

Opening the Black Box of Upper Echelons: Drivers of Poor Information Processing During the Financial Crisis

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ABSTRACT

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Research Question/Issue: Why did the majority of directors prior to the financial crisis not have the foresight to predict the problems of taking on too much risk? We analyze whether executives' characteristics affect strategic choices due to bounded rationality, as proposed by the theory of upper echelons. The literature has thus far not empirically opened this black box. Relying on psychological economics, we develop hypotheses under which conditions expertise and gender can lead to biased information-processing.

Research Findings/Insights: To test the hypotheses, we propose a two-study methodology and take the financial crisis as a natural experimental setting. In Study 1, we analyze individual phenomena and show that under conditions of uncertainty, the processing of information by financial experts and men is worse than by non-financial experts and women. In Study 2, we test these findings for organizational phenomena. We show that banks with a higher percentage of financial experts within TMTs perform better in stable environments, but are more negatively affected by the financial crisis.

Theoretical/Academic Implications: An important moderator within the theory of upper echelons is financial market discipline during turbulent periods, explaining why the performance of homogenous TMTs is volatile and why the performance of diverse TMTs is sustainable. The theory can be strengthened by including the insights of psychological economics as a micro-foundation.

Practitioner/Policy Implications: For a sustainable performance, greater TMT diversity in public companies should be instituted by the board of directors.

INTRODUCTION

The financial market crisis that spread around the globe raises the question as to why a many directors within the banking and insurance industry did not have the foresight to predict the problems of taking on too much risk. In the banking industry, even when problems became apparent, few bank managers or directors spoke up ([Steverman & Bogoslaw, 2008-10-11](#)).

This paper argues that an important reason for these failures may be a lack of heterogeneity and a lack of differentiated viewpoints in top management teams (TMTs). The task of the executive TMT is to suggest an overall strategy with respect to risky investments, while the non-executive TMT has either to agree or disagree with this suggested strategy. The TMT of a company thus has a major influence on risky investments. The theory of upper echelons ([Hambrick & Mason, 1984](#)) proposes that, within turbulent environments and under great job pressure in particular, differences in information, knowledge and perspective may benefit decision-making and thus enhance firm performance ([Hambrick & Finkelstein, 1987](#); [Hambrick, Finkelstein, & Mooney, 2005](#)). In contrast, homogeneous TMTs might be more advantageous within stable environments. Homogeneous groups make faster decisions and are more capable of debating complex issues ([Knight et al., 1999](#); [Pelled, Eisenhardt, & Xin, 1999](#); [van der Walt & Ingley, 2003](#)). The theory of upper echelons explains the influence of executives' characteristics by referring to bounded rationality. Experience, values and personalities are reflected in the characteristics of executives and affect their field of vision, selective perception and interpretation. "In very few studies, however, have researchers attempted to confirm whether executive characteristics affect information processing in this way. As a result, the psychological and social processes, by which executive profiles are converted into strategic choices, still remain largely a mystery – the proverbial black box" ([Hambrick, 2007](#): 337).

Our article addresses this gap by developing a research design that opens the black box of information-processing (for an excellent overview on the gaps see also [Carpenter, Geletkanycz, & Sanders, 2004](#)). We rely on psychological economics, which is sometimes referred to as "behavioral economics." As pointed out by [Simon \(1985\)](#), the term "behavioral" is however misleading, since it may be confounded with the "behaviorist" approach in psychology. We therefore prefer the expression "psychological economics." We combine psychological economics with the theory of upper echelons to develop hypotheses for information-processing, depending on gender and expertise. Both characteristics may be important in explaining risk estimates of TMTs in stable situations and in turbulent environments like the aforementioned financial crisis. In most countries, TMTs are strikingly homogeneous ([Brammer, Millington, & Pavelin, 2007](#); [Campbell & Minguez-Vera, 2008](#); [Francoeur, Labelle, & Sinclair-desgagne, 2008](#); [Kang, Cheng, & Gray, 2007](#); [Rose, 2007](#)). Within the financial sector in particular, most TMTs mainly consist of males with a financial background, i.e., of males with a degree in management, economics, or finance ([Daily, Certo, & Dalton, 1999](#); [Rost & Osterloh, 2008](#)).

Our research contributes to the theory of upper echelons in two ways. First, we connect research on micro-processes with research on macro-organizational phenomena. To open the black box of information-processing in the upper echelon theory, we use a student sample and compare the results with observable measurements of TMTs. Within both samples, the same external stimuli, i.e., the financial crisis, affected personalized constructions of the situation. Second, we treat the financial crisis as a natural experiment. Natural experiments help in sorting out reverse causality, i.e., when it is not clear whether an event is a cause or an effect. In natural experiments, the chronology between cause and effect is clear because the stimulus operates strictly exogenously and cannot be manipulated.

Section 1 introduces the theory of upper echelons and psychological economics, and the resulting research design. Section 2 develops hypotheses on which conditions of expertise and gender systematically influence information-processing of individuals. Section 3 discusses the consequences of biased information-processing for decision making groups. Section 4 presents empirical findings on information-processing of individuals. Section 5 shows empirical consequences for groups. Section 6 discusses the findings and points out the limitations, implications and further research.

THEORETICAL BACKGROUND

The next section introduces the theory of upper echelons and psychological economics. We point out the limitations of the theory of upper echelons, and suggest that some can be overcome by including insights from psychological economics. Building on both theories, we develop a research design to study information-processing of individuals and TMTs.

Theory of Upper Echelons

Building on the premise of bounded rationality ([March & Simon, 1958](#)), the theory of upper echelons emphasizes the importance of understanding the mental models of top managers in explaining the choices they make. Leaders are typically confronted with a vast amount of information that demands attention ([Mintzberg, 1973](#)). They decide on appropriate responses to important stimuli and discard information that is less important ([Weick, 1979](#)), according to their interpretation of the situation, applying their beliefs, knowledge, assumptions and values ([Finkelstein & Hambrick, 1990](#); [March & Simon, 1958](#)). Different mental models can also operate on the group level, e.g., as shared cognition ([Klimoski & Mohammed, 1994](#)) or dominant logic ([Prahalad & Bettis, 1986](#)).

Three facets of the theory of upper echelons have significantly stimulated major streams of research ([Hambrick, 2007](#)). First, most studies focus on TMTs (for an overview see [Certo, Lester, Dalton, & Dalton, 2006](#)), since management is a shared effort in which a dominant coalition collectively shapes organizational outcomes ([Cyert & March, 1963](#)). Second, demographic characteristics of executives are used as valid (but incomplete) indicators of executives' cognitive frames. The linkage between TMT characteristics and firm performance is used as a valid (but incomplete) indicator of real psychological and social processes that mediate between executives' demography and their behavior. This approach is useful for executive research because "black box" problems, i.e., unknown, underlying psychological and social processes of individuals, may be bypassed. Third, the theory's predictive strength is dependent on certain moderators. For example, managerial characteristics have an impact on strategy and performance under the following conditions: (a) there exists a great deal of means-ends ambiguity ([Eisenhardt, 1989](#)), i.e., managerial discretion is high ([Hambrick & Finkelstein, 1987](#)); (b) executives operate under great pressure, i.e., executive job demands are high ([Hambrick et al., 2005](#)); (c) executives have considerable influence on firm outputs ([Miller & Droge, 1986](#)); (d) behavioral integration characterized by intense interaction that produces open information exchange and collaboratively based solutions and decisions is high, i.e., a TMT weighs multiple approaches against each other ([Li & Hambrick, 2005](#); [Simons, Pelled, & Smith, 1999](#)).

Psychological Economics

Psychological economics broadens the standard economic model in three ways: in terms of bounded rationality, bounded self-interest and bounded utility concept ([Frey & Benz, 2004](#)). It has been shown, for example, that markets ([Uzzi, 1997](#)), including stock markets ([Baker, 1990](#)), depart from standard

economic theory systematically under certain conditions, particularly in situations characterized by ambiguity and complexity. One reason may be that individuals face cognitive and emotional constraints. First, under risk and uncertainty, individuals use simple rules of thumb or heuristics (Basov, Blanckenberg, & Gangadharan, 2007), which lead to so called decision anomalies (Ellsberg, 1961). Examples include the sunk cost effect, the opportunity cost effect, the endowment effect, the reference point effect, the availability bias, preference reversal, anchoring and framing. These effects have been empirically validated in numerous experiments (Dawes, 1988; Kahneman & Lovallo, 1993; Kahneman & Tversky, 1979; Thaler, 1992; Tversky & Kahneman, 1974) and are shown to be particularly relevant for experts estimating the probability of non-typical events (Kahneman & Tversky, 1973). Second, under risk and uncertainty, human decisions can be constrained by emotions (Naqvi, Shiv, & Bechara, 2006). Emotion-driven decisions may incorporate a degree of logic, but emotion ultimately overrides logic or supports a pseudo-logic (Loewenstein, Weber, Hsee, & Welch, 2001). We restrict the following discussion mainly to cognitive constraints, as the theory of upper echelon analyzes decision-making in particular with respect to bounded rationality.

Contributions of Psychological Economics to the Theory of Upper Echelons

Within the last decades, many articles brought new insights into the effects of TMT characteristics on organizational strategy and performance. The theory of upper echelons, however, still has important research gaps, which may be overcome by including insights from psychological economics. The theory of upper echelons proposes that executive characteristics are observable (but incomplete) indicators of individual experiences, values and personalities. They therefore affect the personalized construction of the situation, i.e., they limit the field of vision, select perceptions and interpretations, and thus affect choices.

However, few studies ask how executive characteristics affect information-processing in this way (Carpenter et al., 2004; Hambrick, 2007). First, relatively few researchers are interested in psychological determinants of behavior (micro-processes) *and* in the aggregated effects within organizations (macro-organizational phenomena). Second, to open the black box, access to executives is required, and they generally do not participate in research, psychological research in particular. Third, few studies analyze whether external situational changes indeed affect personalized constructions. Most previous studies have a cross-sectional design and fail to empirically distinguish between endogenous and exogenous drivers of choices. For example, the theory argues that TMT diversity enhances performance in uncertain industries, i.e., when solving complex, non-routine problems; cognitive heterogeneity generates greater variance in decision-making alternatives and thus improves decision-making (Bantel, 1993a; Ruigrok, Peck, & Keller, 2006). However, the causal path between TMT diversity and performance under uncertainty could also be the result of endogenous processes.

Figure 1 contrasts the basic logic of the theory of upper echelons (theoretical model) against the stream of empirical investigations (empirical model). The figure illustrates that empirical investigations have so far failed to open the black box.

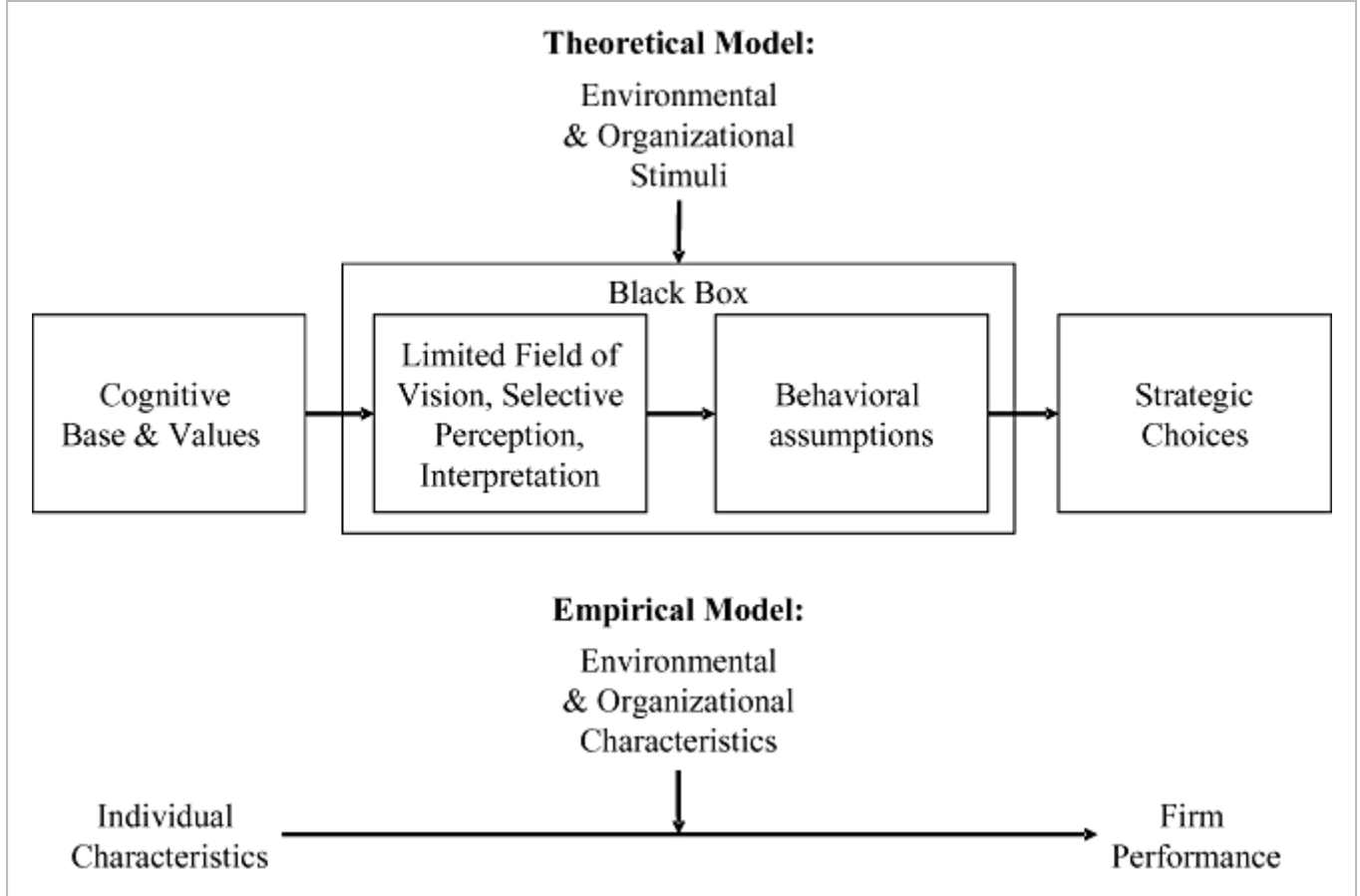


Figure 1

[Open in figure viewer](#) | [↓ PowerPoint](#)

Theoretical Versus Empirical Model of Theory of Upper Echelons

We therefore propose an alternative methodology to overcome some of the limitations of prior empirical studies. We develop hypotheses for financial decision-making and use the recent financial crisis as an unexpected and radical environmental change. We will first open the black box of information-processing by analyzing the limited field of vision of financial experts and of males. Second, we will analyze whether this limited field of vision indeed results in bad strategic choices. This procedure is in line with the theory of upper echelons, which make assumptions on the individual level, but empirically analyzes these effects only on the group level. **Figure 2** illustrates our study design.

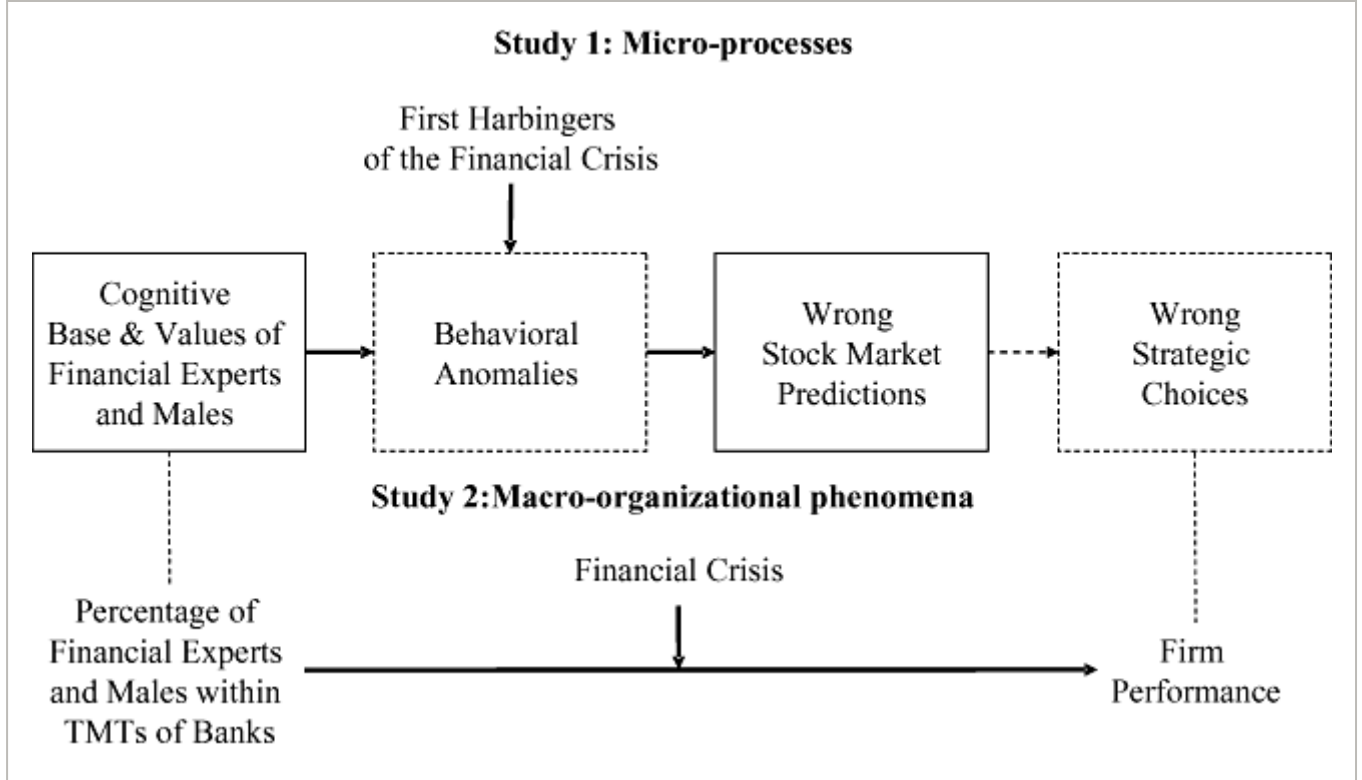


Figure 2

[Open in figure viewer](#) | [PowerPoint](#)

Research Design of This Study

As shown in the upper part of **Figure 2**, Study 1 analyzes microprocesses to open the black box of information-processing of individuals. It has been demonstrated that in particular two individual characteristics, namely financial expertise (**Kahneman & Tversky, 1973**) and gender (**Barber & Odean, 2001**), are closely linked with financial risk-taking in individuals. In standard situations, i.e., under conditions of certainty, individuals with financial expertise and males are expected to make quicker as well as better financial decisions than non-experts and females (**Ricciardi, 2008; Ricciardi & Simon, 2000**). However, in turbulent situations, i.e., under uncertainty, it has been demonstrated that subjective risk factors systematically influence information-processing (**Tversky & Kahneman, 1974**). Experts, in particular, have a greater tendency to over- or underestimate the probability of non-typical events than non-experts (**Ricciardi & Simon, 2001**). Additionally, men underestimate the probability of unlikely negative events more than women (**Schubert, Brown, Gysler, & Brachinger, 1999**). On the individual level, we will therefore test whether both characteristics indeed systematically influence information-processing. We compare stock market predictions of males and financial experts with predictions of females and non-experts, in a situation where the harbingers of the financial crisis were already obvious.

As shown in the lower part of **Figure 2**, Study 2 analyzes macro-organizational phenomena, combining it with the findings on micro-processes of information-processing. According to the theory of upper echelon limited field of vision results in bad strategic choices. We will therefore analyze whether banks with a higher percentage of experts and males within TMTs are more greatly affected by the financial crisis, and compare this to a situation where the financial system was stable.

MICRO-PROCESSES OF INFORMATION-PROCESSING

In the next section we develop our hypotheses on which the conditions expertise and gender systematically influence information-processing.

Expert Knowledge as a Driver of Forecast Errors

Financial expertise is, in the following, understood as financial knowledge gained by interests, experiences, information gathering, beliefs and socialization. Financial experts have a deeper body of knowledge in their specific knowledge domain (Cohen & Levinthal, 1990) than non-experts. It is therefore more likely that financial experts are able to produce better financial decisions and make faster decisions than non-experts. However, even experts often fall victim to an oversight trap in situations of great uncertainty (Arkes, Dawes, & Christensen, 1986; Fox & Clemen, 2005; Griffin & Tversky, 1992; Paese & Feuer, 1991; Spense, 1996). They often overestimate the precision of their information. Examples are clinical psychologists (Oskamp, 1965), physicians and nurses (Baumann, Deber, & Thompson, 1991; Christensen-Szalanski & Bushyhead, 1981), engineers (Kidd, 1970), entrepreneurs (Cooper, Woo, & Dunkelberg, 1988; Hayward, Shepherd, & Griffin, 2006), investment bankers (von Holstein, 1972), stock market forecasters (Deaves, Lüders, & Schröder, 2005) and security analysts (Bar-Yosef & Venezia, 2006).

The cognitive biases of experts can be explained by intense educational experiences and practicing within a particular field. Their familiarity in specific fields of study enables them to rapidly retrieve complex configurations of information from long-term memory (Dreyfus & Dreyfus, 2005), which distinguishes experts from novices and less experienced people. For example, investors utilize familiar heuristics when they assess investment choices within a narrow timeframe (Ricciardi & Simon, 2001). However, familiarity can be of little assistance or even a hindrance when situations are characterized by non-typical circumstances (Kahneman & Tversky, 1973). This can lead to an over- or underestimation of the probability of non-typical events in situations of great uncertainty, due to the following biases.

Availability or Representativeness Bias. Experts might focus too heavily on the circumstances underlying “typical” events and too little on the circumstances underlying a specific event (Fox & Hadar, 2006; Samuelson & Zeckhauser, 1988). Individuals who are subject to this bias favor the current state of understanding and ignore relevant facts that should be included in the decision-making process (Fox & Tversky, 1995).

Overconfidence. Humans have an inclination to overestimate their own skills, abilities and predictions for success (Ricciardi & Simon, 2001). Experts may be overconfident in existing scientific knowledge and thus ignore how certain factors perform together as a whole (Slovic, Fischhoff, & Lichtenstein, 1985).

Anchoring. There is a strong inclination to latch onto a specific belief, which may or may not be correct, and to use this as a reference point for upcoming decisions (Hammond, Keeney, & Raiffa, 1998). One of the most frequent anchors is a past event or trend (Fischhoff & Beyth, 1975). Compared with less experienced people, experts have more knowledge about past events and trends, and thus may also have a higher probability for anchoring. It has been shown that hindsight-biased investment bankers can overreact to information signals, come to incorrect conclusions about volatility and engage in suboptimal investment decisions (Biais & Weber, 2007).

Illusion of Control. This phenomenon may cause an individual to believe that he or she can control the outcome of a random decision or situation based on their skills ([Baker & Nofsinger, 2002](#); [Langer, 1975](#)). Experts may assume that they have a greater ability to foresee and navigate potential hazards and may therefore systematically underestimate the associated risks ([Powell, Lovallo, & Caringal, 2006](#)).

There exists a substantial amount of empirical evidence suggesting that such cognitive biases also affect business decisions. It has been shown that biased executives exhibit high investment cash-flow sensitivity ([Malmendier & Tate, 2005](#)), engage intensively in unsuccessful mergers and acquisitions ([Malmendier & Tate, 2008](#); [Roll, 1986](#)), are convinced of finding hidden synergies and are certain of their ability to select the best targets for their company ([Doukas & Petzemas, 2007](#)), show a willingness to overpay for acquisitions ([Hayward & Hambrick, 1997](#)), fail to diversify their portfolio by executing stock options only shortly before they expire ([Malmendier & Tate, 2003](#)), issue forecasts that the total profit of their company will be positive while that of all other business entrants will be negative ([Camerer & Lovallo, 1999](#)) and are more likely to manage earnings to meet these forecasts ([Hribar & Yang, 2006](#)). Empirical evidence further indicates that there is a pronounced “CFO effect” in corporate decisions ([Bertrand & Schoar, 2003](#)) demonstrating that CFOs, to a major degree, are overconfident ([Ben-david, Graham, & Harvey, 2007](#)).

There is extensive additional evidence suggesting that the familiarity bias under conditions of uncertainty operates in capital market decisions as well. For example, people remain for long periods of time in the default option offered by their firm and make no changes to the composition of their retirement portfolios ([Ben-david et al., 2007](#)). U.S. investment managers invest disproportionately in locally headquartered firms ([Madrian & Shea, 2001](#)). Investors tend to hold the shares of firms that have nearby headquarters and communicate in the investors' native tongue ([Coval & Moskowitz, 1999](#)). Investors concentrate on holdings in stocks to which the investor is geographically or professionally close, or that has been held for a long period ([Grinblatt & Keloharju, 2001](#)). Portfolio managers have more pessimistic expectations about foreign stocks than about domestic stocks ([Massa & Simonov, 2006](#)). In international financial markets, investors tend to hold domestic assets instead of diversifying across countries ([Strong & Xu, 2003](#)). Firms tend to cross list their stocks in countries where investors are more familiar with the firms to be listed ([French & Poterba, 1991](#)). Lower levels of trust toward citizens of a country lead to less trade with that country, less portfolio allocation to assets in that country and less direct investment in that country ([Pagano, Roell, & Zechner, 2002](#)).

In contrast, non-financial experts possess a more diverse body of knowledge. When uncertainty prevails, this diversity is important as to which knowledge domains will be accessed as a source of potentially useful information. Diversity strengthens assimilative power by increasing the prospect that incoming information will relate to what is already known ([Cohen & Levinthal, 1990](#)). Additionally, it results in a more balanced strategy, thanks to the wide range of knowledge domains, coupled with the fact that those who are more diversified are to some extent Jacks-of-all-trades ([Lazear, 2004](#)). Empirical findings show that in situations in which organizations cannot build on previous knowledge, persons with a diverse set of knowledge increase innovative outputs. In contrast, in situations in which incremental innovations are needed, persons with specialized knowledge are better suited ([Rost, Hölzle, & Gemünden, 2007](#)). Empirical findings also show that a diverse body of knowledge increases the probability of discovering novel linkages ([Bessant & Tidd, 2007](#)), and is associated with greater information use ([Dahlin, Weingart, & Hinds, 2005](#)) and greater variance in decision-making

alternatives (Cox, 1993). Under uncertainty, i.e., in a state of limited knowledge, novel linkages, greater information use, and greater variance in decision-making alternatives are particularly important.

In accordance with this literature, we hypothesize that, in situations of uncertainty, the information-processing ability of financial experts with regards to financial decision-making is more biased compared with the information-processing of non-financial experts. We analyze biased financial information-processing by means of stock market forecasts, taking them as indirect evidence of cognitive, not observable, processes of human thinking.

“ Hypothesis 1. In situations of uncertainty after which the market goes into decline, non-financial experts make better stock market forecasts than financial experts. ”

Gender as a Driver of Forecast Errors

Psychologists and sociologists have found strong gender-specific differences in response to non-financial risks (for a meta-analysis see Byrnes, Miller, & Schafer, 1999). Recently, research has been done on gender-specific differences as related to financial decision-making (for an literature overview see, e.g., Schubert, 2006). Studies based on field data conclude that women are relatively more averse to risk than men (Eckel & Grossman, 2002). This observation also holds true among professional men and women (Beckmann & Menkhoff, 2008). Gender differences in risk-taking may be due to differences in the valuation of outcomes or in the weighing of probability. The results of laboratory experiments indicate that value functions do not differ significantly between men and women; but under specific circumstances, women appear to be more averse to risk than men (Fehr-Duda, de Gennaro and Schubert, 2006). The authors find that women (a) are less sensitive to changes in probability than men (b) underestimate large probabilities of gains more than men (c) tend to be pessimistic when profitable but potentially unsafe gambles are framed in investment terms.

These findings can be explained by the facts that, on average, women suffer less than men from overconfidence (Barber & Odean, 2001; Beckmann & Menkhoff, 2008), and show, compared to men, higher anxiety or worrying in situations of uncertainty (Fehr-duda, De gennaro, & Schubert, 2006). From a psychological perspective, “worrying is often seen as a constructive occupation that helps to solve potential problems” (Davey, 1994:35). In contrast, financial literature until recently has focused on the negative effects of risk-aversion and worrying (Ricciardi, 2004). However, the way women process information under uncertainty may prove advantageous, since under these conditions, a higher aversion to risk and a lack of overconfidence is beneficial (Sheridan & Milgate, 2005). We therefore hypothesize that, in situations of uncertainty, the information-processing of women with regards to financial decision-making has its advantages.

“ Hypothesis 2. In situations of uncertainty after which the market goes into decline, women make better stock market forecasts than men. ”

Expert Knowledge and Gender as a Driver of Forecast Errors

Empirical evidence further shows that, in particular, men with a high level of knowledge and experience in financial matters significantly overestimate the probabilities of gains ([Gysler, Brown Kruse, & Schubert, 2002](#)). This result suggests that gender and financial expertise might not be independent from each other with respect to the financial risk-taking of individuals. Their combination can reinforce or weaken risk-taking. As demonstrated in the former sections under uncertainty, risk-taking is a strong driver of cognitive constraints for financial decision-making. One can therefore expect that, under uncertainty, males with financial expertise are most affected by biased information-processing, whereas females with no financial expertise are least affected. The cognitive constraints of individuals with mixed characteristics, i.e., of males with no financial expertise or of females with financial expertise, should be lower in the first group but higher in the second group.

“ Hypothesis 3. In situations of uncertainty after which the market goes into decline, women (experts and non-experts) and male non-experts make stock better market forecasts than male experts. ”

MACRO-ORGANIZATIONAL INFORMATION PROCESSING

The former section discussed the consequences of biased information processing in individuals for forecasts. In line with the former hypotheses, we expect stronger effects by focusing on the compositions of TMTs instead of focusing on the individual level ([Hambrick & Mason, 1984](#)). We define a TMT as the group of executive and non-executive directors of a company. These players are most likely involved in the overall strategy of a company and in financial decision-making, thus having a major influence on risky investments. The task of the executive TMT is to suggest an overall strategy with respect to risky investments, while the non-executive TMT has to agree or disagree with this suggested strategy (for more details on the discussion what constitutes TMTs see [Carpenter et al., 2004](#)).

First, it has been argued that, under uncertainty, the expectations of males and experts are more biased than those of women and non-experts. Under uncertainty, TMTs mainly consisting of males and experts might base their judgments on less valid expectations ([Sjöberg, 2009](#)). Second, TMTs are to a large degree homogenous. Literature on group think argues – albeit not uncontested (e.g., [Katz & Kahn, 1966](#); [Turner & Pratkanis, 1998](#)) – that homogenous groups in particular are prone to group think ([Banerjee, 1992](#); [Gonzalez, Modernell, & Paris, 2006](#)). [Janis \(1972\)](#) hypothesizes that decision-making groups are likely to experience group think under certain conditions, which include strong group cohesion, insulation of the group from outside, homogeneity of members' social background, high stress from external threats and difficult tasks. Under these conditions, symptoms of dependent judgments ([Sjöberg, 2009](#)) are to be expected, such as the illusion of invulnerability, stereotyping of out-groups, self-censorship and the belief in the inherent morality of the group. These symptoms lead to biased information-processing and poor decision-making, characterized by failing to fully survey alternatives and objectives, poor information-seeking, failure to examine the risks of the preferred solution and selective information-processing ([Leahy, 1992](#)).

The theory of upper echelons also proposes that, in particular within turbulent environments and under great job pressure, decision-making and firm performance may benefit from differences in information, knowledge and perspectives ([Hambrick & Finkelstein, 1987](#); [Hambrick et al., 2005](#)).

The biased information-processing of homogenous groups under uncertainty can be explained by the following facts: within turbulent environments, it is important that average errors made by individual judges cancel each other (Surowiecki, 2004). The main reason is that environment changes often destroy the usefulness of established knowledge (Morrison, White, & Van Velsor, 1987). Independent judgments therefore increase the probability that the average judgment of groups is valid (Sjöberg, 2009).

Taking this literature as a basis, we hypothesize that, in situations of uncertainty, firms with TMTs consisting of a high percentage of males and of financial experts, and thus of homogenous TMTs, have a more biased information-processing. They make decisions that tend to weaken the performance of the firm. Literature shows that within innovative contexts, TMT diversity improves the understanding of the market place (e.g., Adams & Flynn, 2005; Carter, Simkins, & Simpson, 2003; Eisenhardt & Schoonhoven, 1990; Erhardt, Werbel, & Shrader, 2003). The positive impact of TMT diversity in turbulent industries may be explained by the following reasons. First, studies show that TMT diversity is associated with greater use of information (Dahlin et al., 2005). Second, when solving complex, non-routine problems, cognitive heterogeneity improves decision-making because group members disagree about task issues (Bantel & Jackson, 1989; Pelled et al., 1999), thus generating greater variance in decision-making alternatives (Cox, 1993). Task conflicts also stimulate creative thinking and divergent thought processes (Coser, 1956; De Wit & Greer, 2008; Deutsch, 1969). For example, Simons et al. (1999) shows that decision comprehensiveness, i.e., the extent to which a TMT weighs multiple approaches against each other, examines the pros and cons of several possible courses of action, or uses multiple criteria for eliminating possible courses of action, positively mediates the effects of TMT diversity on profitability and sales growth. Within the banking sector, it has been empirically shown that TMT diversity increases innovations (Bantel & Jackson, 1989). Further, studies show that overall functional TMT diversity increases firm value (Certo et al., 2006), particularly in turbulent environments (Keck, 1997; Murray, 1989), in diversified firms (Michel & Hambrick, 1992; Wiersema & Bantel, 1992) or in fast growing firms (Eisenhardt & Schoonhoven, 1990). Studies also have indicated that gender diversity in TMTs increases a firm's financial performance (Campbell & Mínguez-Vera, 2009; Francoeur et al., 2008) or that overall TMT diversity increases firm value (Erhardt et al., 2003; Hambrick, Cho, & Chen, 1996).

“ Hypothesis 4. The higher the percentage of males and financial experts within a TMT, the lower the stock market performance of the firm in situations of uncertainty after which the market goes into decline. ”

In contrast, homogeneous TMTs might be more advantageous within stable environments. We hypothesize that, in situations of relative certainty, TMTs consisting predominantly of males with expert knowledge make decisions that strengthen performance. Within such situations, the financial information-processing of males, e.g., taking on more risk, and of experts, e.g., relying on a deeper body of knowledge in specific knowledge domains, is expected to lead to firm value, enhancing strategic choices. Under these conditions, homogeneity can be advantageous. Such groups come to quicker decisions and are more capable of debating complex issues (Knight et al., 1999; Pelled et al., 1999).

The moderating effect of certainty or uncertainty on the link between TMT diversity and firm performance is in line with the diversity literature. Meta-analytic reviews conclude that one cannot assume a simple relationship between TMT diversity and firm performance without considering a series of variables that affect this relationship (van Knippenberg & Schippers, 2007).

“ Hypothesis 5. The higher the percentage of males and financial experts within a TMT, the higher the stock market performance of the firm in situations of certainty in which the market is stable or grows. ”

STUDY 1: MICRO-PROCESSES OF INFORMATION-PROCESSING

Sample

We conducted a survey at the time when harbingers of the financial crisis were already obvious, but the extent of the financial crisis was yet unknown. The survey was conducted from April 3, 2008 to April 8, 2008. The sample consists of 479 students at the University of Zurich and the Swiss Federal Institute of Technology from various fields of study, i.e., students in management, economics, finance, social science, and engineering. We used a combination of two sampling methods – snowball sampling and stratified sampling. In order to reach students with diverse backgrounds, 42 students from different fields of study, e.g., psychologists, students in finance, management and economics, were asked to interview 10–20 students from the University of Zurich and the neighboring Swiss Federal Institute of Technology. In order to ensure a sufficient number of students with financial experience, it was required that at least 20 per cent of the interviewed students had practical experience in the stock market, i.e., they had invested or are still investing their own money in shares and other financial products.

Participants were asked to forecast a future event in the stock market. We analyzed the accuracy of stock market forecasts using the example of the Swiss bank UBS by comparing the forecasts with the true UBS stock price two months later. We choose UBS for two reasons. First, as a consequence of numerous significantly incorrect speculations in the context of the mortgage crises in the second half of the year 2007 and the first quarter of the year 2008, the UBS stock price started to drop dramatically, i.e., from 80 SFR down to 27 SFR. The UBS case was also prominent in the Swiss media, e.g., in newspapers, TV, radio, talk-shows, guaranteeing that people with no financial interests or no expertise were also informed about the UBS case. Second, after the announcement of considerable losses in the quarterly report, the UBS stock price recovered and started to increase again. In the month before we conducted our study, the share price had increased from 27 SFR up to 33 SFR. The situation for market forecasts was characterized by highly volatile stock prices and a high amount of uncertainty.

From November 2007 to mid-March 2008, the UBS share price dramatically collapsed as a consequence of significantly wrong speculations. In the month before the survey was conducted, i.e., from mid-March 2008 to the start of April 2008, the UBS share price had increased temporarily. Within the forecast horizon, i.e., from mid-April 2008 to mid-July 2008, the UBS share price dramatically declined again, as the bank announced even more sub-prime write-offs. In September/October 2008,

the bank had so far been forced to write off about \$43 billion and had to be supported by the Swiss government. In November 2008, a share of UBS had a value of around 10 SFR. Shares were worth four times less than they were five years earlier.

In the time period when the survey was conducted, the recurrence of a fall in prices was contra-intuitive for most people. As we will demonstrate, only 21 per cent of the participants expected such a development. 54 per cent of the participants put emphasis on the latest, most striking news, e.g., the recovery of the UBS share price, in context with the belief that the financial situation would recover soon and all sub-prime write-offs would be included in the UBS quarterly report.

The final sample used in this study was reduced from 479 students originally surveyed to 355 students. 64 students had to be excluded, since they answered “no idea” with respect to our dependent variable “UBS stock price forecasts.”¹ Other individuals had to be excluded because we have incomplete information on some independent variables, e.g., on the financial expertise of the person or some control variables like risk-aversion or income per month.

Measurements

Accuracy of Forecasting Predictions. The accuracy of forecasting predictions was measured by asking the respondents within the time period from April 3, 2008 to April 8, 2008 about the development of the UBS stock price within the next two months. In order to minimize random predictions of irresolute respondents, every person had the possibility of answering “no idea.” The distribution of answers was as follows: 10 per cent answered “1 = UBS stock price will rise massively”; 44 per cent answered “2 = UBS stock price will rise”; 24 per cent answered “3 = UBS stock price will be constant”; 15 per cent answered “4 = UBS stock price will fall”; and 6 per cent answered “5 = UBS stock price will fall massively.” Higher values indicate more accurate forecasts since, in reality, the UBS stock price declined within the forecasting period.

Financial Expertise. We applied different measurements, i.e., education, knowledge, experience, information gathering, beliefs and socialization variables, to capture the independent variable financial expertise.

Education. The participants were asked about their main field of study. 30 per cent of all participants have a non-finance-related background, i.e., they have a background in natural sciences (15 per cent) or in humanities/social sciences (15 per cent). The remaining 70 per cent have a finance-related background. Subsequently, we contrasted these students against students with non-finance-related backgrounds. Students with a finance-related background were classified into four different fields of management education: (1) finance (0 = no, 1 = yes) (2) economics (0 = no, 1 = yes) (3) management (0 = no, 1 = yes), and (4) management and economics, i.e., a combined education in economics and management (0 = no, 1 = yes).

Knowledge. Knowledge about financial issues and stock markets was measured through three criteria. On a general level, the respondents were asked on a 5-point scale to evaluate their knowledge of stock markets (1 = uninformed, 5 = expert). Furthermore, we asked if the students have ever attended lectures about stock markets or financial issues (0 = no, 1 = yes) and if the students dabble in stocks and buy or sell shares (0 = no, 1 = yes). 35 per cent of the participants are active on stock markets with their own money.

Experience. Experiences within the financial sector were measured by two criteria (motivated by [Kaustia & Knüpfer, 2008](#)). Most Swiss students are employed part time in addition to their university studies. We asked whether the students are employed within the financial sector (0 = no, 1 = yes). In fact, 20 per cent have a job within the financial sector. Furthermore, incentive pay, i.e., bonus pay or variable pay through shares and stock options is standard within the financial sector. We asked if the students are paid via incentive pay within their jobs (0 = no, 1 = yes). 19 per cent of the respondents answered yes.

Information. The amount of knowledge is influenced by the type of information gathering and was measured by newspaper reading (motivated by [Kaustia & Knüpfer, 2008](#)). We asked the participants which newspaper sections they read regularly. We differentiated between regular information about “economy” and/or “finance” (0 = no, 1 = yes), about “national politics” and/or “international politics” (0 = no, 1 = yes), and about “society” including sports, culture, and/or gossip (0 = no, 1 = yes).

Beliefs. Beliefs are influenced by the type of education and the type of knowledge. Financial experts learn as part of their education that, in theory, markets work efficiently ([Fama, 1970](#)). This theoretical knowledge influences the beliefs of financial experts, i.e., their subjective personal basis for individual behavior ([Gettier, 1963](#)). In order to capture the beliefs of financial experts that the market and the economy work efficiently, we asked the respondents to agree on five items by using a 5-point scale (1 = totally disagree to 5 = totally agree). These items were: (1) “I have a high trust in banks”; (2) “Competent managers were aware of the mortgage crisis”; (3) “Top CEOs are more talented than other economic participants”; (4) “Principal-agent-theory's predictions are always true”; (5) “The increase in CEO salaries is driven by the “war for talent” and not by managerial power.” We ran a principal-component analysis and a Cronbach's Alpha test in order to test the consistency of the scale. The items formed one component. The Cronbach's Alpha test indicates that all items measure one construct, since every item improves the Cronbach's Alpha of the overall scale ($\alpha = .55$). For each person, we averaged the values of the items 1–5. Higher values indicate a higher trust in optimal contracts. Beliefs might also be reflected in professional career wishes. We asked the respondents where they see themselves within the next 10 years, i.e., as a normal employee, as a manager, as a top-manager, as an entrepreneur or as a full-time mother/father. From these answers, we selected the career as a top-manager (0 = no, 1 = yes). Individuals who wish to become a top-manager may have more typical expert beliefs, e.g., overconfidence ([Hiller & Hambrick, 2005](#)).

Primary socialization. Primary socialization might have consequences on forecasting predictions because it influences learning processes, beliefs or self-selecting in a field of study ([Coleman, 1990](#)). We captured socialization through the following items: (1) At least one parent is working in the finance sector (0 = no, 1 = yes); (2) Parents are wealthy (0 = no, 1 = yes); (3) One parent has a university degree (0 = no, 1 = yes); (4) Parents are active on the stock exchange (0 = no, 1 = yes); (5) Parents bought stocks as a present (0 = no, 1 = yes); (6) Stock market education was provided by parents (0 = no, 1 = yes).

Gender. In order to test Hypothesis 2, we asked the gender of each person (0 = female, 1 = male).

Control Variables. We took into account several control variables which could influence the judgment processes. To exclude the alternative interpretation that non-experts and women are generally more risk-averse in assessing financial markets than experts and males ([Barber & Odean, 2001](#)), we asked

for financial risk-aversion. This alternative interpretation suggests that the correct forecasts of women and non-experts are driven by luck because they generally think more negative. Participants were asked how much money they would be willing to reinvest in shares if they had invested 1000 SFR in shares, but had sold these shares for only 800 SFR. The answers ranged from 0 SFR up to 1200 SFR. We also included a measurement of general risk orientation, as an individual's risk perception may be a driver of judgment processes (Henderson & Clark, 1990; Tushman & Anderson, 1986). We measured the general risk orientation of persons by using a multiple item scale (1 = totally disagree to 5 = totally agree) (Zuckerman, 1979). The scale, which has been validated in a number of studies, e.g., for risky forms of sport (Wagner & Houlihan, 1994) or for marijuana consumption (Kopstein, Crum, Celentano, & Martin, 2001), consists of 14 items and includes statements referring to drug consumption, or gambling. We ran a principal-component analysis and a Cronbach's Alpha test in order to test the consistency of the scale. The items formed three selective components, which we labeled as (1) risk as thrill ($\alpha = .61$), (2) risk as breaking the law ($\alpha = .60$), and (3) risk as readiness to change ($\alpha = .39$). High values indicate a higher risk orientation.

Further, we control for certain demographic characteristics, which are important with respect to financial decision-making (motivated by Lewellen, Lease, & Schlarbaum, 1977). We measured the age of each person (1 = 19–20, 2 = 21–22, 3 = 23–24, 4 = 25–26, 5 = 27–28, 6 = 29–30, 7 = 31), the provided income per month (0 < SFR 1500, 1 = SFR 1500), workload besides study (1 = 0 per cent, 2 < 20 per cent, 3 = 21–40 per cent, 4 = 41–60 per cent, 5 > 60 per cent), the degree of satisfaction at the university (1 = very unhappy to 5 = very happy), number of passed semesters (from 1 up to 12) and grade point average (from 4 up to 5.7; in Switzerland grade “6.0” is the best possible grade).

For descriptive statistics and correlations please ask the first author of this study.

Analyses

We examine the effects of the independent variables on the accuracy of forecast predictions by running simple OLS regression analyses, i.e., we assume that our dependent variable has a quasi-metric scale. We ran sensitivity tests by comparing these results with the results of logit regression analyses using “wrong” and “right” forecasts as our dependent variable, and with the results of ordinal regression analyses. The results do not significantly differ. Furthermore, we ran sensitivity tests by comparing the OLS results with the results of clustered regression analyses. We clustered according to the 42 students who interviewed the 479 students. The snowball sampling method does not significantly bias our results. For simplicity, we will mainly document the results of OLS regression analyses. In the final model, we will show the results of sensitivity tests.

Furthermore, since expert knowledge is measured by using different types of measurements, i.e., education, knowledge, experience, information gathering, beliefs and socialization variables, some of these indicators greatly correlate with each other. In order to avoid problems caused by multi-collinearity, we run separate models for different indicator types. In all partial models, we control for gender, demographic characteristics and risk orientation. Finally, we run a model which includes all variables. As these results could be distorted by multi-collinearity, we also test if the identified significant variables are still significant in a model which only includes these drivers. These final results are then tested for sensitivity by running a clustered regression and an ordinal regression as well. In order to test for interaction effects between gender and expert knowledge, we run a univariate analysis of variance (ANOVA).

Results

Table 1 documents the results of the regression analyses.

Table 1.

Determinants of the Accuracy of Forecasting Predictions

	Model I			Model II			Model III			Model IV			Model V
	B	SD	Sig.	B	SD	Sig.	B	SD	Sig.	B	SD	Sig.	B
(Constant)	4.37	.92	**	4.40	.89	**	4.29	.90	**	4.19	.90	**	4.76
Education (Field of study)													
Finance student	-.39	.17	*										
Management & Economic student	-.10	.24											
Economic student	-.45	.22	*										
Management student	-.17	.14											
Knowledge													
Knowledge about stock market & finance				.02	.08								
Stock market				-.37	.14	**							

Legend: Dependent variable accuracy of forecasting prediction of the change in the UBS stock price in the next 2 months. *p .05, **p .01.

Expert Knowledge. Model 1 tests whether the field of study has any effect on the accuracy of forecast predictions in uncertain situations. The analysis reveals that finance (beta = -0.39 , $p < 0.05$) and economic (beta = -0.45 , $p < 0.05$) students were wrong significantly more often in their forecast predictions than students who have no educational background in finance or economics, temporarily supporting Hypothesis 1. It shows that in situations of great uncertainty, after which the market goes into decline, expert knowledge systematically affects the accuracy of forecasting predictions. For descriptive reasons, we dichotomized the dependent variable “accuracy of forecasting predictions” in wrong predictions containing answers that the UBS stock price will rise or will be constant, and in correct predictions containing answers that the UBS stock price will fall. The descriptive analysis shows that 15 per cent of all finance students and 16 per cent of all students of economics made accurate

forecast predictions. The percentage of accurate forecast predictions for non-finance students totals 23 per cent, and 22 per cent for non-economic students.

Model II tests whether knowledge about the stock exchange and finance knowledge influences forecasts. We obtained one significant effects temporarily supporting Hypothesis 1: students who attended courses about stock markets and finance ($\beta = -.37, p < 0.01$) made less accurate forecasts compared to students without this knowledge. Descriptive analyses demonstrate that the accurate forecasts of students without this knowledge were nearly twice as high.

Model III tests whether experience, i.e., employment in the financial sector or incentive pay influences forecast predictions. Both variables show negative but nonetheless insignificant effects.

Model IV tests the effects of information-gathering on forecast predictions. It turns out that regular information about the economy and finance, as well as about politics, has no effect, while regular information about society ($\beta = .26, p < 0.05$) is associated with a higher likelihood that individuals made more accurate forecasts. Thus, the data indirectly supports Hypothesis 1 by showing that “non-expert” information, i.e., information which is not connected with financial issues, increased the accuracy of forecasts.

Model V-tests whether beliefs influence forecasts. In line with Hypothesis 1, it turns out that people who place a lot of trust in self-regulating, efficient markets ($\beta = -.27, p < 0.01$) made significantly less accurate forecasts. Career wishes within top-management also show a negative but insignificant effect on the accuracy of forecasts.

Model VI tests whether primary socialization influences forecasting predictions. No variable shows significant effects.

Gender. In all models, gender produced significant effects on forecasting predictions (between $\beta = -.30, p < 0.01$ and $\beta = -.43, p < 0.01$). The negative effects temporarily support Hypothesis 2, which predicted that in situations of great uncertainty, after which the market goes into decline, women make better stock market forecasts. A descriptive analysis shows that 16 per cent of all men made accurate forecast predictions. This percentage is nearly twice as high for women, totaling 33 per cent.

Control Variables. With respect to the included control variables, no variable, not even the measurements of risk-aversion, are significant drivers of forecasting predictions (no presentment in the table).

Overall Model. Model VII in [Table 1](#) illustrates the results of an overall model. It mainly supports the results of the partial models. Males ($\beta = -.28, p < 0.05$), students who attended courses about stock markets and finance ($\beta = -.32, p < 0.05$) and those who believe in self-regulating, efficient markets ($\beta = -.23, p < 0.05$) made, in a situation of great uncertainty after which the market goes into decline, significantly less accurate forecasts, temporarily supporting hypotheses 1 and 2.

It should be noted that the R-Square values of all models are low, even though the *F*-values are significant.

Sensitivity Tests. The models in [Table 2](#) test whether the results are stable by including only the significant variables of the overall model, i.e., gender, finance courses and trust in optimal contracts. The results support the former findings, indicating that multi-collinearity has not biased the results. Furthermore, the OLS regression model, the clustered regression model and the ordinal regression model show related findings, indicating that the results are not sensitive to the type of method applied. The explanatory model statistic, i.e., the *R*-value, shows that gender, finance courses and trust in optimal contracts explain the accuracy of forecast predictions between 23 per cent and 28 per cent, indicating that forecasting predictions in situations of great uncertainty, after which the market goes into decline, are to a great degree influenced systematically.

Table 2.
Main Determinants of the Accuracy of Forecasting Predictions

	OLS regression			Clustered OLS regression			Ordinal regression (Logit)		
	B	SD	Sig.	B	SD	Sig.	B	SD	Sig.
(Constant)	4.07	.28	**	4.07	.28	**			
Threshold [1; stock price will rise massive]							-4.65	.55	**
Threshold [2; stock price will rise]							-2.21	.51	**
Threshold [3; stock price will be constant]							-1.04	.50	**
Threshold [4; stock price will fall]							.47	.52	
Knowledge									
Stock market & finance courses	-.31	.11	**	-.22	.11	**	-.60	.20	**
Beliefs									
Trust in optimal contracts	-.25	.08	**	-.21	.09	**	-.35	.15	**
Demographics									
Male	-.31	.11	**	-.31	.14	**	-.45	.20	**
R-Square/Cox and Snell		.08			.05			.07	

Legend: Dependent variable accuracy of forecasting prediction of the change in the UBS stock price in the next 2 months. *p .05, **p .01.

Robustness Test. Even if all models are controlled for risk-aversion in financial markets, it could still be that the results are not driven by cognitive constraints, but solely by the fact that women and non-experts are generally more risk-averse in assessing financial markets. We therefore tested whether this alternative interpretation can be ruled out with the data. We run the OLS regression of [Table 2](#)

by including our measure of financial risk-aversion, and the interaction terms between financial risk-aversion and (a) gender, (b) finance courses, and, respectively (c) trust in optimal contracts. Each model revealed that the main effect of financial risk-aversion, as well as the interaction effects, are not significant. In our sample, the underlying factor for the differences in forecasting predictions can thus not simply be explained as a matter of financial risk-aversion.²

Interaction Tests. Table 3 tests if the significant indicators of Table 2 interact with each other. The results temporarily support Hypothesis 3, i.e., in situations of great uncertainty, male experts in particular make the most inaccurate forecasts. The contrast groups made far better forecasting predictions as compared with the reference group of male experts. The table illustrates the results in cross-tables by showing only the percentage of correct forecasts. The results reveal that only 13 per cent of men who have attended finance courses, and only 12 per cent of men who have strong beliefs in mainstream economic knowledge, succeeded in making accurate forecasts. In contrast, women who have never attended finance courses and women with little trust in mainstream economic knowledge successfully achieved accurate forecasts of 42 per cent and 39 per cent, respectively. Women with strong beliefs or expert knowledge and men with weak beliefs or no expert knowledge attained accurate forecasts of 23 per cent and 27 per cent, respectively, which is still significantly higher than the forecasts of male experts. The results also support that beliefs and education reinforce each other. In particular, finance courses negatively affect forecasting accuracy if individuals additionally hold strong beliefs in mainstream economic knowledge. These individuals achieved only 10 per cent accuracy in forecasts, whereas the forecast accuracy of people who share only one or none of these characteristics varies between 26 per cent and 35 per cent.

Table 3.
Cross-tables of the Accuracy of Forecasting Predictions

Accuracy of forecasting prediction ^a	Gender			
	Female	Sig. ^b	Male	Sig.
Finance courses				
No Finance courses	42%	**	27%	**
Finance courses	27%	**	13%	Ref. group
Trust in optimal contracts				
Low Trust	39%	**	23%	**
High Trust	23%	*	12%	Ref. group

Accuracy of forecasting prediction	Finance course			
	No	Sig.	Yes	Sig.
Trust in optimal contracts				
Low Trust	35%	**	26%	**

Accuracy of forecasting prediction	Finance course			
	No	Sig.	Yes	Sig.
High Trust	30%	**	10%	Ref. group

Legend: *p .05, **p .01.

- a Accuracy of forecasting predictions is dichotomized in wrong predictions containing answers that the UBS stock price will rise or will be constant, and in correct predictions containing answers that the UBS stock price will fall.
- b Significance levels were obtained by using univariate analysis of variance (ANOVA) with the accuracy of forecasting predictions as the dependent variable. The reference group of the ANOVA models is indicated in the table.

In summary, the results of Study 1 are consistent with hypotheses 1, 2 and 3, showing that in situations of great uncertainty, after which the market goes into decline, knowledge and gender systematically affect the accuracy of forecasting predictions.

STUDY 2: MACRO-ORGANIZATIONAL PHENOMENA OF INFORMATION-PROCESSING

The sample of Study 1 is comprised of students and analyzed their personalized construction of the situation, dependent on the individual characteristics gender and financial expertise. The study revealed that both individual characteristics systematically influence information-processing. The theory of upper echelons, however, makes assumptions on the individual level, but analyzes these effects empirically only on the group level of TMTs. In the following, we therefore connect the findings of Study 1 with macro-organizational phenomena. We will analyze whether banks with a higher percentage of financial experts and males within TMTs are more greatly affected by the financial crisis, yet performed better before the crisis. Study 2 thus comprises a sample of people in working life, since one may offer criticism that findings on students cannot be used as surrogates for experienced managers ([Chang & Ho, 2004](#); [Elliott, Hodge, Kennedy, & Pronk, 2007](#)).

We believe that the findings of both samples complement one another. Psychological processes, as analyzed in Study 1, are an inherent feature of all humans. For the individual characteristic “gender,” it should not matter whether a person is a student or a manager. For the individual characteristic “financial expertise,” which further experiences persons gain in their working life play a role. In the following, we will concentrate on one indicator of financial expertise, namely the specialist educational background of individuals. It seems reasonable to assume that, in the long term, the kind of educational background shapes the information-processing of individuals. Education not only has a strong impact on socialization, but also results from the self-selection processes due to former socialization institutions ([Coleman, 1990](#)). We therefore expect that our findings in the student sample may also be valid for a working sample.

Sample

We collected data from all banks listed in the Swiss Market Index (SMI) and in the Swiss Performance Index (SPI), i.e., overall, 30 banks quoted on the Swiss Exchange (SWX). We restricted our sample to

banks, since the miscalculation within banks specifically amplified the magnitude of the financial crisis. The influence of biased information-processing of TMTs on firm performance seems reasonable. TMT, in the following, is defined as all executive directors, i.e., the CEO, the CFO, the heads of marketing, IT, HR, etc., and all non-executive directors in the boards. Banks in Switzerland have a two-tier board structure, i.e., a director can be either a member of the executive or the supervisory board. Further, we restrict the sample to one country because banks are a highly regulated industry. Using data from different governance systems may increase sample size but it also proves highly problematic with respect to the different rules for board composition. Thus, while our sample is relatively small, we believe that the reliability of a sample restricted to banks and to one country is most appropriate for testing our hypotheses.

Measurements

Performance. We measured performance by calculating the development of the stock price of a bank at two different time intervals, each including a 12-month time period: performance before the financial crisis (January 1, 2006/ December 1, 2006), and performance within the financial crisis (March 1, 2008/February 1, 2009). Using a financial-based performance measure conforms to finance research, which strongly supports the conclusion that shareholder wealth maximization should be the definitive criterion for performance (Murphy, 1999). The time interval before the financial crisis, which does not include the liquidity crisis in July 2007, tries to capture the performance of a bank in a situation of relative high certainty. The time interval within the financial crisis begins six months before the global financial crisis emerged, so includes six months of this event and tries to capture the performance of a bank in a situation of great uncertainty. We made robustness checks by calculating the results for different time windows, e.g., by including the performance of the year 2005 instead of 2006. Such changes did not affect our results. Further, studies normally adjust stock price development for general market development (Bliss & Rosen, 2001). However, as we rely on one industry in one market, we did not adjust our performance measures.

TMT Structure. We collected data on the TMT structure with respect to gender and educational composition of all banks for the year 2006. At this time, the balance sheets of banks were healthy and TMTs had the possibility of continuing to invest in Credit Default Swaps or “parallel” banking. In fact, such risky investments were an advantage in the time before the financial crisis, becoming a disadvantage within/after the financial crisis. We further checked how the gender and educational composition of TMTs of the analyzed banks changed from 2006 as compared with 2008. Within this time period, however, only few changes occurred, which are too small to affect our results. From 2006 to 2008, the percentage of female TMT members changed by $-.03$ per cent, and the percentage of persons with a non-financial background by -1.67 per cent. We therefore use the TMT composition in 2006 as our independent variable, which affects both performance measurements.

We analyzed the curriculum vitae of all 450 persons working in 2006 for the TMT of one of these banks. 160 persons worked in an executive position, with 290 in a non-executive position. We coded gender and educational backgrounds of all persons. Educational backgrounds were classified according to five categories: (1) finance-related background, including final degrees in business, finance or economics; (2) background in law; (3) background in engineering; (4) background in natural sciences, including mathematics; and (5) background in social sciences, humanities or the arts. As educational background, we considered study degrees as well as apprenticeships. 52 persons had multiple backgrounds and were assigned to both of these backgrounds.

We calculated the percentage of females within a TMT. Within executive teams, this percentage amounts to 3 per cent; within non-executive teams, to 8 per cent. To capture the amount of non-financial expertise, we calculated the percentage of non-finance-related backgrounds within a TMT. Within executive teams, this percentage amounts to 22 per cent, and within non-executive teams to 45 per cent. Study 1 further showed significant interaction effects between expertise and gender. We therefore computed a combined measurement counting the percentage of directors who are either female or have a finance-related background, or are male or have a non-finance-related background. According to theory, a higher share of crisscross individuals lowers the disadvantages of group diversity by simultaneously offering the same advantages.³ We term this measurement percentage of crisscross individuals.

Control Variables. Due to the small sample size, we use only three major control variables. First, we included firm size by using the logarithms of the number of employees. In general, larger firms are expected to have a higher market performance. Furthermore, firm size may also increase board diversity, due to the fact that, in large firms, the diversity of employees increases (Carter et al., 2003). Second, we included a dummy variable which measures the ownership type of a bank (Daily, Dalton, & Rajagopalan, 2003). The variable takes the value 1 if the bank is a cantonal bank, and 0 otherwise. 14 banks of the sample are cantonal banks, which are to a large extent owned by the cantons (comparable with a federal state), are managed under a public performance mandate and often have a government guarantee. Due to their public performance mandate, cantonal banks demonstrate a greater adversity to risk: stricter control prevents these banks from taking too much risk. For example, in Switzerland, no cantonal bank has required state assistance during the financial crisis. It seems therefore quite likely that these banks were less active in the Credit Default Swaps market and “parallel” banking. Furthermore, the boards of cantonal banks may consist of more non-experts and women, due to the fact that political representatives are often involved. The major shareholder of cantonal banks, the canton, delegates political representatives to the non-executive board. These representatives, who often account for 50 per cent of the non-executive board, are bureaucrats. In a bureaucracy, the amount of persons with non-financial backgrounds and of women is often higher, due to the greater representation of interests and more comprehensive task characteristics. Third, we additionally included board size. Larger boards are more diverse (Carter et al., 2003). This correlation may influence the effects of the percentage of females and of persons with non-financial backgrounds on performance.

For descriptive statistics and correlations please ask the first author of this study.

Analyses

We examined the effects of TMT structure on performance by running OLS regression analyses for different time periods, and by separating between executive and non-executive teams. All variables were tested for normal distribution. We first tested the effects of the percentage of females and the percentage of non-finance-related backgrounds on performance. Second, we tested the effects of the percentage of crisscross individuals on performance.

Results

Table 4 documents the results of the regression analyses.

Table 4.

Determinants of the Stock Market Performance of Banks

	Non-executive directors Model I						Executive directors Model II					
	Performance before the financial crisis (January 1, 2006/December 1, 2006)			Performance after the financial crisis (March 1, 2008/February 1, 2009)			Performance before the financial crisis (January 1, 2006/December 1, 2006)			Performance after financial crisis (March 1, 2008/February 1, 2009)		
	B	SD	Sig.	B	SD	Sig.	B	SD	Sig.	B	SD	
(Constant)	82.63	31.67	*	-141.37	60.32	*	40.30	14.21	**	-26.39	21.76	
Percent of Females	-22.98	37.13		37.60	49.69		25.10	33.04		63.29	50.59	
Percent of non-finance- related backgrounds	-26.22	10.92	*	34.55	13.71	*	-1.21	16.76		-15.19	25.67	
Control variables												
Number of employees (log.)	1.07	1.73		-6.29	2.32	*	-.53	1.99		-1.37	3.05	
Type of bank	-14.22	6.60	*	34.55	11.83	*	-16.74	6.26	*	24.42	9.59	

Legend: †p .10, *p .05, **p .01.

Non-executive TMT Members. Model I shows how the non-executive team structure is associated with firm performance. The results indicate that a higher percentage of persons with a non-finance-related background goes along with significantly lower performance before the financial crisis emerged (model Ia: $\beta = -26.22$, $p < 0.05$), with significantly higher performance after the financial crisis emerged (model Ib: $\beta = 34.55$, $p < 0.05$). The numbers show that, before the financial crisis, banks with the highest percentage of non-executive TMT members with non-financial expertise performed about 21 per cent worse as compared to banks with only financial experts on their boards (no figure). After the financial crisis, the relationships switch completely. Banks with the highest percentage of non-executive TMT members with non-financial expertise performed about 28 per cent better as compared to banks with only financial experts within boards (no figure). These results thus temporarily support our hypotheses 4 and 5, where we postulated that a high number of persons with a financial background in TMTs significantly increase firm performance in situations of relatively high certainty in which the market is stable or grows, but decrease firm performance in situations of great uncertainty after which the market goes into decline.

The percentage of female non-executive TMT members shows the expected signs on performance, but the effects are not significant. One likely reason for such insignificant results may be the small variance of the variable, i.e., the variance of the percentage of female non-executive directors only amounts to 0.8 per cent. We therefore analyzed descriptively how the number of females is associated with performance (no figure). In line with our hypotheses, the results illustrate that a higher number of females corresponds with a lower performance before the financial crisis (0 females correspond with 30 per cent stock price performance, 2 females correspond with 10 per cent stock price performance), and a higher performance after the financial crisis (0 women correspond with –45 per cent stock price performance, 2 women correspond with –10 per cent stock price performance). The results, however, are not significant.

The additional results in [Table 4](#) validate the previous findings for a higher crisscross percentage in non-executive teams. The variable significantly lowers firm performance before the financial crisis (model Ia: $\beta = -23.16$, $p < 0.05$), and enhances firm performance after the financial crisis (model Ib: $\beta = 29.79$, $p < 0.05$). Concerning our control variables, the ownership type of a bank shows by far the strongest influence on performance. Cantonal banks showed weaker performance before, yet stronger performance after the financial crisis. We predicted this result, due to the fact that they are to a large part owned by the federal state, which obligates these banks to take lower risks. The results thus indicate that, in the financial sector, companies majority-owned by the state are not as dependent on environmental changes as companies majority-owned by the public. State ownership does not indicate the same performance fluctuations. The results, however, also show that, with respect to overall performance, i.e., performance in stable and turbulent environments, no ownership structure may be the superior one. Additionally, within banks, boards consisting of many directors were disadvantageous before, but advantageous after the financial crisis. This change in causality is interesting and could be further investigated.

Executive TMT Members. Model II shows how executive team composition influences firm performance. We find no support for our hypotheses. One likely reason may be the small variance in TMT composition, i.e., the percentage of female executives totals 0.9 per cent and the percentage of directors with a non-finance-related background 3.6 per cent. Concerning our control variables, the ownership type of a bank shows again the strongest influence by far on performance, i.e., cantonal banks showed weaker performance before, but stronger performance after the financial crisis.

We did also run a model for overall board composition, i.e., executive and non-executive directors. The results mainly reflect the results of Model I.

DISCUSSION

Contributions

Building on the theory of upper echelons and psychological economics, our research analyzes whether information-processing is systematically influenced by expertise and gender. We discuss explanations arguing that, in an environment of high uncertainty, experts and men have a higher inclination to underestimate financial risks than non-experts and women. In addition, we find homogenous groups are in danger of biased decision-making. In doing so, our research addresses an important gap within executive research, the black box of upper echelons. We propose an alternative methodology to overcome limitations of former empirical studies and find support for bounded rational information-processing.

We conducted two studies. In accordance with hypotheses 1, 2, and 3, the first study shows that students with little financial expertise and female students predicted the collapsing stock market prices of the Swiss bank UBS significantly better than students with financial expertise and male students. The second study aims to complement these findings regarding the share of financial experts and males in TMTs. The results show that banks with non-executive boards consisting predominately of members with a financial-related educational background are more heavily affected by the financial crisis, but did perform better in situations of certainty in which the market was stable or grew. These results are in line with hypotheses 4 and 5. While our descriptive results indicate that hypotheses 4 and 5 could also be supported with respect to the percentage of women in TMTs, the actual number of females within the considered TMTs is too small to gauge any significant results.

Implication for Practice

Our main result is that the market disciplines firms by penalizing homogeneous corporate elites during turbulent periods. As demonstrated, banks with homogenous TMTs were more strongly affected by the financial crisis, due to their risk taking. It suggests that diversity in corporate elites is important and may even help to prevent financial crises, which affect not only the shareholders but also the stakeholders of firms. Corporate elites, in particular, often interpret diversity as an annoying tool to ensure equal rights for minorities, at the expense of competence and economic success. Our results demonstrate that the opposite is true.

This result further implies that an important task of the board of directors is to ensure that TMTs are diverse, and do not merely consist of persons sharing similar demographic characteristics. The board of directors is in the best position to accomplish such changes efficiently. If the board of directors does not fulfill this task, it could be that regulations in favor of more minorities in TMTs in public companies will be introduced. Regulations often come with unintended consequences and undermine the autonomy of firms. The board of directors should therefore have an action plan on TMT diversity. Crisscross individuals may prove particularly useful. If there is a majority consisting of males with financial expertise and a minority consisting of females without financial expertise, crisscross individuals, e.g., females with financial expertise or males without financial expertise, serve as a bridge between otherwise separate minority and majority groups.

Implication for Theory

Our research first points out that the theory of upper echelons should also explain how several demographic characteristics are linked with the bounded rationality of individuals. Most former studies on TMT diversity (Francoeur et al., 2008; Knight et al., 1999; Simons et al., 1999; Tihanyi, Ellstrand, Daily, & Dalton, 2000) or board diversity (Barnes, Bolliger, Cepeda, & Sykes, 2007; Brammer et al., 2007; Campbell & Minguez-Vera, 2008; Carter et al., 2003; Erhardt et al., 2003; Kang et al., 2007; van der Walt & Ingley, 2003) show that diversity is linked to performance or other strategic outcomes, but they do not show why diversity is important. Diversity is important because demographic characteristics are connected with the bounded rationality of individuals. We pointed out this gap in the theory of upper echelons. While the theory is built on the premise of bounded rationality, the black box of information-processing has rarely been opened. One reason may be that the micro-foundations of the theory of upper echelons are still weak. We introduce psychological economics to fill this gap. Psychological economics not only broadens the standard economic model, but may also lead to a valid micro-foundation for the theory of upper echelons. Such an extension may establish a better psychological basis for a theory of corporate governance.

Second, our research explains why the link between TMT diversity and firm performance is in some studies positive, while in other studies negative (Dalton, Daily, Ellstrand, & Johnson, 1998). It is important to consider moderators. While recent research has started to discuss several moderators like managerial discretion (Bantel, 1993b; Hambrick & Finkelstein, 1987), executive job demands (Hambrick et al., 2005), or behavioral integration (Li & Hambrick, 2005; Lubatkin, Simsek, Ling, & Veiga, 2006; Simons et al., 1999), the most important moderator seems to be financial market discipline. It allows the building of a simple theory explaining why TMT diversity ensures sustainable firm performance. The performance of homogenous TMTs is more volatile. Although they perform better in stable periods, due to their risk taking, they are more prone to failure in turbulent times. For shareholders, this result may seem less important, as in the long-run, the cumulative performance of homogenous and heterogeneous TMTs may be comparable. However, for stakeholders, the result is important. Market discipline – as demonstrated by the current financial crisis – does not only affect those whose risk taking is a cause of the problem, e.g., firms with homogenous TMTs, but also other companies, taxpayers, and employees. The theory of upper echelons should therefore be enriched by including the moderator financial market discipline to explain sustainable firm performance, which considers the amount of risk taking. Sustainable firm performance, i.e., good performance without risk taking, should be valued higher than a similar performance with exorbitant risk taking. Corporate governance scholars mostly have not considered this issue, since performance – with or without risk taking – is valued the same.

Limitations

Our study has several limitations with respect to the effects of gender and expertise on individual forecast errors and TMT behavior.

First, Study 1 is based on a student sample. External validity is therefore doubtful (Harrison & List, 2004). We have tried to enhance external validity through Study 2. However, we were unable to replicate our findings for gender differences, due in large part to low numbers of females. Nevertheless, the low number of females in Study 2 can be interpreted in two ways. On the one hand, one may argue that this is merely a limitation of our study. On the other hand, one can argue this is descriptive evidence temporarily supporting our hypothesis: females are more risk-averse. Therefore, under certainty, a high percentage of females in the board might indeed cause low performance. The environment in the Swiss financial sector was quite stable for a long period and thus offered firms no incentive to employ risk-averse persons. This could help explain why gender diversity in Swiss financial boards is low. Studies indeed show that firms operating in complex environments do generate positive and significant abnormal returns when they have a high proportion of women officers (Francoeur et al., 2008). Further research is needed, namely more research on TMT members, in order to find out the validity of this explanation.

Second, Study 1 does not observe behavior, but predictions. Further research, preferably field research, is needed to analyze the effects of gender and expert knowledge not only on information-processing but also on actual decisions.

Third, our empirical design does not explain why the forecasting predictions of women differ from those of men. Further research could begin to examine gender differences more deeply. Fourth, our sample of Study 2 is small. Further research could collect a larger sampling of financial firms, for example by expanding our research topic to other countries. With larger samples, one might be able to gauge significant gender effects.

Furthermore, the question arises as to what extent predictions of non-experts can be explained by luck. While the answer to this question is of high interest, it does not devalue our argument that the information-processing of experts is skewed. Finally, the predictions of women may differ, depending on whether the environmental change is positive or negative. Research shows that women have a more negative problem orientation compared to men ([Robichaud, Dugas, & Conway, 2003](#)). In positive settings, one might therefore expect a different result, i.e., if uncertain environmental changes are viewed positively, the prediction of women may be more biased. This hypothesis could be tested by analyzing the effects of TMT composition on financial performance in both boom and bear markets.

Further Research

While the transferability of our findings has to be validated by further research, our approach holds promise for TMT research. First, studies testing the theory of upper echelons could make more use of psychological economics and findings on behavioral anomalies to identify individual characteristics affecting information-processing. Characteristics like national, religious or family background of TMT members may shape human behavior ([DiMaggio & Powell, 1983](#)) and affect the ways in which information is processed (Lubatkin et al., 2005).

Second, further research could ask the question whether financial experts are more likely to forecast incorrectly only when the unfolding trend is negative. Under such conditions, it might be the case that non-financial experts are, in general, more risk-averse than financial experts.

Third, further research on the theory of upper echelons could make more use of natural events, like the financial crisis, in order to test whether and how external changes influence the personalized construction of the situation, and to solve causality problems. Such research can use external events (e.g., [Tuschke & Sanders, 2003](#)) as well as laboratory experiments (e.g., [Devers, Wiseman, & Holmes, 2007](#)).

Fourth, researchers could think further about how experimental settings, for example labor experiments with managers, can be combined with real data on TMTs. Experimental settings are important for TMT research in understanding underlying psychological processes. However, they lack external validity. TMT data is reliable, but often of little use for opening the black-box. Researchers could use similar environmental stimuli in order to compare the findings of experimental settings with findings on TMTs in the field.

Sixth, our findings on the ownership type of a bank are most interesting, particularly in terms of risk taking, and should be investigated by further research. This issue is highly relevant at the moment with the amount of government assistance to struggling banks. In our sample no Cantonal bank needed state assistance but for example UBS, a public owned bank. It may be that due to their public performance mandate, cantonal banks demonstrate a greater adversity to risk: stricter control prevents these banks from taking too much risk. Further research could investigate how different ownership types of banks affect their performance before and within financial crises. It is interesting to know whether the losses of state banks in times where financial markets increase are offset by their gains in times where markets decrease.

CONCLUSION

In line with the theory of upper echelons, our study tests if the effects of external stimuli on choices systematically depended upon individual experiences, values and personalities. Utilizing the financial crisis as a natural experiment, and behavioral anomalies as a test for bounded information-processing, our research tries to overcome problems of reverse causality and endogeneity, which are significant problems in the theory of upper echelons. We show, on the individual level, that expertise and gender significantly affect financial predictions. On the team level we show, with respect to TMTs decision-making outcomes, that in stable environments homogeneous groups make better decisions. In contrast, in turbulent situations like the financial crisis, heterogeneous groups perform better. These findings help open the black box of the theory of upper echelons.

From a practical point of view, our findings imply that, for a sustainable performance, greater TMT diversity in public companies should be instituted by the board of directors. From a theoretical point of view, our research indicates that the theory of upper echelons can be strengthened by including the insights of psychological economics as a micro-foundation for explaining why several demographic characteristics show linkage with the bounded rationality of individuals. An important moderator within the theory of upper echelons is financial market discipline during turbulent periods, explaining why the performance of homogenous TMTs is volatile and why the performance of diverse TMTs is sustainable.

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NOTES

1 The students had to be excluded since the answer “no idea” can be interpreted in several ways. A logistic regression, using the group of students who gave forecast predications and the group who answered “no idea” as the dependent variable, including all independent variables of [Table 1](#), shows that students who answered “no idea” read to a lesser degree the economic and financial section of newspapers regularly and have a higher workload in addition to study. It indicates that the answer “no idea” can be interpreted as an indication of having no information about the UBS case, permitting the exclusion of this group.

2 We further tested the alternative explanation for our sample of active investors (34.5 per cent). For this sample, the data set includes two additional measures for financial risk-aversion. First, all participants were asked whether they evaluate themselves as very conservative (=1) or very risky (=7) investors. Second, the participants were asked how much money they have invested in risky investments (1 < 1999 SFR, 7 > 10 000 SFR). For both measurements, we repeated the OLS regression of [Table 2](#) by including the interaction terms between financial risk-aversion and (a) gender, (b) finance courses, and, respectively (c) trust in optimal contracts. The main effects of financial risk-aversion and, apart from one model, the interaction effects were not significantly supporting the former findings. For gender, we find that the significant main effect on forecasting predictions turns insignificant when the interaction between self-evaluation as a conservative or risky investor and gender is included. For active investors, the model shows that women made better forecasting predictions because they are more risk-averse investors. This finding, however, is in line with our theory, where we explain gender differences by referring to the higher risk-aversion of women. For knowledge indicators, the results on active investors do not reject our explanation that differences in forecasting predications are more a matter of bias in information processing than of risk-aversion.

3 The term crisscrossing characterizes situations in which several indicators of group identity exist ([Brewer, 1995](#); [Crisp, Ensari, Hewstone, & Miller, 2002](#)), i.e., the same person can be related to the male group and to the group of non-experts ([Eiser, 1986](#)). In such groups, four status constellations are possible: (1) Males who are experts (2) females who are experts (3) males who are non-experts (4) females who are non-experts. In TMTs today, the majority fall under the category of male experts. If the minority consists of female non-experts,

crisscross theory states that the potential for conflicts between both subgroups is high. The likelihood that the majority will exclude the minority from the group therefore increases further. In contrast, the potential for conflict and the likelihood of exclusion would decrease if some members do not have a clear group affiliation, belonging partially to both groups, e.g., males who are non-experts or females who are experts. Such crisscross individuals serve as a bridge between the otherwise separate minority and majority groups. They not only confound group borders between conflicting parties, but also prevent self-reinforcing homogeneity in groups (Flap, 1988).

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