The results, however, show that classical stock investment criteria such as growth in earnings, price development, management, and dividend payments are of the greatest relative importance to the average investor in this sample; this, in turn, corresponds to research conducted by Nagy and Obenberger (1994) and Baker and Haslem (1973). The findings are of specific interest for representatives of the power and renewable technologies industries, as they expose how crucial the role is that marketing and branding play in these industry sectors, which in contrast to traditional consumer goods companies typically do not have large advertising budgets. In particular, the results suggest that companies in this sector should increase their corporate brand visibility on capital markets to generate interest among individual investors.

The *third paper* introduces a conceptual model of investor acceptance of wind power megaprojects and suggests ways of managing investor acceptance based on insights from the literature on behavioral finance, social acceptance of wind power projects, megaproject management, and stakeholder management. This conceptual model could be used as a starting point for further investigation of the issue of investor

acceptance in the context of wind power megaprojects, particularly for empirical studies such as case studies or surveys of investors and megaproject managers. Its findings contain valuable insight for both managers and investors in wind power megaprojects and other stakeholders such as policymakers and consultants. It might also have implications for other energy sectors (e.g. gas-fired power stations or pipelines, electricity transmission grids) or across infrastructure sectors (e.g. transportation) where investor acceptance plays a role.

In sum, the above stakeholders can utilize the findings of this doctoral thesis to help close the gap between the demand and supply of capital in the clean energy domain and thus enable and accelerate the transition to a more sustainable energy system.

Overall Limitations and Suggestions for Further Research

This doctoral thesis also came across some limitations. The *first and second papers* are both empirical in nature and as such share some of the limitations that are common to survey research and conjoint analysis. First, both studies apply an experiment rather than investigate “real” investor behavior. The conjoint approaches applied in the two papers mimic real behavior on the market quite well in comparison to directly asking the respondents to state or rate the criteria on which they base their investment decisions. However, actual investment decisions – both in venture capital and stock markets – are more complex and involve a greater range of criteria. Both papers were therefore able to investigate only a fraction of the relevant attributes and attribute levels, so much room remains for further research involving different sets or a higher number of investment criteria. Second, when working with conjoint analysis, one must bear in mind that conclusions regarding the importance of particular attributes and attribute levels can only be applied in relation, i.e. relative to the other attributes and attribute levels that are included in the design. The results might thus change with alterations to the experimental design, i.e. the attributes and attribute levels. Third, the papers also focus on very specific steps in the investment decision-making process, which define the nature of the respective dependent variables (the deal-screening stage in the venture capital context and stock-purchasing decisions in public equity markets). Particularly of interest would be, to investigate other or several steps in the investment decision process of both of these or other types of investors in the clean energy domain. Fourth, future studies might attempt to further contribute to

the emerging “behavioralized” and “socialized” view of investments through pursuing multi-method approaches, including, perhaps, experimental methods designed to capture the affective component of behavioral and social influences on investor decision-making. Fifth, further studies applying conjoint analysis or a similar experimental approach in the same context might want to increase the size of the sample, as in both papers the sample size limits the number of detailed analyses that can be conducted on subgroups of investors, according, for example, to demographic or psychographic factors. If working with professional investors, however, one needs to take into account they are notoriously hard to access with time-consuming academic surveys. Sixth, the two empirical contributions in this doctoral thesis focus on only one to two specific behavioral or social effects. Further research might want to investigate a number of different behavioral and social effects or a different combination of them in each or across the financial market sectors on which this thesis is focused. Seventh, scholars conducting similar studies in the future might attempt to validate the papers’ findings through applying a cross-industry comparative design in venture capital contexts or through using other industry sectors (e.g. industries other than the energy domain) in a stock market investment environment. Finally, respondents in survey settings are typically pressed for time due to limited opportunity to postpone or reflect on potential alternatives for a longer period of time (at least, that is, if they are unable to set the survey aside and resume at a later point). The literature indicates that decision-making is different under time constraints (Ben Zur & Breznitz, 1981). This limitation emphasizes the need for an examination of the behavioral and social effects that this doctoral thesis investigates via other methodological approaches or a combination of them.

The *third paper* is conceptual in nature and thus does not share the limitations discussed above. However, it also has some limitations that are specifically related to the conceptual model and the conclusion for the management of investor acceptance. Neither distinguishes between different types of investors. An interesting feature specifically of the offshore wind power market, however, is a shift in the type of investors. While strategic investors such as power companies, which are used to building centralized and very large-scale power plants, have traditionally financed these capital-intensive projects, the investor base in such projects is growing increasingly diverse (e.g. pension funds or other financial investors). Different types of investors also apply differing investment strategies and rationales, and their tolerance of risk varies when entering the wind power scene. Future studies (conceptual as well as empirical) might thus specifically focus on differences in risk-return assessment,

risk perception, return expectations, and management-related aspects of these various types of wind energy megaproject investors.

Overall, the contributions to this doctoral thesis show that both behavioral and social influences matter both in general terms and in the context of a highly uncertain and emerging industry, such as the clean energy sector. Further studies and conceptual work might want to build on these findings and thoughts and extend it in different meaningful ways, in order to increase our overall understanding on how investors, and thus more generally, humans, act and decide under conditions of uncertainty.

References

- Aspara J, Nyman H, Tikkanen H. 2008. Influence of share ownership on repeat patronage. *Journal of Customer Behaviour* **7**(2): 149-163.
- Aspara J, Tikkanen H. 2008. Interactions of individuals' company-related attitudes and their buying of companies' stocks and products. *Journal of Behavioral Finance* **9**(2): 85-94.
- Aspara J, Tikkanen H. 2011. Corporate marketing in the stock market: the impact of company identification on individuals' investment behaviour. *European Journal of Marketing* **45**(9): 1446-1469.
- Baier D, Bruschi M (eds). 2009. *Conjointanalyse: Methoden, Anwendungen, Praxisbeispiele*. Springer: Berlin, Heidelberg.
- Baker HK, Hargrove MB, Haslem JA. 1977. An empirical analysis of the risk-return preferences of individual investors. *Journal of Financial and Quantitative Analysis* **12**(3): 377-389.
- Baker HK, Haslem JA. 1973. Information needs of individual investors. *Journal of Accountancy* **136**(5): 64-69.
- Baker HK, Nofsinger JR. 2002. Psychological biases of investors. *Financial Services Review* **11**(2): 97-116.
- Barber BM, Heath C, Odean T. 2003. Good reasons sell: reason-based choice among group and individual investors in the stock market. *Management Science* **49**(12): 1636-1652.
- Barber BM, Odean T. 2000a. Too many cooks spoil the profits: investment club performance. *Financial Analysts Journal* **56**(1): 17-25.
- Barber BM, Odean T. 2000b. Trading is hazardous to your wealth: the common stock investment performance of individual investors. *Journal of Finance* **55**(2): 773-806.
- Barber BM, Odean T. 2001. Boys will be boys: gender, overconfidence, and common stock investment. *Quarterly Journal of Economics* **116**(1): 261-292.
- Barber BM, Odean T. 2002. Online investors: do the slow die first? *Review of Financial Studies* **15**(2): 455-487.
- Barber BM, Odean T. 2008. All that glitters: the effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies* **21**(2): 785-818.

- Barberis N, Thaler R. 2003. Chapter 18: a survey of behavioral finance. In *Handbook of the Economics of Finance*, Constantinides GM, Harris M, Stulz RM (eds). North-Holland: Amsterdam; 1053-1128.
- Barradale MJ. 2010. Impact of public policy uncertainty on renewable energy investment: wind power and the production tax credit. *Energy Policy* **38**(12): 7698-7709.
- Ben Zur H, Breznitz SJ. 1981. The effect of time pressure on risky choice behavior. *Acta Psychologica* **47**(2): 89-104.
- Benartzi S. 2001. Excessive extrapolation and the allocation of 401(k) accounts to company stock. *Journal of Finance* **56**(5): 1747-1764.
- Breukers S, Wolsink M. 2007. Wind power implementation in changing institutional landscapes: an international comparison. *Energy Policy* **35**(5): 2737-2750.
- Chassot S, Hampl N, Wüstenhagen R. 2011. Policy aversion bias and the financing of clean energy innovation. Paper presented at the Academy of Management (AOM) Annual Meeting, San Antonio, TX.
- Clark-Murphy M, Soutar GN. 2004. What individual investors value: some Australian evidence. *Journal of Economic Psychology* **25**(4): 539-555.
- Coval JD, Moskowitz TJ. 1999. Home bias at home: local equity preference in domestic portfolios. *Journal of Finance* **54**(6): 2045-2073.
- Dorn D, Huberman G. 2005. Talk and action: what individual investors say and what they do. *Review of Finance* **9**(4): 437-481.
- Folta TB. 2007. Uncertainty rules the day. *Strategic Entrepreneurship Journal* **1**(1-2): 97-99.
- Franke N, Gruber M, Harhoff D, Henkel J. 2006. What you are is what you like – similarity biases in venture capitalists' evaluations of start-up teams. *Journal of Business Venturing* **21**(6): 802-826.
- French KR, Poterba JM. 1991. Investor diversification and international equity markets. *American Economic Review* **81**(2): 222-226.
- Frieder L, Subrahmanyam A. 2005. Brand perceptions and the market for common stock. *Journal of Financial and Quantitative Analysis* **40**(1): 57-85.
- Golden BR. 1992. The past is the past – or is it? The use of retrospective accounts as indicators of past strategy. *Academy of Management Journal* **35**(4): 848-860.
- Green PE, Krieger AM, Wind Y. 2001. Thirty years of conjoint analysis: reflections and prospects. *Interfaces* **31**(3): S56-S73.
- Green PE, Rao VR. 1971. Conjoint measurement for quantifying judgmental data. *Journal of Marketing Research* **8**(3): 355-363.

- Green PE, Srinivasan V. 1990. Conjoint analysis in marketing: new developments with implications for research and practice. *Journal of Marketing* **54**(4): 3-19.
- Grinblatt M, Keloharju M. 2001. How distance, language, and culture influence stockholdings and trades. *Journal of Finance* **56**(3): 1053-1073.
- Grullon G, Kanatas G, Weston JP. 2004. Advertising, breadth of ownership, and liquidity. *Review of Financial Studies* **17**(2): 439-461.
- Huberman G. 2001. Familiarity breeds investment. *Review of Financial Studies* **14**(3): 659-680.
- IEA. 2007. *Climate Policy Uncertainty and Investment Risk*. International Energy Agency. <http://www.iea.org> [31 August 2012].
- IEA. 2008. *IEA Calls for "Clean Energy New Deal" to Stimulate Global Economy and Combat Climate Change*. International Energy Agency. <http://www.iea.org> [31 August 2012].
- IWÖ-HSG. 2010. The price of renewable energy policy risk: an empirical analysis based on choice experiments with international wind and solar energy investors. Working paper, Institute for Economy and the Environment, University of St. Gallen, Switzerland.
- Jordan J, Kaas KP. 2002. Advertising in the mutual fund business: the role of judgmental heuristics in private investors' evaluation of risk and return. *Journal of Financial Services Marketing* **7**: 129-140.
- Kahneman D, Slovic P, Tversky A (eds). 1982. *Judgment under Uncertainty: Heuristics and Biases*. Cambridge University Press: Cambridge, UK.
- Kahneman D, Tversky A. 1979. Prospect theory: an analysis of decision under risk. *Econometrica* **47**(2): 263-291.
- Kahneman D. 2003. Maps of bounded rationality: psychology for behavioral economics. *American Economic Review* **93**(5): 1449-1475.
- Knight FH. 1921. *Risk, Uncertainty and Profit*. Houghton Mifflin: Boston, MA.
- Landström H, Manigart S, Mason C, Sapienza HJ. 1998. Contracts between entrepreneurs and investors: terms and negotiation processes. In *Frontiers of Entrepreneurship Research*, Reynolds P, Bygrave W, Carter N, Manigart S, Mason C, Meyer D, Shaver K (eds). Babson College: Boston, MA; 571-585.
- Landström H. 1998. Informal investors as entrepreneurs. *Technovation* **18**(5): 321-333.
- Lea SE, Tarpy RM, Webley P. 1987. *The Individual in the Economy*. Cambridge University Press: Cambridge, UK.

- Loock M. 2012. Going beyond best technology and lowest price: on renewable energy investors' preference for service-driven business models. *Energy Policy* **40**: 21-27.
- Louviere JJ, Hensher DA, Swait J, Adamowicz W. 2003. *Stated Choice Methods Analysis and Applications*. Cambridge University Press: Cambridge, UK.
- Louviere JJ, Islam T, Wasi N, Street D, Burgess L. 2008. Designing discrete choice experiments: do optimal designs come at a price? *Journal of Consumer Research* **35**(2): 360-375.
- Luce RD, Tukey JW. 1964. Simultaneous conjoint measurement: a new type of fundamental measurement. *Journal of Mathematical Psychology* **1**(1): 1-27.
- Lüdeke-Freund F, Loock M. 2010. Debt for brands: tracking down a bias in financing photovoltaic projects in Germany. *Journal of Cleaner Production* **19**(12): 1356-1364.
- Lüthi S, Prässler T. 2011. Analyzing policy support instruments and regulatory risk factors for wind energy deployment: a developers' perspective. *Energy Policy* **39**(9): 4876-4892.
- Lüthi S, Wüstenhagen R. 2012. The price of policy risk: empirical insights from choice experiments with European photovoltaic project developers. *Energy Economics* **34**(4): 1001-1011.
- Masini A, Menichetti E. 2012. The impact of behavioural factors in the renewable energy investment decision making process: conceptual framework and empirical findings. *Energy Policy* **40**: 28-38.
- McFadden D. 1986. The choice theory approach to market research. *Marketing Science* **5**(4): 275-297.
- Mitchell C, Bauknecht D, Connor P. 2006. Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in system in Germany. *Energy Policy* **34**(3): 297-305.
- Mormann F. 2012. Enhancing the investor appeal of renewable energy. *Environmental Law* **42**: forthcoming.
- Muzyka D, Birley S, Leleux B. 1996. Trade-offs in the investment decisions of European venture capitalists. *Journal of Business Venturing* **11**(4): 273-287.
- Nagy RA, Obenberger RW. 1994. Factors influencing individual investor behavior. *Financial Analysts Journal* **50**(4): 63-68.
- Netzer O, Toubia O, Bradlow ET, Dahan E, Evgeniou T, Feinberg FM, Feit EM, Hui SK, Johnson J, Liechty JC, Orlin JB, Rao VR. 2008. Beyond conjoint analysis: advances in preference measurement. *Marketing Letters* **19**(3): 337-354.

- Odean T. 1998. Are investors reluctant to realize their losses? *Journal of Finance* **53**(5): 1775-1798.
- Odean T. 1999. Do investors trade too much? *American Economic Review* **89**(5): 1279-1298.
- Riquelme H, Rickards T. 1992. Hybrid conjoint analysis: an estimation probe in new venture decisions. *Journal of Business Venturing* **7**(6): 505-518.
- Sanderson J. 2012. Risk, uncertainty and governance in megaprojects: a critical discussion of alternative explanations. *International Journal of Project Management* **30**(4): 432-443.
- Sapienza HJ, Korsgaard MA. 1996. Procedural justice in entrepreneur-investor relations. *Academy of Management Journal* **39**(3): 544-574.
- Sapienza HJ. 1992. When do venture capitalists add value? *Journal of Business Venturing* **7**(1): 9-27.
- Savage LJ. 1954. *The Foundations of Statistics*. Wiley: New York, NY.
- Sawtooth Software. 2009. The adaptive choice-based conjoint (ACBC) technical paper. *Sawtooth Software Technical Paper Series* August. <http://www.sawtoothsoftware.com> [24 August 2012].
- Schoenbachler DD, Gordon GL, Aurand TW. 2004. Building brand loyalty through individual stock ownership. *Journal of Product and Brand Management* **13**(7): 488-497.
- Shane S, Cable D. 2002. Network ties, reputation, and the financing of new ventures. *Management Science* **48**(3): 364-381.
- Shepherd DA, Zacharakis A, Baron RA. 2003. VCs' decision processes: evidence suggesting more experience may not always be better. *Journal of Business Venturing* **18**(3): 381-401.
- Shepherd DA. 1999. Venture capitalists' assessment of new venture survival. *Management Science* **45**(5): 621-632.
- Shiller RJ. 2003. From efficient markets theory to behavioral finance. *Journal of Economic Perspectives* **17**(1): 83-104.
- Simon HA. 1955. A behavioral model of rational choice. *Quarterly Journal of Economics* **69**(1): 99-118.
- Simon HA. 1996. *Models of My Life*. MIT Press: Cambridge, MA.
- Slovic P. 2001. Psychological study of human judgment: implications for investment decision making. *Journal of Psychology and Financial Markets* **2**(3): 160-172.

- Sonntag-O'Brian V, Usher E. 2004. Mobilising Finance for Renewable Energies. Renewable Energy Policy Network for the 21st Century (REN21). <http://www.renewables-bonn-2004.de> [31 August 2012].
- Tversky A, Kahneman D. 1974. Judgment under uncertainty: heuristics and biases. *Science* **185**(4157): 1124-1131.
- UNEP. 2009. Private Financing of Renewable Energy: A Guide for Policymakers. United Nations Environment Programme, Bloomberg New Energy Finance, Chatham House. <http://sefi.unep.org> [31 August 2012].
- UNEP. 2012. Global Trends in Sustainable Energy Investment 2012. Frankfurt School UNEP (United Nations Environment Programme) Collaborating Centre for Climate & Sustainable Energy Finance. <http://fs-unep-centre.org> [31 August 2012].
- von Neumann J, Morgenstern O. 1944. *The Theory of Games and Economic Behavior*. Princeton University Press: Princeton, NJ.
- Wang M, Keller C, Siegrist M. 2011. The less you know, the more you are afraid of – a survey on risk perceptions of investment products. *Journal of Behavioral Finance* **12**(1): 9-19.
- Zacharakis AL, McMullen JS, Shepherd DA. 2007. Venture capitalists' decision policies across three countries: an institutional theory perspective. *Journal of International Business Studies* **38**(5): 691-708.
- Zacharakis AL, Meyer GD. 1998. A lack of insight: do venture capitalists really understand their own decision process? *Journal of Business Venturing* **13**(1): 57-76.
- Zacharakis AL, Shepherd DA. 2001. The nature of information and overconfidence on venture capitalists' decision making. *Journal of Business Venturing* **16**(4): 311-332.

First Paper

The Strength of Strong Ties in an Emerging Industry: A Joint Test for the Effects of Status Hierarchies and Personal Ties in Venture Capitalist Decision-Making⁹

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Abstract

Building on social network theory, scholars have identified two ways in which social ties influence venture capital investment decisions: directly through personal ties and indirectly through status hierarchies. However, previous research has examined these effects independently. This paper conducts a joint test for the influence of personal ties and status hierarchies in venture capital investment decision-making in an emerging industry. We empirically examine the relative importance of these two mechanisms based on an adaptive choice-based conjoint (ACBC) analysis comprising 3,132 experimental investment decisions made by 86 venture capitalists from the United States and Europe. Our findings confirm the important role of social networks in explaining venture capital investment decisions. In a high-uncertainty context, such as investing in an emerging industry, strong personal ties – whether or not the deal came from a trusted referral in the venture capitalist’s direct network – exert more influence over investment decisions than the presence of a high-status lead investor.

Keywords: Venture Capital, Social Network, Reputation, Entrepreneurship

JEL Codes: C93, D81, G2

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Introduction

Venture capital decision-making has been a topic of longstanding interest to entrepreneurship scholars. While the primary focus of this literature has been the decision policies of individual venture capitalists (exemplary studies include Brundin, Patzelt, and Shepherd, 2008; Franke *et al.*, 2006, 2008; Mitchell and Shepherd, 2010; Muzyka, Birley, and Leleux, 1996; Riquelme and Rickards, 1992; Shepherd, 1999; Shepherd and Zacharakis, 1999; Shepherd, Zacharakis, and Baron, 2003; Zacharakis, McMullen, and Shepherd, 2007), a complimentary stream of research focuses on the contextual factors associated with those criteria, specifically how early-stage investors process private information beyond the risk/return profile of the project. This work has in large measure focused on the role that social networks play in investment decision-making (Sorenson and Stuart, 2001; Shane and Cable, 2002; Hochberg, Ljungqvist, and Lu, 2007, 2010), and findings from these studies suggest that venture capital decision-making can be influenced *directly*, through personal ties (e.g. Shane and Cable, 2002; Hsu, 2007) and *indirectly*, based on the relative status of other venture capital firms (e.g. Hochberg *et al.*, 2007; Ozmel, Reuer and Gulati, 2012).

However, previous research has examined these two mechanisms independently. While venture capital research has demonstrated that social networks play an important role across the venture capital cycle, we know surprisingly little about their joint influence or relative effect. Gaining a more differentiated understanding of how social networks influence venture capital decisions is an important issue for entrepreneurs seeking capital, and policymakers seeking to understand how to support regional economic growth and high-impact entrepreneurship.

The purpose of this paper is to improve our understanding of how social networks influence decision-making by conducting a joint test for the influence of personal ties and status hierarchies on venture capital decision-making. In so doing, we hope to broaden our understanding of network governance (Jones, Hesterly and Borgatti, 1997) using the venture capital context to explore the informal social systems that emerge to coordinate exchanges in uncertain and competitive environments. We focus on the screening phase of the venture capital decision, where we employ an adaptive choice-based conjoint (ACBC) experiment involving 3,132 decisions made by a sample of 86 venture capital investors from the United States and Europe. Our findings confirm that both direct and indirect social ties have a measurable influence on venture capital investment decisions. However, in the context of high uncertainty

(for example, an emerging industry in which traditional risk/return parameters are more difficult to determine) personal ties – specifically, whether or not the deal came from a trusted referral in the investor’s network – are more important than the reputation of the other investors present in the deal. Our global sample of venture capital investors also allows us to explore the influence of geography (network density) and experience on our main results. We find that the influence of personal ties is less pronounced in the European investment community as compared to more densely networked U.S. investors. We also find that experience plays a moderating role in this process; our results show a U-shaped relationship between investment experience and the influence of strong ties.

Theory and Hypothesis Development

A Socialized View of Venture Capitalist Decision-Making

Venture capitalists invest in firms characterized by a lack of substantial tangible assets, the expectation of several years of negative earnings, and extremely uncertain prospects. Venture capital investors bring to the table a set of organizational and contractual mechanisms – for example due diligence processes, staged financing, syndication of investments, compensation contracts, and governance practices (Sahlman, 1990; Kaplan and Strömberg, 2003; Gompers, 1995; Lerner, 1994). Complimenting these studies is an emerging literature influenced by social network theory that provides a different perspective and discloses additional mechanisms employed by venture capitalists to mitigate investment risk. This “socialized view” of venture capital decision-making argues that venture capitalists – as a specialized financial intermediary that has evolved to resolve information problems associated with early-stage investment that other capital markets actors are unable to perform effectively (Berger and Udell, 1998; King and Levine, 1993) – incorporate information revealed through social mechanisms or personal networks to inform and improve their investment decision-making (Shane and Cable, 2002). The introduction of constructs such as direct and indirect ties from network theory in the venture capital literature has helped to shape our understanding how venture capital firms generate outsized returns through network positioning (Hochberg *et al.*, 2007), and how these networks influence related outcomes like market entry (Hochberg *et al.*, 2010), the formation of

investment syndicates (Bygrave, 1987), and the spatial distribution of early-stage investment (Sorenson and Stuart, 2001; Chen *et al.*, 2010).

One explanation for how social networks influence these organizational outcomes is an indirect mechanism: the reputation of the lead investor in the deal. The investments that highly reputable venture capital firms make may convey important information that influences the investment decisions of the focal venture capital firm (Lee, Pollock and Jin, 2011). Industry peers might infer – based on which venture capital firm made an investment – information about the underlying quality of the firm (Lerner, 1994; Ueda, 2004; Hsu, 2004). The network position (Hochberg *et al.*, 2007) and resource advantages associated with reputation (Hsu, 2004) enable some venture capital firms to source, screen, and select projects. Thus, the affiliation with a reputable venture capital firm may constitute an inter-organizational endorsement or certification that favorably influences investor perceptions of quality (Janney and Folta, 2006; Stuart, Hoang, and Hybels, 1999).

The sociological literature on status hierarchies suggests that status, like reputation, is commonly associated with quality (Lynn, Podolny, and Tao, 2009; Washington and Zajac, 2005). In venture capital, indications for the existence of status hierarchies are the popularity and influence of some famous Silicon Valley venture capital firms (e.g. Kleiner Perkins), as well as the publication of yearly rankings of venture capital firms (e.g. InvestorRank, Entrepreneur.com's Top 100 Venture Capital Firms). These firms are accorded their status due to their social positions in the exchange network of syndicate partnerships (Hochberg *et al.*, 2007; Gould, 2002; Wilson, 1985) and their performance. Choice of exchange partners by venture capitalists have effects on performance, as the quality of resources to which firms gain access and the prestige accorded to that firm is based on the selection of its partners (Podolny, 2005). Social status, therefore, simplifies decision-making for the venture capital firm and provides additional network benefits.

A second explanation for the influence of social networks on organizational outcomes is a direct mechanism: through personal networks. Drawing from organizational theory, some scholars emphasize the role of social relationships and personal ties on the financing decision (Shane and Cable, 2002). Venture capital investors find their deal flow mainly from personal networks, repeat entrepreneurs, and previous syndication partners.

In a venture capital context scholars have investigated network effects in various ways such as entrepreneur-investor social ties and venture financing (Shane and Cable, 2002) and the relationship between entrepreneurs and investors (Landström *et al.*,

1998; Sapienza, 1992; Sapienza and Korsgaard, 1996). However, the majority of studies (a notable exception being Shane and Cable, 2002) focus on outcomes unrelated to the financing decision. The findings of Shane and Cable (2002) suggest that direct network ties influence investment decision-making through information transfer, a process in which investors exploit their social ties to gather private information. In a venture capital context, direct ties develop through various forms of cooperation between industry actors. Venture capital firms routinely cooperate by referring deals and people to each other, arranging funding through investment syndicates, providing introductions, and sharing resources such as in-house research or findings from due diligence activities. These social ties help overcome the information problems inherent in early-stage venture finance.

The Relative Strength of Strong Ties

Taken as a whole, the literature on social networks and the “socialized view” of venture capital investment suggest that both status hierarchies and personal ties will have a measurable effect on venture capital investment decisions. But this begs the question: which of the two effects is stronger, and in particular which will be stronger in an industry in which there is no “prior art” or best practice for venture capital firms to draw from? In other words, in an emerging industry, when trading off two deals with similar characteristics in all other respects, where one originates from within an investor’s personal network while the other represents an opportunity to co-invest with a high-status lead investor, which of the two options will a venture capitalist prefer?

We draw on the literature on network selection and change under conditions of high uncertainty to address this question. The origins of this stream of research can be traced back to a debate of Mark Granovetter’s (1973) seminal “strength of weak ties” hypothesis, in which he argued that novel information is more likely to flow through loosely connected actors in a network than through “strong ties”, i.e. close personal contacts. Building on weak ties allows firms to expand their networks in order to reduce resource dependency (Burt, 1983) and to learn new technologies or practices (Kogut, 1988; Powell, Koput, and Smith-Doerr, 1996).

In a later review, Granovetter (1983: 209) concedes, however, that his original hypothesis might have underemphasized the important role of strong ties, which “have greater motivation to be of assistance and are typically more easily accessible”. Krackhardt (1992: 218) takes this a step further and points to “the strength of strong ties in cases of severe change and uncertainty”. When people need to take action in an

uncertain context, they are more likely to resort to strong ties rather than weak ties. Similarly, firms faced with conditions of high uncertainty tend to re-invest in their present network rather than expanding relationships, and hence the stability of network structure tends to prevail (Wellman and Berkowitz, 1988). The “strength of strong ties” in high-uncertainty contexts has been demonstrated in the case of a group closely related to venture capital investors – investment bankers. Podolny (1994) shows that – when operating in markets characterized by high uncertainty – investment bankers tended to interact with those with whom they have interacted in the past. Further, Rost (2011) highlights the interplay between weak and strong ties, and argues that the absence of strong ties may be counter-productive for the creation of innovation. Beckman, Haunschild and Phillips (2004) suggest that the nature of uncertainty facing the firm drives network partner selection. They find that while firms broaden their networks in an attempt to mitigate firm-level uncertainty (Thompson, 1967; Pfeffer and Salancik, 2003; Burt, 1983), they tend to rely on existing networks when they are confronted with market-level uncertainty (Galaskiewicz and Shatin, 1981; Gulati, 1995). The higher level of market uncertainty in the case of an emerging industry leads us to conclude that the venture capital firm is more likely to reinforce its existing network, and work with partners which it has previously worked with and trusts. We thus hypothesize that:

Hypothesis 1. In an emerging industry, personal network ties dominate the effect of a high-status venture capital firm.

The Moderating Influence of Geographic Density

Venture capital investment has long been conceptualized as a local business, in which the venture capitalist’s ability to source, syndicate, monitor, and add value to portfolio firms depends critically on access to knowledge obtained through ties to a local, geographically proximate, network (Hochberg *et al.*, 2007; Sorenson and Stuart, 2001; Chen *et al.*, 2010; Gompers, 1995). In venture capital investment, social networks are shown to play a crucial role in evaluating investment opportunities. Venture capital firms routinely cooperate by referring deals, providing introductions, and sharing resources such as in-house research or findings from due diligence activities. These activities bind venture capital firms and the individuals within those firms within a dense web of network relationships that are predominantly local in nature, as detailed by Shane and Cable (2002). In this view, relationships between

venture capital investors in a local ecosystem create social obligations that influence investment decisions (Gulati, 1995).

While the venture capital industry is indeed geographically concentrated, network-reliant, and traditionally focused on the local environment, the finance, sociology, and networks literature focusing on venture capital investment document an ecosystem dominated by a few densely networked regions. The majority of venture capital firms and professional investors operate in California (more than half) and New England (another eleven percent). More than half the offices of active venture capital firms listed in *Pratt's Guide to Private Equity and Venture Capital Sources* are located in three metropolitan areas: San Francisco, Boston, and New York. This unusual industry context provides us with the opportunity to examine the role that proximity plays in investment decision-making by comparing a densely networked cluster (for example, the United States) with a less densely networked cluster (for example, Europe).

How might differences in proximity and network density influence investment decision-making? We expect that in a more densely networked market, venture capitalists have more opportunities to extract information about deal quality from where the deal came from – whether or not it originated from a personal tie in his network. Conversely, in a less densely networked market, such “socialized” signals are not as readily available and will therefore play a less important role in shaping venture capitalists’ investment decision-making, suggesting the following hypothesis:

Hypothesis 2. The strength of strong ties is more pronounced among U.S. venture capitalists than among European VCs.

The Moderating Effect of Experience

How would experienced venture capitalists differ from their less-experienced counterparts in their reliance on strong vs. weak ties? In related work exploring networks and experience, Hite and Hesterly (2001) find that less-experienced firm founders rely more on strong ties to attract resources during the early stages of firm formation and growth. As these individuals gain experience, they argue (and find) that their network evolves into a parsimonious and consciously managed network, with access to weak ties more conducive to success as the venture grows. Complimenting this work on venture beginnings is a collection of studies exploring path dependence and lock-in at the other end of the organizational life cycle. Mature firms tend to be characterized by a cohesive network of close ties that ultimately endangers their ability

to adapt in a changing environment (Henderson and Clark, 1990; Tripsas and Gavetti, 2000). This pattern of reliance on strong ties initially, then increasing attention to weak ties and eventually returning to denser network structure has been found across networks of inter- and intra-firm partnerships (Hagedoorn and Frankort, 2008; Morrison 2002) and governance relationships (Carpenter and Westphal, 2001) and has been the subject of extended inquiry in sociology and network theory (Uzzi, 1997; Meulemann *et al.*, 2010). Despite the rich literature in the network paradigm across several different research streams (Borgatti and Foster, 2003) to our knowledge the dynamic role of strong and weak ties in investment decision-making has yet to be explored. Both at the firm level (Uzzi, 1997) and the individual level (Meulemann *et al.*, 2010; Hite and Hesterly, 2001) strong ties are positively related to performance up to a certain experience threshold, at which time firms become “over-embedded” (for example, by becoming insulated from information that exists beyond their networks). We suggest that less-experienced venture capitalists will initially rely on strong ties to reduce uncertainty (Hite and Hesterly, 2001) followed by a phase of growing experience and a development of their informal network, eventually returning to a focus on strong ties in a later part of their career (Henderson and Clark, 1990; Tripsas and Gavetti, 2000). Our line of reasoning is informed by related work on venture capital investment experience by Shepherd *et al.* (2003), who observe a U-shaped relationship between VC experience and decision accuracy, although our focus in this study is not geared towards individual-level cognitive biases but towards social network structures as an explanation for the observed effect of experience. We therefore hypothesize:

Hypothesis 3. There is a U-shaped relationship between experience and the relative strength of strong ties in influencing venture capital decision-making.

Method

Sample and Data Collection

We derived the list of potential participants for our experiment from the Thomson SDC VentureXpert database, gathering investment partner contact information for all active venture capital firms between 1990-2010. We extracted and cleaned a list of 22,258 e-mail addresses, which was extended by 70 venture capitalist contacts from

the authors' personal network and 17 e-mail addresses that were provided to us at the end of our survey instrument in which we allowed a participant to recommend it to a colleague. We approached these contacts by a standardized mass e-mailing (initial mailing and a reminder after two weeks). Our primary mechanism for gathering the data for this study was a web-based survey administered between March and April 2010. As our database reached back to 1990, this produced a large number of delivery failures due to outdated e-mail addresses (6,227 delivery failures in total). The total number of contacts receiving our invitation to participate was 16,118 investment professionals.

A total of 176 venture capitalists took part in our request to participate in the experiment, constituting a response rate of 1.1%. After cleaning our sample for 42 incomplete responses, 16 investors from outside of the United States and Europe, and two double entries, we retained 116 complete responses, of which 86 independent and 30 corporate venture capitalists. As decision-making procedures of corporate and independent VCs show substantial differences (Dushnitsky and Lenox, 2005), in this paper we exclusively report on the final sample of 86 independent venture capitalists. We present descriptive statistics for our sample in Table 2.

While our broad sampling strategy was not aimed at creating a statistically representative sample of the global venture capital industry, we managed to control for a mix of venture capitalists with regard to demographic characteristics such as age, position in the firm, experience in different industries, venture capital affiliation, as well as firm characteristics such as the location of the main office and firm size (number of employees). Table 2 also compares the demographic characteristics of our sample with statistics from the official North American and European venture capital industry associations (NVCA, EVCA). It shows that our sample represents the venture capital population well in terms of geographic location and firm size.

Conjoint Analysis

The conjoint design we employ in this study allows us to vary the characteristics of deals experimentally. Conjoint analysis continues to enjoy a surge in popularity in the domain of entrepreneurship research, in particular by venture capital scholars (e.g. Franke *et al.*, 2006, 2008; Mitchell and Shepherd, 2010; Shepherd, 1999; Shepherd and Zacharakis, 1999; Shepherd *et al.*, 2003; Zacharakis *et al.*, 2007), and calls for its broader use in the domain continue (Dean, Shook, and Payne, 2007; DeSarbo, MacMillan, and Day, 1987; Lohrke, Holloway, and Woolley, 2010; Shepherd and

Zacharakis, 1997). Conjoint analysis has at least two advantages in the context of examining individual decision-making generally, and investment decision-making in particular. First, it enables researchers to overcome the challenges with *post hoc* data collection, which requires that respondents both recall and articulate past decisions, which may result in recall bias and revisionism (Golden, 1992). Second, by presenting investors with hypothetical choices among realistic investment objects described by several attributes at the same time, it addresses challenges like social desirability bias and investors' inability to articulate complex decision processes (Shepherd and Zacharakis, 1997).

Historically, preference measurement in the entrepreneurship literature has used metric or conventional conjoint analysis in which respondents engage in a decision-making task and are asked to evaluate a series of hypothetical options (e.g. deal characteristics) and decide whether or not they would act on the opportunity as presented. These options are derived from a set of theoretically derived attributes and are based on the specific combination of attributes the decision-maker expresses their likelihood of action on a rating scale (e.g. Brundin *et al.*, 2008; Mitchell and Shepherd, 2010). Part-worth utilities for each attribute can then be estimated using a decompositional approach, where the overall preference for an option expressed by its rating is broken down into the preferences of the particular attributes and attribute levels (e.g. Green and Rao, 1971; Green and Srinivasan, 1990; Louviere *et al.*, 2003; Louviere *et al.*, 2008; McFadden, 1986).

Several recent advances have been made in the conjoint method, most of them originating from marketing research. Our study incorporates two important methodological advances. The first is our use of adaptive choice-based conjoint (ACBC) in our experimental design (Johnson and Orme, 2007; Chapman *et al.*, 2009; Sawtooth Software 2009a). The second is our estimation technique, where we estimate part-worth values using a hierarchical Bayesian approach (Lenk *et al.*, 1996; Orme, 2000; Moore, 2004).

Adaptive Choice-Based Conjoint Analysis

In the marketing literature, approaches like choice-based conjoint (CBC) represent the standard in the field. While the general process is similar to metric conjoint analysis, the difference is that respondents are asked to indicate their choice among a set of options (typically three or four opportunities per choice task) instead of rating each of the options individually. The advantage of CBC is that it more accurately

represents actual decision-making situations where respondents typically choose between various alternatives. The change from a rating to a choice-based approach implies a decrease in the information gathered per respondent, necessitating an increase in the overall sample size. Traditionally, it has been difficult for scholars examining venture capital decision-making to acquire large enough samples, precluding the adoption of this approach. However, developments in conjoint analysis, such as adaptive choice-based conjoint (ACBC) mitigate in large measure the downside of CBC studies and add compositional elements in order to gather more information per individual (Baier and Brusch, 2009).¹⁰

We used Sawtooth Software to design the adaptive choice-based conjoint experiment. Our web-based choice experiment collects preference data in an interactive mode and through different approaches that increases the information gathered per respondent. The computer-administered interview consists of three sections that build on each other: (1) the first section is called “build your own” (BYO) where respondents are asked to select their most preferred level for each of the attributes included in the design; (2) based on this first response the software generates a pool of 24 alternatives¹¹, i.e. a customized, fractional factorial design¹². The alternatives are presented to the respondents in groups of four (screening section). Individuals have to indicate for each of the alternatives if they would consider it or not (construction of a “consideration set”). This section also includes multiple “must have” and “unacceptable” questions that are constructed based on the individual’s answers to the screening questions; (3) all alternatives that passed the screening task are transferred to the final section of the survey where the alternatives are grouped into a series of choice tasks (choice tournament). Respondents typically face three to four alternatives per choice task and in each task they have to indicate their most favored option. The winning alternatives then compete in subsequent rounds until the most preferred option is identified (Johnson and Orme, 2007).

¹⁰ Johnson and Orme (2007) compared traditional CBC and ACBC in two studies and show that ACBC results are more predictive of holdout tasks than traditional CBC, specifically for small samples.

¹¹ These alternatives are generated as “near-neighbors” to the levels the respondent chooses in the BYO task but still include the full range of levels of the attributes in the experiment (Sawtooth Software, 2009a).

¹² The customized designs are near-orthogonal, generated by the software “on-the-fly” based on the information provided by the respondent in the BYO section by following a controlled, randomized process. This process controls for a maximum possible balance of levels and statistical efficiency (Sawtooth Software, 2009a).

Decision Task

Venture deals are complex, with venture investors potentially leading the round of investment (orchestrating the investment syndicate) and then potentially choosing to pass (or play a reduced role) in subsequent rounds of financing. These deals can occur at different stages in the life cycle of the firm, from early-stage investment (the first professional venture money in the deal) to middle or late-stage investment, when more capital is required but much of the product or market risk has been wrung out of the investment. In order to control for the complexity of the venture process we hold these factors constant by focusing on the first round of investment. We control for variations across industry contexts by selecting a single industry for the deal – renewable energy.

The venture capital investment decision is a multi-stage process, with different criteria employed depending on the stage (e.g. Payne *et al.*, 2009; Petty and Gruber, 2011). An important early step in a venture capitalist's assessment of a new venture is the screening process. More than eighty percent of new venture proposals are rejected at this initial stage (Roberts, 1991). A central consideration in this process is the deal sheet, which represents the consolidation of the opportunity for review by the general partners of the venture capital firm. This document, usually no more than one to two pages, provides a potential investor with the information needed to determine whether to pursue the opportunity or not, i.e. to invite the entrepreneur or startup team for a project presentation (Dixon, 1991). Due to its importance and in order to mitigate any biases in our experimental setting, we only focus on this first stage in the venture capital evaluation process, the screening phase. Respondents were asked to assume that they were screening through incoming business opportunities where the objective is to identify the investment that they would be most likely to further investigate in a next stage.

Measures

Similar to laboratory experiments, conjoint analysis requires that researchers know *a priori* the most critical attributes and levels affecting respondent decision-making. Thus, the selection of attributes is crucial, as they represent a “closed system” of assumptions upon which the experiment rests. Yet an important limitation in conjoint analysis is to keep the choice tasks manageable for the interviewees. Our task in designing the choice experiment was therefore to find the right balance between on one hand including the most important standard deal criteria that would make the

choice setting as realistic as possible, and on the other hand including attributes that would reflect the “socialized” influences on venture capital decision making – and all this while keeping complexity within reasonable boundaries.

We drew from the rich literature on venture capital decision-making to identify the standard attributes of investment opportunities, in particular the comprehensive review of decision criteria by Petty and Gruber (2011). Venture capitalists particularly pay attention to four broad categories: (1) product or service characteristics; (2) target market characteristics; (3) management team; and (4) return potential. We used these categories to formulate four measures that apply to the context of our experiment (see below for an in-depth discussion of each of them): technological maturity, regulatory exposure, founder experience and return potential. As for the second objective of our research approach, to capture the influence of “socialized” criteria on venture capital investment decision-making, we extracted two additional attributes from the literature that have been shown to be of importance and would allow us to test our hypotheses: the lead investor (to measure the effect of status hierarchies) and the source of the deal (to measure effects of personal ties). For each of the six attributes, we included four levels in our conjoint survey. Using a consistent number of levels across attributes is an important element in securing the validity of conjoint experiments, because attributes with a higher number of levels could artificially get more weight in respondents’ choices (Wittink, Krishnamurthi, and Reibstein, 1990; Verlegh, Schifferstein, and Wittink, 2002). To check for face validity of the attributes and attribute levels we reviewed this list with twenty professional venture capital investors. A complete list of attributes and levels are detailed in Table 1. Based on the attributes selected, the choice tasks were composed on a random basis.

Table 1. Attributes and levels used in this study

| Attribute | Description | Attribute Levels | References |
|------------------|---|---|---|
| Lead Investor | Primary investor in the funding syndicate | Draper Fisher Jurvetson Kleiner Perkins Khosla Ventures Insight Capital Partners | Janney and Folta (2006); Zider (1998) |
| Deal Source | Where in your professional network the deal came from | Personal network Syndicate partner Met at venture fair E-mail business plan | Petty and Gruber (2011); Sahlman (1990); Shane and Cable (2002) |
| Return Potential | The upside potential of the investment | 20x in 5 years 15x in 5 years 10x in 5 years | DeSarbo <i>et al.</i> (1987); MacMillan <i>et al.</i> (1985); MacMillan and Subba |

| | | | |
|------------------------|--|--|--|
| | | 5x in 5 years | Narasimha (1986); Petty and Gruber (2011); Tyebjee and Bruno (1984); Zider (1998) |
| Technological Maturity | The state of the technology | In production with customers Finished product Working prototype Works in laboratory | DeSarbo <i>et al.</i> (1987); MacMillan <i>et al.</i> (1985); MacMillan and Subba Narasimha (1986); Petty and Gruber (2011); Tyebjee and Bruno (1984); Zider (1998) |
| Founder Experience | Level of general, startup, and domain experience | Previous startup founder Previous startup experience Previous executive experience Graduate student | DeSarbo <i>et al.</i> (1987); Franke <i>et al.</i> (2006, 2008); MacMillan <i>et al.</i> (1985); MacMillan and Subba Narasimha (1986); Petty and Gruber (2011); Zider (1998) |
| Regulatory Exposure | Presence and extent of regulatory risk | Very high High Low Very low | Petty and Gruber (2011); Wüstenhagen and Teppo (2006) |

We performed a pre-test with six students and twenty professional venture capital investors (twelve in the United States and eight in Europe). Figure 1 shows an example of a choice task presented to the venture capitalists in the survey.

Figure 1. Sample choice task from web-based survey^a

| | | | |
|---|-------------------------|-------------------|-------------------------|
| Out of these three investment opportunities in the Clean Energy industry, which one is the best option that you would investigate further? | | | |
| Lead Investor | Draper Fisher Jurvetson | Kleiner Perkins | Draper Fisher Jurvetson |
| Deal Source | Personal network | Syndicate partner | Syndicate partner |
| Return Potential | 10x in 5 years | 5x in 5 years | 20x in 5 years |
| Technological Maturity | Works in laboratory | Working prototype | Finished product |
| | ○ | ○ | ○ |

^a In an Adaptive Choice Based Conjoint Analysis (ACBC), respondents have the opportunity to select a subsample of attributes, eliminating those that they perceive to be of lower relevance to them. This allows to collect more finegrained information about the most relevant choice attributes while reducing the complexity of the choice task and hence avoiding cognitive overload. In our experimental design, respondents were asked to select the four most relevant out of the six attributes included in the design before entering the conjoint experiment. In this example, the respondent chose the attributes lead investor, deal source, return potential, and technological maturity.

In order to avoid respondents' cognitive overload on the one hand and to ensure realistic choice situations on the other, we chose a particular add-on feature of adaptive choice-based conjoint analysis that allowed respondents to select a subset of the attributes included in the survey design. In our experiment, we asked respondents to indicate four out of the six attributes that were most relevant to their investment decision. Only those four attributes that were most relevant to each respondent were then included in the individual choice tasks.

The following section provides a discussion of how we operationalized the key variables.

Lead Investor Status and Personal Network Ties. The dependent variable in this study is the relative strength of strong ties, defined as the difference between two forms of social network influences, namely personal ties (deal source, representing strong ties) and status of the lead investor (weak ties). Using the attribute "lead investor" we can examine the influence of high-status venture capital firms on other investors' decisions to investigate a specific deal or not. We used different web-based sources to identify high-status venture capitalists (for example TheFunded.com, which provides reviews of venture capital firms by entrepreneurs and the results of a ranking of the Top 100 Venture Capitalists from Entrepreneur Magazine). Given the international scope of our study, and because the venture capital industry in the United States is larger than anywhere else in the world, we picked three classic Silicon Valley venture capitalists, assuming that those had the highest chances of being known¹³ to respondents around the world: (1) Kleiner Perkins Kauffield & Byers (also known as Kleiner Perkins), a very prominent venture capitalist, famous for backing successful companies such as Amazon and Google; (2) Draper Fisher Jurvetson (DFJ), an early-stage investor in high-profile firms like Tesla Motors and Hotmail; and (3) Khosla Ventures as a prominent specialist in the clean energy space. To have a baseline against which we could compare those high-status firms, we added a fictional venture

¹³ We controlled for this in the survey instrument by asking respondents to indicate their level of awareness of a range of venture capital firms. The three Silicon Valley firms selected for our experiment turned out to be among the top 4 well known VCs among U.S. respondents and the top 6 well-known VCs among European respondents. We also controlled for any influence that the slight differences in awareness of the selected firms between the two subsamples could have had on our conjoint results, and found no statistically significant difference.

capital firm (Insight Capital Partners) representing the low end of the status hierarchy.¹⁴

The attribute deal source was described along four levels: personal network, syndicate partner, met at venture fair and received business plan by e-mail. This allowed us to measure the influence of strong personal ties on venture capitalists' evaluation of deals.

Market Risk. Venture capitalists seek markets or industries that are growing fast at high rates in order to maximize revenue streams and value creation (Hisrich and Jankowicz, 1990; MacMillan, Siegel, and Subba Narasimha, 1985; Tyebjee and Bruno, 1981; Zider, 1998). Petty and Gruber (2011) analyzed a large longitudinal set of data on decision-making criteria and revealed four categories of critical information specifically related to the market or industry dimension: the existence and/or clarity of the market, the character of the market (related to size, competitive environment, fragmentation, and maturity), the acceptance of the products or services, and regulations. In our conjoint experiment, we held the industry dimension constant through setting the context as clean energy technology deals. We included the attribute "regulatory exposure" as an element related to the market dimension (Petty and Gruber, 2011) and ranging from very low to very high regulatory exposure.

Product/Technology Risk. Previous studies have operationalized this category in different ways, such as product feasibility (Bruno and Tyebjee, 1983, 1986), product(-market) differentiation or product(-market) uniqueness (Hisrich and Jankowicz, 1990; Hutt and Thomas, 1985; Riquelme and Rickards, 1992; Tyebjee and Bruno, 1984), product characteristics (e.g. related to the maturity of the product from prototype to proprietary rights protection) (MacMillan *et al.*, 1985; Riquelme and Rickards, 1992), use of technology (Hisrich and Jankowicz, 1990) and in a negative way product development/design failures (Gorman and Sahlman, 1986; Meyer, Zacharakis, and De Castro, 1993). In our study we operationalized this dimension through the attribute "technological maturity", indicating the technology's state of development at four levels: in production with customers, finished product, working prototype, works in laboratory.

¹⁴ We chose to use the names of real venture capital firms in our experiment for two reasons. Using "real" names of products and organizations is quite common in marketing research (e.g. Green, Krieger, and Wind, 2001) and we followed this strategy in order to make our choice tasks as realistic as possible.

Management Risk. The management team of the startup business plays an important role in the evaluation of venture capitalists (e.g. Franke *et al.*, 2008; MacMillan *et al.*, 1985; Muzyka *et al.*, 1996; Silva, 2004; Wells, 1974). Zider (1998: 138), for instance, concludes that venture capitalists “want to invest in proven, successful people”. Literature also shows that prior startup experience positively relates to survival and performance of a venture (Batjargal, 2007; Chandler, 1996). By including the attribute “founder experience” in our experiment, we simulated a varying management and entrepreneurial experience level among the profiles shown to the decision makers. We chose four experience levels corresponding to the ones identified in prior studies (e.g. Franke *et al.*, 2008; Hsu, 2007; Matusik, George, and Heeley, 2008): previous experience as a startup founder, general startup experience, executive experience and graduate student (indicating an inexperienced founder).

Return Potential. Related to the fourth dimension, return potential, MacMillan and Subba Narasimha (1986) found in their study two criteria, financial projections and a balanced and professionally written business plan, to be most important for venture capitalists whether or not to fund a venture. Various other studies also report financial factors (or the expected risk associated with financial returns) to be important in venture capital investment decisions (e.g. Gompers and Lerner, 1999; MacMillan *et al.*, 1985; Muzyka *et al.*, 1996; Riquelme and Rickards, 1992). Thus, we included the parameter “return potential” with values ranging from five to twenty times the initial investment within five years.

Post-Experiment Questionnaire. After the conjoint experiment we gathered firm and fund-level information including location (country); size (total number of employees); firm age; number of funds; deal size (in thousands USD); whether the firm is an independent or a corporate venture capital firm. We also gathered demographic information about the individual venture capital investors: the age of the investor; the number of years of experience in the venture capital industry and of investment experience; the domain experience of the investor, by domain and number of years as an active investor in that domain (related to six industries: biotechnology, information and communication technologies, consumer related, clean energy, conventional energy, medical and health, and other products); number of boards served; and whether the respondent was a managing director, general partner, partner, or analyst.

Data Analysis

We estimate the part-worth values for the attribute levels per individual respondent using a hierarchical Bayes procedure. Historically, entrepreneurship scholars using conjoint analysis have mainly estimated part-worth values by employing metric (rating-based) approaches and using ordinary least square (OLS) regression models. With the rise of choice-based conjoint designs hierarchical Bayes, first introduced in 1995 (Allenby, Arora, and Ginter, 1995; Allenby and Ginter, 1995; Lenk *et al.*, 1996), has gained high popularity within the last decade, specifically in the field of marketing (Baier and Bruschi, 2009). Hierarchical Bayes is a likelihood-based and random-effects method (Netzer *et al.*, 2008). Different from OLS estimates, the hierarchical Bayes procedure consists of two levels – an upper or population level and a lower or individual level. This allows the hierarchical Bayes algorithm to “borrow” missing information on the individual level from the overall sample of respondents.¹⁵ A main advantage of this procedure is that it deals with the problem of preference heterogeneity by estimating individual-level parameters (Baier and Bruschi, 2009; Evgeniou, Boussios, and Zacharia, 2005). This is specifically important in the case of fractional factorial designs (Rossi, Allenby, and McCulloch, 2005)¹⁶ where the application of standard OLS often leads to unreliable coefficient estimates (Baier and Bruschi, 2009) or in choice-based conjoint where much less information is generated per respondent than by other methods. Further, the hierarchical Bayes approach is much less prone to the influence of outliers (Rossi and Allenby, 2003; Kaplan, 2004).

Bayesian estimation, as with classical frequentist procedures, can basically be applied to any statistical model (Train, 2009). The advantage of using Bayesian analysis for discrete choice experiments is that it can deal with major drawbacks of classical procedures such as the maximization requirement of functions (e.g. of logit or probit models) and the stringent conditions for consistency and efficiency of the estimation (Train, 2009). In a conjoint context, comparisons show that rating-based conjoint analyses using hierarchical Bayes outperform frequentist-based estimations in

¹⁵ See Appendix for more details on the Bayesian methodology and hierarchical Bayes procedure.

¹⁶ In a fractional factorial design (versus a full factorial design where all possible combinations of attribute levels are included) respondents usually receive a low number of choice tasks compared to the overall number of part-worth values to be estimated. However, as full factorial designs would be too large to handle for respondents it is widespread standard to use a fractional factorial design in various conjoint application fields such as marketing (Green and Srinivasan, 1990) as well as venture capital and entrepreneurship research (e.g. Brundin *et al.*, 2008; Mitchell and Shepherd, 2010).

terms of hit rate (e.g. Andrews, Ansari, and Currim, 2002; Lenk *et al.*, 1996; Moore, Gray-Lee, and Louviere, 1998). In our study we use a common approach for the analysis of discrete choice data (Train, 2009; Greene, 2011) by applying the Bayesian procedure to estimate the parameters of a multinomial logit model (Johnson, 2000; Sawtooth Software, 2009b).

Besides the advantages for Bayesian analysis for discrete choice experiments – in particular its ability to resolve one of the historic drawbacks of classical approaches such as the maximization requirement of logit and probit models and the stringent conditions for consistency and efficacy of estimations (Train, 2009) – Table 3 also presents the results of a simple multinomial logit (MNL) estimation of part-worth utilities to support analysis by readers who are less familiar with hierarchical Bayes estimation. Our dependent variable in these supplementary estimations is Choices Per Respondent, equal or greater to two depending on the particular section of the ACBC experiment. Our results generally support our findings; however, we caution readers that these findings are only of limited use when comparing them to our hierarchical Bayes estimates due to an advance we applied in our conjoint experiment allowing respondents to de-select attributes that they feel are of minor importance in their investment decisions. The hierarchical Bayes algorithm we used is tailored to dealing with such deselected attributes and sets the final individual-level part worths to zero to account for their lack of importance to the respective respondent. However, a simple MNL model has two notable limitations: (1) it treats these “knock-out” criteria as missing values, and (2) only estimates part-worth utilities on an aggregate rather than individual level, and thus we cannot complete any post-estimation corrections for this effect. Since these supplementary analyses results are based only on data from individuals who did not de-select an attribute, our results for those attributes are likely to be over-stated. This is reflected in the (slightly) larger differences between the highest and lowest part-worth utilities for these particular attributes reported in Table 3.

Results

Our results are based on the responses of 86 venture capital investors performing 3,132 choice tasks (an average of 36.4 tasks per respondent; includes build-your-own, screening and choice tournament sections of the questionnaire). Descriptive statistics for our sample are displayed in Table 2.

The venture capitalists in our sample are nearly equally distributed between the United States and Europe (52% and 48%, respectively). On average the firms in our sample have about 18 employees.

Table 2. Descriptive statistics

| Sample Characteristics | N | % | Mean | Median | SD | Min | Max | Population |
|---|----|----|----------|--------|-----------|-----|--------|------------------------|
| Firm and Fund Information | | | | | | | | |
| <i>Firm location (N = 86)</i> | | | | | | | | |
| Europe | 41 | 48 | | | | | | 47% (714) ^a |
| United States | 45 | 52 | | | | | | 53% (791) ^a |
| Firm size (number of employees) | 86 | | 18.01 | 10 | 24.78 | 1 | 150 | 9.91/8.00 ^b |
| Firm age (years) | 86 | | 12.76 | 10 | 8.31 | 1 | 38 | |
| Number of funds ^c | 85 | | 2.89 | 2 | 2.50 | 1 | 16 | |
| Deal size (in thousands USD) | 86 | | 7,631.98 | 4,000 | 12,795.29 | 100 | 70,000 | |
| Investor Information | | | | | | | | |
| Investor age (years) | 86 | | 43.37 | 42.50 | 11.22 | 23 | 70 | |
| VC industry affiliation (years) | 86 | | 9.00 | 8 | 7.52 | 1 | 35 | |
| VC investment experience (years) | 86 | | 7.43 | 5 | 6.98 | 0 | 30 | |
| Number of boards | 86 | | 7.86 | 5 | 9.55 | 0 | 50 | |
| <i>Position in firm (N = 86)</i> | | | | | | | | |
| Managing director | 28 | 33 | | | | | | |
| General partner | 12 | 14 | | | | | | |
| Partner | 17 | 20 | | | | | | |
| Analyst | 18 | 21 | | | | | | |
| Other | 11 | 13 | | | | | | |
| <i>Industry domain experience (years)^d</i> | | | | | | | | |
| Biotechnology | 38 | | 7.50 | 5 | 7.34 | 1 | 30 | |
| ICT | 50 | | 8.74 | 7 | 7.73 | 1 | 30 | |
| Consumer Related | 44 | | 7.34 | 5 | 6.79 | 1 | 25 | |
| Clean Energy | 45 | | 5.09 | 3 | 5.85 | 1 | 25 | |
| Conventional Energy | 19 | | 8.47 | 10 | 7.02 | 1 | 25 | |
| Medical/Health | 51 | | 6.80 | 4 | 7.09 | 1 | 30 | |
| Other (e.g. Financial Services) | 11 | | 9.64 | 6 | 7.93 | 2 | 25 | |

^a Active venture capital firms only (EVCA, 2011a, b; NVCA, 2011).

^b Average number of employees per venture capital firm, Europe (714 firms, 7,077 employees) and U.S. (791 firms, 6,328 employees), respectively (EVCA, 2011a, b; NVCA, 2011).

^c N = 85; one respondent did not indicate the number of funds.

^d Multiple answers possible.

We report the main results of our conjoint experiment in Tables 3 and 4. An analysis of the relative importance of the six attributes in explaining observed choices (reported in Table 4) shows that, aligned with previous studies, “traditional” venture capital investment criteria (return potential, technological maturity, and founder experience) are of highest importance to the average investor in our sample. The attributes representing the influence of social networks have a small, but significant, effect on the investment decision.

Our results also detail the average effect of a particular attribute level on the investment decision. The part-worth values are hierarchical Bayes estimates calculated on individual respondent preferences for $N = 86$. We report effects-coded raw utilities in Table 3 (Orme, 2010). The average part-worth utility measures the influence of a change of the respective attribute level on choice. Positive values indicate an increase in the individual’s utility, implying higher desirability while negative values indicate a decrease in utility, implying lower desirability. Since part-worth utilities are interval data, scaled to an arbitrary additive constant and summed to zero within each attribute, it is not possible to directly compare utility values across attributes.

The preferences for the attribute levels related to return potential, technological maturity, founder experience and regulatory exposure all follow an obvious order, i.e. the levels indicating lowest return potential (5x in 5 years), highest product/technology risk (works in laboratory), highest management risk (graduate student), and highest market risk (very high regulatory exposure) have the lowest part-worth estimates. The results for the attribute lead investor show that the highest-status venture capitalist in the experimental design (Kleiner Perkins) offers the highest part-worth utility, whereas the fictitious company (Insight Capital Partners, representing the bottom end of the status hierarchy) contributes the lowest value to overall investor utility. These results, in combination with the small but significant importance of this attribute as detailed above, support prior research on the relationship between VC reputation and decision-making.

A similar picture can be drawn for the influence of personal network ties. The attribute level representing the absence of a social tie between investor and entrepreneur (e-mail business plan) achieved the lowest part-worth utility estimate, whereas a deal originating in the respondents’ personal network (indicating a strong tie) is associated with the highest part-worth utility. With these results we reinforce findings in previous work showing that the likelihood to invest in a deal is moderated by the deal source: a venture capitalist is less likely to invest in a deal originating from a distant source in his or her social network.

With regard to our first hypothesis, predicting that personal network ties dominate the effect of status hierarchies, the relative importance values show that our respondents perceive the attribute deal source (6.41%), measuring personal ties, as more important than lead investor (3.17%), measuring status. A two-sided Wilcoxon test for paired samples shows that the difference between the relative importance values of these two attributes is significant ($p < 0.01$). We can therefore confirm Hypothesis 1: in environments of high uncertainty, investors tend to resort to strong personal ties, and this effect is stronger than the influence of a high-status lead investor.

Table 3. Results of the hierarchical Bayes and multinomial logit estimation for decision to further investigate the deal

| Attributes and Levels | Hierarchical Bayes Model | | | Multinomial Logit Model ^c | | |
|-------------------------------|--------------------------|--------------------|---|--------------------------------------|----------------|--|
| | Coefficient ^a | Standard Deviation | 95% Interval of Posterior Distribution ^b | Coefficient | Standard Error | |
| Lead Investor | | | | | | |
| Kleiner Perkins | 0.098 | 0.302 | [-0.054:0.260] | 0.218* | 0.087 | |
| Draper Fisher Jurvetson | 0.015 | 0.217 | [-0.135:0.165] | 0.040 | 0.091 | |
| Khosla Ventures | -0.045 | 0.251 | [-0.201:0.109] | -0.045 | 0.095 | |
| Insight Capital Partners | -0.068 | 0.211 | [-0.225:0.085] | -0.213* | 0.105 | |
| Deal Source | | | | | | |
| Personal network | 0.396 | 0.524 | [0.206:0.596] | 0.856*** | 0.091 | |
| Syndicate partner | 0.197 | 0.346 | [0.030:0.372] | 0.720*** | 0.097 | |
| Met at venture fair | -0.214 | 0.277 | [-0.383:-0.050] | -0.441*** | 0.127 | |
| E-Mail business plan | -0.380 | 0.507 | [-0.607:-0.171] | -1.135*** | 0.141 | |
| Return Potential | | | | | | |
| 20x in 5 years | 1.704 | 0.932 | [1.366:2.050] | 0.970*** | 0.068 | |
| 15x in 5 years | 0.896 | 0.605 | [0.628:1.177] | 0.467*** | 0.065 | |
| 10x in 5 years | -0.280 | 0.359 | [-0.538:-0.020] | -0.204** | 0.068 | |
| 5x in 5 years | -2.320 | 1.299 | [-2.761:-1.901] | -1.233*** | 0.080 | |
| Technological Maturity | | | | | | |
| In production with customers | 1.745 | 1.717 | [1.311:2.221] | 1.077*** | 0.071 | |
| Finished product | 0.818 | 0.851 | [0.528:1.121] | 0.334*** | 0.071 | |
| Working prototype | -0.781 | 1.140 | [-1.184:-0.429] | -0.335*** | 0.076 | |
| Works in laboratory | -1.782 | 1.452 | [-2.269:-1.337] | -1.076*** | 0.093 | |
| Founder Experience | | | | | | |
| Previous startup founder | 1.261 | 0.688 | [0.984:1.545] | 0.776*** | 0.065 | |
| Previous startup experience | 0.661 | 0.460 | [0.401:0.921] | 0.397*** | 0.063 | |
| Previous executive experience | 0.138 | 0.781 | [-0.176:0.451] | 0.119 [†] | 0.070 | |
| Graduate student | -2.060 | 0.790 | [-2.476:-1.685] | -1.292*** | 0.098 | |
| Regulatory Exposure | | | | | | |
| Very high | -0.367 | 0.642 | [-0.608:-0.157] | -0.929*** | 0.153 | |
| High | -0.215 | 0.431 | [-0.403:-0.042] | -0.280* | 0.128 | |

| | | | | | |
|------------------------------------|-------|-------|---------------|-----------|-------|
| Low | 0.280 | 0.496 | [0.106:0.466] | 0.638*** | 0.105 |
| Very Low | 0.302 | 0.582 | [0.112:0.497] | 0.571*** | 0.107 |
| Number of Observations | 3,132 | | | 3,132 | |
| RLH Value ^d | 0.685 | | | | |
| Log-likelihood | | | | -1940.548 | |
| Pseudo R ² ^e | 0.547 | | | 0.259 | |

^a Coefficient estimates are equal to the posterior population means across the saved draws (as suggested by Train (2009) only every 5th was retained of a total of 50,000 draws and used for calculation in order to reduce the correlation among draws from Gibbs sampling) reported with the standard deviation of the individual coefficients' values (across the respondents in the sample) per attribute level in the subsequent column. Coefficient estimates are interval-scaled and zero-centered within attributes.

^b The 95% interval is calculated based on the population means drawn from the posterior distribution per parameter per iteration that were also used to calculate the coefficient estimates. The interval indicates how reliable the final coefficient estimates are across all draws over the iteration process.

^c The results of the multinomial logit model (MNL) are only comparable to the hierarchical Bayes estimates to a limited extent because of a particular feature we applied in conjoint experiment, which allows respondents the possibility to deselect attributes that they feel are of minor importance to their decision-making. The hierarchical Bayes algorithm we used is tailored to dealing with such deselected attributes and sets the final individual-level part worths to zero to account for that they not important to the respective respondent. The simple MNL model treats them as missing values and further only estimates part-worth utilities on an aggregated level (not on the individual level) what does not allow any post-estimation corrections. Hence, the part-worth utilities in this model are only based on data from those respondents who did not deselect the attributes, and therefore overstates the importance of those attributes for the average of the sample.

^d Root likelihood (RLH) measures the goodness of fit of the hierarchical Bayes model in predicting respondent choices and is calculated by taking the n th root of the likelihood, where n is the total number of choices made by all respondents in all tasks. RLH is therefore the geometric mean of the predicted probabilities. The best possible value is 1.0, and the worst possible is the reciprocal of the number of choices available in the average task, i.e. the expected RLH value for a chance model is $1/k$, where k is the number of alternatives in each choice task, e.g. $1/3 = 0.33$ for three alternatives (Sawtooth Software, 2009b). The RLH value reported in the table is the average of the RLH values over 500 iterations (we retained only every 100th value out of 50,000 iterations after burn-in in order to reduce correlation effects).

^e Pseudo R² (McFadden's R²) is defined as $1 - (LL_1/LL_0)$, where LL_0 is the log-likelihood of the intercept-only model (null model or base model) and LL_1 is the log-likelihood of the full model. Pseudo R² is a common measure for discrete or limited dependent variable models (Veall and Zimmermann, 1996). The Pseudo R² for the hierarchical Bayes model is the average of the Pseudo R² values over the 500 iterations (see average RLH).

Note: † p < 0.10; * p < 0.05; ** p < 0.01; *** p < 0.001.

Table 4. Average relative importance values of attributes based on hierarchical Bayes model

| Attributes | Importance % ^a | SD |
|------------------------|---------------------------|-------|
| Return Potential | 30.38 | 14.64 |
| Founder Experience | 27.03 | 10.60 |
| Technological Maturity | 26.40 | 16.87 |
| Regulatory Exposure | 6.61 | 11.29 |
| Deal Source | 6.41 | 8.36 |
| Lead Investor | 3.17 | 4.70 |
| Total | 100 | |

^a The relative importance values for each attribute are calculated by taking the difference between the highest and the lowest part-worth utility within each attribute and scaling this value to 100% across attributes (Orme, 2010).

In order to test Hypothesis 2 in which we suggest that there will be variations in the relative strength of strong and weak ties in venture capital investment decision-making between different types of respondents we calculated the difference between the individual relative importance values for the attribute deal source and lead investor. Negative values of this dependent variable means that the attribute lead investor is more important (lead investor > deal source) whereas positive values indicate a higher preference for strong over weak ties (deal source > lead investor). Table 6 displays the test results related to differences in our dependent variable with respect to a number of descriptive factors from our sample. We transformed the continuous variables into three approximately equally sized groups along two percentiles (33rd and 66th percentiles) based on the distribution of the particular variable.

Testing for differences between U.S. and European venture capitalists, we find significant results (Mann-Whitney U test, $p < 0.05$). While investors on both sides of the Atlantic attach higher relative importance to the source of the deal than to the lead investor, our results show that the difference between the two is higher among U.S. venture capitalists ($M = 5.22\%$) than among European VCs ($M = 1.07\%$), confirming our second hypothesis about the strength of strong ties in the densely networked North American venture capital industry.

We test our third hypothesis about the U-shaped relationship between experience and strength of strong ties based on three measures for venture capital experience: VC investment experience, number of boards served, and position in the firm. If we measure experience as number of years that a venture capitalist has had responsibility for making investment decisions (0-2 years, 3-9 years, 10-30 years) or in terms of

number of boards on which the VC has served (0-1 boards, 2-8 boards, 9-50 boards), we find slightly significant evidence for the hypothesized U-shaped relationship (Kruskal-Wallis test, $p < 0.10$). Segmenting respondents according to their position in the firm and investment experience (Analysts, Junior Partners, Senior Partners) also leads to significant results (Kruskal-Wallis test, $p < 0.05$). Investigating these differences in more detail shows that for less experienced VCs, deal source is more important than lead investor, indicating a reliance on strong ties. With increasing experience, investors in our sample tend to rely more on the lead investor than on whether the deal came from a close source in their personal network, whereas after a tipping point the strength of weak ties seems to decrease again. Very experienced venture capitalists seem to return to their initial preference for stronger social ties over weak ones. This U-shaped relationship also holds true for the other two variables, number of boards served and position in the firm. We therefore find strong support for Hypothesis 3.

Table 5. Pearson correlation between variables (continuous variables only; N = 86)

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|-------|--------|--------|--------|------|--------|--------|--------|------|
| 1. Difference of Relative Importances Deal Source minus Lead Investor | | | | | | | | | |
| 2. Firm size | 0.02 | | | | | | | | |
| 3. Firm age | 0.04 | 0.48** | | | | | | | |
| 4. Number of funds ^a | -0.08 | 0.53** | 0.39** | | | | | | |
| 5. Deal size | 0.03 | 0.29** | 0.21 | 0.23* | | | | | |
| 6. Investor age | -0.01 | 0.01 | 0.31** | 0.19 | 0.10 | | | | |
| 7. VC industry affiliation | 0.00 | 0.04 | 0.44** | 0.38** | 0.05 | 0.68** | | | |
| 8. VC investment experience | 0.03 | 0.05 | 0.43** | 0.38** | 0.08 | 0.72** | 0.95** | | |
| 9. Number of boards | 0.13 | 0.03 | 0.39** | 0.20 | 0.11 | 0.58** | 0.77** | 0.80** | |
| 10. Clean energy experience | -0.10 | 0.18 | 0.15 | 0.54** | 0.03 | 0.29** | 0.33** | 0.35** | 0.12 |

^a N = 85; one respondent did not indicate the number of funds.

* Correlation significant $p < 0.05$ (two-sided); ** Correlation significant $p < 0.01$ (two-sided).

Table 6. Tests for differences between groups of moderator variables (N = 86)

| Variables | Difference of Relative Importances Deal Source minus Lead Investor % | | | Test for Differences between groups ^a |
|---|--|-------|-------|--|
| | N | M | SD | |
| Firm and Fund Information | | | | |
| <i>Firm location</i> | | | | $p = 0.047^b$ |
| United States | 45 | 5.22 | 10.91 | |
| Europe | 41 | 1.07 | 9.25 | |
| <i>Firm size (number of employees)</i> | | | | $p = 0.192$ |
| 1-7 employees | 29 | 3.43 | 9.52 | |
| 8-14 employees | 27 | 0.35 | 9.77 | |
| 15-150 employees | 30 | 5.67 | 11.16 | |
| <i>Firm age (years)</i> | | | | $p = 0.194$ |
| 1-8 years | 27 | 0.52 | 9.06 | |
| 9-13 years | 32 | 5.14 | 9.67 | |
| 14-38 years | 27 | 3.73 | 11.90 | |
| <i>Number of funds^c</i> | | | | $p = 0.784$ |
| 1 fund | 27 | 2.72 | 8.94 | |
| 2-3 funds | 39 | 3.33 | 10.70 | |
| 4-16 funds | 19 | 4.70 | 11.25 | |
| <i>Deal size (in thousands USD)</i> | | | | $p = 0.458$ |
| 100-1,500 TUSD | 27 | 5.28 | 10.48 | |
| 1,501-5,000 TUSD | 36 | 2.00 | 9.24 | |
| 5,001-70,000 TUSD | 23 | 2.80 | 11.72 | |
| Investor Information | | | | |
| <i>Investor age (years)</i> | | | | $p = 0.137$ |
| 23-37 years | 29 | 5.32 | 9.34 | |
| 38-58 years | 27 | 0.51 | 9.45 | |
| 49-70 years | 30 | 3.70 | 11.65 | |
| <i>VC industry affiliation (years)</i> | | | | $p = 0.522$ |
| 1-3 years | 31 | 3.61 | 10.48 | |
| 4-10 years | 31 | 2.07 | 10.27 | |
| 11-35 years | 24 | 4.29 | 10.42 | |
| <i>VC investment experience (years)</i> | | | | $p = 0.070$ |
| 0-2 years | 25 | 3.95 | 9.23 | Groups 1 & 2: $p = 0.097^b$ |
| 3-9 years | 31 | 0.36 | 10.10 | Groups 2 & 3: $p = 0.030^b$ |
| 10-30 years | 30 | 5.64 | 10.96 | Groups 1 & 3: $p = 0.620^b$ |
| <i>Number of boards</i> | | | | $p = 0.081$ |
| 0-1 boards | 27 | 4.74 | 10.31 | Groups 1 & 2: $p = 0.067^b$ |
| 2-8 boards | 28 | -0.46 | 8.04 | Groups 2 & 3: $p = 0.042^b$ |
| 9-50 boards | 31 | 5.29 | 11.48 | Groups 1 & 3: $p = 0.876^b$ |
| <i>Position in firm^e</i> | | | | $p = 0.024$ |
| Analyst, other ^d | 29 | 5.03 | 10.05 | Groups 1 & 2: $p = 0.022^b$ |
| Junior managing director, general partner, partner (VC investor < 10 years) | 29 | -0.88 | 8.52 | Groups 2 & 3: $p = 0.017^b$ |
| Senior managing director, general partner, partner | 28 | 5.66 | 11.26 | Groups 1 & 3: $p = 0.841^b$ |

| (VC investor \geq 10 years) | | | | $p = 0.948$ |
|--|----|------|-------|-------------|
| <i>Clean energy experience (years)</i> | | | | |
| 0 years | 41 | 3.26 | 11.05 | |
| 1-2 years | 17 | 4.72 | 12.61 | |
| 3-25 years | 28 | 2.33 | 7.57 | |

^a Kruskal-Wallis test.

^b Mann-Whitney U test (two-sided).

^c N = 85; one respondent did not indicate the number of funds.

^d Categories built based on position in firm and VC investment experience.

^e e.g. associate, investment manager etc.

Conclusion

This study was motivated by a growing scholarly interest in the role that social networks play in venture capital decision-making. While prior research on social networks in venture capital has demonstrated the influence of both direct and indirect effects, to date we know little as to their joint influence or relative effect. Our interest in this paper is improving our understanding of how social networks influence investment decisions by conducting a joint test for the influence of status hierarchies and personal ties in a context of high uncertainty. When trading off two deals with similar characteristics in all other respects, where one originates within the venture capitalist's personal network and the other represents an opportunity to co-invest with a high-status lead investor, which of the two options will a venture capitalist prefer? Our study is the first to answer this question, and our findings align with and build on previous work. We confirm that both direct and indirect network ties have a measurable influence on venture capital investment decision making; however, in a high-uncertainty context (for example in an emerging industry in which the traditional risk/return parameters are more difficult to determine) personal ties – specifically, whether or not the deal came from a trusted referral in the investor's network – is more important than the reputation of the other investors in the deal.

Our empirical analysis of a novel sample of venture capitalists from the United States and Europe adds further specificity to Shane and Cable's (2002) observation that aspects related to venture investors' social network play a role in explaining investment decisions, while reflecting their finding that neither an over- nor an under-socialized view are warranted. The venture capitalists we surveyed cannot be conceived as herds blindly following their peers, yet they are not completely free from the influence of others. The involvement of a high-status lead investor in the deal, such

as Kleiner Perkins or Draper Fisher Jurvetson, positively influences the venture capitalist's decision to consider an investment in a newly emerging industry, but this effect is smaller than whether or not the deal originates from a trusted source in the venture capitalist's personal network.

Our results also show that the reliance on strong personal ties is more pronounced in the densely networked U.S. venture capital industry than among the European respondents in our sample. Experience is an important moderating factor, and our findings add further specificity to Shepherd *et al.*'s (2003) evidence for a U-shaped relationship between venture investors' experience and their decision-making: We show that inexperienced investors rely more on strong ties. This reliance decreases as venture capitalists gain experience, but only up to a point, after which the strength of strong ties increases again. To put this into context, our data also confirm that traditional venture investment criteria related to market, technology, and management risk as well as return potential matter.

With this article we contribute to social network theory in entrepreneurship and venture capital and to literature on decision-making criteria of venture investors. We specifically advance our understanding in these research areas by focusing on the earliest but quite critical stage in the venture funding process (deal screening phase) and by simultaneously investigating a set of different types of investment criteria (business plan-related and "socialized" criteria). Further we complement existing studies that examine the decision criteria of venture capitalists using conjoint experiments by applying a larger sample (86 professional venture capitalists conducting 3,132 experimental choices) with an international focus. Our study also makes important methodological contributions to the entrepreneurship and venture capital literature, especially through our use of adaptive choice-based conjoint (ACBC) as one of the latest advances in the design of efficient choice experiments, and of hierarchical Bayes estimation as a significant step forward in increasing the validity of conjoint analysis under conditions of preference heterogeneity and scarce information per respondent.

This study has important implications for entrepreneurs seeking venture funding by increasing their understanding about the factors most important to venture capitalists, especially in the context of an emerging industry. Our research shows that social factors play a role, although it also confirms that they do not substitute for the good old virtues of a promising product, a clear market opportunity, and demonstrated entrepreneurial experience. Among the two types of social network influences that we tested, entrepreneurs should be particularly aware of the value of direct personal ties.

We discerned a clear relationship between strong personal ties and the inclination to consider an opportunity for investment in a newly emerging industry, with deals originating from a more distant source in the venture capitalist's network showing smaller chances of getting funded. Entrepreneurs in new industries are therefore well advised to use and extend their personal network, and the potential benefit from this activity seems to be greater than seeking affiliation with a distant, but high-status venture capitalist. Our results, however, also show important nuances: The "strength of strong ties" is relatively less pronounced among venture capitalists with a medium level of experience than among both inexperienced and very senior investors, as well as in Europe compared to North American venture capitalists.

We also come across some limitations that provide starting points for further research on the role of social network ties on venture capital investment decisions. First, our study is part of the growing body of experimental approaches to research in entrepreneurship and venture capital, and as such has to be conscious about possible gaps between experiment and reality. While choice-based conjoint experiments better mimic real market behavior compared to rating-based conjoint (Elrod, Louviere, and Davey, 1992; Huber, Ariely, and Fischer, 2002), this method produces less information than individually rating each option (Moore, 2004). We deal with this issue by using adaptive choice-based conjoint that gathers more information per respondent through the combination of compositional and decompositional approaches. Yet we cannot completely dismiss the possibility that our methodological design leads to an overestimation of traditional financial criteria such as return potential, when compared to the social network criteria such as lead investor or deal source. This may be due to an attribute-task compatibility effect (Nowlis and Simonson, 1997), where comparable attributes, like price or the potential financial return, are more important in choice-based tasks, whereas, less comparable attributes, such as brand name, are more important in rating-based tasks. Another reason could be the use of the add-on feature in the adaptive choice-based conjoint experiment to reduce complexity of the choice tasks where respondents were asked to de-select two out of six attributes, which might have induced socially desirable behavior. Future studies could try to further contribute to the emerging "socialized" view of venture capital investing by pursuing multi-method approaches, possibly including experimental methods that are tailored at capturing the affective component of social network influences on investor decision-making.

While the sample size of this study is well in line with previous conjoint experiments on venture capital investment criteria, and professional venture investors

are notoriously hard to access with time-consuming academic surveys, the sample size is a limiting factor when it comes to performing detailed analyses on subgroups of venture investors, e.g. according to investor types or level of domain-specific experience. We only report about a sufficiently coherent subsample of our respondents, independent venture capitalists from the United States and Europe, in this paper. Our initial sample included corporate venture capitalists and investors from other world regions, but their number was insufficient to perform systematic analysis of differences. Future research could try to investigate whether systematic differences between investor types or other world regions can be identified on a significant level, for example by working with a larger sample and/or further isolating the influence of social networks from other attributes of decision making.

Finally, we found that under high uncertainty, investors resort to strong personal ties rather than status hierarchies, and operationalized uncertainty by defining the context of the experimental choice task as an opportunity to invest in a newly emerging industry, namely clean energy. Further research could try to validate our findings by applying a cross-industry comparative design, comparing an emerging industry context to more mature venture capital sectors such as biotechnology or information technology.

In conclusion, our study is the first to perform a joint examination of the role of status hierarchies and social ties in venture capital decision-making, and the role that geographic density and experience play in that process. While a rich literature has identified and ranked the traditional criteria employed in early-stage investment, this study examines, and provides strong evidence for the view of venture investors as specialized capital market actors capable of incorporating and analyzing information “beyond the business plan”, and that network membership plays a crucial role in venture capital investment decisions.

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Appendix

Bayesian Methodology

In conventional (non-Bayesian or frequentist) statistical analysis it is assumed that the data (in this context, choices made by individuals) is described by a particular model (assumptions about data) with specified parameters (numerical values used in models, e.g. a particular variable is described by the parameters mean and standard deviation) and then it is estimated whether the data is consistent with those assumptions, i.e. the *probability distribution of the data* is estimated given the assumptions and parameters ($p(y|H_i)$). In Bayesian statistical analysis this process is turned around. It is also assumed that the data is described by a particular model and it is tested if the data is consistent with those assumptions. But in Bayesian analysis then the *probability distribution of the parameters* is estimated given the data ($p(H_i|y)$) (Sawtooth Software, 2009b). Thus, the “Bayes theorem” can be defined as

$$p(H_i|y) \propto p(y|H_i)p(H_i)$$

where $p(H_i)$ is the “prior probability” of the hypothesis and describes the belief about the hypothesis before the data is seen; $p(y|H_i)$ is the conditional probability of that particular data given the hypothesis about the data (“likelihood of the data”); and $p(H_i|y)$ is the “posterior probability” of the hypothesis given not only the prior information about its truth, $p(H_i)$, but also the information contained in the data, (Sawtooth Software, 2009b). The symbol \propto means “is proportional to”.

Hierarchical Bayes Procedure

The hierarchical Bayes model used in this study is called “hierarchical” because it consists of two levels: (1) at the higher level it is assumed that individuals’ part worths are described by a multivariate normal distribution; (2) at the lower level it is assumed that, given an individual’s part worths, his or her probabilities of choosing particular

alternatives are governed by a multinomial logit model (Johnson, 2000; Sawtooth Software, 2009b). In the ACBC survey approach choice data from all three choice sections can be combined in one multinomial logit model.¹⁷ In statistical terms we can write (1) as

$$\beta_i \approx \text{Normal}(\alpha, D)$$

where β_i is a vector of part worths of the i^{th} individual; α a vector of means of the distribution of individuals' part worths; and D a matrix of variances and covariances of the distribution of part worths across individuals.

At the individual level (2), the utility, u_k , that the i^{th} individual ascribes to the k^{th} alternative is defined as and the probability of the i^{th} individual choosing the k^{th} alternative can be written as

$$p_k = \frac{\exp(x'_k \beta_i)}{\sum_j \exp(x'_j \beta_i)}$$

where p_k is the probability of an individual choosing the k^{th} concept in a particular choice task; and x_j a vector of attribute values describing the j^{th} alternative in that choice task.

Two different Monte Carlo Markov Chain (MCMC) methods are used to estimate the parameters β_i , α , and D . As the overall procedure to estimate the parameters we use Gibbs sampling as a special type of Metropolis-Hasting algorithm (Gelman and Rubin, 1992). The estimation of the part-worth vector, β_i , is done by a more complex iterative process of Metropolis-Hastings algorithm as suggested by Chib and Greenberg (1995, 1996) and Gelman *et al.* (2003) (Greene, 2011; Sawtooth Software, 2009b). Even this process is quite robust Sawtooth Software takes a conservative approach and sets the iteration starting values of the parameters β_i , α , and D to zero (Sawtooth Software, 2009b).¹⁸

¹⁷ Usually this generates enough information per respondent to permit estimation of the individual part worths without having to “borrow” information from other respondents using the hierarchical Bayes algorithm (Johnson and Orme, 2007).

¹⁸ A more detailed description of the MCMC estimation procedures can be found in Sawtooth Software (2009b).

We used 20,000 draws as burn-in of a total of 70,000 iterations in order to ensure convergence before using the results.¹⁹ Point estimates for each individual are achieved by averaging the results of the last 50,000 iterations with a skip factor of 5 (i.e. every 5th of 50,000 draws is retained for a total of 10,000 final draws) in order to account for correlation between the draws due to the iterative estimation process (Train, 2009).

¹⁹ We tested if convergence has actually been achieved by running the estimation procedure several times and by plotting the results of each iteration to see if the draws are trending (Train, 2009). Our tests verify that convergence is achieved during the burn-in.

References

- Allenby GM, Arora N, Ginter JL. 1995. Incorporating prior knowledge into the analysis of conjoint studies. *Journal of Marketing Research* **32**(2): 152-162.
- Allenby GM, Ginter JL. 1995. Using extremes to design products and segment markets. *Journal of Marketing Research* **32**(4): 392-403.
- Andrews RL, Ansari A, Currim IS. 2002. Hierarchical Bayes versus finite mixture conjoint analysis models: a comparison of fit, prediction, and partworth recovery. *Journal of Marketing Research* **39**(1): 87-98.
- Baier D, Bruschi M (eds). 2009. *Conjointanalyse: Methoden, Anwendungen, Praxisbeispiele*. Springer: Berlin, Heidelberg.
- Batjargal B. 2007. Internet entrepreneurship: social capital, human capital, and performance of Internet ventures in China. *Research Policy* **36**(5): 605-618.
- Beckman CM, Haunschild PR, Phillips DJ. 2004. Friends or strangers? Firm-specific uncertainty, market uncertainty, and network partner selection. *Organization Science* **15**(3): 259-275.
- Berger AN, Udell GF. 1998. The economics of small business finance: the roles of private equity and debt markets in the financial growth cycle. *Journal of Banking and Finance* **22**(6-8): 613-673.
- Borgatti SP, Foster PC. 2003. The network paradigm in organizational research: a review and typology. *Journal of Management* **29**(6): 991-1013.
- Brundin E, Patzelt H, Shepherd, DA. 2008. Managers' emotional displays and employees' willingness to act entrepreneurially. *Journal of Business Venturing* **23**(2): 221-243.
- Bruno AV, Tyebjee TT. 1983. The one that got away: a study of ventures rejected by venture capitalists. In *Frontiers of Entrepreneurship Research*. Babson College: Boston, MA; 289-306.
- Bruno AV, Tyebjee TT. 1986. The destinies of rejected venture capital deals. *Sloan Management Review* **27**(2): 43-53.
- Burt RS. 1983. *Corporate Profits and Cooptation: Networks of Market Constraints and Directorate Ties in the American Economy*. Academic Press: New York, NY.
- Bygrave WD. 1987. Syndicated investments by venture capital firms: a networking perspective. *Journal of Business Venturing* **2**(2): 139-154.

- Carpenter MA, Westphal JD. 2001. The strategic context of external network ties: examining the impact of director appointments on board involvement in strategic decision making. *Academy of Management Journal* **44**(4): 639-660.
- Chandler GN. 1996. Business similarity as a moderator of the relationship between pre-ownership experience and venture performance. *Entrepreneurship Theory and Practice* **20**(3): 51-65.
- Chapman CN, Alford JL, Johnson C, Weidemann R, Lahav M. 2009. CBC vs. ACBC: comparing results with real product selection. *Sawtooth Software Research Paper Series*. <http://www.sawtoothsoftware.com> [24 August 2012].
- Chen H, Gompers P, Kovner A, Lerner J. 2010. Buy local? The geography of venture capital. *Journal of Urban Economics* **67**(1): 90-102.
- Chib S, Greenberg E. 1995. Understanding the Metropolis-Hastings algorithm. *American Statistician* **49**(4): 327-335.
- Chib S, Greenberg E. 1996. Markov chain Monte Carlo simulation methods in econometrics. *Econometric Theory* **12**(3): 409-431.
- Dean MA, Shook CL, Payne GT. 2007. The past, present, and future of entrepreneurship research: data analytic trends and training. *Entrepreneurship Theory and Practice* **31**(4): 601-618.
- DeSarbo W, MacMillan IC, Day DL. 1987. Criteria for corporate venturing: importance assigned by managers. *Journal of Business Venturing* **2**(4): 329-350.
- Dixon R. 1991. Venture capitalists and the appraisal of investments. *Omega* **19**(5): 333-344.
- Dushnitsky G, Lenox MJ. 2005. When do incumbents learn from entrepreneurial ventures? Corporate venture capital and investing firm innovation rates. *Research Policy* **34**(5): 615-639.
- Elrod T, Louviere JJ, Davey KS. 1992. An empirical comparison of ratings-based and choice-based conjoint models. *Journal of Marketing Research* **29**(3): 368-377.
- EVCA. 2011a. Creating lasting value: yearbook 2011. European Private Equity and Venture Capital Association. <http://www.evca.eu> [24 August 2012].
- EVCA. 2011b. Email conversation with EVCA. 6th and 10th of October 2011.
- Evgeniou T, Boussios C, Zacharia G. 2005. Generalized robust conjoint estimation. *Marketing Science* **24**(3): 415-429.
- Franke N, Gruber M, Harhoff D, Henkel J. 2006. What you are is what you like – similarity biases in venture capitalists' evaluations of start-up teams. *Journal of Business Venturing* **21**(6): 802-826.

- Franke N, Gruber M, Harhoff D, Henkel J. 2008. Venture capitalists' evaluations of start-up teams: trade-offs, knock-out criteria, and the impact of VC experience. *Entrepreneurship Theory and Practice* **32**(3): 459-483.
- Galaskiewicz J, Shatin D. 1981. Leadership and networking among neighborhood human service organizations. *Administrative Science Quarterly* **26**(3): 434-448.
- Gelman A, Carlin JB, Stern HS, Rubin DB. 2003. *Bayesian Data Analysis*. CRC Press: Boca Raton, FL.
- Gelman A, Rubin D. 1992. Inference from iterative simulation using multiple sequences. *Statistical Science* **7**(4): 457-472.
- Golden BR. 1992. The past is the past – or is it? The use of retrospective accounts as indicators of past strategy. *Academy of Management Journal* **35**(4): 848-860.
- Gompers PA, Lerner J. 1999. An analysis of compensation in the U.S. venture capital partnership. *Journal of Financial Economics* **51**(1): 3-44.
- Gompers PA. 1995. Optimal investment, monitoring, and the staging of venture capital. *The Journal of Finance* **50**(5): 1461-1489.
- Gorman M, Sahlman WA. 1986. What do venture capitalists do? In *Frontiers of Entrepreneurship Research*. Babson College: Boston, MA; 414-436.
- Gould RV. 2002. The origins of status hierarchies: a formal theory and empirical test. *American Journal of Sociology* **107**(5): 1143-1178.
- Granovetter MS. 1973. The strength of weak ties. *The American Journal of Sociology* **78**(6): 1360-1380.
- Granovetter MS. 1983. The strength of weak ties: a network theory revisited. *Sociological Theory* **1**: 201-233.
- Green PE, Krieger AM, Wind Y. 2001. Thirty years of conjoint analysis: reflections and prospects. *Interfaces* **31**(3): S56-S73.
- Green PE, Rao VR. 1971. Conjoint measurement for quantifying judgmental data. *Journal of Marketing Research* **8**(3): 355-363.
- Green PE, Srinivasan V. 1990. Conjoint analysis in marketing: new developments with implications for research and practice. *The Journal of Marketing* **54**(4): 3-19.
- Greene WH. 2011. *Econometric Analysis*. Pearson Education: Harlow, UK.
- Gulati R. 1995. Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances. *Academy of Management Journal* **38**(1): 85-112.
- Hagedoorn J, Frankort HTW. 2008. The gloomy side of embeddedness: the effects of overembeddedness on inter-firm partnership formation. In *Network Strategy* (Advances in Strategic Management **25**), Baum JAC, Rowley TJ (eds). Emerald Group Publishing; 503-530.

- Henderson RM, Clark KB. 1990. Architectural innovation: the reconfiguration of existing product technologies and the failure of established firms. *Administrative Science Quarterly* **35**(1): 9-30.
- Hisrich RD, Jankowicz AD. 1990. Intuition in venture capital decisions: an exploratory study using a new technique. *Journal of Business Venturing* **5**(1): 49-62.
- Hite JM, Hesterly WS. 2001. The evolution of firm networks: from emergence to early growth of the firm. *Strategic Management Journal* **22**(3): 275-286.
- Hochberg YV, Ljungqvist A, Lu Y. 2007. Whom you know matters: venture capital networks and investment performance. *The Journal of Finance* **62**(1): 251-301.
- Hochberg YV, Ljungqvist A, Lu Y. 2010. Networking as a barrier to entry and the competitive supply of venture capital. *The Journal of Finance* **65**(3): 829-859.
- Hsu DH. 2004. What do entrepreneurs pay for venture capital affiliation? *The Journal of Finance* **59**(4): 1805-1844.
- Hsu DH. 2007. Experienced entrepreneurial founders, organizational capital, and venture capital funding. *Research Policy* **36**(5): 722-741.
- Huber J, Ariely D, Fischer G. 2002. Expressing preferences in a principal-agent task: a comparison of choice, rating, and matching. *Organizational Behavior and Human Decision Processes* **87**(1): 66-90.
- Hutt RW, Thomas B. 1985. Venture capital in Arizona. In *Frontiers of Entrepreneurship Research*. Babson College: Boston, MA; 155-169.
- Janney JJ, Folta TB. 2006. Moderating effects of investor experience on the signaling value of private equity placements. *Journal of Business Venturing* **21**(1): 27-44.
- Johnson RM, Orme BK. 2007. A new approach to adaptive CBC. *Sawtooth Software Research Paper Series* October. <http://www.sawtoothsoftware.com> [24 August 2012].
- Johnson RM. 2000. Understanding HB: an intuitive approach. *Sawtooth Software Research Paper Series* March. <http://www.sawtoothsoftware.com> [24 August 2012].
- Jones C, Hesterly WS, Borgatti SP. 1997. A general theory of network governance: exchange conditions and social mechanisms. *Academy of Management Review* **22**(4): 911-945.
- Kaplan D (ed). 2004. *The Sage Handbook of Quantitative Methodology for the Social Sciences*. Sage Publications: Thousand Oaks, CA.

- Kaplan SN, Strömberg P. 2003. Financial contracting theory meets the real world: an empirical analysis of venture capital contracts. *Review of Economic Studies* **70**(2): 281-315.
- King RG, Levine R. 1993. Finance, entrepreneurship and growth. *Journal of Monetary Economics* **32**(3): 513-542.
- Kogut B. 1988. Joint ventures: theoretical and empirical perspectives. *Strategic Management Journal* **9**(4): 319-332.
- Krackhardt D. 1992. The strength of strong ties: the importance of philos in organizations. In *Networks and Organizations: Structure, Form, and Action*, Nohria N, Eccles, R (eds). Harvard Business School Press: Boston, MA; 216-239.
- Landström H, Manigart S, Mason C, Sapienza HJ. 1998. Contracts between entrepreneurs and investors: terms and negotiation processes. In *Frontiers of Entrepreneurship Research*, Reynolds P, Bygrave W, Carter N, Manigart S, Mason C, Meyer D, Shaver K (eds). Babson College: Boston, MA; 571-585.
- Lee PM, Pollock TG, Jin K. 2011. The contingent value of venture capitalist reputation. *Strategic Organization* **9**(1): 33-69.
- Lenk PJ, DeSarbo WS, Green PE, Young MR. 1996. Hierarchical Bayes conjoint analysis: recovery of partworth heterogeneity from reduced experimental designs. *Marketing Science* **15**(2): 173-191.
- Lerner J. 1994. The syndication of venture capital investments. *Financial Management* **23**(3): 16-27.
- Lohrke FT, Holloway BB, Woolley TW. 2010. Conjoint analysis in entrepreneurship research: a review and research agenda. *Organizational Research Methods* **13**(1): 16-30.
- Louviere JJ, Hensher DA, Swait J, Adamowicz W. 2003. *Stated Choice Methods Analysis and Applications*. Cambridge University Press: Cambridge, UK.
- Louviere JJ, Islam T, Wasi N, Street D, Burgess L. 2008. Designing discrete choice experiments: do optimal designs come at a price? *Journal of Consumer Research* **35**(2): 360-375.
- Lynn FB, Podolny JM, Tao L. 2009. A sociological (de)construction of the relationship between status and quality. *American Journal of Sociology* **115**(3): 755-804.
- MacMillan IC, Siegel R, Subba Narasimha PN. 1985. Criteria used by venture capitalists to evaluate new venture proposals. *Journal of Business Venturing* **1**(1): 119-128.

- MacMillan IC, Subba Narasimha PN. 1986. Characteristics distinguishing funded from unfunded business plans evaluated by venture capitalists. In *Frontiers of Entrepreneurship Research*. Babson College: Boston, MA; 404-413.
- Matusik SF, George JM, Heeley MB. 2008. Values and judgment under uncertainty: evidence from venture capitalist assessments of founders. *Strategic Entrepreneurship Journal* **2**(2): 95-115.
- McFadden D. 1986. The choice theory approach to market research. *Marketing Science* **5**(4): 275-297.
- Meuleman M, Lockett A, Manigart S, Wright M. 2010. Partner selection decisions in interfirm collaborations: the paradox of relational embeddedness. *Journal of Management Studies* **47**(6): 995-1019.
- Meyer GD, Zacharakis AL, De Castro JO. 1993. A post-mortem of new venture failure: an attribution theory perspective. In *Frontiers of Entrepreneurship Research*. Babson College: Boston, MA; 256-269.
- Mitchell JR, Shepherd DA. 2010. To thine own self be true: images of self, images of opportunity, and entrepreneurial action. *Journal of Business Venturing* **25**(1): 138-154.
- Moore WL, Gray-Lee J, Louviere JJ. 1998. A cross-validity comparison of conjoint analysis and choice models at different levels of aggregation. *Marketing Letters* **9**(2): 195-207.
- Moore WL. 2004. A cross-validity comparison of rating-based and choice-based conjoint analysis models. *International Journal of Research in Marketing* **21**(3): 299-312.
- Morrison EW. 2002. Newcomers' relationships: the role of social network ties during socialization. *Academy of Management Journal* **45**(6): 1149-1160.
- Muzyka D, Birley S, Leleux B. 1996. Trade-offs in the investment decisions of European venture capitalists. *Journal of Business Venturing* **11**(4): 273-287.
- Netzer O, Toubia O, Bradlow ET, Dahan E, Evgeniou T, Feinberg FM, Feit EM, Hui SK, Johnson J, Liechty JC, Orlin JB, Rao VR. 2008. Beyond conjoint analysis: advances in preference measurement. *Marketing Letters* **19**(3): 337-354.
- Nowlis SM, Simonson I. 1997. Attribute-task compatibility as a determinant of consumer preference reversals. *Journal of Marketing Research* **34**(2): 205-218.
- NVCA. 2011. Yearbook 2011. National Venture Capital Association. <http://www.nvca.org> [24 August 2012].

- Orme BK. 2000. Hierarchical Bayes: why all the attention? *Sawtooth Software Research Paper Series* October. <http://www.sawtoothsoftware.com> [24 August 2012].
- Orme BK. 2010. *Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research*. Research Publishers: Madison, WI.
- Ozmel U, Reuer JJ, Gulati R. 2012. Signals across multiple networks: how venture capital and alliance networks affect interorganizational collaboration. *Academy of Management Journal* 24 July: 1-36. <http://amj.aom.org> [24 August 2012].
- Payne GT, Davis JL, Moore CB, Bell RG. 2009. The deal structuring stage of the venture capitalist decision-making process: exploring confidence and control. *Journal of Small Business Management* 47(2): 154-179.
- Petty JS, Gruber M. 2011. "In pursuit of the real deal": a longitudinal study of VC decision making. *Journal of Business Venturing* 26(2): 172-188.
- Pfeffer J, Salancik G. 2003. *The External Control of Organizations: A Resource Dependence Perspective*. Stanford University Press: Stanford, CA.
- Podolny JM. 1994. Market uncertainty and the social character of economic exchange. *Administrative Science Quarterly* 39(3): 458-483.
- Podolny JM. 2005. *Status Signals*. Princeton University Press: Princeton, NJ.
- Powell WW, Koput KW, Smith-Doerr L. 1996. Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology. *Administrative Science Quarterly* 41(1): 116-145.
- Riquelme H, Rickards T. 1992. Hybrid conjoint analysis: an estimation probe in new venture decisions. *Journal of Business Venturing* 7(6): 505-518.
- Roberts EB. 1991. High stakes for high-tech entrepreneurs: understanding venture capital decision making. *Sloan Management Review* 32(2): 9-20.
- Rossi PE, Allenby GM, McCulloch R. 2005. *Bayesian Statistics and Marketing*. John Wiley & Sons: Chichester, UK.
- Rossi PE, Allenby GM. 2003. Bayesian statistics and marketing. *Marketing Science* 22(3): 304-328.
- Rost K. 2011. The strength of strong ties in the creation of innovation. *Research Policy* 40(4): 588-604.
- Sahlman WA. 1990. The structure and governance of venture-capital organizations. *Journal of Financial Economics* 27(2): 473-521.
- Sapienza HJ, Korsgaard MA. 1996. Procedural justice in entrepreneur-investor relations. *Academy of Management Journal* 39(3): 544-574.

- Sapienza HJ. 1992. When do venture capitalists add value? *Journal of Business Venturing* 7(1): 9-27.
- Sawtooth Software. 2009a. The adaptive choice-based conjoint (ACBC) technical paper. *Sawtooth Software Technical Paper Series* August. <http://www.sawtoothsoftware.com> [24 August 2012].
- Sawtooth Software. 2009b. The CBC/HB system for hierarchical Bayes: version 5.0 technical paper. *Sawtooth Software Technical Paper Series*. <http://www.sawtoothsoftware.com> [24 August 2012].
- Shane S, Cable D. 2002. Network ties, reputation, and the financing of new ventures. *Management Science* 48(3): 364-381.
- Shepherd DA, Zacharakis AL, Baron RA. 2003. VCs' decision processes: evidence suggesting more experience may not always be better. *Journal of Business Venturing* 18(3): 381-401.
- Shepherd DA, Zacharakis AL. 1997. Conjoint analysis: a window of opportunity for entrepreneurship research. In *Advances in Entrepreneurship, Firm Emergence and Growth*, Katz J (ed.). JAI Press: Greenwich, CT; 203-248.
- Shepherd DA, Zacharakis AL. 1999. Conjoint analysis: a new methodological approach for researching the decision policies of venture capitalists. *Venture Capital* 1(3): 197-217.
- Shepherd DA. 1999. Venture capitalists' assessment of new venture survival. *Management Science* 45(5): 621-632.
- Silva J. 2004. Venture capitalists' decision-making in small equity markets: a case study using participant observation. *Venture Capital* 6(2/3): 125-145.
- Sorenson O, Stuart TE. 2001. Syndication networks and the spatial distribution of venture capital investments. *The American Journal of Sociology* 106(6): 1546-1588.
- Stuart TE, Hoang H, Hybels RC. 1999. Interorganizational endorsements and the performance of entrepreneurial ventures. *Administrative Science Quarterly* 44(2): 315-349.
- Thompson JD. 1967. *Organizations in Action*. McGraw-Hill: New York.
- Train K. 2009. *Discrete Choice Methods with Simulation*. Cambridge University Press: Cambridge, UK.
- Tripsas M, Gavetti G. 2000. Capabilities, cognition, and inertia: evidence from digital imaging. *Strategic Management Journal* 21(10-11): 1147-1161.

- Tyebjee TT, Bruno AV. 1981. Venture capital decision making: preliminary results from three empirical studies. In *Frontiers of Entrepreneurship Research*. Babson College: Boston, MA; 316-334.
- Tyebjee TT, Bruno AV. 1984. A model of venture capitalist investment activity. *Management Science* **30**(9): 1051-1066.
- Ueda M. 2004. Banks versus venture capital: project evaluation, screening, and expropriation. *The Journal of Finance* **59**(2): 601-621.
- Uzzi B. 1997. Social structure and competition in interfirm networks: the paradox of embeddedness. *Administrative Science Quarterly* **42**(1): 35-67.
- Veall MR, Zimmermann KF. 1996. Pseudo R2 measures for some common limited dependent variable models. *Journal of Economic Surveys* **10**(3): 241-259.
- Verlegh PWJ, Schifferstein HNJ, Wittink DR. 2002. Range and number-of-levels effects in derived and stated measures of attribute importance. *Marketing Letters* **13**(1): 41-52.
- Washington M, Zajac E. 2005. Status evolution and competition: theory and evidence. *Academy of Management Journal* **48**(2): 282-296.
- Wellman B, Berkowitz SD. 1988. Toward a structural sociology. In *Social Structures: A Network Approach*, Wellman B, Berkowitz SD (eds). Cambridge University Press: Cambridge, UK; 1-18.
- Wells WA. 1974. Venture capital decision making. Unpublished doctoral dissertation, Carnegie-Mellon University.
- Wilson R. 1985. Reputations in games and markets. In *Game-Theoretic Models of Bargaining*, Roth AE (ed). Cambridge University Press: Cambridge, UK; 27-62.
- Wittink DR, Krishnamurthi L, Reibstein DJ. 1990. The effect of differences in the number of attribute levels on conjoint results. *Marketing Letters* **1**(2): 113-123.
- Wüstenhagen R, Teppo T. 2006. Do venture capitalists really invest in good industries? Risk-return perceptions and path dependence in the emerging European energy VC market. *International Journal of Technology Management* **34**(1/2): 63-87.
- Zacharakis AL, McMullen JS, Shepherd DA. 2007. Venture capitalists' decision policies across three countries: an institutional theory perspective. *Journal of International Business Studies* **38**(5): 691-708.
- Zider B. 1998. How venture capital works. *Harvard Business Review* **76**(6): 131-140.

Second Paper

Invest in What You Know: An Experimental Approach to Investigating the Influence of Corporate Brands on Individual Investors' Decisions²⁰

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Abstract

In consumer markets, brands play an important role in purchase situations marked by uncertainty. Though it is not clear whether decisions concerning financial products respond to the same principles as consumer goods, research in behavioral finance shows evidence that brands fulfill a similar function in capital markets. This article reports from a conjoint survey comprising 1,044 experimental stock ratings made by 87 individual investors. Our findings confirm the influence of the corporate brand on investment decisions in two industry contexts. Further, we show that more familiar brands have a higher influence on investment decisions than those that are less well known.

Keywords: Investment decision-making, Individual investors, Corporate brands, Familiarity effect, Conjoint analysis

JEL Codes: C93, D14, D81, G02, M31

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Introduction

Peter Lynch, one of the most successful Wall Street investors in history, famously advises people to “invest in what you know” (Lynch, 2000). At first glance, these words do not seem particularly insightful – after all, we all know from experience that it is easier to judge the quality of something that is familiar to us. Researchers have found evidence of familiarity effects in stock markets for individual investors in particular (e.g. Huberman, 2001; Wang, Keller, and Siegrist, 2011). The research suggests that familiarity with specific stocks automatically leads people to expect higher returns and lower risks than stocks with which they are less familiar (Huberman, 2001; Kilka and Weber, 2000). The reason for the underestimation of risks, in particular, is that familiarity increases our sense of comfort and safety (Baker and Nofsinger, 2002; Wang *et al.*, 2011). Familiarity develops either through individual investors’ engagement on the stock market, where they collect a variety of information about companies in which they are interested or in which they have invested or through other forms of economic behavior, such as consuming a particular companies’ products²¹ or having a past or present relationship with such a company as an employee (Aspara and Tikkanen, 2008).

The literature on behavioral finance and marketing also contains evidence of individual investors’ familiarity with (corporate) brands affecting their investment behavior (Aspara and Tikkanen, 2011; Barber and Odean, 2008; Brady, Bourdeau, and Heskell, 2005; Frieder and Subrahmanyam, 2005; Grullon, Kanatas, and Weston, 2004; Jordan and Kaas, 2002). This effect functions in a manner similar to brand awareness in consumer markets (Hoyer and Brown, 1990; Keller, 1993). A brand, which according to Kotler is “a name, term, sign, symbol, or design, or a combination of them, intended to identify the goods or services of one seller or group of sellers and to differentiate them from those of competitors” (2003: 418), plays an important role in consumer markets – specifically in purchase situations marked by uncertainty with regard to the characteristics and future performance of the product in question due to flawed distribution of information (Erdem, Swait, and Louviere, 2002; Wernerfelt, 1988). In this function, brands reduce perceived risk through their impact on consumers’ evaluation of different product characteristics (e.g. quality) and further on economic and psychographic factors such as information costs and level of trust (Erdem *et al.*, 2002; Keller and Lehmann, 2006). Though it is not clear whether

²¹ With “product” we always refer to both, tangible and intangible products, i.e. services.

decisions concerning financial products respond to the same principles as other products such as consumer goods (Zhou and Pham, 2004a) a link between individual investor and consumer choice seems obvious (Aspara and Tikkanen, 2008; Thaler, 1980; Zhou and Pham, 2004b). Correspondingly, brands – and in particular corporate brands – would appear to play a similar role in capital markets (Tomczak and Coppetti, 2006) in which investors form their expectations about future stock performance based on “a set of noisy and vague variables” (Jordan and Kaas, 2002: 130). Aaker (2004: 7) defines the corporate brand as the brand of “the organization that will deliver and stand behind the offering”. As such, the corporate brand is presumed to reach a much wider audience than only consumers, including business partners, employees, and shareholders (Aspara and Tikkanen, 2011).

Aside from this behavioral effect, as shown in the previous paragraph, corporate brands can also impact risk-return considerations on a “purely financial” level. Brands also constitute “economic value”, since they generate additional cash flow through consumers’ choice of company A’s branded product over that of company B or a non-branded offering (Simon and Sullivan, 1993; Yoo, Donthu, and Lee, 2000). Several scholars of traditional financial theory (Changeur and Dherment-Ferere, 2004; De Mortanges and Rad, 1998; Kerin and Sethuraman, 1998; Lane and Jacobson, 1995; Madden, Fehle, and Fournier, 2006) have found evidence that marketing and branding do indeed influence investors’ expectations with regard to future earnings and, as a result, the respective companies’ share prices.

Though it is not possible to strictly distinguish between these two effects, our empirical design was primarily aimed at measuring the behavioral influence of corporate brands on individual investment decisions in public equity markets. Our goal in doing so is to contribute to the stream of literature on behavioral finance that deals with the familiarity effects of brands in capital markets. We build on previous research in this field (Aspara and Tikkanen, 2011; Barber and Odean, 2008; Frieder and Subrahmanyam, 2005; Huberman, 2001; Grullon *et al.*, 2004), extending it in two ways: first, we examine the effect of corporate brands on individual investors’ decisions to purchase stocks by applying a conjoint experiment among individual investors to assess the corporate brand’s relative importance to various other common criteria in stock market investments. The method of conjoint analysis is used primarily for consumer research, but has also been utilized in a financial context in several instances (e.g. Clark-Murphy and Soutar, 2004; Franke *et al.*, 2006; Hampl, Wuebker, and Wüstenhagen, 2012; Landström, 1998; Shepherd, Zacharakis, and Baron, 2003; Zacharakis, McMullen, and Shepherd, 2007). Second, we investigate whether this

brand effect is stronger in a market environment in which there is a higher level of uncertainty than in one in which there is less uncertainty by examining hypothetical investment decisions in stocks of an emerging (photovoltaic energy) versus an established (utilities) industry. We report from a dataset of 87 individual investors from Austria, Germany, and Switzerland who participated in a ratings-based conjoint experiment that required them to evaluate a series of hypothetical stocks, indicating the degree of likelihood that they would invest. An analysis of a total of 1,044 experimental stock ratings indicated a significant influence of the corporate brand relative to other investment decision criteria on the evaluation of stock offerings in both industry contexts. In addition, we found that more familiar corporate brands more significantly influence investment decisions than less-known brands.

This article proceeds as follows: the next two chapters review the literature on the influence of brands on capital markets and investment decisions and examine how familiarity biases affect investors' behavior. Further, we explain our method and provide detailed information concerning the sample and the data collection. Finally, we report and discuss our results and suggest avenues for further research.

Theory

The Impact of Brands on Capital Markets

From a modern financial theory and accounting perspective, the financial value of a brand and/or the total value of all (consumer) brands a company holds are particularly important with regard to asset valuation. In the course of mergers and acquisitions, for instance, where the difference between the value of the physical assets and the price is referred to as intangible assets or "goodwill", brands are seen as part of these intangible corporate assets that represent economic value (Aaker, 1996; Kerin and Sethuraman, 1998). This also incorporates the present value of all future returns on brand investments. Based on the efficient market theory that stock prices provide the best available unbiased estimates of a company's tangible and intangible assets (Agrawal and Kamakura, 1995; Fama, 1991), the value of a company's brand(s) would presumably also be reflected in the firm's value on the stock exchange. Kerin and Sethuraman (1998: 260) summarize this relationship by noting that "[i]f company brand names represent both an asset and a source of future earnings and cash flow, it is reasonable to speculate that their worth would manifest itself in the financial market

value of a firm and, ultimately, shareholder value". The authors conducted an exploratory study among publicly held consumer goods companies in the U.S. that validated a positive relationship between brand value and shareholder value measured by the market-to-book (M/B) ratio. Building on the same underlying hypothesis of efficient capital markets, several marketing scholars have used event study methodology to show the positive effects that a variety of marketing and branding strategies (Changeur and Dherment-Ferere, 2004), such as celebrity endorsements (Agrawal and Kamakura, 1995), product launches (Chaney, Devinney, and Winer, 1991), changes of advertising slogans (Mathur and Mathur, 1995), brand leveraging (Lane and Jacobson, 1995), and e-commerce initiatives (Subramani and Walden, 2001) can have on the market value of firms.

As outlined above, leading studies on the intersection of branding and finance from modern financial theory are built on the supposition of efficient markets and strictly rational market participants (Fama, 1991). Scholars of behavioral finance, however, have challenged this assumption on more than one occasion (Barberis and Thaler, 2003; Kahneman, 2003; Kahneman and Tversky, 1979; Shiller, 2003; Simon, 1955). This raises the question of whether investors really price brand value rationally when deciding whether to purchase, or rather if behavioral factors also play a role in influencing stock market investments in brands, thus leading to the undervaluation or overvaluation of stocks. As the following paragraph shows, several studies from within the literature on behavioral finance take the view that behavioral elements of the brand impact on capital markets are important and can lead to biases in investment decisions and even market distortion and fluctuations on an aggregated level.

The Influence of Familiarity on Individual Investors' Decision-Making

Past studies have shown in several different contexts that familiarity affects individual investors' decision-making. This manifests itself, for instance, in a stronger preference for domestic stocks (Coval and Moskowitz, 1999; French and Poterba, 1991; Grinblatt and Keloharju, 2001; Huberman, 2001; Wang *et al.*, 2011), employer stocks (Benartzi, 2001; Huberman, 2001), or stocks from companies whose products the given investors purchase (Aspara, Nyman, and Tikkanen, 2008; Aspara and Tikkanen, 2008; Frieder and Subrahmanyam, 2005; Schoenbachler, Gordon, and Aurand, 2004). In general, these studies show that familiarity with investment products moderates the perceived risk of those products (Wang *et al.*, 2011), which increases their attractiveness to investors. Such familiarity effects can also be induced

and enforced by corporate brands; in other words, investors are more likely to purchase stocks from companies whose corporate or product brands they are familiar with.

Frieder and Subrahmanyam (2005), for instance, empirically analyzed how the brand perception of a company's products impacts investors' decisions concerning ownership of stock in that firm. The authors found positive evidence that individual investors prefer to own stock in firms whose products and brands are more visible. They assert that investors have more valuable knowledge of these stocks because they are more familiar with the respective companies' offerings. They also found that the portfolios of institutional investors are more likely to contain stock in brand names due to the fact that clients are less likely to penalize them for poor performance than is the case for investments in lesser known brands and companies. Grullon *et al.* (2004) reported similar brand familiarity effects for individual investors in particular, and also found there to be a positive relationship between investor interest and a firm's advertising expenditures. They made the conclusion that "advertising helps to attract a disproportionate number of investors who, at least in part, make their investment decisions based on familiarity rather than on more fundamental information" (Grullon *et al.*, 2004: 441). More generally, Barber and Odean (2008) provided evidence that investors prefer stocks that catch their attention (e.g. via news coverage, atypical trading volumes or returns, etc.). Further, the effect of brands can also be shown with regard to other financial products such as mutual funds (Brady, Bourdeau, and Heskell, 2005; Jordan and Kaas, 2002).

In this study, we are specifically interested in the importance of the corporate brand in stock purchase decisions relative to other criteria commonly used to evaluate company shares. Research in this specific field is still rare. Baker and Haslem (1973) and Nagy and Obenberger (1994) have investigated the influence of a company's reputation relative to other investment criteria, which is quite close to the concept of a corporate brand (Aaker, 2010). The studies of Baker and Haslem (1973) and Nagy and Obenberger (1994) both report importance of the factor "firm reputation" for share purchase decisions of investors.

Based on evidence from the literature, we suggest that corporate brands do play an important role in individual investors' decision-making, though traditional criteria such as the economic prospects, management, and share price development of a company will be of greater relevance to their decisions with regard to stock purchase (Baker and Haslem, 1973; Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994).

Method

Using the method of conjoint analysis, we measured the influence of the brand on stock evaluations relative to other investment criteria. Conjoint analysis is an indirect questioning method that applies a decompositional approach to the study of decision-making processes and criteria of individuals (Green and Srinivasan, 1990). Based on the work of mathematical psychologists in the sixties it was first introduced in marketing by Green and Rao (1971). Conjoint analysis has gained a foothold within several other applied research domains, such as health care and environmental studies (Teichert and Shehu, 2009) over the last few decades. In the financial sector, conjoint analysis has been applied to decision-making processes in areas such as venture capital (Franke *et al.*, 2006; Hampl *et al.*, 2012; Muzyka, Birley, and Leleux, 1996; Riquelme and Rickards, 1992; Shepherd, 1999; Shepherd, Zacharakis, and Baron, 2003; Zacharakis, McMullen, and Shepherd, 2007), informal investing (Landström, 1998), and the investment decisions of individual investors (Clark-Murphy and Soutar, 2004).

The conjoint methodology enables the decision-making process to be partitioned into underlying response preferences for particular attributes, i.e. the characteristics of products or services. These preferences, known in technical terms as part-worth utilities and relative importance weights of attributes (independent variables), are derived from the decisions or evaluations (dependent variable) made in a series of choice or rating tasks (Green and Rao, 1971; Green and Srinivasan, 1990; Louviere *et al.*, 2003; Louviere *et al.*, 2008; McFadden, 1986). In particular, the format of indirect questioning gives this method an advantage over simply asking respondents to rate separate decision-making criteria according to their preferences. Previous studies have revealed that individuals may be biased with regard to their own behavior and thus may avoid discussing potential mistakes or non-rational behavior, and/or may even lack an understanding of their own decision-making processes (Golden, 1992; Zacharakis and Meyer, 1998). Since our goal is to investigate biases in decision-making related to familiarity with corporate brands, which might be unconscious to investors, this method seems especially appropriate to our purposes.

In this study, our approach was to apply a ratings-based full-profile conjoint analysis based on six attributes: company (corporate brand), management, growth in earnings (over the next five years), price-earnings ratio, dividend, and price development (over the last 12 months). Each of the attributes was varied at two levels (low level and high level). We used Sawtooth Software to design the conjoint

experiment in a web-based format as well as for part-worth estimation. A full factorial design involving the six attributes at two levels (2^6) would have led to 64 profiles, which would not have been manageable for the respondents. Thus, we used a near-orthogonal, efficient fractional factorial design including full profiles of twelve rating tasks (hypothetical stocks).

Two parallel questionnaires were used in order to test for differences in two industry contexts with a varying level of maturity and uncertainty (utilities and photovoltaic industry). The questionnaires were completely identical except for the attribute “corporate brand”. We chose the utilities industry as less uncertain environment as this sector is commonly seen as a defensive industry that is less dependent on the overall economic development (Becher, Jensen, and Mercer, 2008), which was also confirmed in qualitative interviews with individual investors prior to the survey. The photovoltaic industry, in contrast, is still a young sector and investments in this industry are subject to considerable uncertainty for a number of reasons, including the volatile price of oil, ongoing technological developments, and uncertainties related to public policies (IEA, 2007; Mitchell, Bauknecht, and Connor, 2006). The fact that photovoltaic companies are often relatively young adds additional uncertainty for investors, which is a lack of information about historic financial performance. To verify our assumptions, we measured risk perception related to investments in the context of these particular industries by a single item (“The investment risk in this industry is very high.”) on a scale of 1 (“totally disagree”) to 5 (“totally agree”) prior to the conjoint experiment. The results of the survey validate our assumption that the perceived investment risk was significantly lower for the utilities industry ($M = 2.68$, $SD = 0.93$) than for the photovoltaic industry ($M = 3.49$, $SD = 1.01$, Mann-Whitney U test, $p < 0.001$). Further, one might assume that the brand’s influence on individual investors’ stock evaluations is higher in the context of fledgling industries (e.g. the photovoltaic industry) than in that of established industries (such, for example, as the utilities industry) because individuals are more likely to use heuristics when uncertainty is high (Kahneman, 2003; Tversky and Kahneman, 1974).

Independent variables. The “corporate brand” is the variable under investigation in this study and is therefore included as an attribute in the conjoint design. This attribute varied in the rating tasks between two real brands either from the utilities or the photovoltaic industry (depending on the industry context). In both surveys, brand A was a well-known brand and brand B, on the other hand, was a brand where we

expected lower brand familiarity. We based our selection of brands and assumptions on brand equities retrieved from data providers such as EuPD Research's PV BrandMonitor for Germany (2009) and Semion Brand-Broker's brand€valuation (2009). In addition, we measured brand familiarity by a single-item question ("How familiar are you with the following firms of the international X-industry?" where X stands for either "utilities" or "photovoltaic") on a scale of 1 = "very familiar" to 5 = "very unfamiliar, but heard of". The responses to this question confirm our assumptions and show highly significant differences between the brand familiarity of brand A and brand B in the photovoltaic (brand A_{PV} : $M = 3.74$, $SD = 1.59$; brand B_{PV} : $M = 2.93$, $SD = 1.55$, Wilcoxon $Z = -3.30$, $p = 0.001$) and in the utilities industry context (brand $A_{Utilities}$: $M = 4.20$, $SD = 1.41$; brand $B_{Utilities}$: $M = 2.41$, $SD = 1.55$, Wilcoxon $Z = -4.17$, $p < 0.001$).

The other attributes and attribute levels for the conjoint experiment were defined based on (1) a review of the literature on criteria in individual investment decision-making; (2) 24 personal interviews with a cross-section of individual investors related to their investment decision-making process and criteria; and (3) expert interviews with three investor relations representatives from the renewable energy industry and a focus group with representatives from different financial institutions in Switzerland (most of them with direct client contact) whom we asked to share their views on the relevant investment criteria of individual investors.

The literature review reveals several studies over the past decades that investigate the attitudes and behavior of individual investors and behavioral effects on their decision-making (Antonides and Van Der Sar, 1990; Blume and Friend, 1978; Glaser and Weber, 2007; Green and Maheshwari, 1969; Kottke, 2005; Lease, Lewellen, and Schlarbaum, 1974; Odean, 1998, 1999; Potter, 1971; Riley and Chow, 1992; Warren, Stevens, and McConkey, 1990). However, empirical research on criteria – and specifically the simultaneous investigation of a larger set of criteria – that influences individual investor's portfolio decisions has been limited so far (Clark-Murphy and Soutar, 2004). One of the earliest studies on individual investor's decision criteria is attributable to classical financial theory and has been conducted by Baker and Haslem (1973). Common stock investors rated the importance of 33 criteria relevant for investment decisions. Results show that criteria that allow direct (e.g. future economic outlook) or indirect (e.g. historical trend of profitability) inferences on future development are perceived as most important. Further empirical studies are part of the behavioral finance stream. Nagy and Obenberger (1994) surveyed experienced individual shareholders about the importance of 34 criteria. They revealed that

“investors employ diverse decision criteria when choosing stocks” and that the majority of respondents base their investment decision on “classical wealth-maximization criteria such as ‘expected earnings’, ‘diversification needs’ and ‘minimizing risk’” (Nagy and Obenberger, 1994: 64). A study conducted by Clark-Murphy and Soutar (2004) shows that the average individual investor focuses on long-term wealth creation rather than speculation and pays more attention to qualitative information such as the company’s management or recent price movements than pure financial measures such as dividends or price-earning ratios.

The criteria derived from the literature review were grouped into 25 categories. These categories were then matched with the results of the personal interviews, the interviews with investor relations representatives, and the focus group. From this analysis a total set of five attributes – besides our experimental variable “corporate brand” – could be extracted that are perceived to be most important for the stock purchase decision of individual investors. The face validity and relevance of the attributes and attribute levels was confirmed in a pretest with individual investors and academics. Table 1 summarizes the list of attributes and levels used in this study. Besides the indirect measurement of the relative importance of each pre-selected investment criterion we also asked the respondents to directly rate a list of criteria on a scale of 1 = “very low importance” to 5 = “very high importance”.

Table 1. Attributes and levels used in this study

| Attributes | Description | Attribute Levels | References |
|------------------------------------|---|--|--|
| 1. Company | Company that issues the shares. This is an exemplary indicated company only. | (1) Brand A (higher brand equity) (2) Brand B (lower brand equity) | Barber and Odean (2008); Frieder and Subrahmanyam (2005); Grullon <i>et al.</i> (2004); Jordan and Kaas (2002) |
| 2. Management | Management of the share issuing company. | (1) Management has much experience in this industry (2) Management has little experience in this industry | Baker and Haslem (1973); Clark-Murphy and Soutar (2004) |
| 3. Earnings outlook (next 5 years) | Earnings outlook of an independent institution for the next 5 years. | (1) Earnings increase by trend (2) Earnings decrease by trend | Baker and Haslem (1973) |
| 4. Price-Earnings-Ratio | The price-earnings ratio (P/E ratio) is a result of dividing the share price by the earnings per share. A | (1) P/E ratio better than peer group (2) P/E ratio worse than peer group | Baker and Haslem (1973); Clark-Murphy and Soutar (2004) |

| | | | |
|---------------------------------------|---|---|---|
| | “better” (“worse”) P/E ratio in this context means that the P/E ratio of the respective company is lower (higher) than the one of the peer group. | | |
| 5. Dividend | Part of the company’s profit that is regularly issued to its shareholders. | (1) Dividends are distributed (2) No dividends distributed | Baker and Haslem (1973); Clark-Murphy and Soutar (2004) |
| 6. Price development (past 12 months) | Share price development over the past 12 months. | (1) Price rises per trend (2) Price falls per trend | Baker and Haslem (1973); Clark-Murphy and Soutar (2004); Nagy and Obenberger (1994) |

Dependent variable. The dependent variable was generated by asking the respondents to indicate how likely they would invest on a nine-point scale (1 = very unlikely to invest; 9 = very likely to invest) for a series of hypothetical stocks. Table 2 shows an example of a rating task from the conjoint experiment.

Table 2. Sample rating task from conjoint experiment

| How likely would you invest in the following share from the X ^a -industry? | | | | | | | | | |
|---|---|---|---------------------------|---|-----------|---|-----------------------|---|-------------------------|
| Company | Brand A | | | | | | | | |
| Management | Management has much experience in this industry | | | | | | | | |
| Earnings outlook (next 5 years) | Earnings increase by trend | | | | | | | | |
| Price-Earnings-Ratio | P/E ratio better than peer group | | | | | | | | |
| Dividend | Dividends are distributed | | | | | | | | |
| Price development (past 12 months) | Price falls per trend | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | Would definitely not invest | – | Would probably not invest | – | Undecided | – | Would probably invest | – | Would definitely invest |

^a Either “utilities” or “photovoltaic” depending on the industry context.

Note: As we used real brands in the conjoint experiment we included a disclaimer on the bottom of each rating task stating that all presented stock offerings were purely fictitious and that they did not relate to real market conditions or indicate past or future company performance. Further, a brief description of the attributes was shown when the respondent moved the computer mouse over the respective words.

Demographic variables. To ensure that our sample was representative of the overall population of individual investors in the relevant countries, we collected various demographic data, including respondents' country of residence, gender, age, income, education, and marital status as well as actual industry investment (i.e. number of years of investing in the relevant industry) and general stock market investment experience (number of years of stock market investment) via an accompanying questionnaire.

Sample and Data Collection

We worked jointly with the two largest German individual investor associations and the Austrian individual investor association to get access to the respondent population of individual investors in the stock market. No official individual investor association could be identified for Switzerland. The associations posted the link to the web-based questionnaire on their webpages and included a request for participation in their newsletters. In order to reach investors in Switzerland and other investors that are not members of one of the associations mentioned above we also posted the link in online blogs and discussion boards. Studies on individual investor behavior and characteristics (Birchler *et al.*, 2011; DAI, 2009a, b) show that investors from the countries in scope have similar profiles allowing for a joint investigation. As an incentive to participate we invited the respondents to take part in a raffle for six one-year subscriptions sponsored by two popular German investment magazines.

Since the market share of investors that hold stocks in photovoltaic companies was assumed to be relatively small, we took care to include a large enough sample through a screening question in the beginning of the survey. Respondents were asked to indicate whether or not they hold or held stocks in photovoltaic companies or if they had concrete interest in shares from that industry. Those who answered "yes" were automatically directed to the survey version on photovoltaic. Those who indicated "no" were asked the same question with reference to the utilities industry. Respondents who answered "no" to that question were randomly assigned to one of the two questionnaires.

A total of 143 questionnaires were returned. The sample was in a first step reduced to 95 fully completed questionnaires and in a second step respondents were excluded whose individual level regression results had an R^2 of lower than 0.300 leading to a final dataset of 87 respondents (photovoltaic: 43; utilities: 44) and 1,044 conjoint ratings (photovoltaic: 516; utilities: 528; 12 ratings per respondent). The data was

collected from March to September 2011. There were no major changes in stock market conditions during this period.

Table 3 shows the sample characteristics. More than half of the respondents ($N = 87$) are from Germany (56.3%). The average investor in our sample is male (90.8%), is 48 year old ($SD = 14.58$), has a median monthly net income of 4,000 euros, a university degree (78.2%), and is married (62.1%). Compared to the regular survey conducted by the Deutsches Aktieninstitut (DAI, 2009), the respondents in our sample are more likely to be male than the typical German stock market investor and tend to have a higher level of formal education than the average. However, other studies of individual investors report similar deviations from the overall population (e.g. the 2005 study by Dorn and Huberman, of whose 1,345 survey participants 88% were male). Dorn and Huberman (2005) further reported a median gross income per month of 3,728 euros, which is also in line with our sample (considering average inflation adjustments in income from 2005 to 2011 and an average tax rate of 24%).

Depending on industry and investment experience, the average investor from our sample reported having an average of 5.59 years ($SD = 8.16$) of industry investment experience and a median length of 15 years of experience in stock market investments.

Table 3. Sample characteristics

| Characteristics | Total Sample | | Sample 1 "Utilities" | | Sample 2 "PV" ^a | | German Individual Investors Population % ^c |
|-------------------------------------|--------------|------|-------------------------|------|-------------------------------|------|--|
| | N | % | N | % | N | % | |
| Number of Respondents ^b | N = 87 | | N = 44 | | N = 43 | | |
| <i>Country of Residence</i> | | | | | | | |
| Germany | 49 | 56.3 | 23 | 52.3 | 26 | 60.5 | 67.8 ^e |
| Austria | 21 | 24.1 | 11 | 25.0 | 10 | 23.2 | 9.5 ^e |
| Switzerland | 15 | 17.3 | 9 | 20.4 | 6 | 14.0 | 22.7 ^e |
| Other ^d | 2 | 2.3 | 1 | 2.3 | 1 | 2.3 | |
| <i>Gender</i> | | | | | | | |
| Male | 79 | 90.8 | 38 | 86.4 | 41 | 95.3 | 58.7 |
| Female | 8 | 9.2 | 6 | 13.6 | 2 | 4.7 | 41.2 |
| <i>Age</i> | | | | | | | |
| 18-29 years | 10 | 11.5 | 7 | 15.9 | 3 | 7.0 | 9.7 (10-29 years) |
| 30-39 years | 19 | 21.8 | 7 | 15.9 | 12 | 27.9 | 22.6 |
| 40-49 years | 19 | 21.8 | 11 | 25.0 | 8 | 18.6 | 24.9 |
| 50-59 years | 15 | 17.3 | 8 | 18.2 | 7 | 16.3 | 17.3 |
| 60-75 years | 24 | 27.6 | 11 | 25.0 | 13 | 30.2 | 25.4 (60-79 years) |
| <i>Monthly Net Income</i> | | | | | | | |
| Up to 1,500 EUR/ 3,000 CHF | 3 | 3.5 | 2 | 4.6 | 1 | 2.3 | |
| 1,500-3,000 EUR/ 3,000-5,000 CHF | 20 | 23.0 | 6 | 13.6 | 14 | 32.6 | |
| 3,000-5,000 EUR/ | 20 | 23.0 | 13 | 29.6 | 7 | 16.3 | |

| | | | | | | | |
|--|----|------|----|------|----|------|-------------------|
| 5,000-10,000 CHF | | | | | | | |
| 5,000-10,000 EUR/ 10,000-20,000 CHF | 18 | 20.7 | 10 | 22.7 | 8 | 18.6 | |
| Greater than 10,000 EUR/20,000 CHF | 5 | 5.7 | 3 | 6.8 | 2 | 4.6 | |
| Not specified | 21 | 24.1 | 10 | 22.7 | 11 | 25.6 | |
| <i>Highest Education</i> | | | | | | | |
| University degree | 68 | 78.2 | 36 | 81.8 | 32 | 74.4 | 34.9 |
| Secondary School Diploma | 7 | 8.0 | 3 | 6.8 | 4 | 9.3 | 8.9 |
| Apprenticeship | 3 | 3.5 | 1 | 2.3 | 2 | 4.7 | |
| Other | 9 | 10.3 | 4 | 9.1 | 5 | 11.6 | 56.2 |
| <i>Marital Status</i> | | | | | | | |
| Married | 54 | 62.1 | 29 | 65.9 | 25 | 58.1 | |
| Other | 33 | 37.9 | 15 | 34.1 | 18 | 41.9 | |
| <i>Investment Experience</i> | | | | | | | |
| 1-3 years | 5 | 6.0 | 2 | 4.8 | 3 | 7.3 | |
| 4-5 years | 8 | 9.6 | 4 | 9.5 | 4 | 9.8 | |
| 6-10 years | 9 | 10.8 | 3 | 7.1 | 6 | 14.6 | 35.9 (< 10 years) |
| 11-15 years | 13 | 15.7 | 7 | 16.7 | 6 | 14.6 | 64.1 (≥ 10 years) |
| More than 15 years | 48 | 57.8 | 26 | 61.9 | 22 | 53.7 | |
| <i>Industry Investment Experience</i> | | | | | | | |
| 0 years | 23 | 26.4 | 13 | 29.5 | 10 | 23.3 | |
| 1-5 years | 40 | 46.0 | 13 | 29.5 | 27 | 62.8 | |
| 6-10 years | 15 | 17.2 | 9 | 20.5 | 6 | 14.0 | |
| More than 10 years | 9 | 10.3 | 9 | 20.5 | 0 | 0.0 | |

^a PV stands for photovoltaic.

^b For the variables related to investment experience, the percentages, means, and standard deviations are based on the following number of respondents: Total Sample: N = 83; Sample 1 “Utilities”: N = 42; Sample 2 “PV”: N = 41. The number of respondents is smaller, as four (two per industry context) indicated that they have either less than a year of experience with direct stock investment or no experience whatsoever, so they were not asked these questions.

^c DAI (2009b).

^d Belgium and The Netherlands.

^e Percent of individual direct investors in the stock market per country; absolute numbers of shareholders for Austria and Switzerland were calculated based on population statistics from the World Bank (<http://www.worldbank.org>) for the respective year of survey data record and based on the share of stockholders with respect to total population per country from DAI (2008b) and Birchler *et al.* (2011); absolute number for Germany is based on DAI (2008a): Germany: 67.8% (6.2% in 2007; 4,047,000 shareholders); Austria: 9.5% (7.0% in 2003; approx. 568,400 shareholders); Switzerland: 22.7% (17.4% in 2010; approx. 1,357,200 shareholders).

Note: This comparison is only a proxy; the question for the country of residence refers merely to the “residence” of the respondent, i.e. this does not necessarily equate with nationality.

Results and Discussion

Table 4 below shows the actual ratings of the hypothetical stocks in the conjoint experiment. Each respondent evaluated a total of 12 stock offerings. The number combination in the second column shows which level (level 1 or level 2) per attribute

was present in the specific rating task (e.g. Stock 1: 2 1 1 2 2 1: means that for the first attribute of the first hypothetical stock the second level was present, for the second attribute the first level etc.). Please refer to Table 1 for an overview of the attributes and attribute levels. A test of differences in ratings between the industries shows no significant results. Analyzing the stock offerings and the respective ratings in more detail shows that there is a high statistically significant difference (Wilcoxon $Z = -2.77$, $p < 0.01$) between the ratings of stock offerings that contained brand A versus stock offerings that contained brand B. This partly holds true for the industry subsamples (utilities: Wilcoxon $Z = -1.77$, $p = 0.078$; photovoltaic: Wilcoxon $Z = -2.16$, $p < 0.05$).

Table 4. Ratings of the hypothetical stock offerings in the conjoint experiment

| Hypothetical Stocks | | Total Sample | | | Sample 1 "Utilities" | | | Sample 2 "PV" | | |
|---------------------|-----------------------|------------------|----------|-----------|-------------------------|----------|-----------|------------------|----------|-----------|
| | | Max ^a | <i>M</i> | <i>SD</i> | Max ^a | <i>M</i> | <i>SD</i> | Max ^a | <i>M</i> | <i>SD</i> |
| | Number of Respondents | N = 87 | | | N = 44 | | | N = 43 | | |
| Stock 1 | 2 1 1 2 2 1 | 7 | 4.52 | 1.89 | 7 | 4.23 | 1.82 | 7 | 4.81 | 1.93 |
| Stock 2 | 2 1 2 2 1 1 | 9 | 3.98 | 1.84 | 9 | 4.05 | 1.86 | 7 | 3.91 | 1.85 |
| Stock 3 | 1 2 2 2 1 2 | 9 | 2.85 | 1.97 | 7 | 2.82 | 1.83 | 9 | 2.88 | 2.13 |
| Stock 4 | 1 1 1 1 1 2 | 9 | 5.47 | 1.99 | 9 | 5.34 | 1.98 | 9 | 5.60 | 2.03 |
| Stock 5 | 1 2 2 1 2 1 | 8 | 3.63 | 1.94 | 8 | 3.43 | 1.95 | 8 | 3.84 | 1.93 |
| Stock 6 | 1 1 1 2 2 2 | 9 | 4.08 | 1.91 | 8 | 4.16 | 1.99 | 9 | 4.00 | 1.85 |
| Stock 7 | 1 2 1 2 1 1 | 9 | 4.93 | 1.81 | 9 | 4.89 | 1.86 | 7 | 4.98 | 1.78 |
| Stock 8 | 2 2 1 1 2 2 | 7 | 3.41 | 1.77 | 7 | 3.68 | 1.93 | 6 | 3.14 | 1.57 |
| Stock 9 | 2 2 2 2 2 2 | 8 | 1.83 | 1.34 | 8 | 1.95 | 1.48 | 5 | 1.70 | 1.19 |
| Stock 10 | 2 1 2 1 1 2 | 8 | 3.80 | 1.80 | 8 | 3.75 | 1.82 | 7 | 3.86 | 1.79 |
| Stock 11 | 1 1 2 1 2 1 | 9 | 4.15 | 1.85 | 7 | 3.86 | 1.80 | 9 | 4.44 | 1.87 |
| Stock 12 | 2 2 1 1 1 1 | 9 | 5.39 | 1.91 | 9 | 5.25 | 1.98 | 8 | 5.53 | 1.84 |

^a Min ratings are always 1.

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 5 contains the part-worth utilities that were estimated based on the hypothetical stocks in the conjoint experiment and the respective ratings by applying a hierarchical Bayes procedure. This estimation method is based on Bayesian statistics and called "hierarchical" as it uses information from two different aggregation levels in order to estimate part-worth utilities: (1) at the individual level, part-worth utilities are estimated by applying a linear regression model; (2) in the case of missing information on the individual level, the algorithm "borrows" information from the overall sample of respondents, which assumes that individuals' part-worths are described by a multivariate normal distribution (Johnson, 2000). In contrast to simple

OLS regression models, the hierarchical Bayes approach has the advantage of allowing for the estimation of robust part-worth utilities at the individual level (Evgeniou, Boussios, and Zacharia, 2005) and of being less prone to potential outliers (Rossi and Allenby, 2003; Kaplan, 2004). Another main advantage of this procedure is that by accounting for preference heterogeneity on the individual level it is specifically applicable in the case of fractional factorial designs (Rossi, Allenby, and McCulloch, 2005) where the application of standard OLS regression models could lead to unreliable coefficient estimates (Baier and Brusch, 2009).

The part-worth utilities reported in Table 5 are interval data and scaled to an arbitrary additive constant within each attribute; they can thus only be compared within attributes and not across attributes (Orme, 2010). Further, due to effects coding, they are zero-centered, i.e. they add up to zero within each attribute. We defined only two levels per attribute in our conjoint experiment, and the conjoint results thus also deliver only two values per attribute, one of which is positive and the other of which is negative. The positive value indicates that the particular attribute level makes a positive contribution to the overall utility of the average respondent in the sample. The values below zero negatively impact the overall utility. The results show that having a management team with much experience in the industry, increasing earnings, an increasing share price, a better P/E ratio compared to industry peers, and the distribution of dividends increases the overall utility; their counterparts, on the other hand, have a decreasing effect on utility. The signs of the part-worth values are all as expected. The part-worth values for the corporate brand attribute show that brand A makes a positive contribution to the overall utility ($U M_{Brand A} = 20.18$) whereas brand B makes a negative contribution ($U M_{Brand B} = -20.18$). The results for the levels of the corporate brand attribute thus reflect a very significant difference between the ratings of stock offerings that contained brand A and the ratings that contained brand B that we found in analyzing the raw data displayed in Table 4. However, we could not identify any statistically significant difference between the part-worth values of the two industry subsamples.

The conjoint results related to the difference in utility contribution between brand A and brand B also correspond to the significant differences between the familiarity scores of the two brands for both industry contexts (brand A_{PV}: $M = 3.74$, $SD = 1.59$; brand B_{PV}: $M = 2.93$, $SD = 1.55$, Wilcoxon $Z = -3.30$, $p = 0.001$; brand A_{Utilities}: $M = 4.20$, $SD = 1.41$; brand B_{Utilities}: $M = 2.41$, $SD = 1.55$, Wilcoxon $Z = -4.17$, $p < 0.001$). See Table 6 for a detailed overview of the brand familiarity ratings per brand and industry. The combined findings from the conjoint analysis and brand familiarity

ratings suggest that brands with which investors are more familiar exert more influence on investment decisions than less familiar brands. These results are in line with studies conducted by various scholars, such as Frieder and Subrahmanyam (2005) and Barber and Odean (2008). The familiarity effect holds true for both industry contexts and thus for varying levels of market uncertainty.

Table 5. Results of the hierarchical Bayes estimation: total sample and subsamples

| | Total Sample | | Sample 1 "Utilities" | | Sample 2 "PV" | |
|---|--------------|-------|-------------------------|-------|------------------|-------|
| | UM^a | SD | UM^a | SD | UM^a | SD |
| Number of Respondents | N = 87 | | N = 44 | | N = 43 | |
| Number of Observations | N = 1,044 | | N = 516 | | N = 528 | |
| Attributes and Levels | UM^a | SD | UM^a | SD | UM^a | SD |
| <i>Company</i> | | | | | | |
| Brand A | 20.18 | 52.58 | 12.41 | 48.86 | 25.97 | 56.71 |
| Brand B | -20.18 | 52.58 | -12.41 | 48.86 | -25.97 | 56.71 |
| <i>Management</i> | | | | | | |
| Management has much experience in this industry | 37.22 | 46.89 | 34.43 | 40.05 | 38.38 | 55.38 |
| Management has little experience in this industry | -37.22 | 46.89 | -34.43 | 40.05 | -38.38 | 55.38 |
| <i>Earnings Outlook (next five years)</i> | | | | | | |
| Earnings increase by trend | 66.34 | 38.43 | 70.71 | 38.21 | 59.21 | 42.48 |
| Earnings decrease by trend | -66.34 | 38.43 | -70.71 | 38.21 | -59.21 | 42.48 |
| <i>Price-Earnings-Ratio</i> | | | | | | |
| P/E ratio better than peer group | 31.16 | 38.58 | 27.28 | 46.18 | 34.16 | 34.15 |
| P/E ratio worse than peer group | -31.16 | 38.58 | -27.28 | 46.18 | -34.16 | 34.15 |
| <i>Dividend</i> | | | | | | |
| Dividends are distributed | 45.46 | 33.05 | 45.75 | 38.60 | 42.37 | 29.36 |
| Dividends are not distributed | -45.46 | 33.05 | -45.75 | 38.60 | -42.37 | 29.36 |
| <i>Price Development (past 12 months)</i> | | | | | | |
| Price rises per trend | 47.37 | 39.22 | 41.88 | 44.60 | 52.01 | 36.02 |
| Price falls per trend | -47.37 | 39.22 | -41.88 | 44.60 | -52.01 | 36.02 |
| Average R^2 ^b | 0.644 | | 0.602 | | 0.696 | |

^a The average utilities (UM) are equal to the posterior population means across the saved draws (as suggested by Train (2009) only every tenth was retained of a total of 10,000 draws after convergence had been achieved and used for calculation in order to reduce the correlation among draws from Gibbs sampling) reported with the standard deviation of the individual coefficients' values (across the respondents in the sample or subsample) per attribute level in the subsequent columns.

Coefficient estimates are interval-scaled and zero-centered (according to the zero-centered diff method by Sawtooth Software (1999)) within attributes. The average utilities for the samples 1 ($N = 44$) and 2 ($N = 43$) are estimated separately; estimates of the total sample are based on a consolidated dataset from sample 1 and 2 ($N = 87$). There is no significant difference between the part-worth utilities of sample 1 and 2.

^b The average R^2 equals the average squared correlation between each respondent's predicted and actual rating for the 12 hypothetical stocks in the conjoint experiment (dependent variable) (Sawtooth Software, 2002).

Table 6. Familiarity ratings of brands

| Number of Respondents | Sample 1 "Utilities" | | Sample 2 "PV" | |
|--|-------------------------|------|---------------------|------|
| | N = 44 | | N = 43 | |
| Characteristics | M/N | SD/% | M/N | SD/% |
| <i>Brand Familiarity Brand A (PV)</i> | | | | |
| Avg. rating | | | 3.74** ^a | 1.59 |
| 1 (low) | | | 8 | 18.6 |
| 2 | | | 2 | 4.7 |
| 3 | | | 6 | 14.0 |
| 4 | | | 4 | 9.3 |
| 5 (high) | | | 23 | 53.5 |
| <i>Brand Familiarity Brand B (PV)</i> | | | | |
| Avg. rating | | | 2.93** ^a | 1.55 |
| 1 (low) | | | 12 | 27.9 |
| 2 | | | 7 | 16.3 |
| 3 | | | 5 | 11.6 |
| 4 | | | 10 | 23.3 |
| 5 (high) | | | 9 | 20.9 |
| <i>Brand Familiarity Brand A (Utilities)</i> | | | | |
| Avg. rating | 4.20*** | 1.41 | | |
| 1 (low) | 6 | 13.6 | | |
| 2 | 0 | 0.0 | | |
| 3 | 3 | 6.8 | | |
| 4 | 5 | 11.4 | | |
| 5 (high) | 30 | 68.2 | | |
| <i>Brand Familiarity Brand B (Utilities)</i> | | | | |
| Avg. rating | 2.41*** | 1.55 | | |
| 1 (low) | 19 | 43.2 | | |
| 2 | 7 | 15.9 | | |
| 3 | 7 | 15.9 | | |
| 4 | 3 | 6.8 | | |
| 5 (high) | 8 | 18.2 | | |

^a $p = 0.001$.

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

In Table 7 the part-worth utilities are transformed to relative importance values for each attribute by taking the difference between the highest and the lowest part-worth utility within each attribute and then scaling this value to 100% across attributes (Orme, 2010). Because these values constitute percentages and can be compared across attributes, they are easier to interpret. The results show that the corporate brand has a minor, but statistically significant influence on investors' decision whether to invest in both industry contexts, while the influence of the brand in the utilities context is marginally higher than in the photovoltaic context. The most important attribute is growth in earnings, followed by price development, management, and dividend. The

second-least important criterion is the price-earnings ratio. These results are in accordance with Nagy and Obenberger (1994) who show that about 40% of the experienced private shareholders in their sample do not make use of valuation models –including such simple ones as the price-earnings ratio – but instead pay greater attention to criteria that indicate future development, such as expected earnings. In the post-experiment questionnaire 87.4% (N = 76) of the respondents indicated long-term wealth as one of their primary investment goals, which suggests that the results are also in line with Baker and Haslem (1973) and Clark-Murphy and Soutar (2004). The authors show that the average investor in their study focuses more on creating long-term wealth than on speculation and pays greater attention to qualitative information such as the company's management or recent price movements than on factors of a strictly financial nature, such as dividends or price-earning ratios. The results of the direct attribute ratings from the post-experiment questionnaire also support the rankings of the investment criteria's relative importance. Figure 1 displays the ratings from 1 = "very low importance" to 5 = "very high importance" for the investment decision that the average respondent (N = 87) attributes to the criteria also used in the conjoint experiment. The reversals of price development and earnings outlook as well as P/E ratio and dividend compared to the relative importance rankings of the total sample mirrors the differences in the direct ratings between the industry samples. A direct comparison of the conjoint results with the direct rating of attributes for the corporate brand, however, is problematic in that brands' direct and indirect effects are inseparable. Investors who are surveyed, for example, may associate a strong brand with stronger future sales and accordingly, greater firm value; as a result, they may rate the brand as of greater importance. In our conjoint experiment, we exposed investors to different corporate brands (using the logos of real brands) with the specific aim of measuring the direct, (more) behavioral effects of brands on individual investors' preferences with regard to stock offerings.

From a behavioral finance perspective, it is also interesting that the average investor in our sample, when asked directly, ranks the attribute "price development", which relates to the price trend over the past 12 months, as more important than future-oriented information such as expected earnings. Though the majority of financial forecasting models are based on historical data, past share price behavior does not necessarily indicate future price trends and thus might mislead investment decisions (Baker and Nofsinger, 2002). The conjoint results, where the importance of investment criteria was indirectly measured, show that investors actually and intuitively pay more attention to the earnings outlook than to past price development.

A similar effect is examined for the price-earnings-ratio, to which respondents who were questioned directly assigned greater importance than the results of the conjoint analysis suggest where the P/E ratio only ranked second to last.

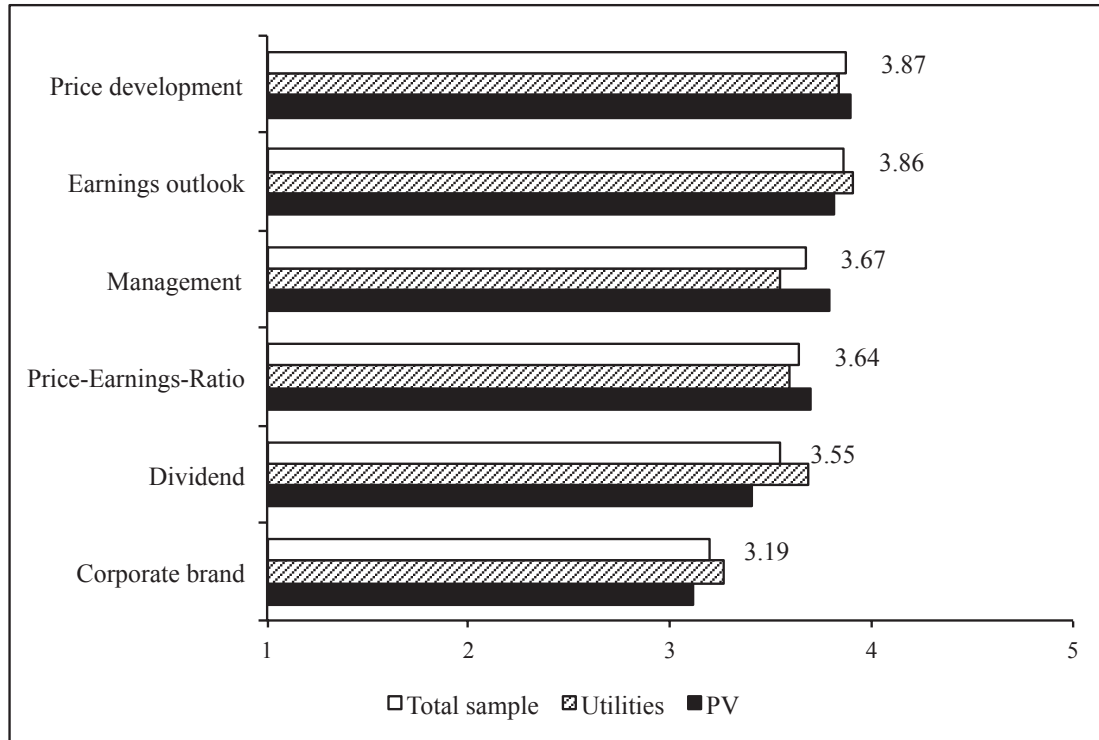


Figure 1. Average direct ratings of investment criteria

Though the effect of the corporate brand on the overall rating is quite low, the influence is nevertheless statistically significant and different from zero. This indicates that the corporate brand does play a role in the investment decision of individual investors. This finding is in line with the prevailing literature in this field (Barber and Odean, 2008; Frieder and Subrahmanyam, 2005).

Comparing the two industry contexts, the results suggest a slightly greater relative importance of the corporate brand in the high uncertainty context (PV industry; $M_{Company\ PV} = 13.98\%$) compared to the low uncertainty context (utilities industry; $M_{Company\ Utilities} = 12.65\%$). However, this difference is not statistically significant (Mann-Whitney U test, $p = 0.905$). Interestingly, however, respondents in the utilities sample attributed greater importance to the dividend ($M_{Dividend\ Utilities} = 16.16\%$), while respondents to the PV questionnaire paid greater attention to the company's management ($M_{Management\ PV} = 17.94\%$). This difference could be due to the differing maturity of these two industries and their principal players. More mature companies

operating in an established industry are more likely to distribute dividends than companies that are still at the beginning of their development curve, and are more likely to invest profits in their future growth than to pay dividends to shareholders. Fundamentals such as the management thus seem to be of higher relative importance in stock evaluations for emerging companies and industries, which further underscores our argument that qualitative information is more important in a high-uncertainty context than factors of a strictly financial nature (the P/E ratio ranked lowest in the PV industry sample, $M_{P/E \text{ ratio PV}} = 13.19\%$, yet came in third in the Utilities sample, $M_{P/E \text{ ratio Utilities}} = 14.79\%$).

Table 7. Relative importance values of attributes in total sample and industry subsamples

| Number of Respondents | Total Sample | | Sample 1 "Utilities" | | Sample 2 "PV" | |
|---------------------------------------|--------------------------------------|-------|--------------------------------------|-------|--------------------------------------|-------|
| | N = 87 | | N = 44 | | N = 43 | |
| Attributes | Relat. Imp. M % ^a | SD | Relat. Imp. M % ^a | SD | Relat. Imp. M % ^a | SD |
| Earnings outlook (next five years) | 23.23 | 10.63 | 24.39 | 11.05 | 21.68 | 10.87 |
| Price development (past 12 months) | 18.12 | 9.55 | 17.66 | 10.06 | 18.83 | 9.43 |
| Management | 16.13 | 11.70 | 14.34 | 10.13 | 17.94 | 13.38 |
| Dividend | 15.50 | 10.52 | 16.16 | 11.67 | 14.39 | 9.38 |
| Price-Earnings-Ratio | 13.85 | 8.97 | 14.79 | 9.88 | 13.19 | 9.18 |
| Company | 13.17 | 13.32 | 12.65 | 10.91 | 13.98 | 15.30 |
| Total | 100 | | 100 | | 100 | |

^a The relative importance values for each attribute are calculated by taking the difference between the highest and the lowest part-worth utility within each attribute and scaling this value to 100% across attributes (Orme, 2010). Thus, the relative importance values of all attributes add up to 100%. There is no statistically significant difference between the relative importance values of samples 1 and 2.

Contributions to Research

Our study contributes to the literature on the intersection of behavioral finance and marketing – more specifically, on the effect of familiarity with respect to corporate brands on individual investors' decision making. Though numerous scholars have investigated the effects that (corporate) brands have in a financial context (Aspara and Tikkanen, 2011; Barber and Odean, 2008; Brady, Bourdeau, and Heskell, 2005; Frieder and Subrahmanyam, 2005; Grullon *et al.*, 2004; Jordan and Kaas, 2002) the resulting studies have examined these effects in isolation from other traditional investment

criteria, such as earnings expectations, share price development, a company's management, or the industry context in which the firm operates.²² To deepen our understanding of the corporate brand's importance relative to other investment-related factors in stock purchase decisions, we conducted a ratings-based conjoint experiment comprising 1,044 experimental investment decisions made by 87 individual investors from Austria, Germany, and Switzerland. The conjoint analysis method is frequently used for marketing research purposes in fields such as pricing and product development to determine how various certain product characteristics contribute to the overall utility of an offering. This method has also been shown to be useful for investigating the relative importance of characteristics of financial products such as stocks (Clark-Murphy and Soutar, 2004), but as yet few scholars have applied it.

Our study builds on previous research in this area (Aspara and Tikkanen, 2011; Barber and Odean, 2008; Frieder and Subrahmanyam, 2005; Huberman, 2001; Grullon *et al.*, 2004) and confirms these scholars' findings that corporate brands do influence the investment decision of individual investors and that this effect is stronger for more familiar brands than for those that are less familiar. However, the results show that classical stock investment criteria such as growth in earnings, price development, management, and the paying of dividends are of the greatest relative importance to the average investor in our sample. This corresponds to the findings of Nagy and Obenberger (1994) and Baker and Haslem (1973), who find similar rankings for reputation-related factors compared to other investment criteria. A specific new feature of our study is that we examined the effects that corporate brands have on decisions related to the purchasing of stocks in two different industry contexts that differ with regard to the degree of uncertainty that is associated with them: the photovoltaic energy industry (high uncertainty) and the utilities industry (low uncertainty). One might expect that, as in consumer markets, where brands play a decisive role in purchase situations that are characterized by high uncertainty with regard to products' characteristics and future performance (Erdem *et al.*, 2002; Wernerfelt, 1988), corporate brands would be of greater relative importance in more uncertain, emerging industry environments than in more established ones. Our study found no such context-related difference with regard to the relative importance of the brand. It did, however, indicate that it was of slightly greater importance for respondents from the

²² As mentioned above, two exceptions here are Baker and Haslem (1973) and Nagy and Obenberger (1994) who investigated the relative influence of a company's reputation to other investment criteria, whereas the concept of "corporate reputation" or "firm reputation" is quite close to the corporate brand concept (Aaker, 2010).

utilities sample whether a company distributes dividends than for respondents from the photovoltaic sector, for whom a company's management seemed to be of greater concern.

Managerial Implications

Our findings are of particular interest to corporate brand managers and professionals in the fields of marketing, communications, and investor relations, who are all often faced with the question of the financial return on their investments. Historically, brand managers have primarily focused on building brand awareness and maintaining a positive image among consumers. Our study, however, found that brands – corporate brands in particular – also affect demand among individual investors in stocks. Though scholars have found evidence of a certain spillover between marketing activities from consumer markets and financial markets (Aspara and Tikkanen, 2011), specific measures to increase brand visibility and affinity on capital markets (e.g. advertising in financial magazines, sponsoring respective conferences, incorporating branding in communications and investor relations activities, etc.) in fact create “return on investment” in terms of better market liquidity and, potentially, cost of capital (Grullon *et al.*, 2004). The notion of “share marketing” and “share branding” is not new in the industry (cf. Tomczak and Coppetti, 2006), but is not widely employed in Europe or, more specifically, in German-speaking countries. Discussion of this subject in the literature is largely based on the viewpoint of practitioners. Empirical findings from academic research related to the impact of corporate brands on investors' decision-making might therefore add another interesting perspective to this field.

Our findings are of specific interest to representatives of the power generation and renewable technology industries, as they underline the importance of marketing and branding in these industry sectors, which in contrast to traditional consumer goods companies typically are not equipped with large advertising budgets. In particular, our results suggest that companies in this sector should increase their corporate brand visibility in capital markets in order to increase the share of individual – and also institutional – investors. Non-Western and emerging photovoltaic companies, in particular, are growing increasingly aware of spillover effects between marketing and branding on debt capital markets. An interview-based study conducted by Hampl *et al.* (2011) indicated that the familiarity of a photovoltaic company influences the

“bankability” of that firm. Thus, as also shown by Frieder and Subrahmanyam (2005) and Grullon *et al.* (2004), spillover effects between marketing in consumer markets and capital markets also occur among institutional investors, though these effects are perceived to be less significant than among individual investors.

Limitations and Further Research

We also encountered some limitations. The personal interviews and a review of the literature showed that stock market investments are quite complex and that investors use a variety of different criteria in their purchase decisions (Baker and Haslem, 1973; Clark-Murphy and Soutar, 2004; Nagy and Obenberger, 1994). This study could therefore only investigate a fraction of the relevant attributes and attribute levels; as such, plenty of room remains for further research. The importance of the corporate brand can only be evaluated in relation to the nature and number of the other criteria included in the conjoint experiment. Further studies using the same or different methodology might thus increase the number of characteristics that describe stock market offerings or use criteria (aside from the corporate brand attribute) other than those applied in our study. Future research might also want to distinguish specifically between the direct – i.e. behavioral – and indirect – i.e. related to the (future) financial value of a brand – effects that brands have on individual investors. Further, respondents in survey settings are typically pressed for time due to limited opportunity to postpone or reflect on potential alternatives for a longer period of time (at least, that is, if they are unable to set the survey aside and resume at a later point). The literature indicates that decision-making is different under time constraints (Ben Zur and Breznitz, 1981).

With regard to the context of the stock ratings, scholars have shown that deciding to sell is different from deciding to purchase financial assets (Barber and Odean, 2008; Kottke, 2005; Odean, 1999). Thaler (1980), for instance, reported that the price or perceived value of a good varies between buying and selling situations. Huberman (2001) also suggests that investors are more likely to buy and hold familiar stocks than to sell them. Thus, the effect of the corporate brand on individual investors’ selling decisions might be inversed, i.e. the higher the familiarity with the particular brand, the less likely the investor is to sell that particular stock. Our study’s scope is limited to purchase decisions. The importance of corporate brands in selling decisions might thus be an interesting extension of this study. Other interesting avenues of research

might be the inclusion of monetary incentives in the conjoint design (Netzer *et al.*, 2008) or the investigation of preference heterogeneity related to investors' emotional state or mood (Kottke, 2005).

As our overall sample is too small to conduct meaningful subsample analyses e.g. with regard to demographic variables, future research might do well to increase the number of respondents to test for differences between groups. Past studies have specifically shown that gender (Baker and Haslem, 1974a, b; Eckel *et al.*, 2008; Lewellen, Lease, and Schlarbaum, 1977; Olsen and Cox, 2001; Powell and Ansic, 1997; Schubert *et al.*, 1999), age (Baker and Haslem, 1974a, b; Lewellen *et al.*, 1977; Riley and Chow, 1992), income (Lewellen *et al.*, 1977; Riley and Chow, 1992; Warren *et al.*, 1990), wealth (Cohn *et al.*, 1975), education (Riley and Chow, 1992; Warren *et al.*, 1990), and marital status (Warren *et al.*, 1990) can considerably impact risk perception, risk preference, investment decision-making, and investment criteria. Past empirical evidence also suggests that the influence of brands on risk perception (and thus on investment decision-making) seems to be stronger for uninformed investors than for informed investors (Jordan and Kaas, 2002).

Another promising avenue for further research in this area might be to compare the impact of brands on investment decisions between completely different industry sectors. In the energy sector, on which this study was focused, companies typically use their corporate brand to brand their products as well. In the consumer goods industry, on the other hand, firms tend to have a large number of different product brands that are well known to the average consumer (and thus presumably to the average investor, if one considers spillover effects between these different economic roles) under the umbrella of one corporate brand with which individuals are often not as familiar (e.g. Procter and Gamble, Unilever, Kraft Foods, Nestlé). When comparing different industry sectors, one must also take into account the vast potential differences among advertising expenditures, which have a tremendous impact on the visibility of brands in general (e.g. Grullon *et al.*, 2004) and traditionally are higher for consumer goods companies than for industrial firms.

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References

- Aaker DA. 1996. *Building Strong Brands*. Free Press: New York, NY.
- Aaker DA. 2004. Leveraging the corporate brand. *California Management Review* 46(3): 6-18.
- Aaker J. 2010. Rethinking brands. Executive Circle Webinars, Stanford Graduate School of Business. <http://www.gsb.stanford.edu> [17 May 2010].
- Agrawal J, Kamakura WA. 1995. The economic worth of celebrity endorsers: an event study analysis. *Journal of Marketing* 59(3): 56-62.
- Antonides G, Van Der Sar NL. 1990. Individual expectations, risk perception and preferences in relation to investment decision making. *Journal of Economic Psychology* 11(2): 227-245.
- Aspara J, Nyman H, Tikkanen H. 2008. Influence of share ownership on repeat patronage. *Journal of Customer Behaviour* 7(2): 149-163.
- Aspara J, Tikkanen H. 2008. Interactions of individuals' company-related attitudes and their buying of companies' stocks and products. *Journal of Behavioral Finance* 9(2): 85-94.
- Aspara J, Tikkanen H. 2011. Corporate marketing in the stock market: the impact of company identification on individuals' investment behaviour. *European Journal of Marketing* 45(9): 1446-1469.
- Baier D, Bruschi M (eds). 2009. *Conjointanalyse: Methoden, Anwendungen, Praxisbeispiele*. Springer: Berlin, Heidelberg.
- Baker HK, Haslem JA. 1973. Information needs of individual investors. *Journal of Accountancy* 136(5): 64-69.
- Baker HK, Haslem JA. 1974a. The impact of investor socioeconomic characteristics on risk and return preferences. *Journal of Business Research* 2(4): 469-476.
- Baker HK, Haslem JA. 1974b. Toward the development of client-specified valuation models. *Journal of Finance* 29(4): 1255-1263.
- Baker HK, Nofsinger JR. 2002. Psychological biases of investors. *Financial Services Review* 11(2): 97-116.
- Barber BM, Odean T. 2008. All that glitters: the effect of attention and news on the buying behavior of individual and institutional investors. *Review of Financial Studies* 21(2): 785-818.

- Barberis N, Thaler R. 2003. Chapter 18: a survey of behavioral finance. In *Handbook of the Economics of Finance*, Constantinides GM, Harris M, Stulz RM (eds). North-Holland: Amsterdam; 1053-1128.
- Becher DA, Jensen GR, Mercer JM. 2008. Monetary policy indicators as predictors of stock returns. *Journal of Financial Research* **31**(4): 357-379.
- Ben Zur H, Breznitz SJ. 1981. The effect of time pressure on risky choice behavior. *Acta Psychologica* **47**(2): 89-104.
- Benartzi S. 2001. Excessive extrapolation and the allocation of 401(k) accounts to company stock. *Journal of Finance* **56**(5): 1747-1764.
- Birchler U, Volkart R, Ettl D, Heggin R. 2011. Aktienbesitz in der Schweiz 2010. Institute for Banking und Finance, University of Zurich. <http://www.bf.uzh.ch> [31 August 2012].
- Blume ME, Friend I. 1978. *The Changing Role of the Individual Investor: A Twentieth Century Fund Report*. Wiley: New York, NY.
- Brady MK, Bourdeau BL, Heskell J. 2005. The importance of brand cues in intangible service industries: an application to investment services. *Journal of Services Marketing* **19**(6): 401-410.
- Chaney PK, Devinney TM, Winer RS. 1991. The impact of new product introductions on the market value of firms. *Journal of Business* **64**(4): 573-610.
- Changeur S, Dherment-Ferere I. 2004. From customer-based brand equity to firm-based brand equity: a study of stock market reactions to brand strategy announcements. Paper presented at the 33rd EMAC Conference, Murcia, Spain.
- Clark-Murphy M, Soutar GN. 2004. What individual investors value: some Australian evidence. *Journal of Economic Psychology* **25**(4): 539-555.
- Cohn RA, Lewellen WG, Lease RC, Schlarbaum GG. 1975. Individual investor risk aversion and investment portfolio composition. *Journal of Finance* **30**(2): 605-620.
- Coval JD, Moskowitz TJ. 1999. Home bias at home: local equity preference in domestic portfolios. *Journal of Finance* **54**(6): 2045-2073.
- DAI. 2008a. In turbulenten Zeiten – Aktionärszahlen rückläufig, DAI-Kurzstudie 2/2008. Deutsches Aktieninstitut. <http://www.dai.de/> [31 August 2012].
- DAI. 2008b. DAI-Factbook. Deutsches Aktieninstitut. <http://www.dai.de/> [31 August 2012].
- DAI. 2009a. Privataktionäre in börsennotierten Unternehmen: Ergebnisse einer Umfrage. Deutsches Aktieninstitut. <http://www.dai.de/> [31 August 2012].

- DAI. 2009b. Verhalten und Präferenzen deutscher Aktionäre. Deutsches Aktieninstitut. <http://www.dai.de/> [31 August 2012].
- De Mortanges CP, Rad AT. 1998. Marketing strategy and market value: an event-study analysis. *European Management Journal* **16**(3): 365-371.
- Dorn D, Huberman G. 2005. Talk and action: what individual investors say and what they do. *Review of Finance* **9**(4): 437-481.
- Eckel CC, Grossman PJ, Charles RP, Vernon LS. 2008. Men, Women and Risk Aversion: Experimental Evidence. In *Handbook of Experimental Economics Results*, Plott CR, Smith VL (eds). North-Holland: Amsterdam; 1061-1073.
- Erdem T, Swait J, Louviere J. 2002. The impact of brand credibility on consumer price sensitivity. *International Journal of Research in Marketing* **19**(1): 1-19.
- EuPD Research. 2009. PV BrandMonitor 2008/2009 – Germany, brand awareness of solar manufacturers in the German photovoltaic market. <http://www.eupd-research.com> [25 February 2010].
- Evgeniou T, Boussios C, Zacharia G. 2005. Generalized robust conjoint estimation. *Marketing Science* **24**(3): 415-429.
- Fama EF. 1991. Efficient capital markets: II. *Journal of Finance* **46**(5): 1575-1617.
- Franke N, Gruber M, Harhoff D, Henkel J. 2006. What you are is what you like – similarity biases in venture capitalists' evaluations of start-up teams. *Journal of Business Venturing* **21**(6): 802-826.
- French KR, Poterba JM. 1991. Investor diversification and international equity markets. *American Economic Review* **81**(2): 222-226.
- Frieder L, Subrahmanyam A. 2005. Brand perceptions and the market for common stock. *Journal of Financial and Quantitative Analysis* **40**(1): 57-85.
- Glaser M, Weber M. 2007. Why inexperienced investors do not learn: they do not know their past portfolio performance. *Finance Research Letters* **4**(4): 203-216.
- Golden BR. 1992. The past is the past – or is it? The use of retrospective accounts as indicators of past strategy. *Academy of Management Journal* **35**(4): 848-860.
- Green PE, Maheshwari A. 1969. Common stock perception and preference: an application of multidimensional scaling. *The Journal of Business* **42**(4): 439-457.
- Green PE, Rao VR. 1971. Conjoint measurement for quantifying judgmental data. *Journal of Marketing Research* **8**(3): 355-363.
- Green PE, Srinivasan V. 1990. Conjoint analysis in marketing: new developments with implications for research and practice. *Journal of Marketing* **54**(4): 3-19.
- Grinblatt M, Keloharju M. 2001. How distance, language, and culture influence stockholdings and trades. *Journal of Finance* **56**(3): 1053-1073.

- Grullon G, Kanatas G, Weston JP. 2004. Advertising, breadth of ownership, and liquidity. *Review of Financial Studies* **17**(2): 439-461.
- Hampl N, Lüdeke-Freund F, Flink C, Olbert S, Ade V. 2011. The myth of bankability: definition and management in the context of photovoltaic project financing in Germany. goetzpartners and COLEXON (eds). <http://www.goetzpartners.com> [31 August 2012].
- Hampl N, Wuebker R, Wüstenhagen R. 2012. A joint test of status hierarchies and personal ties in VC decision-making. Paper presented at the Academy of Management (AOM) Annual Meeting, Boston, MA.
- Hoyer WD, Brown SP. 1990. Effects of brand awareness on choice for a common, repeat-purchase product. *Journal of Consumer Research* **17**(2): 141-148.
- Huberman G. 2001. Familiarity breeds investment. *Review of Financial Studies* **14**(3): 659-680.
- IEA. 2007. Climate policy uncertainty and investment risk. International Energy Agency. <http://www.iea.org> [31 August 2012].
- Johnson RM. 2000. Understanding HB: an intuitive approach. *Sawtooth Software Research Paper Series* March. <http://www.sawtoothsoftware.com> [24 August 2012].
- Jordan J, Kaas KP. 2002. Advertising in the mutual fund business: the role of judgmental heuristics in private investors' evaluation of risk and return. *Journal of Financial Services Marketing* **7**: 129-140.
- Kahneman D. 2003. Maps of bounded rationality: psychology for behavioral economics. *American Economic Review* **93**(5): 1449-1475.
- Kahneman D, Tversky A. 1979. Prospect theory: an analysis of decision under risk. *Econometrica* **47**(2): 263-291.
- Kaplan D (ed). 2004. *The Sage Handbook of Quantitative Methodology for the Social Sciences*. Sage Publications: Thousand Oaks, CA.
- Keller KL, Lehmann DR. 2006. Brands and branding: research findings and future priorities. *Marketing Science* **25**(6): 740-759.
- Keller KL. 1993. Conceptualizing, measuring, and managing customer-based brand equity. *Journal of Marketing* **57**(1): 1-22.
- Kerin RA, Sethuraman R. 1998. Exploring the brand value-shareholder value nexus for consumer goods companies. *Journal of the Academy of Marketing Science* **26**(4): 260-273.
- Kilka M, Weber M. 2000. Home bias in international stock return expectations. *Journal of Psychology and Financial Markets* **1**(3/4): 176-192.

- Kotler P. 2003. *Marketing Management*. Prentice Hall: New York, NY.
- Kottke N. 2005. *Entscheidungs- und Anlageverhalten von Privatinvestoren: Psychologische Aspekte der Wertpapieranlage*. Deutscher Universitäts-Verlag: Wiesbaden, Germany.
- Landström H. 1998. Informal investors as entrepreneurs. *Technovation* **18**(5): 321-333.
- Lane V, Jacobson R. 1995. Stock market reactions to brand extension announcements: the effects of brand attitude and familiarity. *Journal of Marketing* **59**(1): 63-77.
- Lease RC, Lewellen WG, Schlarbaum GG. 1974. The individual investor: attributes and attitudes. *Journal of Finance* **29**(2): 413-433.
- Lewellen WG, Lease RC, Schlarbaum GG. 1977. Patterns of investment strategy and behavior among individual investors. *Journal of Business* **50**(3): 296-333.
- Louviere JJ, Hensher DA, Swait J, Adamowicz W. 2003. *Stated Choice Methods Analysis and Applications*. Cambridge University Press: Cambridge, UK.
- Louviere JJ, Islam T, Wasi N, Street D, Burgess L. 2008. Designing discrete choice experiments: do optimal designs come at a price? *Journal of Consumer Research* **35**(2): 360-375.
- Lynch P. 2000. *One Up on Wall Street: How to Use What You Already Know to Make Money in the Market*. Simon & Schuster: New York, NY.
- Madden TJ, Fehle F, Fournier S. 2006. Brands matter: an empirical demonstration of the creation of shareholder value through branding. *Journal of the Academy of Marketing Science* **34**(2): 224-235.
- Mathur LK, Mathur I. 1995. The effect of advertising slogan changes on the market value of firms. *Journal of Advertising Research* **35**(1): 59-65.
- McFadden D. 1986. The choice theory approach to market research. *Marketing Science* **5**(4): 275-297.
- Mitchell C, Bauknecht D, Connor P. 2006. Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in system in Germany. *Energy Policy* **34**(3): 297-305.
- Muzyka D, Birley S, Leleux B. 1996. Trade-offs in the investment decisions of European venture capitalists. *Journal of Business Venturing* **11**(4): 273-287.
- Nagy RA, Obenberger RW. 1994. Factors influencing individual investor behavior. *Financial Analysts Journal* **50**(4): 63-68.
- Netzer O, Toubia O, Bradlow ET, Dahan E, Evgeniou T, Feinberg FM, Feit EM, Hui SK, Johnson J, Liechty JC, Orlin JB, Rao VR. 2008. Beyond conjoint analysis: advances in preference measurement. *Marketing Letters* **19**(3): 337-354.

- Odean T. 1998. Are investors reluctant to realize their losses? *Journal of Finance* **53**(5): 1775-1798.
- Odean T. 1999. Do investors trade too much? *American Economic Review* **89**(5): 1279-1298.
- Olsen RA, Cox CM. 2001. The influence of gender on the perception and response to investment risk: the case of professional investors. *Journal of Psychology and Financial Markets* **2**(1): 29-36.
- Orme BK. 2010. *Getting Started with Conjoint Analysis: Strategies for Product Design and Pricing Research*. Research Publishers: Madison, WI.
- Potter RE. 1971. An empirical study of motivations of common stock investors. *Southern Journal of Business* **6**: 41-48.
- Powell M, Ansic D. 1997. Gender differences in risk behaviour in financial decision-making: an experimental analysis. *Journal of Economic Psychology* **18**(6): 605-628.
- Riley WB, Chow KV. 1992. Asset allocation and individual risk aversion. *Financial Analysts Journal* **48**(6): 32-37.
- Riquelme H, Rickards T. 1992. Hybrid conjoint analysis: an estimation probe in new venture decisions. *Journal of Business Venturing* **7**(6): 505-518.
- Rossi PE, Allenby GM, McCulloch R. 2005. *Bayesian Statistics and Marketing*. John Wiley & Sons: Chichester, UK.
- Rossi PE, Allenby GM. 2003. Bayesian statistics and marketing. *Marketing Science* **22**(3): 304-328.
- Sawtooth Software. 1999. Scaling conjoint part worths: points vs. zero-centered diffs. <http://www.sawtoothsoftware.com> [31 August 2012].
- Sawtooth Software. 2002. CVA/HB technical paper. *Sawtooth Software Technical Paper Series*. <http://www.sawtoothsoftware.com> [31 August 2012].
- Schoenbachler DD, Gordon GL, Aurand TW. 2004. Building brand loyalty through individual stock ownership. *Journal of Product and Brand Management* **13**(7): 488-497.
- Schubert R, Brown M, Gysler M, Brachinger HW. 1999. Financial decision-making: are women really more risk-averse? *American Economic Review* **89**(2): 381-385.
- Semion Brand-Broker. 2009. brand€valuation 2009. <http://semion.com> [25 February 2010].
- Shepherd DA, Zacharakis A, Baron RA. 2003. VCs' decision processes: evidence suggesting more experience may not always be better. *Journal of Business Venturing* **18**(3): 381-401.

- Shepherd DA. 1999. Venture capitalists' assessment of new venture survival. *Management Science* **45**(5): 621-632.
- Shiller RJ. 2003. From efficient markets theory to behavioral finance. *Journal of Economic Perspectives* **17**(1): 83-104.
- Simon CJ, Sullivan MW. 1993. The measurement and determinants of brand equity: a financial approach. *Marketing Science* **12**(1): 28-52.
- Simon HA. 1955. A behavioral model of rational choice. *Quarterly Journal of Economics* **69**(1): 99-118.
- Subramani M, Walden E. 2001. The impact of e-commerce announcements on the market value of firms. *Information Systems Research* **12**(2): 135-154.
- Teichert T, Shehu E. 2009. Diskussion der Conjointanalyse in der Forschung. In *Conjointanalyse: Methoden, Anwendungen, Praxisbeispiele*, Baier D, Bruschi M. (eds). Springer: Berlin, Heidelberg; 19-39.
- Thaler R. 1980. Toward a positive theory of consumer choice. *Journal of Economic Behavior and Organization* **1**(1): 39-60.
- Tomczak T, Coppetti C. 2006. Kommunikation der Corporate Brand: Shareholder durch Corporate Brand Management überzeugen. In *Corporate Brand Management – Marken als Anker strategischer Führung von Unternehmen*, Esch FR, Tomczak T, Kernstock J, Langner T (eds). Gabler: Wiesbaden; 273-291.
- Train K. 2009. *Discrete Choice Methods with Simulation*. Cambridge University Press: Cambridge, UK.
- Tversky A, Kahneman D. 1974. Judgment under uncertainty: heuristics and biases. *Science* **185**(4157): 1124-1131.
- Wang M, Keller C, Siegrist M. 2011. The less you know, the more you are afraid of – a survey on risk perceptions of investment products. *Journal of Behavioral Finance* **12**(1): 9-19.
- Warren WE, Stevens RE, McConkey CW. 1990. Using demographic and lifestyle analysis to segment individual investors. *Financial Analysts Journal* **46**(2): 74-77.
- Wernerfelt B. 1988. Umbrella branding as a signal of new product quality: an example of signalling by posting a bond. *RAND Journal of Economics* **19**(3): 458-466.
- Yoo B, Donthu N, Lee S. 2000. An examination of selected marketing mix elements and brand equity. *Journal of the Academy of Marketing Science* **28**(2): 195-211.
- Zacharakis AL, McMullen JS, Shepherd DA. 2007. Venture capitalists' decision policies across three countries: an institutional theory perspective. *Journal of International Business Studies* **38**(5): 691-708.

- Zacharakis AL, Meyer GD. 1998. A lack of insight: do venture capitalists really understand their own decision process? *Journal of Business Venturing* **13**(1): 57-76.
- Zhou R, Pham MT. 2004a. Advances in the psychology of consumer investment. *Advances in Consumer Research* **31**(1): 604-606.
- Zhou R, Pham MT. 2004b. Promotion and prevention across mental accounts: when financial products dictate consumers' investment goals. *Journal of Consumer Research* **31**(1): 125-135.

Third Paper

Management of Investor Acceptance in Wind Power Megaprojects: A Conceptual Perspective²³

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Abstract

Governments throughout the world are seeking to generate more of their domestic power from renewable energy sources. Power generation from wind energy is one of the most mature and important renewable energy technologies. On average, projects are steadily growing in size; the trend is towards large-scale wind power plants. Such wind power megaprojects, however, are often marked by high complexity, poor design, and poor delivery, which can diminish their attractiveness to investors. This paper aims to shed light on investors' willingness to finance wind power megaprojects and illuminate the ways in which not only risk and return factors of wind power megaprojects, but also behavioral and social factors influence this attitude, which we call investor acceptance. In addition, this paper examines ways in which megaproject managers can enhance and manage their project's attractiveness to investors. This paper develops a conceptual model of investor acceptance of wind power megaprojects and its management based on insights from literature on behavioral finance, social acceptance of wind power projects, megaproject management and stakeholder management. The paper concludes that investor acceptance of wind power megaprojects is theoretically prone to behavioral and social effects and that megaproject managers can influence investor acceptance through two different approaches: (1) indirectly (with respect to tactical project management) and (2) directly (related to stakeholder management). This paper broadens the scope of the research on investor acceptance by applying and further developing this concept in the context of megaprojects in the wind power industry and by discussing implications on megaproject management in a wind power context.

Keywords: Megaproject, Investor Acceptance, Behavioral Finance, Project Management, Wind Power

JEL Codes: D81, G02, G2, Q42

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Introduction

Governments throughout the world are seeking to generate more of their domestic power from renewable energy sources with the common goal of decreasing both carbon emissions and the dependence on limited fossil fuels. Power generation from wind energy is one of the most mature and fastest-growing renewable energy technologies. Over the last 17 years, annual installations of wind power in Europe have continuously grown at an average rate of 15.6 % per year (EWEA, 2012a). Currently, 94 GW wind power capacity is installed in the European Union (GWEC, 2012). Most of the wind power installations in the European Union today range from small to mid-scale in size (the average onshore wind park size is about 10 MW²⁴), but the size of projects is steadily increasing and the trend is for large-scale wind parks (EWEA, 2012a; IEA Wind, 2010). Particularly in the offshore wind power sector a number of very large-scale projects, so called “megaprojects” (Flyvbjerg, Bruzelius, and Rothengatter, 2003), are under construction so far, such as the British offshore wind park Greater Gabbard (500 MW) or the German offshore wind park Borkum West II (400 MW)²⁵ but this trend can also be witnessed onshore: the largest wind park in continental Europe is currently being built at Fântânele and Cogelac, Romania, with a capacity of 600 MW. The Romanian Black Sea coast (Constanța county) offers very good wind conditions and will host several large-scale onshore wind parks in the 400-600 MW-class that are currently under construction or approved.

Megaprojects, in general, have several advantages such as synergies in construction and maintenance and better financing and purchasing conditions. But they are also characterized as “complex, politically-sensitive and involving a large number of partners” (van Marrewijk *et al.*, 2008: 591) and often suffer from negative project performance, i.e. they overrun budgets and fall behind schedule (e.g. the case of the London Array offshore wind park, see further below). These issues have important implications for construction companies as well as for other stakeholders such as project initiators, developers and investors. Negative project performance can, for instance, be attributed to the underestimation of costs (Flyvbjerg *et al.*, 2003) or the establishment of “misaligned or underdeveloped governance arrangements”

²⁴ Own calculations based on http://www.thewindpower.net/windfarms_list_en.php [5 October 2012].

²⁵ The EWEA (2012b) shows that the average size of offshore wind power projects being planned in Europe is about 555 MW.

(Sanderson, 2012). Research shows that cost estimation and forecasting is more prone to psychological biases (e.g. optimism) and politics (e.g. strategic misrepresentation) besides technical issues related to data and forecasting models (Flyvbjerg, 2006). Further, studies suggest that diverse and competing project cultures and rationalities (van Marrewijk *et al.*, 2008) and the unexpected increase of costs during construction (Morrow, 2003) paired with lack of ex post governing mechanisms to deal with extraordinary and unexpected events (Sanderson, 2012) contribute to poor megaproject delivery. A common issue with megaprojects that often hampers their effective design and delivery and thus positive project performance is that they operate in an environment of uncertainty (project outcomes and probabilities of entry unknown) rather than risk (project outcomes and probabilities of entry known) (Sanderson, 2012). Research particularly shows a positive relation between the level of technical, social, organizational and environmental complexity and uncertainty (Antoniadis, Edum-Fotwe, and Thorpe, 2011; Bosch-Rekveldt *et al.*, 2011; Giezen, 2012).

This brings up the question of how megaproject stakeholders – both in general terms and with regard to wind power megaprojects in particular – deal with this uncertainty when making their decisions. In this paper, we focus particularly on investors, whose importance as key stakeholders who provide financial backing without which projects could not exist. In addition, both empirical evidence and the literature show that “investor acceptance” plays a decisive role in determining the success or failure of wind power projects (IEA Wind, 2010) and renewable energy innovations in general (e.g. Wüstenhagen, Wolsink, and Bürer, 2007). In the offshore wind power industry, for instance, non-recourse debt financing grew by 40% in 2011 and interest in offshore wind park investments has increased among equity investors (EWEA, 2012b). But the relatively young age of this industry still creates high risk for investors (specifically, with regard to technology and regulation, e.g. related to grid connection) and makes it more difficult for offshore developers to obtain funding for their projects (Prässler and Schaechtele, 2012). Increasing investor acceptance of offshore wind power projects is essential in the context of the European clean energy strategy. It would take more than a tenfold increase in capacity from 3.8 GW installed by the end of 2011 (EWEA, 2012b) to achieve the target of 43 GW offshore wind power by 2020 set by the members of the European Union in course of their National Renewable Energy Action Plans (NREAP) (European Commission, 2010).

From a theoretical perspective, investor acceptance can be defined as the decision of financiers to invest in innovative technologies or projects. In the context of wind

power, this concept is treated as part of a more comprehensive model of social acceptance as defined by Wüstenhagen *et al.* in 2007. The social acceptance model distinguishes between three distinct, yet interdependent dimensions: socio-political acceptance of a new technology (e.g. of the general public or policymakers), community acceptance (e.g. of the community and neighborhoods that are adjacent to infrastructure projects) and market acceptance (e.g. of consumers or investors). As this paper takes an investor acceptance perspective, it interprets the other two dimensions of social acceptance as policy risk (socio-political acceptance) and community acceptance risk, which both relate to the macro environment of a wind power (megaproject) investment. Such macro risk factors, along with other types of risks, which relate to a more technical micro context of a wind power project (e.g. technology risk, completion risk, and market risk), affect investors' risk-return assessment during the decision-making process.

In an investment context, risk is traditionally treated as “objective” (Ganzach, 2000) whereas empirical research shows that a more comprehensive theory of financial risk such as perceived risk, which also considers psychological mechanisms better explains investor behavior (e.g. Ganzach, 2000; Olsen, 2008; Slovic, 1992; Slovic *et al.*, 2004). Particularly scholars in the field of behavioral finance (e.g. Barberis and Thaler, 2003; Kahneman, 2003; Kahneman and Tversky, 1979; Shiller, 2003; Simon, 1955) provide evidence that psychological factors such as status quo bias, frame dependence, loss aversion or overconfidence affect investor behavior. They also show that their influence is specifically prevalent in the context of investment decision-making under uncertainty. Two examples from the offshore wind power industry illustrate the way in which behavioral and social factors might influence investment decision-making: first, that of the London Array offshore wind park, which had to deal with serious increases in cost due to the rising prices of steel and wind turbines before production began, which contributed to Shell's exit from the project in 2008.²⁶ Such rotation of key project stakeholders can have negative impact on project performance (Giezen, 2012) but can also alert other investors in the industry to reconsider their investment plans based on this information. The second example is the Hypo-Vereinsbank (HVB), one of the pioneers in project financing. The bank announced that it was setting aside reserves of 710 million euros due to considerable

²⁶ <http://www.handelsblatt.com/unternehmen/industrie/zweifel-am-weltgroessten-offshore-projekt-london-array/3101228.html?p3101228=all>; <http://www.handelsblatt.com/technologie/energie-umwelt/energie-technik/oelriesen-aendern-gruene-strategie/2954516.html> [5 October 2012].

delay in one of its offshore wind parks – thus effectively issuing a warning to other banks that might be entering or planning to enter the offshore wind power industry.²⁷

The example of the London Array offshore wind park also illustrates that investor acceptance is not static; in other words, even though an investor decides to finance a megaproject, investor acceptance can decrease over time due to different reasons and lead to a withdrawal of capital, and thus potentially induce project instability or failure. Deepening our theoretical understanding of the determining factors in the investment decision-making process under uncertainty and the management of issues related to investor acceptance in the context of very large-scale wind power projects thus forms a fruitful gateway to further research. More specifically, this paper seeks to respond to the following two questions:

- How do behavioral and social effects besides macro and micro risk factors in wind power megaproject investments influence investors' risk-return assessment, risk and return perceptions, and thus investor acceptance of wind power megaprojects?
- How can wind power megaproject managers positively influence investor acceptance i.e. through which mechanisms and elements?

This paper puts forward a conceptual model of investor acceptance of wind power megaprojects, drawing on insight gleaned from literature on behavioral finance, social acceptance of wind power projects, megaproject management, and stakeholder management. It aims at establishing a theoretical foundation to increase our understanding of investor acceptance and its implications on megaproject management in a wind power context – an approach that could conceivably be further developed as well as empirically verified and validated in future research. Moreover, the findings elaborated here provide insight that should prove beneficial not only to those who manage and/or invest in wind power megaprojects, but also to policymakers, consultants, and other stakeholders.

The paper proceeds as follows: first, the authors explore the concept of investor acceptance in greater depth and further put it in the context of investment decision-making under uncertainty. Next, they introduce a conceptual model of investor acceptance in wind power megaprojects based on insights from the literature review.

²⁷ <http://www.handelsblatt.com/unternehmen/banken/offshore-windparks-finanzinvestoren-sind-risiken-auf-hoher-see-zu-gross/6518072.html> [5 October 2012].

Lastly, the authors discuss implications of investor acceptance on the management of wind power megaprojects and approaches to influencing and managing investor acceptance.

Theory

Investor Acceptance of Renewable Energy Technology

This paper specifically focuses on investors in wind power megaprojects as internal stakeholders who possess the capabilities and resources to highly influence the performance of a project (Atkin and Skitmore, 2008; Cleland, 1995; Lim, Ahn, and Lee, 2005; Mitchell, Bradley, and Wood, 1997). Megaproject investors, in this context, are defined as all equity shareholders of a wind power megaproject or project company (special purpose vehicle, SPV), i.e. for instance project sponsors, financial or institutional (e.g. infrastructure funds, private equity funds, pension funds) and strategic (e.g. power companies) investors and other stakeholders that hold an equity stake in a project or SPV such as project developers or technology producers (Sonntag-O'Brian and Usher, 2004; UNEP, 2012). We additionally include banks and other debt capital providers (e.g. mezzanine capital) into the definition of megaproject investors used in this paper as banks, in particular, typically provide large parts of project finance and are also subject to acceptance issues (“bankability of projects”) (Lüdeke-Freund and Loock, 2011). The actual group of investors differs between projects (see e.g. EWEA, 2012b). The actual megaproject managers also vary between projects and can be project sponsors, project developers, consultants, or other service providers.

In general terms, investor acceptance can be defined as financiers’ decisions to invest in innovative technologies or projects. This concept is related to the diffusion of innovations (Rogers, 2003), i.e. the adoption of innovative goods or services in consumer markets. If investors accept an investment opportunity or adopt a financial product, it means that they are willing to financially engage in a tangible asset (e.g. power generation project) or intangible asset (e.g. bond, stock, etc.) in return for economic gain. Investor acceptance also indicates an investor’s decision as to whether or not to exit or disinvest over time.

In the context of wind power, investor acceptance was first introduced as part of a more comprehensive framework of social acceptance (Wüstenhagen *et al.*, 2007). In a

narrower sense, social acceptance of wind power or renewable energy technology in general can be defined as the public support of such technology and routes back to the 1980s (Bosley and Bosley, 1988; Carlman, 1982, 1984; McDaniel, 1983; Thayer, 1988; Wolsink, 1987, 1988, 1989). Since then a large number of scholars have further developed and investigated this concept and its implications in more detail with respect to the impact of landscape issues (e.g. Pasqualetti, 2011a, b, c; Wolsink, 2007a), the influence of social acceptance on renewable energy diffusion (e.g. Toke, Breukers, and Wolsink, 2008; Raven *et al.*, 2008) benefit and risk sharing (e.g. Wolsink, 2007a, b), and with respect to specific subtypes of renewable energy technology such as offshore wind power (e.g. Firestone and Kempton, 2007; Firestone, Kempton, and Krueger, 2009; Haggett, 2008).

While studies on the subject of social acceptance specifically build on public, political, and regulatory issues (Carlman, 1984), the conceptual model introduced by Wüstenhagen *et al.* (2007) takes a more holistic approach and integrates three dimensions: (1) socio-political acceptance; (2) community acceptance; and (3) market acceptance (see also Figure 1). In contrast to previous models, this one specifically references market acceptance in addition to public and political elements.

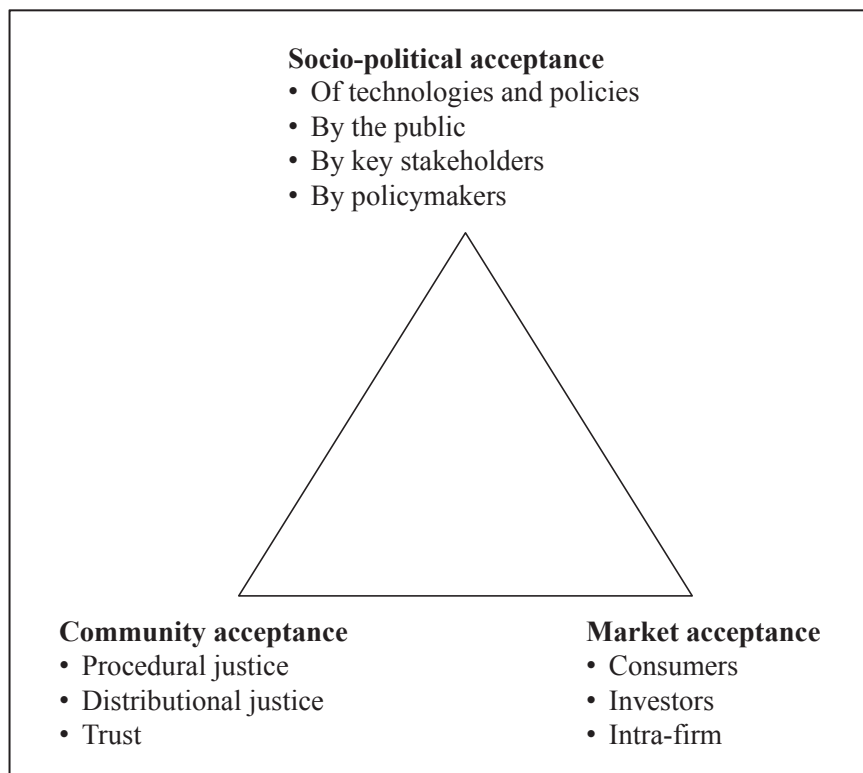


Figure 1. The triangle of social acceptance of renewable energy innovation (Wüstenhagen *et al.*, 2007)

Wüstenhagen et al. (2007) also emphasize the interdependence of these dimensions of social acceptance. Specifically important in this context, is the influence of socio-political and community acceptance on investor acceptance. On the one hand, an investor's risk and return assessment is highly influenced by the prevailing renewable energy support scheme, the amount of financial support or the stability of the political framework (Breukers and Wolsink, 2007). On the other hand, investors are sensitive to community acceptance issues since local resistance has a negative impact on the business case, i.e. it increases costs and extends the project development period (IEA Wind, 2010; Mormann, 2012). Both of these two risk factors, policy risk and community acceptance risk, complemented by legal and regulatory risk, can be treated as macro risk factors from a project investor's perspective. Further, investors differentiate a number of micro risk factors (e.g. structural risk, technology risk, completion risk) that are directly related to the specific wind power project. In general, wind power megaproject investments share the same risk factors as investments in smaller-scale wind power projects, other renewable energy technology, and general infrastructure (mega)projects. Table 1 summarizes the risk factors that are involved in wind power investments.

Table 1. Overview of risk factors involved in wind power investments

| Risk factors | Description | References |
|---------------------------|--|---|
| <i>Macro risk factors</i> | | |
| Legal and regulatory risk | Legal and regulatory risk is attributed to host government regulations, including currency risk, high taxes and royalties, demands for equity participation, expropriation and nationalization or political violence such as war, sabotage, or terrorism. | Farrell (2003); Yescombe (2002) |
| Policy risk | Policy risk arises from a possible negative change in national laws and provisions, i.e. if the national wind power support scheme is changed with negative impacts on wind power projects (e.g. reduction in feed-in tariff, requirements that a specific percentage of the components needs to be locally produced, abolishment of priority dispatch for electricity from renewable energy sources). | Lüthi and Wüstenhagen (2012); Wüstenhagen and Menichetti (2012) |
| Community acceptance risk | Community acceptance risk relates to the potential negative attitude towards the actual installation of wind turbines and parks as local resistance increases costs and extends the project development phase. | IEA Wind (2010); Wüstenhagen et al. (2007) |
| <i>Micro risk factors</i> | | |
| Structural risk | Structural risk e.g. relates to the structure of the ownership of the project company (special | SAM (2012) |

| | | |
|-------------------------|---|---|
| | purpose vehicle, SPV), quality of the sponsor and contractual risk sharing between parties. | |
| Technology risk | Technology risk stems from the innovativeness or ongoing development of the technology used to produce the final output. | Farrell (2003); Fitch Ratings (2011) |
| Completion risk | Completion risk can be defined as the likelihood and the extent to which a project may incur construction delays or cost overruns. | Fitch Ratings (2011) |
| Operation risk | Operation risk mainly relates to a reduction in productivity (due to outages and or failure to meet expected performance standards) or may incur costs that are greater than projected. | Fitch Ratings (2011) |
| Supply risk | Supply risk is particularly attributed to the risk that the main input factor (wind) will not be available or not be available as projected. | SAM (2012) |
| Market and revenue risk | Market risk mainly relates to revenue (return) components and stems from the possibility that the project may lose its competitive position in the output market, e.g. if the national wind power support scheme is changed in a negative manner (e.g. if the feed-in tariff is reduced). | Farrell (2003); Fitch Ratings (2011) |

Previous research related to investor acceptance of wind power is scarce (Wüstenhagen *et al.*, 2007). Past studies only focused on the buy side (investor's perspective) rather than both, the buy and the sell (in this case, the project manager's perspective) side. Further, scholars specifically investigated the influence of renewable energy policy frameworks (policy risk) and community acceptance (community acceptance risk) on investors' or project developers' willingness to invest in wind power projects.

Bürer (2009), for instance, conducted qualitative interviews with investors and project developers in Switzerland in order to increase the understanding of investor acceptance of wind power projects. Key findings of this study show that investor acceptance generally follows local and social acceptance due to the various possibilities for locals, environmental groups, and the national landscape protection organization to oppose wind power projects. Further, high regulatory and administrative burdens in the permitting process, high development costs related to cabling, transportation of wind turbines (due to challenging topography) and decreased feed-in tariffs limit the attractiveness of the return on investment (ROI) for investors in wind power projects in Switzerland. Thus, this study highlights the importance of both, socio-political and community acceptance for investor acceptance of wind power projects. Studies on the intersection of renewable energy policy and investor

acceptance also emphasize the importance of policy risk such as policy stability for international investors in wind power and other renewable energy projects in emerging economies (IWÖ-HSG, 2010), Europe (e.g. Breukers and Wolsink, 2007) and the U.S. (Barradale, 2010; Mormann, 2012). Lüthi and Prässler (2011) report from a survey among American and European project developers that aside from the level of total remuneration, non-economic barriers such as legal security and the administrative process duration greatly impact project developers' decisions regarding location.

Investment Decision-Making Under Conditions of Uncertainty

As already shown in the previous subchapter, investors in wind power megaprojects, but also in general, typically decide on their financial engagements through a process of carefully weighting risks and returns. Frameworks and mathematical models have been developed to support investors in their decision-making processes. However, there are two important issues that limit the application of traditional investment decision models in a context of megaprojects in general and specifically with respect to wind power megaprojects: (1) they assume that decisions are made in a context of risk rather than uncertainty; and (2) further consider financial risk as a purely statistical and objective concept without incorporating psychological factors.

Traditional investment decision frameworks and models mostly assume conditions of risk, i.e. decision-makers are able to assign mathematically or statistically derived objective probabilities to a range of known future events or outcomes (Knight, 1921). However, in the case of megaprojects, due to their high degree of complexity (Giezen, 2012), investors are often faced with conditions of uncertainty. Literature distinguishes two types of uncertainty: In the first type, decision-makers know the alternative future events or outcomes but are only able to assign subjective probabilities to them based on "expectations grounded in historical practice" (Sanderson, 2012: 435). In the second type, the "nature and range of future events or outcomes is unknown and unknowable, not simply hard to predict because of a lack of relevant data" and thus decision-makers are faced with a situation where the future is socially constructed over time with "little or no relation to the past or the present" (ibid.). The underlying assumption of this research paper is that megaproject investors normally treat and manage uncertainties as risks and assign probabilities to a range of future events or outcomes even though this practice might be questionable (Koppenjan *et al.*, 2010; Perminova, Gustafsson, and Wikström, 2008). Treating uncertainties as risks or simply

ignoring them is even more problematic when investing in megaprojects in the offshore wind power industry. The reasons are an increased technological complexity and lacking past experience and historical data, which might even be exaggerated under specific geographical conditions, such as in the German offshore wind power industry. The German Federal Ministry for the Environment, for instance, emphasizes in this context that “the offshore wind energy usage in Germany with its prevailing requirements related to water depth and distance to coast is a completely new way of wind energy usage” (BMU, 2007: 113).

Thus, literature suggests, that the higher the degree of context-uncertainty the higher the degree of subjectivity in decision-making related to the particular context. A more comprehensive theory of financial risk that better explains this subjectivity in decision-making under uncertainty, is the concept of perceived risk, which views financial risk as “a multi attribute psychological phenomenon that involves other attributes besides probabilities and outcomes” (Olsen, 2008: 58). Such other attributes include, for instance, feelings, which are based on emotion and affect (Slovic *et al.*, 2004). This theory of risk specifically builds on the perspective that risk is “inherently subjective” and that it “does not exist out there, independent of our minds and cultures, waiting to be measured” (Slovic, 1992: 119).

However, independent of adopting this view of “pure subjectivity” scholars in this field agree that what actually influences human decisions are perceptions of risk and return rather than purely statistical risk and return values (Olsen, 2008). Ganzach (2000), for instance, further examined such risk and return judgments in a financial context and distinguished two different models depending on whether the investor is familiar with the financial asset or not. He showed that in case familiarity with financial assets is given, risk and return judgments are generated based on “appropriate ecological information” about risk and return values available through e.g. past experience or summary statistics from financial reports (*ibid*: 356). In case of unfamiliar assets, both risk and return judgments are derived from global preferences toward the assets. Further, the results of Ganzach’s experiments suggest that although the ecological values of risk and return are positively related, perceptions of risk and return are not. The inverse relationship between perceived risk and return, which can be attributed to affect, has also been reported by other authors such as Alhakami and Slovic (1994), Finucane *et al.* (2000), and Finucane and Holup (2006).

Different studies from the behavioral finance literature further show in this context that investors tend to buy assets they are familiar with such as domestic stocks, as they (wrongly) perceive these assets to bear less financial risk (Coval and Moskowitz,

1999; French and Poterba, 1991; Grinblatt and Keloharju, 2001; Huberman, 2001; Wang, Keller, and Siegrist, 2011). Several behavioral finance scholars provide empirical evidence of other systematic biases²⁸ that influence investment decisions under uncertainty as well as risk and return perceptions (e.g. Barberis and Thaler, 2003; Kahneman, 2003; Kahneman and Tversky, 1979; Shiller, 2003; Simon, 1955) such as status quo bias, frame dependence, loss aversion or overconfidence.

Besides such cognitive or behavioral biases literature also shows the influence of social effects on investment decision-making and risk perception (e.g. Wang and Johnston, 1995; Wang, Simons, and Brédart, 2001). A social phenomenon in financial markets is, for instance, herding, which refers to the behavior that investors are influenced by other investors' decisions. If their investment decision is different than the decision of other investors they alter their initial decision to follow the "crowd" (Bikhchandani, Hirshleifer, and Welch, 1992; Bikhchandani and Sharma, 2001; Froot, Scharfstein, and Stein, 1992; Hirshleifer and Teoh, 2003). Related mechanisms are also discussed in the science and technology as well as diffusion of innovations literature, such as expectation dynamics (e.g. Wüstenhagen *et al.*, 2009) and peer effects (Rogers, 2003). Scholars define expectation dynamics as specific (related to a product or project) or general (related to the role of a particular technology in society) expectations about the future (Ruef and Markard, 2010), which might add momentum or create a hype cycle in an innovation diffusion process accelerating adoption and technological development (Borup *et al.*, 2006). Peer effects in the diffusion of innovations literature refer to that members of a social system adopt an innovation over time by means of communication through e.g. mass media and, specifically, the interaction between individuals (Rogers, 2003).

The influence of behavioral and social effects on investment decisions under uncertainty related to renewable energy technology has also been shown by various studies: Hampl, Wuebker, and Wüstenhagen (2012), for instance, reveal that venture capitalists' investments in renewable energy start-ups are strongly influenced by social networks; Chassot, Hampl, and Wüstenhagen (2011) provide empirical evidence suggesting that venture capitalists' underinvestment in renewable energy deals can be explained by a policy aversion bias; Lüdeke-Freund and Loock (2011) show that banks' financing decisions with regard to large-scale photovoltaic projects are prone to

²⁸ The question remains whether this deviation from the efficient market hypothesis (Fama, 1991) is a bias to fully rational behavior rather than a facet of rationality in order to deal with the uncertainty in decision-making (e.g. Todd and Gigerenzer, 2003).

a “debt for brands” bias related to the photovoltaic modules that are implemented in the project.

Conceptual Model of Investor Acceptance in Wind Power Megaprojects

Based on insights from our literature review in the previous chapters of this paper, we introduce a conceptual model of investor acceptance in wind power megaprojects in Figure 2. This model builds on previous work and extends it in two ways: (1) by explicitly distinguishing between the influence of behavioral (e.g. status quo bias, overconfidence) and social effects (e.g. peer effects) besides macro and micro risk factors (e.g. policy risk, community acceptance risk, technology risk) on investment decisions in wind power megaprojects; and (2) by illustrating how megaproject managers can positively influence investor acceptance, which will be the explicit subject of the following chapter of this paper.

The conceptual model as depicted in Figure 2 shows that information about actual macro and micro risk factors of the underlying wind power megaproject have a positive relationship to return factors of such projects, i.e. if risks increase, investors demand a risk compensation and thus higher returns on their investment. This information about actual risk and return values further influence investor-specific perceptions about risks and returns related to the project investment (Ganzach, 2000). In course of this cognitive process of risk-return assessment several behavioral (e.g. status quo bias, overconfidence) or social (e.g. peer effects) biases or effects might occur, which directly influence risk and return perceptions (e.g. Kahneman, 2003; Olsen, 2008). Specifically social effects are relevant in the context of wind power megaprojects. The decisions of investors, but also the decisions of other industry players such as EPCs (engineering, procurement and construction contractors) or technology producers, can have a much wider impact that even goes beyond the affected project by acting as references and thus by influencing future investor acceptance of large-scale and complex wind power projects. This is what we, for instance, refer to as “peer effects” in this specific context. The risk and return judgments finally affect an investor’s decision whether to invest in a wind power megaproject or not. This whole process of risk-return evaluation and decision-making is regularly updated over time during project implementation, i.e. although if investor acceptance is achieved at a certain stage of the project, this is no guaranty that it will

remain stable over time (see, for instance, the London Array case where Shell exited during project implementation).

The conceptual model in Figure 2 further shows which elements of the investment decision-making process megaproject managers can influence in order to increase investor acceptance. More detailed explanations related to these mechanisms and managerial implications are subject of the following chapter.

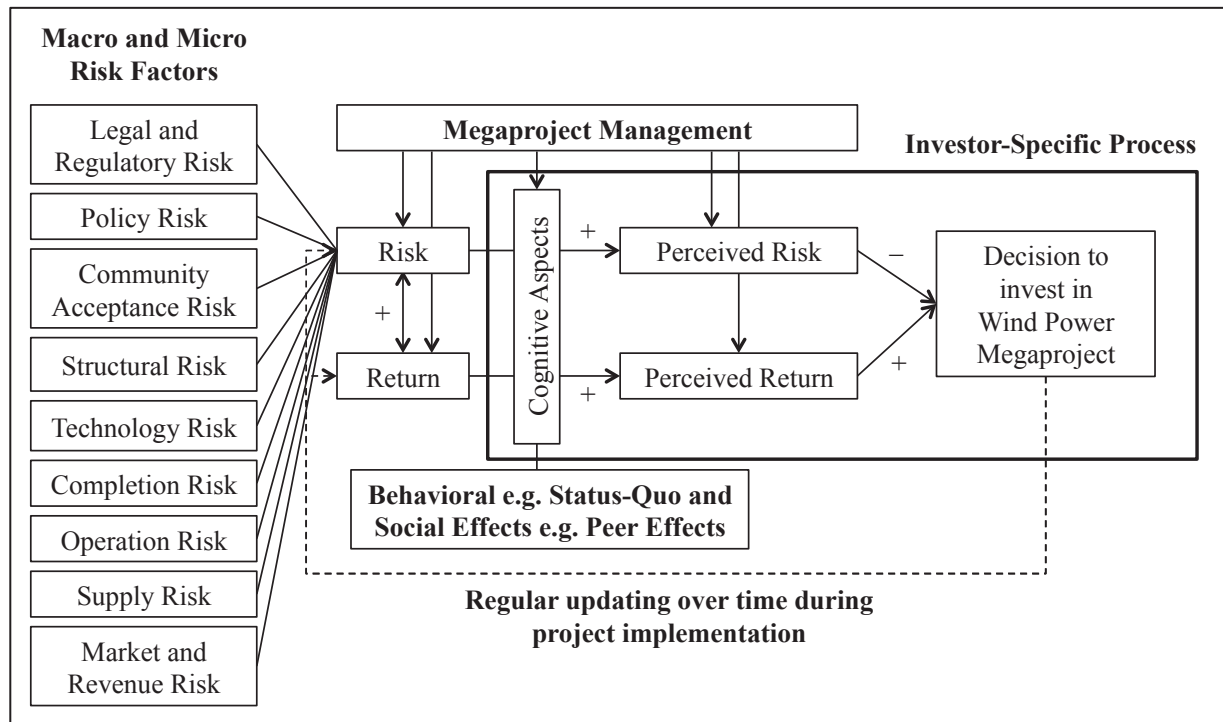


Figure 2. Conceptual model of investor acceptance of wind power megaprojects (relations between (perceived) risk and return attributes based on Ganzach, 2000; overall model adapted from Wüstenhagen and Menichetti, 2012)

Managerial Implications

Management of Projects and Stakeholders

The Project Management Institute (PMI)²⁹ defines a project as “a temporary group activity designed to produce a unique product, service or result” and thus project management as “the application of knowledge, skills and techniques to execute projects effectively and efficiently”. Project management and project management

²⁹ <http://www.pmi.org/en/About-Us/About-Us-What-is-Project-Management.aspx> [5 October 2012].

training in a narrower sense is more tactical and execution focused dedicated to optimizing time and cost factors (Eweje, Turner, and Müller, 2012). But due to their scale, duration, and far-reaching impact, megaprojects additionally require a more strategic management and decision-making approach. An important element of strategic project management is the management of stakeholder interests. Stakeholder management in a megaproject context, thus, puts high emphasis on the identification, analysis, and management of key stakeholders and the establishment of effective governance structures (Dunović, 2010; Eweje *et al.*, 2012).

Stakeholder management is a traditional strategic management instrument routed in stakeholder theory in the context of organizations (Freeman, 1984). Transferred from a corporate level to the management of construction projects, Newcombe (2003: 842) defines stakeholders as any “groups or individuals who have a stake in, or expectation of, the project’s performance”, which includes “clients, project managers, designers, subcontractors, suppliers, funding bodies, users and the community at large”. Literature provides different classifications of stakeholders such as according to their involvement in a project (internal versus external stakeholders) (e.g. Freeman, 1984; Gibson, 2000), their power and legitimacy (Johnson, Scholes, and Whittington, 2005; Mitchell *et al.*, 1997; Newcombe, 2003) or their position towards a project (e.g. McElroy and Mills, 2007). Meeting the expectations of stakeholders over the life cycle of a construction project is mandatory for a successful project delivery as stakeholders can have the power to delay or even stop projects (Atkin and Skitmore, 2008; Cleland, 1995; Lim, Ahn, and Lee, 2005; Mitchell *et al.*, 1997).

Figure 3 gives an overview of typical stakeholders involved in wind power (mega)projects. In megaprojects often more than one firm or individual can be attributed to a stakeholder type. Sometimes one firm or individual takes over multiple stakeholder roles.

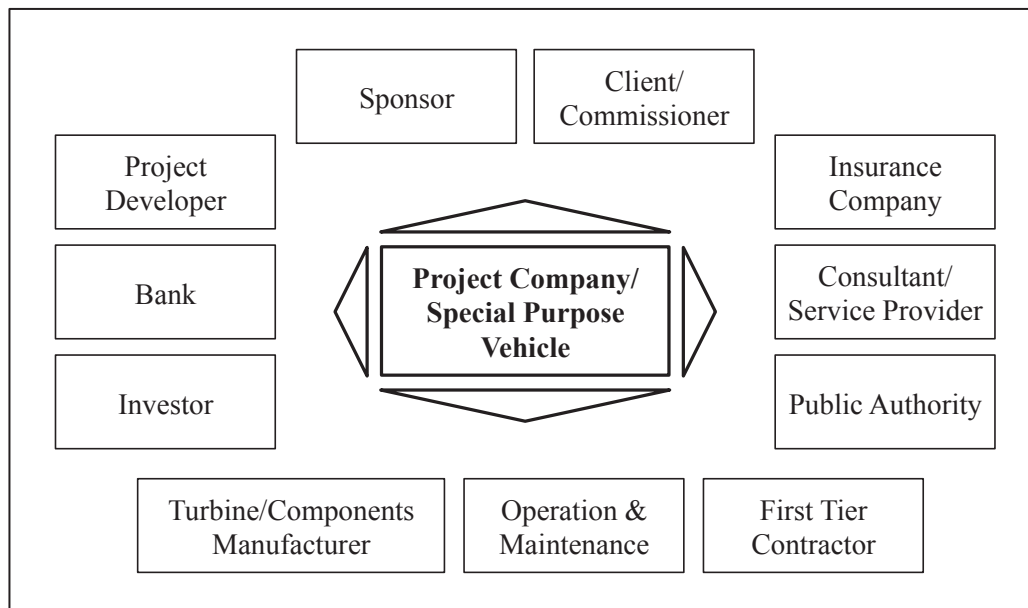


Figure 3. Typical stakeholders of a wind power (mega)project (own figure based on Richter, 2009; Stohlmeyer and Küver, 2002)

Approaches to Influencing and Managing Investor Acceptance

From a megaproject manager's perspective investor acceptance can be influenced over two different routes:³⁰ (1) indirectly through tactical project management focusing on project performance in terms of time and costs (as project performance has a high impact on investor acceptance); and (2) directly through the active management of investor acceptance as part of stakeholder management and governance. Both approaches are essential in order to achieve high investor acceptance as they target two different elements of the investor acceptance model (see Figure 2) as elaborated in the following paragraphs.

Tactical project management particularly influences the macro and micro risk factors (excluding risks that can only be influenced by other stakeholders and force majeure risks). Some of these risks are also influenced by strategic project management techniques such as external stakeholder management (community acceptance risk). In general, risks are managed through an adequate risk management process that typically comprises the steps of initiation, identification, analysis, planning, monitoring, and control (risk retention, transfer, reduction and avoidance)

³⁰ We particularly focus on "risk" and "risk perceptions" in the following paragraphs, as we assume in our conceptual model a positive relationship between risk and return factors, between risk and perceived risk as well as between return and perceived return factors.

(e.g. Chapman, 1997; Akintoye and MacLeod, 1997; Perminova *et al.*, 2008). In order to manage community acceptance risks managers of wind power megaprojects can adopt different benefit and risk sharing models, such as co-ownership through community funds or power contracting, in order to increase the community acceptance of projects. A more comprehensive model of stakeholder management with the objective to increase social acceptance of renewable energy technology projects is the ESTEEM methodology³¹, which might also be applied to manage investor acceptance issues. How megaproject managers treat and manage such risks, and thus ensure positive project performance, has high influence on an investor's risk-return assessment and thus on investor acceptance. Therefore, this is what we summarize as the indirect influence on investor acceptance.

The investor's perceived risks (and returns) that are for instance influenced by behavioral and social factors such as actions by peers or other industry players, are harder to influence and manage. Typically, the investor acceptance risk (specifically related to exit or disinvestment over the lifecycle of a megaproject) is treated through contractual arrangements. Besides adequate contracts this active investor acceptance management also includes investor relationship management as part of stakeholder management activities and strategic megaproject management (Eweje *et al.*, 2012). Relationship management should specifically target the perceptions of risks and returns that investors hold with regards to a financial engagement in wind power megaprojects. This can comprise techniques such as active communication, negotiation, or the offering of incentives (Chinyio and Akintoye, 2008).

The management of investor perceptions is important in both stages of an investment cycle: (1) the pre-contractual phase of opportunity identification and assessment; and (2) the post-contractual phase of investment management (e.g. decision to exit or disinvest). Negative (e.g. no investment interest at all) or decreased investor acceptance over the lifecycle of a project may have negative impact on project performance in terms of time and budget overruns. This active and ongoing management of investor acceptance relates to the common tenor of recent literature in the megaproject management field with regards to megaproject governance. Scholars emphasize the importance of "governing" practices in terms of a dynamic process versus a static establishment of processes and practices in course of the project planning stage ("governance") (Sanderson, 2012).

³¹ For more information on this methodology, please refer to <http://www.esteem-tool.eu> [5 October 2012].

Figure 4 summarizes the two approaches how to influence and manage investor acceptance.

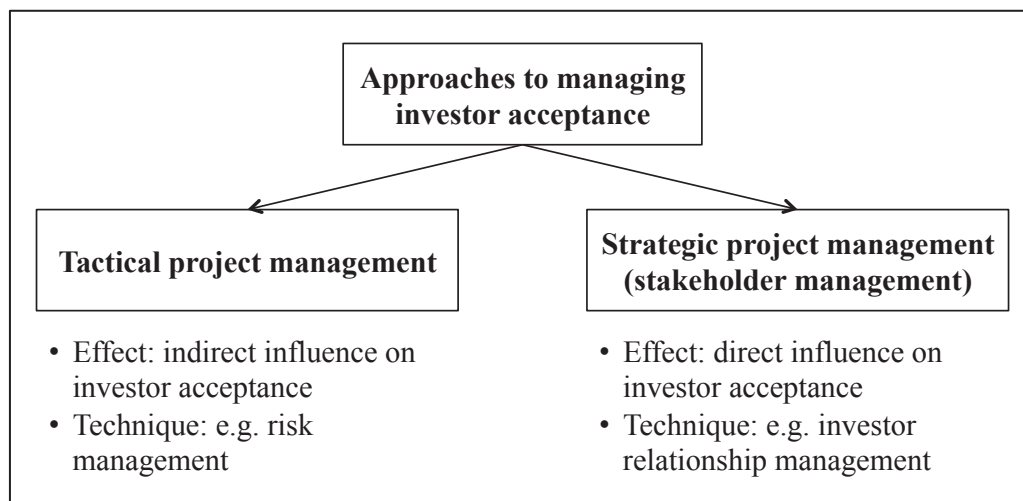


Figure 4. Approaches to managing investor acceptance

Conclusions

The energy industry is undergoing a fundamental transformation, which has been coined a “global energy technology revolution” by the International Energy Agency (IEA, 2008). In search of a sustainable energy supply, governments around the globe have set the goal to grow the supply of energy from renewable sources. As a consequence, there is a need to significantly scale up previous levels of investment in renewable energy. Specifically important in this context, is the financing of wind power as one of the most mature and fastest-growing renewable energy technologies. As the trend in this industry, in both sectors, onshore and offshore, is for very large-scale wind power projects the average project gets more complex in technical, social, organizational and environmental terms and thus more uncertain. In the offshore wind power industry this uncertainty is even higher as this market sector is still in earlier stages of development than the established onshore sector. The question arises how key stakeholders like investors deal with this increased uncertainty inherent to such wind power megaprojects and how megaproject managers can positively influence and manage investor acceptance.

In this contribution we introduce a conceptual model of investor acceptance of wind power megaprojects and approaches how to manage investor acceptance based

on insights from the literature on behavioral finance, social acceptance of wind power projects, megaproject management and stakeholder management. This conceptual model could be used as a starting point to further investigate the issue of investor acceptance in a wind power megaproject context particularly in course of empirical studies such as case studies or surveys of investors and megaproject managers. Findings will generate valuable insights for managers and investors of wind power megaprojects but also for other stakeholders such as policymakers and consultants. Potentially it will also be possible to draw lessons for other energy sectors (e.g. gas-fired power stations or pipelines, electricity transmission grids) or even across infrastructure sectors (e.g. transportation) that specifically have to deal with investor acceptance issues.

An interesting feature of the offshore wind power market is a shift in the type of investors. While these capital-intensive projects have traditionally be financed by strategic investors such as power companies that are used to build centralized and very large-scale power plants the investor base in such projects is getting more diverse (e.g. pension funds or other financial investors). With new types of investors with differing investment strategies, rationalities, and risk appetites entering the wind power scene analyzing investor acceptance and its management gets even more relevant. Further studies on this issue, both conceptual and empirical ones, might thus specifically focus on differences in risk-return assessment, risk perceptions and return expectations as well as management aspects between these various types of wind power megaproject investors.

References

- Akintoye AS, MacLeod MJ. 1997. Risk analysis and management in construction. *International Journal of Project Management* **15**(1): 31-38.
- Alhakami AS, Slovic P. 1994. A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Analysis* **14**(6): 1085-1096.
- Antoniadis DN, Edum-Fotwe FT, Thorpe A. 2011. Socio-organo complexity and project performance. *International Journal of Project Management* **29**(7): 808-816.
- Atkin B, Skitmore M. 2008. Stakeholder management in construction. *Construction Management and Economics* **26**(6): 549-552.
- Barberis N, Thaler R. 2003. Chapter 18: a survey of behavioral finance. In *Handbook of the Economics of Finance*, Constantinides GM, Harris M, Stulz RM (eds). North-Holland: Amsterdam; 1053-1128.
- Barradale MJ. 2010. Impact of public policy uncertainty on renewable energy investment: wind power and the production tax credit. *Energy Policy* **38**(12): 7698-7709.
- Bikhchandani S, Hirshleifer D, Welch I. 1992. A theory of fads, fashions, customs and cultural change as informational cascades. *Journal of Political Economy* **100**(5): 992-1026.
- Bikhchandani S, Sharma S. 2001. Herd Behavior in Financial Markets. *International Monetary Fund (IMF) Staff Papers* 47(3): 279-310. <http://www.imf.org> [5 October 2012].
- BMU. 2007. *EEG-Erfahrungsbericht 2007*. Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit. <http://www.erneuerbare-energien.de> [5 October 2012].
- Borup M, Brown N, Konrad K, Van Lente H. 2006. The sociology of expectations in science and technology. *Technology Analysis and Strategic Management* **18**(3/4): 285-298.
- Bosch-Rekvelde M, Jongkind Y, Mooi H, Bakker H, Verbraeck A. 2011. Grasping project complexity in large engineering projects: the TOE (Technical, Organizational and Environmental) framework. *International Journal of Project Management* **29**(6): 728-739.
- Bosley P, Bosley K. 1988. Public acceptability of California's wind energy developments: three studies. *Wind Engineering* **12**(5): 311-318.

- Breukers S, Wolsink M. 2007. Wind power implementation in changing institutional landscapes: an international comparison. *Energy Policy* **35**(5): 2737-2750.
- Bürer MJ. 2009. Investor acceptance of wind energy in Switzerland, Swiss Federal Office of Energy. <http://www.bfe.admin.ch> [5 October 2012].
- Carlman I. 1982. Wind energy potential in Sweden: the importance of non-technical factors. In Proceedings of the Forth International Symposium on Wind Energy Systems, Stockholm, Sweden: 335-348.
- Carlman I. 1984. The views of politicians and decision-makers on planning for the use of wind power in Sweden. In Proceedings of the European Wind Energy Conference, Hamburg, Germany: 339-343.
- Chapman C. 1997. Project risk analysis and management: PRAM the generic process. *International Journal of Project Management* **15**(5): 273-281.
- Chassot S, Hampl N, Wüstenhagen R. 2011. Policy aversion bias and the financing of clean energy innovation. Paper presented at the Academy of Management (AOM) Annual Meeting, San Antonio, TX.
- Chinyio EA, Akintoye AS. 2008. Practical approaches for engaging stakeholders: findings from the UK. *Construction Management and Economics* **26**(6): 591-599.
- Cleland DJ. 1995. *Project Management Strategic Design and Implementation*. McGraw-Hill: Singapore.
- Coval JD, Moskowitz TJ. 1999. Home bias at home: local equity preference in domestic portfolios. *Journal of Finance* **54**(6): 2045-2073.
- Dunović IB. 2010. A study of project governance frameworks for large infrastructure projects with reflection on road transport projects. *Organization, Technology and Management in Construction* **2**(1): 145-155.
- European Commission. 2010. National renewable energy action plans. <http://ec.europa.eu/energy/renewables> [5 October 2012].
- EWEA. 2012a. Wind in power: 2011 European statistics. European Wind Energy Association. <http://www.ewea.org> [5 October 2012].
- EWEA. 2012b. The European offshore wind industry key 2011 trends and statistics. European Wind Energy Association. <http://www.ewea.org> [5 October 2012].
- Eweje J, Turner R, Müller R. 2012. Maximizing strategic value from megaprojects: the influence of information-feed on decision-making by the project manager. *International Journal of Project Management* **30**(6): 639-651.
- Fama EF. 1991. Efficient capital markets: II. *Journal of Finance* **46**(5): 1575-1617.
- Farrell LM. 2003. Principal-agency risk in project finance. *International Journal of Project Management* **21**(8): 547-561.

- Finucane ML, Alhakami AS, Slovic P, Johnson SM. 2000. The affect heuristic in judgments of risks and benefits. *Journal of Behavioral Decision Making* **13**(1): 1-17.
- Finucane ML, Holup JL. 2006. Risk as value: combining affect and analysis in risk judgments. *Journal of Risk Research* **9**(2): 141-164.
- Firestone J, Kempton W, Krueger A. 2009. Public acceptance of offshore wind power projects in the USA. *Wind Energy* **12**(2): 183-202.
- Firestone J, Kempton W. 2007. Public opinion about large offshore wind power: underlying factors. *Energy Policy* **35**(3): 1584-1598.
- Fitch Ratings. 2011. Global infrastructure and project finance: rating criteria for onshore wind farm debt instruments. <http://www.fitchratings.com> [5 October 2012].
- Flyvbjerg B, Bruzelius N, Rothengatter W. 2003. *Megaprojects and Risk: An Anatomy of Ambition*. Cambridge University Press: Cambridge, UK.
- Flyvbjerg B. 2006. From Nobel prize to project management: getting risks right. *Project Management Journal* **37**(3): 5-15.
- Freeman RE. 1984. *Strategic Management: A Stakeholder Approach*. Pitman Publishing: Boston, MA.
- French KR, Poterba JM. 1991. Investor diversification and international equity markets. *American Economic Review* **81**(2): 222-226.
- Froot K, Scharfstein D, Stein J. 1992. Herd on the street: informational efficiencies in a market with short-term speculation. *Journal of Finance* **47**(4): 1461-84.
- Ganzach Y. 2000. Judging risk and return of financial assets. *Organizational Behavior and Human Decision Processes* **83**(2): 353-370.
- Gibson K. 2000. The moral basis of stakeholder theory. *Journal of Business Ethics* **26**(3): 245-257.
- Giezen M. 2012. Keeping it simple? A case study into the advantages and disadvantages of reducing complexity in mega project planning. *International Journal of Project Management* **30**(7): 781-790.
- Grinblatt M, Keloharju M. 2001. How distance, language, and culture influence stockholdings and trades. *Journal of Finance* **56**(3): 1053-1073.
- GWEC. 2012. Global wind report: annual market update 2011. Global Wind Energy Council. <http://www.gwec.net> [5 October 2012].
- Haggett C. 2008. Over the sea and far away? A consideration of the planning, politics and public perception of offshore wind farms. *Journal of Environmental Policy & Planning* **10**(3): 289-306.

- HAMPL N, WUEBKER R, WÜSTENHAGEN R. 2012. A joint test of status hierarchies and personal ties in VC decision-making. Paper presented at the Academy of Management (AOM) Annual Meeting, Boston, MA.
- HIRSHLEIFER D, TEOH SH. 2003. Herd behaviour and cascading in capital markets: a review and synthesis. *European Financial Management* **9**(1): 25-66.
- HUBERMAN G. 2001. Familiarity breeds investment. *Review of Financial Studies* **14**(3): 659-680.
- IEA WIND. 2010. IEA wind task 28: social acceptance of wind energy: state of the art report. International Energy Agency Wind Task 28. <http://www.socialacceptance.ch> [5 October 2012].
- IEA. 2008. Now or never: IEA energy technology perspectives 2008 shows pathways to sustained economic growth based on clean and affordable energy technology. International Energy Agency. <http://www.iea.org> [5 October 2012].
- IWÖ-HSG. 2010. The price of renewable energy policy risk: an empirical analysis based on choice experiments with international wind and solar energy investors. Working paper, Institute for Economy and the Environment, University of St. Gallen, Switzerland.
- JOHNSON G, SCHOLES K, WHITTINGTON R. 2005. *Exploring Corporate Strategy: Text and Cases*. Prentice Hall: London, UK.
- KAHNEMAN D, TVERSKY A. 1979. Prospect theory: an analysis of decision under risk. *Econometrica* **47**(2): 263-291.
- KAHNEMAN D. 2003. Maps of bounded rationality: psychology for behavioral economics. *American Economic Review* **93**(5): 1449-1475.
- KNIGHT FH. 1921. *Risk, Uncertainty and Profit*. Houghton Mifflin: Boston, MA.
- KOPPENJAN J, VEENEMAN WW, VAN DER VOORT H, TEN HEUVELHOF E, LEIJTEN M. 2010. Competing management approaches in large engineering projects: the Dutch RandstadRail project. *International Journal of Project Management* **29**(6): 740-750.
- LIM G, AHN H, LEE H. 2005. Formulating strategies for stakeholder management: a case based reasoning approach. *Expert Systems with Applications* **28**: 831-40.
- LÜDEKE-FREUND F, LOOCK M. 2011. Debt for brands: tracking down a bias in financing photovoltaic projects in Germany. *Journal of Cleaner Production* **19**(12): 1356-1364.
- LÜTHI S, PRÄSSLER T. 2011. Analyzing policy support instruments and regulatory risk factors for wind energy deployment: a developers' perspective. *Energy Policy* **39**(9): 4876-4892.

- Lüthi S, Wüstenhagen R. 2012. The price of policy risk: empirical insights from choice experiments with European photovoltaic project developers. *Energy Economics* **34**(4): 1001-1011.
- McDaniel BA. 1983. Economic and social foundations of solar energy. *Environmental Ethics* **5**(2): 155-168.
- McElroy B, Mills C. 2007. Managing stakeholders. In *Gower Handbook of Project Management*, Turner JR (ed). Gower Publishing: Aldershot; 757-77.
- Merrow EW. 2003. Mega-field developments require special tactics, risk management. *Offshore* **63**(6): 90-92.
- Mitchell RK, Bradley RA, Wood DJ. 1997. Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Academy of Management Review* **22**(4): 853-885.
- Mormann F. 2012. Enhancing the investor appeal of renewable energy. *Environmental Law* **42**: forthcoming.
- Newcombe R. 2003. From client to project stakeholders: a stakeholder mapping approach. *Construction Management and Economics* **21**(8): 841-848.
- Olsen RA. 2008. Perceptions of financial risk: axioms and affect. *Icfai University Journal of Behavioral Finance* **5**(4): 58-80.
- Pasqualetti MJ. 2011a. The misdirected opposition to wind power. In *Learning from wind power: governance, societal and policy perspectives on sustainable energy*, Szarka J, Cowell R, Ellis G, Strachan P, Warren C (eds). Palgrave Macmillan: Hampshire, UK: 133-152.
- Pasqualetti MJ. 2011b. Opposing wind energy landscapes: a search for common cause. *Annals of the Association of American Geographers* **101**(4): 907-917.
- Pasqualetti MJ. 2011c. Social barriers to renewable energy landscapes. *Geographical Review* **101**(2): 201-223.
- Perminova O, Gustafsson M, Wikström K. 2008. Defining uncertainty in projects: a new perspective. *International Journal of Project Management* **26**(1): 73-79.
- Prässler T, Schaechtele J. 2012. Comparison of the financial attractiveness among prospective offshore wind parks in selected European countries. *Energy Policy* **45**: 86-101.
- Raven RPJM, Heiskanen E, Lovio R, Hodson M, Brohmann B. 2008. The contribution of local experiments and negotiation processes to field-level learning in emerging (niche) technologies: meta-analysis of 27 new energy projects in Europe. *Bulletin of Science Technology Society* **28**(6): 464-477.

- Richter, M. (2009), Offshore-Windenergie in Deutschland: Potenziale, Anforderungen und Hürden der Projektfinanzierung von Offshore-Windparks in der deutschen Nord- und Ostsee. Working paper, Centre for Sustainability Management, Leuphana University of Lüneburg, Germany.
- Rogers EM. 2003. *Diffusion of Innovations*. The Free Press: New York, NY.
- Ruef A, Markard J. 2010. What happens after a hype? How changing expectations affected innovation activities in the case of stationary fuel cells. *Technology Analysis and Strategic Management* **22**(3): 317-338.
- SAM. 2012. Personal communication, Sustainable Asset Management (SAM), St. Gallen, Zurich, Switzerland, June 2012.
- Sanderson J. 2012. Risk, uncertainty and governance in megaprojects: a critical discussion of alternative explanations. *International Journal of Project Management* **30**(4): 432-443.
- Shiller RJ. 2003. From efficient markets theory to behavioral finance. *Journal of Economic Perspectives* **17**(1): 83-104.
- Simon HA. 1955. A behavioral model of rational choice. *Quarterly Journal of Economics* **69**(1): 99-118.
- Slovic P, Finucane ML, Peters E, MacGregor DG. 2004. Risk as analysis and risk as feelings: some thoughts about affect, reason, risk, and rationality. *Risk Analysis* **24**(2): 311-322.
- Slovic P. 1992. Perceptions of risk: reflections on the psychometric paradigm. In *Theories of Risk*, Krinsky S, Golding D (eds). Praeger: Westport, CT; 117-152.
- Sonntag-O'Brian V, Usher E. 2004. Mobilising Finance for Renewable Energies. Renewable Energy Policy Network for the 21st Century (REN21). <http://www.renewables-bonn-2004.de> [5 October 2012].
- Stohlmeyer H, Küver S. 2002. Finanzierung von Offshore-Windenergieprojekten. In *Fascination offshore – report 2002*, Övermöhle Consult & Marketing GmbH & Ingenieurbüro elexyr (ed). Hamburg; 146-149.
- Thayer RL. 1988. The aesthetics of wind energy in the United States: case studies in public perception. In Proceedings of the European Community Wind Energy Conference, Herning, Denmark; 470-476.
- Todd PM, Gigerenzer G. 2003. Bounding rationality to the world. *Journal of Economic Psychology* **24**(2): 143-165.
- Toke D, Breukers S, Wolsink M. 2008. Wind power deployment outcomes: How can we account for the differences? *Renewable and Sustainable Energy Reviews* **12**(4): 1129-1147.

- UNEP. 2012. Global Trends in Sustainable Energy Investment 2012. Frankfurt School UNEP (United Nations Environment Programme) Collaborating Centre for Climate & Sustainable Energy Finance. <http://fs-unep-centre.org> [5 October 2012].
- van Marrewijk A, Clegg SR, Pitsis TS, Veenswijk M. 2008. Managing public-private megaprojects: paradoxes, complexity, and project design. *International Journal of Project Management* **26**(6): 591-600.
- Wang M, Keller C, Siegrist M. 2011. The less you know, the more you are afraid of – a survey on risk perceptions of investment products. *Journal of Behavioral Finance* **12**(1): 9-19.
- Wang XT, Johnston VS. 1995. Perceived social context and risk preference: A re-examination of framing effects in a life-death decision problem. *Journal of Behavioral Decision Making* **8**(4): 279-293.
- Wang XT, Simons F, Brédart S. 2001. Social cues and verbal framing in risky choice. *Journal of Behavioral Decision Making* **14**(1): 1-15.
- Wolsink M. 1987. Wind power for the electricity supply of houses. *Netherlands Journal of Housing and Environmental Research* **2**(3): 195-214.
- Wolsink M. 1988. The social impact of a large wind turbine. *Environmental Impact Assessment Review* **32**(8): 324-325.
- Wolsink M. 1989. Attitudes and expectancies about wind turbines and wind farms. *Wind Engineering* **13**(4): 196-206.
- Wolsink M. 2007a. Planning of renewables schemes: deliberative and fair decision-making on landscape issues instead of reproachful accusations of non-cooperation. *Energy Policy* **35**(5): 2692-2704.
- Wolsink M. 2007b. Wind power implementation: the nature of public attitudes: equity and fairness instead of ‘backyard motives’. *Renewable and Sustainable Energy Reviews* **11**(6): 1188-1207.
- Wüstenhagen R, Menichetti E. 2012. Strategic choices for renewable energy investment: conceptual framework and opportunities for further research. *Energy Policy* **40**: 1-10.
- Wüstenhagen R, Wolsink M, Bürer MJ. 2007. Social acceptance of renewable energy innovation: an introduction to the concept. *Energy Policy* **35**(5): 2683-2691.
- Wüstenhagen R, Wuebker R, Bürer MJ, Goddard D. 2009. Financing fuel cell market development: exploring the role of expectation dynamics in venture capital investment. In *Innovation, Markets, and Sustainable Energy: The Challenge of*

Hydrogen and Fuel Cells, Pogutz S, Russo A, Migliavacca P (eds). Edward Elgar: Cheltenham, UK; 118-137.

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