BIASED JUDGMENTS WITH CSR.
A Study on the Effects of Cognitive and Behavioral Biases on Professional
Investment Judgments when CSR in Involved

Kumulative Dissertation

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Abstract

CSR (Corporate Social Responsibility) disclosures i.e., reports by companies on their impact on issues such as climate change, pollution, gender diversity or human rights, are now published by the majority of all major companies worldwide.

Little is known about how an important target group of corporate disclosure, professional investors, use CSR disclosure and whether they process it in a rational manner. What is known, however, is that processing of financial and economic information by investment professionals is often not rational, and, as many studies have shown, investment professionals' judgments often fall victim to cognitive or behavioral biases. The research question in this dissertation is therefore whether and to what extent investment professionals' judgments are affected by cognitive and behavioral biases when they use CSR disclosures, and if so, which factors account for the occurrence.

The dissertation addresses the research question with one theoretical and three empirical research paper. The theoretical paper provides a map for pinpointing cognitive and behavioral biases of investment professionals in the context of the utilization of CSR disclosure. Its hypotheses on the potential susceptibility of investment professionals to behavioral and cognitive bias set a framework for future behavioral research on CSR disclosure. The first empirical research paper investigates the effect of timing of CSR disclosure on investment professionals' company valuations. In an online experiment, an asymmetric anchoring effect occurs in which participants in sequential information provision anchor on financial information so that subsequent adjustment after receiving CSR disclosure does not take place. This effect that does not occur when investors receive the financial and CSR information simultaneously – an indication of the effect of integrated reporting. The second empirical research paper utilizes eye-tracking as a method to assess the impact of using graphical information for CSR disclosure. Results show that graphical information, given a higher level of salience compared to numerical information, can direct attention of investors

to positive CSR information which results in a higher valuation of a company. The fourth empirical research paper examines how investment professionals respond to market feedback in a set-up with and without provision of CSR disclosure into account. The paper-and-pencil experiment, in which participants had to value a company over two rounds, shows that feedback from a market with CSR mitigates investment professionals' susceptibility to false consensus bias, i.e., they learn from other investors; what is not mitigated, however, is their overconfidence about the accuracy of their own valuations (in some cases, overconfidence actually becomes stronger).

The dissertation contributes to current CSR research by providing evidence, first of all, that investment professionals do use CSR disclosure – a finding that could not be taken for granted given the skepticism towards CSR by many practitioners and also many accounting scholars. Second, the dissertation contributes to the debate on the usefulness of CSR disclosure by providing evidence that cognitive and behavioral biases arise in its use by investment professionals. These biases affect the rationality of investment professionals' judgments. Their occurrence may impair the rapid diffusion of methods of integrating sustainable aspects into investment decisions – a diffusion, however, that seems indispensable for achieving the political goal of transformation of financial markets towards sustainable finance (e.g., EU Action Plan: Financing Sustainable Growth). It is in the interest of regulators and legislators that their ambitious sustainable finance goals are not thwarted by behavioral misjudgments of one of the key groups in the financial market.

Within CSR research in finance, the results of this dissertation have significance for two specific reasons. First, they were generated experimentally, which offers greater validity than self-report methods such as questionnaires that are often used in CSR research. Second, the experiments were conducted exclusively with professional investors and not, as is often the case in experimental research, with master's students or MBAs, lending validity to the results.

Zusammenfassung

CSR (Corporate Social Responsibility) Berichte[1], Informationen von Unternehmen über ihre Auswirkungen auf Themen wie Klimawandel, Umweltverschmutzung, Diversity, oder Menschenrechte, werden von mittlerweile von der Mehrheit aller großen Unternehmen weltweit veröffentlicht.

Es ist wenig darüber bekannt, wie eine wichtige Zielgruppe von Unternehmensberichten, professionelle Investoren, CSR-Berichte nutzen und ob sie diese Informationen auf rationale Weise verarbeiten. Was jedoch bekannt ist, ist, dass die Verarbeitung von Finanz- und Wirtschaftsinformationen durch Investment Professionals oft nicht rational ist und, wie viele Studien gezeigt haben, die Urteile von Investment Professionals oft kognitiven oder verhaltensbedingten Biases[2] zum Opfer fallen. Die Forschungsfrage in dieser Dissertation lautet daher, ob und inwieweit Investment Professionals kognitiven und verhaltensbedingten Biases unterliegen, wenn sie CSR-Informationen nutzen.

Die Dissertation untersucht die Forschungsfrage mit einer theoretischen und drei empirischen Forschungsarbeiten. Die theoretische Forschungsarbeit liefert eine ‚Landkarte‘, um die kognitiven und verhaltensbezogenen Biases von Investment Professionals im Zusammenhang mit der Nutzung von CSR-Disclosure zu lokalisieren. Seine Hypothesen über die potentielle Anfälligkeit von Investment Professionals für verhaltensbezogene und kognitive Biases bieten einen Rahmen für die zukünftige ‚Behavioral‘-Forschung zur Disclosure von CSR. Die erste empirische Forschungsarbeit untersucht den Effekt des Timings der CSR-Offenlegung auf die Unternehmensbewertungen von Investment Professionals. In einem Online-Experiment tritt ein asymmetrischer Verankerungseffekt auf, bei dem sich die Teilnehmer bei sequentieller Informationsbereitstellung auf Finanzinformationen verankern, so dass eine nachträgliche

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[1] ‚Bericht‘, ‘Disclosure’ und ‚Information‘ werden in diesem Text als Synonyme verwendet.
[2] Im Deutschen wird ‘bias’ als Terminus Technicus beibehalten; eine ungefähre Übersetzung wäre ‚Verzerrung‘.

Anpassung nach Erhalt der CSR-Offenlegung nicht stattfindet. Dieser Effekt tritt nicht auf, wenn Investoren die Finanz- und CSR-Informationen gleichzeitig erhalten - ein Hinweis auf den Effekt von Integrated Reporting. Die zweite empirische Forschungsarbeit nutzt Eye-Tracking als Methode, um die Auswirkungen der Verwendung von grafischen Informationen für die CSR-Offenlegung zu bewerten. Die Ergebnisse zeigen, dass grafische Informationen bei höherer Salienz im Vergleich zu numerischen Informationen die Aufmerksamkeit der Investoren auf positive CSR-Informationen lenken können, was zu einer höheren Bewertung eines Unternehmens führt. Die vierte empirische Forschungsarbeit untersucht, wie Investment Professionals auf Marktfeedback in einem Set-up mit und ohne Berücksichtigung der CSR-Offenlegung reagieren. Das Paper-and-Pencil-Experiment, bei dem Teilnehmer ein Unternehmen über zwei Runden bewerten mussten, zeigt, dass das Feedback von einem Markt mit CSR die Anfälligkeit von Investment Professionals für einen falschen Konsens-Bias abschwächt, d.h. sie lernen von anderen Investoren. Nicht hingegen abgeschwächt wird ihre Selbstüberschätzung (Overconfidence) der Genauigkeit ihrer eigenen Bewertungen (in einigen Fällen wird ihre Selbstüberschätzung sogar stärker).

Die Dissertation trägt zur aktuellen CSR-Forschung bei, indem sie erstens Belege dafür liefert, dass Investment Professionals CSR-Informationen nutzen - eine Erkenntnis, die angesichts der Skepsis vieler Praktiker und auch vieler Accounting-Wissenschaftler gegenüber CSR nicht selbstverständlich ist. Zweitens trägt die Dissertation zur Debatte über die Nützlichkeit von CSR-Offenlegungen bei, indem sie Belege dafür liefert, dass kognitive und verhaltensbezogene Biases bei der Nutzung von CSR-Disclosure durch Investment Professionals auftreten. Diese Biases beeinträchtigen die Rationalität der Urteile von Investment Professionals. Ihr Auftreten kann die schnelle Durchdringung des Marktes mit Methoden zur Integration nachhaltiger Aspekte in Anlageentscheidungen beeinträchtigen - eine Durchdringung, die unabdingbar erscheint, um das politische Ziel einer Transformation der Finanzmärkte in Richtung nachhaltiger Finanzen zu erreichen (z.B. EU Action Plan: Financing Sustainable Growth). Es liegt im Interesse von

Regulatoren und Gesetzgebern, dass ihre ambitionierten Sustainable-Finance-Ziele nicht durch Verhaltensfehlentscheidungen einer der Schlüsselgruppen des Finanzmarktes konterkariert werden.

Innerhalb der CSR-Forschung im Finanzbereich haben die Ergebnisse dieser Dissertation aus zwei spezifischen Gründen Bedeutung. Erstens wurden sie experimentell generiert, was eine höhere Validität bietet als ‚Self-report'-Methoden wie Fragebögen, die häufig in der CSR-Forschung eingesetzt werden. Zweitens wurden die Experimente ausschließlich mit professionellen Investoren durchgeführt und nicht, wie es in der experimentellen Forschung oft der Fall ist, mit Masterstudenten oder MBAs. Dies verleiht den Ergebnissen Validität.

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Part I: General Introduction

1. Introduction

According to a survey of KPMG (2020), 70 percent of the world's largest 5,200 companies[1] report on their sustainability. 90% of all companies in the US, 77% in Europe, 84 % Asia Pacific, 80% globally, disclose CSR (KPMG, 2020). Obviously, the percentage of companies disclosing CSR is already very high around the globe, and CSR reporting has become an integral part of corporate disclosure [2].

While *CSR* refers to a particular type of self-regulation, namely "a type of international private law (…) which generates private self-regulatory initiatives (…) seeking to ameliorate and mitigate the social harms of and to promote public good by industrial organisations" (Sheehy, 2015, p. 639), *CSR disclosure* refers to companies disclosing how their activities and impacts comply with self-regulatory initiatives under CSR. An integral part of CSR disclosure is ESG (for environmental, social, and governance issues) which in financial markets is often used synonymously with CSR or with responsible investing[3]. CSR is strongly related to, often used synonymously with 'corporate sustainability' (Huang and Watson, 2015), which is also reflected in companies' use of alternative terms for their CSR disclosure such as 'corporate sustainability report' or 'sustainability report' (KPMG, 2013; see also Hahn and Kühnen's (2013) taxonomy of CSR and sustainability).

Little is known about whether and to what extent investment professionals use CSR, especially what influence CSR possibly has on their decisions, and, moreover, whether they

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[1] These are the 100 biggest companies in the 52 jurisdictions that KPMG serves, hence 5,200.

[2] The terms disclosure and reporting or are used interchangeably in this dissertation.

[3] Clark and Viehs (2014) propose an intelligent conception that integrates CSR and ESG. CSR in their way of thinking describes all those activities of a company that directly or indirectly have impact on stakeholders in a monetary or non-monetary way – which in the extreme case can refer to *all* of the company's activities and processes. Since companies want to account for all of their activities in their CSR reports, they need metrics and targets that document their accountability and trustworthiness. These metrics and targets are the information reported under E for environmental, S for social, and G for governance. ESG is therefore a touchstone for the CSR quality of a company. CSR disclosure contains ESG material. ESG, then, is that part of CSR reporting that typically enters investment analysis.

process CSR at all in a rational manner. We do know, though, after more than 50 years of behavioral research, that information processing by investors is often *not* rational when measured against criteria of standard economic models (Ackert and Deaves, 2010; DellaVigna, 2009; Libby, Bloomfield, and Nelson, 2002), and that users of accounting information incur cognitive and behavioral biases when making decisions. Since a large number of these cognitive and behavioral biases were identified in the context of investment professionals using financial and economic information (for an overview see Hirshleifer, 2001), it is legitimate to ask whether these cognitive and behavioral biases also occur when CSR disclosures enter the decision-making context of investment professionals.

McEwan and Welsh (2001) posit that when biases arise in investor information processing, typically, these are caused by a) informational inadequacy, by b) user behavior, or c) a combination of both factors. Although "user behavior" is the focus of this paper in the context of CSR bias, some comments on the informational adequacy of CSR are nevertheless in order.

Some authors question why companies make voluntary CSR disclosures at all (e.g., Brooks and Oikonomou, 2018), suspect cynical intentions, and assume that CSR reports of many companies may not be motivated by sincerity, but resemble advertising campaign or marketing action (Schaltegger and Burritt, 2010). Companies have been accused of *greenwashing*, i.e., intending to obtain an image as a 'green' or 'responsible' company without actually acting green or responsible in their core activities (Seele and Gatti, 2017; Lyon and Montgomery, 2015; Mahoney et al., 2013), and *corporate camouflage* i.e., highlighting individual or marginal activities of green or sustainable character in order to mask unsustainable or environmental or social wrongdoings in other areas of business (Michelon et al., 2016;

Moneva, Archel, and Correa, 2006)[4]. When compared to the requirements for accounting information under IFRS, CSR largely fails to comply with criteria of decision usefulness such as comparability, verifiability, understandability[5]. Orlitzky (2013) notes that CSR disclosure may generate noise, first, because the preparation CSR reports is not governed by rigorous standards (such as IFRS for finance), and second, because CSR disclosure may be selective because companies have the discretion to omit reporting negative instances of CSR (Boiral, 2013; Moser and Martin, 2012). Also, unlike financial reports, CSR are not subjected to a strict audit, but only to an assurance (Simnett et al., 2009).

This dissertation asks whether and to what extent cognitive and behavioral biases occur when investment professionals use CSR disclosure for their investment judgments, that is, whether and to what extent CSR makes investment professionals' behavior deviate from rational behavior. For instance, small changes in the verbal description of an asset can result in significant differences in judgments, i.e., *framing* (Koonce and Mercer, 2005; Daniel, Hirshleifer, and Teoh, 2002). Also, extrapolating future performance estimates from past performance thus saving on mental efforts i.e., *cognitive laziness* (Kahneman, 2011; Hirshleifer, 2001), thinking that it is best to follow other investors' decisions because they may know something that oneself does not i.e., *herding* (Spyrou, 2013; Welch, 2000), thinking one has better information than one effectively has and thinking that one's judgmental capacities are above average, i.e., *overconfidence* (Pires, 2020; Glaser and Weber, 2007), or the tendency to be too attached to the status quo and to avoid necessary investments or changes in the portfolio, i.e., *status quo bias* (Dean, Kibris, and Matsatlioglu, 2017; Kahneman, Knetsch, and

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[4] In all these cases, one could speak of a CSR disclosure with little or no CSR, i.e., behaviors and processes concerning the E, the S, and the G are weak or not pronounced at all. The report then simply lacks underpinning, it is an empty shell, so to speak. CSR skeptics would say that this is not unusual.

[5] In its Conceptual Framework, the IFRS (2018) defines under point 2.4 qualitative characteristics of useful financial information: "If financial information is to be useful, it must be relevant and faithfully represent what it purports to represent. The usefulness of financial information is enhanced if it is comparable, verifiable, timely and understandable" (p. 14).

Thaler, 1991) are but a few behavioral biases that have been found to stand in the way of investors making rational investment decisions.

In research investigating biases and heuristics, a positive and a negative agenda exist (Gilovich and Griffin, 2004), also referred to as constructive and destructive mode (Prelec, 2006). The positive agenda attributes a positive function to heuristics, as economic and efficient shortcuts, the negative agenda of the heuristics and biases program regards them as leading to biases (Gilovich and Griffin, 2004). In a profession like investment management, the negative agenda inevitably raises a normative question: shouldn't professional investors and intermediaries who manage and invest other people's money be particularly insensitive, i.e., resistant, to biases? After all, they bear a great responsibility for the prosperity of other people, and not least, as professionals they are paid to be better at investing than their clients (Freidson, 2001).

Sustainable investing stands for the practice of investors to invest in a sustainable and responsible way, taking account of ESG (environmental, social and governance issues)[6]. CSR is information that speaks about a corporate's sustainability and "whether a company is suited for a sustainable investment portfolio or not" (Clark and Viehs, 2014, p.3). Sustainable investing has grown disproportionately in recent years, and is not a niche anymore (Arvidsson, 2019). Sustainable assets already account for 48.8% of all assets-under-management in Europe (USA 25.7%, Australia 63.2%) (GSIA, 2018). Massive investments – for instance $400 billion in additional ESG-managed assets – have been predicted for the next decade (KPMG, 2019). There is every indication that the growth of sustainable finance will continue. And it is therefore very likely that the rise in sustainable investment will also influence the growth and importance of CSR and CSR disclosure. Investment professionals will have to deal with CSR more and

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[6] The terms sustainable investing, responsible investing and ESG are understood to effectively mean the same.

more intensively in the future, because CSR will become an integral part of their professional curriculum in view of market developments. It is therefore important to know whether, in what form and to what intensity CSR evokes cognitive and behavioral biases in investors.

2. Research Approach

2.1. Research Question

This dissertation is grounded in Behavioral Accounting Research, 'behavioral' meaning to build "behavioral assumptions about the addressees or users of accounting that deviate from standard economic theory assumptions about human behavior (…) [such as] unrestricted capacities for the reception of information and its error-free processing" (Gillenkirch and Arnold, 2008, p. 1, translation RF). In this light, the dissertation investigates how investment professionals' judgments deviate from standard economic theory, most notably economic rationality, when they are exposed to CSR, and whether and to what extent cognitive and behavioral biases do occur in those situations.

In economics, rationality is generally modelled as *objective rationality* (Simon, 1947), in which 1. actors are fully informed, absorb all information relevant to their decision situation in a complete and unbiased manner, and process information logically and accurately; 2. they are guided by utility maximization in all their decisions; and 3. have rid themselves of all their emotions and sentiments and act in a strictly logical and rational manner (Von Nitzsch and Friedrich, 1999). This model of rationality is deemed unrealistic (Einhorn, 1976; Edwards, 1954).

Rather, the concept of rationality that is deployed in this dissertation as a benchmark is *instrumental rationality* on the one hand i.e., rationality that is based on decision-makers "having reliable means to achieve goals. The goals are very often objective in the sense of being

external ends (…) But the goals are not objective in the sense that all rational people will agree on them" (Over, 2004, p. 5). Instrumental rationality resonates with Simon's (1997) concept of *bounded rationality*, "rational choice that takes into account the cognitive limitations of the decision maker – limitations of both knowledge and computational capacity" (p. 291), which has little interest in a concept of rationality that is inaccessible to the 'ordinary mortal'. For bounded rationality, procedural rationality is crucial: "The rational person of cognitive psychology goes about making his or her decisions in a way that is procedurally reasonable in the light of the available knowledge and means of computation" (Simon, 1986, p. S211), and "[a]ction is rational to the degree that it is well adapted to [the individual's] goals. Decisions are rational to the extent that they lead to such action" (Simon, 1993, p. 393).

The topic of this dissertation are cognitive and behavioral biases that may occur when investment professionals encounter CSR in their information environment, as compared to when they don't. The approach could be described as phenomenological, as for instance in Moser and Martin's (2012) ratio for engaging in CSR research: "Most companies try to project an image of corporate social responsibility (CSR), often by voluntarily supplementing their annual financial reports with separate CSR reports. *Because such CSR reports represent additional disclosures*, accounting researchers have become increasingly interested in the role that such disclosures play in firm valuation" (p. 797; emphasis RF). One could add that CSR reports are not only additional disclosures but also specific disclosures due to their "nonfinancial character [which is different] from ordinary valuation determinants commonly used in capital markets" (Gödker and Mertins, 2018, p. 38). Thus, it is not just a question of what impact an additional set of information might have on investors, but rather what behavioral impact a specific, largely atypical set of information, presumably still unfamiliar to the majority of corporate information users, might have.

Hirshleifer and Teoh (2003) note that there remains a notable divide in the accounting literature between proponents of analytic models of investor information processing, and proponents of experimental research. The former, according to Hirshleifer and Teoh (2003), still cling to the assumption of objective rationality (Simon, 1947). From such a perspective, the story of CSR disclosure is not particularly interesting and is quickly told: investors know about the materiality of CSR aspects and use (or do not use) CSR disclosure in their decisions, integrating it in a rational way so that the decisions stand up to rational criteria. Investment professionals may have objective argued reasons why one cannot or should not use CSR; there may also be skepticism about CSR; or there are technical problems that speak against the use of CSR disclosure, as statements from surveys among investment experts show[7], but that investors' judgmental rationality is possibly impacted by CSR is not in question.

Experimental accounting researchers, on the other hand, work on the basic assumption that "both naive and sophisticated investors and professional analysts are systematically biased in their interpretation of accounting data" (Hirshleifer and Teoh, 2003, p. 340). Little is known about whether and to what extent investment professionals' judgments are actually affected by cognitive or behavioral biases when CSR disclosure is in the information environment, or when they use it. This dissertation addresses responses of investment professionals to CSR by investigating which of the known systematic biases that investment professionals are typically susceptible to (i.e., as evidenced by behavioral research) occur when investment professionals interpret CSR. Therefore, this dissertation addresses the following research question:

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[7] A proportion of 27% of 1,588 participants in a survey on environmental, social, and governance utilization among investment professionals by the CFA Institute (CFA, 2017) states that they do take ESG issues into account for the following reasons: lack of demand from clients (47%), issues are not material (43%), lack of information/data (19%), insufficient knowledge of how to consider the issues (17%), inability to integrate ESG information into quantitative models (15%), market prices required them to focus on short-term performance (5%), because ESG is not relevant to their job (5%).

> *RQ: Whether and to what extent are investment professionals' judgments affected by cognitive and behavioral biases when they use CSR disclosures, and if so, which factors account for the occurrence?*

2.2. General Considerations about the Appropriate Research Methodology

By their very nature, the observation of cognitive and behavioral biases that exist among investment professionals can hardly be studied in any other way than through experiments in which investment professionals make judgments under laboratory conditions. Other methods commonly used in CSR research, which are essentially based on self-reports (Helfritz et al., 2006), are not effective in answering our research question.

Some of extant academic research on CSR has relied on *self-report* methods of data collection, that is, asking investment professionals by means of interviews or questionnaires about what they think or make of sustainability issues in investment decision-making, or what their requirements are in terms of CSR items to be disclosed by companies, or simply how they use CSR[8]. While questionnaires may be useful tool to obtain a general picture of investment professionals' awareness about sustainability or CSR disclosure is, the research set-ups of this dissertation only deployed questionnaires to gather supplementary data from participants after the experiments, but not as the prime instruments for empirical research. Two reasons account for this choice: First, it is debatable how accurate investment professionals' self-reports on CSR

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[8] Examples of academic research on CSR that is methodologically based on self-reports are e.g., Krueger, Sautner, and Starks (2020), Khemir, Baccouche, and Ayadi (2019), Patel (2018), Amel-Zadeh and Serafeim (2018), CFA Institute (2017), Eccles, Kastrapeli, and Potter (2017), van Duuren, Plantinga, and Scholtens (2016), CFA Institute (2015) to name but a few. Also, practitioner organization such as asset management firms, rating agencies, or professional associations, have a long tradition of questionnairing investors on their ESG attitude and use. Two recent examples are EFFAS (2019) and BNP Paribas (2019).

could possibly be. Nisbett and Wilson (1983) argue that individuals in most cases cannot answer accurately when asked which information they used for a judgment, and exactly which pieces of information served as triggers for a perception or judgment. A questionnaire about ESG, in fact any issue, would require that investment professionals do know and are able to report about which information items they do use, which ones they do not use, and for what reasons. Whether they do know this, is open to dispute. Second, self-report methods are susceptible to a variety of biases, notably response biases (Donaldson and Grant-Vallone, 2002), and social desirability biases (Niszczota, 2015)[9]. Surveys built on investment professionals' self-reports have limitations, especially when research requires measuring something that cannot be accessed directly (Arnold and Brueggen, 2012, p. 94), such as integration of CSR items in a judgment.

Therefore, the three research papers that form the core of this dissertation are based on laboratory experiments as a research method, namely an online experiment (paper 2), a physical experiment with eyetracking equipment (paper 3), and a conventional paper-and-pencil experiment (paper 4). Laboratory experiments have become an increasingly common approach in economic research. They are relatively easy to create and, provided subjects match the adequate target group, have a high degree of internal validity. Experiments offer the possibility to observe independent and dependent variables that could hardly be observed in settings outside the laboratory (Bloomfield and Anderson, 2010). Experiments in a laboratory set-up provide "possibilities to control decision environments in ways that are hard to duplicate with

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[9] Self-report-based methods such as questionnaires are susceptible to framing effects and minor changes in wording of questions, their format, or their sequence can produce significant changes (Moorman and Podsakoff, 1992). This makes self-reports "a fallible source of data" (Schwarz, 1999, p. 93). Moreover, surveys may be limited when used to investigate "sensitive issues such as moral hazard and fraudulent behavior" (Arnold and Brueggen, 2012, p. 94). Consider the following hypothetical case: how likely is it that an investment professional would admit that she doesn't care if her investments emit a lot of CO2, or if the fast-moving consumer goods manufacturers she is invested in operate sweat stores in third world countries, or that the prime goal for her in reality was to achieve nothing but maximum risk-adjusted return? The phenomenon at hand is socially desirable responding i.e., "presenting oneself favorably regarding current social norms and standards" (Zerbe and Paulhus, 1987, p. 250).

the use of naturally occurring settings" (Falk and Heckman, 2009, p. 536), they allow "disentangling variables that are confounded in natural settings and measuring intervening processes to draw strong causal inferences" (Libby et al., 2002, p. 776), and, according to some researchers, are better than other methods in helping to identify causal relationships between variables (Podsakoff and Podsakoff, 2019; Jones, 1985). Experiments have been called, perhaps somewhat effusively, the 'gold standard' of scientific research" (Podsakoff and Podsakoff, 2019, p. 12). Experiments offer themselves not just for testing theories or the interplay of variables with individuals, but also in large set-ups such as markets or industrial organizations (Roth, 1995, p. 23).

Despite all this appreciation, experiments naturally have their limitations. Over long periods experiments have been viewed as "contrived, irrelevant, and even misleading" (Highhouse, 2009, p. 555) – unfit for economic research, especially because of their sterility i.e., their supposedly limited external validity (Highhouse, 2009). Laboratory experiments are simplifications of a messy reality in which "(1) the task is ill defined; (2) the information must be searched for - it is not given; (3) data are rarely perfectly reliable" (Einhorn, 1976, p. 200). Arnold and Brueggen (2012) caution against generalizing the benefits of behavioral experiments: "even though experiments have the advantage of isolating the effects of various factors, it is difficult—if not impossible—to predict how the overall impact of several factors with offsetting effects will be in reality" (p. 95).

Another limiting factor of experiments that is occasionally pointed out is the selection of participants, especially the use of university students as participants instead of professionals or experts, who, however, are often difficult to reach or simply unwilling to participate (Lonati et al., 2018; Arnold and Brueggen, 2012; Camerer, 2003). Using master or MBA students as participants, has been criticized because students typically lack the knowledge and experience of experts, thus possibly compromising the results of the experiment and hence their validity.

However, this factor does not play a role in the experiments that form the core of this dissertation, because experiments are carried out exclusively with genuine investment professionals, a professional community to which during the time of carrying out the experiments access was easily available[10].

3. Structure of the Thesis

The dissertation comprises of four research papers that deal with CSR in the context of investment judgments. The first paper is theoretical in nature, while the other three paper are empirical, and report about behavioral experiments that were all conducted with investment professionals as subjects. Table 1 provides an overview of the four papers.

The first paper provides a framework for assessing cognitive and behavioral biases in the context of CSR and investment professionals. Based on Hirshleifer's (2001) taxonomy of cognitive and behavioral errors in investment decision-making, seven hypotheses are defined: *Heuristic simplification* effectively means that investors are cognitively lazy which might lead them to misperceive insalient but potentially important pieces of information such as CSR. As another effect, it is hypothesized that cognitive laziness leads investors to anchor on prior judgments and adjust too little when new information arrives, e.g., CSR information. *Self-deception* in Hirshleifer (2001), is hypothesized to make investors susceptible to overconfidence about their investment knowledge, methods, heuristics. Hirshleifer's (2001) category *distaste for ambiguous information* is almost self-explanatory as CSR disclosure has been described as ambiguous, potentially noise-generating information (Orlitzky, 2013). By

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[10] During the period of conducting experiments i.e., 2010 through to 2017, I was Managing Director of DVFA Society of Investment Professionals in Germany, and a member of the Board of the European umbrella organization of investment professional societies, EFFAS.

social interactions Hirshleifer (2001) understands that investors infer other investors' beliefs from observing them and use feedback from the market as a source of information. However, observations and feedback regarding the use of CSR disclosures might be biased.

Paper 1	Paper 2	Paper 3	Paper 4
Research agenda for behavioral biases with CSR	**Timing effects of corporate social responsibility disclosure**	**How Graphics Can Influence Investment Professionals' Valuations under Time Pressure**	**The Benefits and Limits of Market Feedback for Investment Professionals' Valuations and Market Estimations: The Case of Corporate Social Responsibility Disclosure**
▪ Provides framework for mapping behavioral biases of investors' responses to CSR ▪ Seven hypotheses built to	▪ Experiment with online set-up ▪ Testing effect of CSR and financial information when provided temporally separate, or integrated ▪ Includes pretest on value relevance of 64 GRI indicators from A+ reporting level with experienced ESG-investors ▪ Two 1x2 between treatments ▪ 60 participants of which ▪ All investment professionals, >70% with 11+ years' experience	▪ Experiment with eye-tracking equipment ▪ Testing effect of CSR and financial information when provided numerically only as compared to numerically + graphically ▪ 1x2 between-subjects treatments ▪ 19 participants of which ▪ All investment professionals, 39% with 10+ years of experience	▪ Paper-and-pencil experiment over two rounds ▪ Testing effect of market feedback on own valuation and estimation of market judgment with and without CSR over two rounds ▪ Two-stage mixed factorial design experiment ▪ 46 participants of which ▪ All investment professionals, 34% with 5+ years of experience

Table 1. Overview of the four papers of this dissertation

The second paper investigates how the *timing* of CSR disclosure influences how professional investors value firms. Given that financial and CSR disclosures are typically disclosed not only in different reports but also at different times, it was hypothesized that an anchoring effect might occur i.e., an investor makes a judgment based on financials which she receives first, so that when she receives CSR disclosure subsequently, an adjustment to her judgment, that the CSR disclosure calls for, could possibly be insufficient. It might also be decisive whether the second piece of information, i.e., the information requiring a belief revision, sends a positive or a negative signal, i.e., whether CSR disclosure requires an upward or downward revision of the previous judgment. Thus, a 2x2 treatment was set up i.e., CSR and financials separately and

combined, and good financial performance combined with bad CSR performance, and vice versa. The experiments were conducted in an online set-up in which participants were tasked with valuing a company at a scale from 0 (meaning not investable at all) to 100 (superb investment opportunity). Participants, all of which were experienced investment professionals, were randomly assigned to one of four treatments in which they received an information package about a fictitious company (narrative information about the company, financial statement, CSR statement), whereas in two treatments information was provided sequentially (first narrative statement and financials, then CSR disclosure) while in the other two treatments information was provide simultaneously in an integrated format. Two treatments contained a combination of the company with good financial performance, and bad CSR performance, while the other two treatments contained the opposite i.e., bad financial performance and good performance. Information items that were provided in the CSR disclosure were tested with ESG specialized investors in a pretest before the experiment. Participants at the pretest ranked 64 items from the Global Reporting Initiative's (GRI) A+ Reporting Level. The fifteen highest ranking items for chosen for inclusion in the CSR disclosure package in the experiment.

The third paper investigates heuristic simplification, too, albeit in terms of presentation format. The role model for the provision of information to participants in this experiment is investor and analyst presentations (IAPs), which are ubiquitous in companies' communications with investors (see DVFA, 2010). The format of IAPs allows users of corporate reports to get a quick picture of the company without much analytical effort. For reasons of capital market law, the contents of IAPs must not deviate from those of regulated reports, but they leave companies a high degree of discretion in their design, e.g., through the use of graphic elements. For example, information that is presented in tables or prose-style text in regulated corporate disclosure, in IAP is often *graphically* prepared and presented. In an experimental study with investment professionals, we investigate whether adding a graphic connecting (positive) non-

financial performance driver to financial performance outcomes instead of simply describing this connection in words, can direct investors' attention to specific, positive key performance indicators and impact subsequent investment judgments. We use eye-tracking equipment in order to measure direction and time of attention subjects afford to information items.

The fourth paper asks how CSR influence investment professionals' capacity to read and interpret feedback from the market i.e., price or aggregate valuation (compared to when CSR disclosure is not in the information environment). Keynes' (1997 [1936]) beauty contest metaphor has served to describe financial markets as determined by actors which are not geared to determining the value of an asset as accurately as possible but are rather geared to "knowing before the market" where the market is heading i.e., interpreting feedback from it and deciphering prices and behavior of other actors. Fundamentally, investment professionals' success depends on "reading" the market and interpreting price (which, as Keynes (1997 [1936]) insinuates, changes anyway with the attractiveness of the investment *in the eyes of the majority of investors* and consequently demand, but not necessarily through changes in a 'fundamental' value). This paper-and-pencil experiment with investment professionals went over two rounds in which subjects received financial and CSR information about a fictitious company, were tasked to assign a value to the company, and to provide estimations of market valuations i.e., the average market valuation and the estimated valuation span (min – max). At the end of round one, experimenters collected individual valuations of participants privately and calculated an average value which, together with the minimum and maximum value, was revealed to all participants at the beginning of round two of the experiment. In round two, participants could but did not have to provide a new own valuation and new estimations of the average, minimum and maximum market valuation.

4. Conclusion

4.1. Main Findings and Contribution

The four papers in the dissertation contribute to current research on CSR in financial markets research, particularly to the growing field of behavioral research on CSR. The three empirical research papers provide evidence that CSR disclosure has in fact an influence on investment professionals. The empirical papers show that CSR disclosure can complement the information environment of investors, because CSR data lead investment professionals to make different judgments than they do with financial data only and without CSR disclosure.

That investment professionals use CSR information de facto is a finding that holds for all three empirical papers in this dissertation, but it is not so self-evident. Given the fundamental criticisms leveled against CSR, especially from academia, it would not have been improbable if the arguments against CSR, such as that it is unreliable (Orlitzky, 2013), hypocritical (Cho et al., 2015), a sign of greenwashing (Seele and Gatti, 2017), were also shared by investment professionals, such that they completely disregarded CSR in our experiments. But most importantly, evidence from the three papers shows that investors will not always use CSR reports in a fully rational manner which can be accounted for with the occurrence of cognitive and behavioral biases. In the following the contributions of each of the papers will be described in detail.

Paper 1: "A research agenda for behavioral biases' effects on investors' responses to CSR disclosure"

The first paper in this dissertation provides a "map" for future research, highlighting specific areas where cognitive and behavioral biases can be expected when CSR disclosure is included in the information environment. Behavioral economics and behavioral research have

accumulated much evidence over decades of human deviations from economic rationality or logical reasoning. A significant criticism from conventional finance research is that the behavioral finance approach allows for many "degrees of freedom [i.e.,] there are many ways in which individual agents can deviate from complete rationality" (Hommes & Wagener, 2008, p. 6). The authors seem to imply that behavioral economics cultivates a kind of arbitrariness with which biases are identified and described. In search of a conceptual framework, simple lists or collections of biases, as can sometimes be found in the literature, are considered not appropriate to structure a research agenda. Apart from the fact that, to our knowledge, there is no specific framework or taxonomy for behavioral biases related to CSR disclosure, a conceptual framework was needed that, first, is already adequately established in the discipline of behavioral finance and, second, is based on valid psychological categories (rather than phenomenological criteria). The last point in particular seemed to be a weighty argument for Hirshleifer's (2001) framework. His paper not only provides a framework that offers a psychologically grounded structure of four categories which accommodates the seven hypotheses that are defined, but it provides an enormous number of practical examples of how biases and errors manifest themselves in finance and investment decision-making.

Paper 2: "Timing effects of corporate social responsibility disclosure: an experimental study with investment professionals"

The results of Paper 2 provide evidence that the disconnect of CSR from financial reporting can be a source of biased judgments by investment professionals. An anchoring effect could be elicited, however, only when – that is the gist of the findings of the experiments of paper 2 – the specific case of a company's poor financial performance is contrasted with CSR performance that is good. The anchoring effect that we found only occurs when positive CSR

information follows negative financial data, but not when positive financial performance precedes negative CSR performance.

The simultaneous provision of financials and CSR goes under the name of integrated reporting (Eccles and Krzus, 2014; Slack and Tsalavoutas, 2018). The International Integrated Reporting Council (IIRC), the standard-setting organization behind integrated reporting, argues that integrated reports fundamentally benefit companies and their stakeholders and are therefore beneficial. However, the results from paper 2 suggest a more nuanced view, namely that the economic situation of the reporting company is crucial. Integrated reporting of financials and CSR information would make sense for companies that cannot show positive economic performance (e.g., no sales growth, "sideways development") but instead can score in CSR performance. For companies that have good economic performance and do not care much about CSR, and thus do not have much to offer in terms of CSR disclosure, decoupling financial and CSR reporting does not seem to matter. In our experiments, investors who receive financial and CSR reports one after the other do not come to a different valuation for a company in that specific situation (good financials, bad CSR) than those who receive both reports in one package.

The suggestion might be that, in principle, companies that are underperforming but committed to CSR benefit from integrated reports, while those companies that are prospering economically but do not seem to care much about CSR have no downside to expect from the integration of financials and CSR. In this respect, findings from Paper 2 fill a gap because the IIRC argues pro integrated reporting from an ethical-normative perspective that seems not to have taken note of behavioral economic considerations at all[11].

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[11] The IIRC grew out of A4S, Accounting for Sustainability, whose founder was HRH The Prince of Wales, who in 2004 invited business leaders in the UK to discuss with him how to "cost the earth". In his view, companies should quantify environmental costs and account for them in their decision-making (Banerjee, 2019).

Our robustness checks show that the results are independent of attitudes toward the value relevance of CSR or the professional experience of the participants. Thus, they contribute to the understanding of how CSR disclosures need to be structured so that they can be integrated by investment professionals into their judgments as free as possible from behavioral biases. In addition, the paper contributes to the debate about to what extent CSR is decision-useful information for investment professionals (Torelli, Balluchi, and Fulatti, 2020; Brooks and Oikonomou, 2018; Ioannou and Serafeim, 2010).

Paper 3: "How Graphics Can Influence Investment Professionals' Valuations under Time Pressure: Evidence from an Eye-tracking Study"

Paper 3 reports about an experiment with investment professionals that entails the deployment of graphical information in the context of investment judgment under *time pressure*. The results indicate that graphical information influences the attention of subjects towards positive key performance indicators and hence increases their salience and subsequently influences how attractive subjects rate the investments. The data that we gain from employing eye-tracking equipment show that investment professionals who participated in our experiment significantly spend more time on areas of interest which contain the highlighted key performance indicators after they have been exposed to the graphic. Notably, guidance of attention was limited to those pieces of information the salience of which was graphically enhanced; we did not record any spillover effect so that e.g., non-highlighted non-financial information also received increased attention.

Two contributions can be derived from our results, which are closely related. First, results could be of interest to companies, because they suggest that companies might want to give CSR disclosure more salience by presenting individual items of information graphically.

Companies could use graphs to draw the attention of their investors to CSR aspects that are important to them, which, without graphical amplification, might receive less attention if disclosed in tables or prose-style text. Although we specifically used IAP as a vehicle in our experiment, and although IAP gives companies more degrees of freedom than other currently regulated disclosures, our results also can be applied to other forms of disclosure, basically those in which companies are legally permitted to use graphical elements e.g., in video clips or on investor relations websites.

By the same token, our results may also provide input for standard setters and legislators of CSR reports. For example, the European Commission is planning an amendment to the Non-Financial Reporting Directive (NFRD)[12] in 2021, which regulates the scope and content of CSR reporting by companies in the European Union. In order to increase the usability of CSR content and thus give political objectives enforcement, the European Commission could define rules in the NFRD regulation that apply to the presentation format of information, endorsing evidence that speaks to the importance of utilizing salience. Closely related are questions from private sector standardization initiative such as the IIRC about how disclosure that integrates CSR aspects with financial aspects should actually be presented (e.g., Eccles and Saltzman 2011; Abeysekera 2013; Busco et al., 2014). For example, the IIRC framework[13] for the design of integrated reports suggests that companies report on six 'capitals' but remains largely agnostic about the presentation of information within integrated reports. Precisely because too much freedom in corporate reporting, especially in less regulated formats such as IAPs or websites, can lead to undue influence on investors, standardization or promotion of best practices makes sense - not least because major impetus for the use of CSR and, to a lesser extent, intangible and intellectual capital account information by investors and lenders comes from policymakers.

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[12]   https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en

[13] To be found at https://integratedreporting.org/resource/international-ir-framework/, accessed at 19 Dec 2020

That the regulatory impetus to engage with imagery makes sense is already evident from the fact that companies are engaging with imagery via media outside of regulated disclosure vehicles, namely so-called non-GAAP imagery that shows measures of corporate earnings that differ from accounting data (Brown, Elliott, and Grant, 2019).

Second, companies' discretion to use information representation in an instrumental way has a significant flipside, namely the risk of *manipulation* of investor attention. Investors need to be aware that companies, especially in non-regulated disclosure such as IAP, may seek to manipulate their attention. Companies can direct investors' attention towards content that is favorable to them and at the same time distracting investors from unfavorable content or content that they have deliberately omitted because it is in the nature of salience that directing attention towards certain content at the same time diverts attention from other content (Bruner, 1948). If, however, investors condone companies directing (manipulating) their attention, they should be aware that they incur opportunity costs (Hertwig and Engel, 2016).

Paper 4: "The Benefits and Limits of Market Feedback for Investment Professionals' Valuations and Market Estimations: The Case of Corporate Social Responsibility Disclosure"

The fourth paper contributes to current CSR research in several ways, but probably has its greatest contribution in opening the debate to a new perspective, namely that not only fundamental CSR disclosure matters when investors make a judgment, but also market feedback[14]. Bourghelle, Jemel, and Louche (2009) suggest that regulators and NGOs who seek

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[14] Above, it was mentioned that much of the research on CSR use by investment professionals is based on self-reports. To pick one specific example, Van Duuren et al. (2016) report that asset managers who they survey via questionnaires do integrate ESG information into their investment processes. A crucial aspect here is what ESG information is meant when investors answer the question whether they use ESG information. We speculate that it is often the *fundamental ESG* information reported by companies that Van Duuren et al. (2016), and others, refer to rather than information that reflects *opinions or beliefs of market participants about ESG*.

to promote the usage of CSR to investment professionals, need to take into account that investors intuitively will wonder as to what other market actors think of CSR. Effectively, Bourghelle, Jemel, and Louche (2009) argue, investors play a coordination game in which they must infer how other investors interpret CSR, knowing or assuming that other investors will try to draw similar inferences i.e., will also wonder how others think about CSR (or how others think the market thinks about CSR) – effectively a game of investors observing other investors to infer what other investors infer from other investors, and so on, akin to Keynes' (1997 [1936]) beauty contest.

CSR as a source of information in the form of market feedback adds a perspective to CSR research that, to our knowledge, has not been taken before. Accounting research that focuses on feedback from the behavior and opinions of others in the marketplace (referred to in psychology as q i.e., social learning, see Bentley, Earls, and O'Brien (2011)) is relatively sparse.[15] Our work shows that market feedback, which as investors who attend to it must build where CSR is (can be) included, is used by investment professionals, that is, they learn socially, and that learning from others is also beneficial because it reduces investors' bias (false consensus) in their own evaluations (Koonce, Seybert, and Smith, 2011; Ross, Greene, and House, 1977). However, it does not reduce investors' confidence in the accuracy of their valuation, much of which is unwarranted confidence, i.e., overconfidence.

Another contribution of paper 4 is to show how CSR information disclosure affects the capacity investment professionals to evaluate a firm, and moreover, their capacity to estimate

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[15] Examples are Rangvid, Schmeling, and Schrimpf, 2013; Fernandez et al., 2011; Bloomfield and Hales, 2009; Camerer, 2003, 1992; Libby et al., 2002; Hirshleifer, 2001; Bloomfield, Libby, and Nelson, 1996; Berg, Dickhaut, and McCabe, 1995. Most accounting research seems more concerned with μ i.e., individual learning (Bentley, Earls, and O'Brien, 2011), thus pursuing research questions such as "do investors understand how to deal with recognized vs. disclosed information?" (Dilla, Janvrin, and Jeffrey, 2013; Hirshleifer and Teoh, 2003; Aboody, 1996), "what impact does CSR have when investors might have reason to perceive it as unreliable?" (Orlitzky, 2013), or "to what extent are financial analysts skeptical about environmental disclosure?" (Campbell and Slack, 2011).

5how other investors judge. Our results show that CSR disclosure leads to a wider range and dispersion of valuations in the 'market', but investment professionals do not seem to be aware of this effect of CSR. These results are important for CSR research and for practitioners, i.e., preparers and users, because they show that the use of CSR information in valuations is more prone to individual behavioral biases than the use of financial information alone. The results are also potentially informative for organizations in which investment professionals must make valuations based on CSR disclosures. Overconfidence, potentially amplified when CSR is involved, may lead investment professionals to maintain their potentially biased judgments despite conflicting feedback from the market. Organizations could take steps to offset this effect.

4.2. Future Research

Paper 1 contains a research agenda for behavioral research on CSR that provides guidance for future research. The research agenda focuses on 4 categories according to Hirshleifer (2001), which leave room for further hypotheses than just the seven in this dissertation. Particularly attractive should be combinations and interplays of different biases. Hypothesis 7 of paper 1 heads towards that research avenue by hypothesizing that overconfidence affects heuristic simplification, aversion to ambiguity and social transmission, effectively functioning as a meta-bias. Similarly, anchoring would make a candidate for a meta-bias. Although anchoring-and-adjustment heuristic is operationalized in this dissertation in an experiment (paper 2), if anchoring is elevated to the rank of a "fundamental judgment strategy" (Hastie and Dawes, 2010, p. 71), then the anchor may be professional orthodoxy ('it is not proper for an investment professional to use CSR'), a narrow-minded attitude toward novelty ('CSR is newfangled nonsense'), accounting fixation ("failure to adapt decisions to a change in accounting method",

Libby, 2005, p. 385), or the fear of having to admit that one has for years ignored important information, CSR i.e., cognitive dissonance (Akerlof and Dickens, 1982), or sunk cost fallacy (Arkes and Blumer, 1985).

Questions that lend themselves to follow-up research to paper 2 could be, first of all, whether differences between the constellations "good financials/bad CSR" and "bad financials/good CSR" can also be replicated for *individual* CSR aspects. Current regulation e.g., in the European Union e.g., EU Action Plan for Financing Sustainable Growth[16], and also 'soft regulation' e.g., TCFD Task Force on Climate-Related Financial Disclosure[17], favor approaches where the probably most pressing issue - climate change - is prioritized over other important life-world issues such as resource depletion, biodiversity, circular economy, human rights, demographic change, gender diversity, corruption, remuneration etc. Another research opportunity would be to work with sustainability ratings instead of CSR reports and detailed reporting points and try to answer the research question whether sustainability ratings have similar effects as granular CSR data. Assuming that cognitive laziness can exert an influence on judgments (Kahneman, 2011), a sustainability rating relieves an investor from having to deal with detailed CSR information, which moreover may not be known.

Paper 3 experimented with the variable salience, a relatively obvious set-up given the literature on attention (e.g., Gabaix, 2017; Caplin, 2016; Hirshleifer, Lim, and Teoh, 2011). Investors and lenders as economic stakeholders generally enjoy prerogatives when it comes to content and access to information[18], but they are not the only stakeholders of companies. Do results from paper 3 hold when other stakeholders such as employees, communities, in which

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[16] https://ec.europa.eu/info/publications/sustainable-finance-renewed-strategy_en

[17] https://www.fsb-tcfd.org/

[18] The IFRS Conceptual Framework reads: "The objective of general-purpose financial reporting is to provide financial information about the reporting entity that is useful to existing and potential investors, lenders and other creditors in making decisions relating to providing resources to the entity" (IFRS, 2018, p. 8).

the company operates, or NGOs are investigated? Another direction of research would pursue the testing different types of salience. For instance, one type of salience that was not tested in the experiments is the salience related to familiarity (Giora, 2003). Do the effects of manipulating of attention dissipate when subjects become more familiar with an issue? Could the observed effects of investor attention being occupied through a graphic still be observed when investors become experts in CSR e.g., in truly sustainable financial markets?

The fourth paper, finally, encourages research in which CSR disclosure by companies is less central than CSR information that has already been processed in judgment formation, i.e., has entered into the actual judgment, is aggregated into price, and can be socially transmitted, or that has become part of the belief system, and thus is culturally transmitted (Hirshleifer, 2020). Research questions that follow from paper 4 might be closer to adaptations of non-CSR related research topics from game theory (Gintis, 2009; Colman, 1995) or Behavioral Game Theory (Camerer, 2003; Gächter, 2004) such as: does social transmission in the context of CSR have a tipping point? When do CSR skeptics change their mind – for example, when a proportion of X% of market actors are or become CSR proponents? Or after a number of X iterations (say, valuations, or feedbacks) – similar issues investigated in level-k contests (Shapiro, Shi, and Zillante, 2014; Arad and Rubinstein, 2012), or research on information cascades (Kendal et al., 2018; Bikhchandani, Hirshleifer, and Welch, 1992)?

5. Papers

Each of the papers is included in the part 2 of this dissertation. The submission status of the publications is as of December 20, 2020.

1) Frank, R. (2020). A research agenda for behavioral biases' effects on investors' responses to CSR.

2) Arnold, M.C., Bassen, A., Frank, R. (2018). Timing effects of corporate social responsibility disclosure: an experimental study with investment professionals. *Journal of Sustainable Finance & Investment*, *8*(1), pp. 45-71.

3) Frank, R., Hörner, C. (2020). How Graphics Can Influence Investment Professionals' Valuations under Time Pressure: Evidence from an Eye-tracking Study.

4) Arnold. M.C., Bassen, A., Frank, R. (2020). The Benefits and Limits of Market Feedback for Investment Professionals' Valuations and Market Estimations: The Case of Corporate Social Responsibility Disclosure.

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Part II: The Four Papers of the Dissertation

A Research Agenda for Behavioral Biases' Effects on Investors' Responses to CSR Disclosure

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A Research Agenda for Behavioral Biases' Effects on Investors' Responses to CSR Disclosure

Abstract

This paper provides a framework for investigating how cognitive and behavioral biases possibly affect the utilization of CSR disclosure by professional investors. The paper identifies several research opportunities that can enhance understanding of cognitive errors and behavioral biases with regards to CSR in the professional investing space. The study uses Hirshleifer's (2001) framework for categorizing cognitive and behavioral biases in order to provide hypotheses for why investors possibly do not act rationally when encountering CSR disclosure that is incurring cognitive or behavioral. We hypothesize that CSR utilization may be affected by cognitive laziness, avoidance of information that is perceived as ambiguous, falsely assuming that other investors do not use CSR, either, or overconfidence, or a combination of these biases.

1.   Introduction

Although CSR disclosure[1] has gained considerable ground with investors[2] over the past 10-15 years, financial information is still the dominant category of types of information for investment decision making for professional investors. Although CSR has travelled a long way from the "margins of accounting" (Miller, 1998) towards the mainstream, it is not clear to what extent investment professionals use CSR. Moreover, it is not clear to what extent investment professionals use CSR in a rational manner, because for all we know, *behavioral failures* (Shogren and Taylor, 2008) occur when investment professionals use financial and economic information for investment decision-making.

To illustrate our thinking, suppose that a group of investors is presented financial disclosure of a company and makes judgments using this information. Another group of investors is presented with the same financial disclosure about the company but also with CSR. Do we expect judgments between the two groups of investors to differ? Probably, but in what respect and to what extent? Moreover, assuming that investors are susceptible to cognitive and behavioral biases, for which there is a large body of literature[3], which psychological effects do we expect to occur when investors are exposed to CSR as compared to when they are not?

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[1] We distinguish between CSR and CSR disclosure. Following Sheehy (2015), CSR refers to a particular type of self-regulation, namely "a type of international private law (…) which generates private self-regulatory initiatives (…) seeking to ameliorate and mitigate the social harms of and to promote public good by industrial organisations" (p. 639), while CSR disclosure refers to company reports that detail how they comply with self-regulatory initiatives under CSR. An integral part of CSR disclosure is ESG (for environmental, social, and governance issues) which in financial markets is often used synonymously with CSR disclosure or with responsible investing. For reasons of readability, we will generally only use CSR as a terminus for CSR disclosure in the following.

[2] In this paper, the terms investor and investment professional are used interchangeably, with both designating persons who professionally evaluate or manage investments or credit risks, that is, the term denotes fund managers, buy-side analysts, sell-side analysts, M&A specialists, valuation experts, and so on.

[3] A selection would look like this: Hirshleifer, 2015, 2001; Lovallo and Sibony, 2010; Ackert and Deaves, 2010; Hastie and Dawes, 2010; Baker and Nofsinger, 2010; Daniel, Hirshleifer, and Teoh, 2002; Daniel, Hirshleifer, and Subrahmanyam, 1998, to name a few.

Although this paper does not take a position on whether investors should use CSR, reasons could be identified. For instance, the political agenda in Europe and the demands that have been formulated for financial markets (e.g., EU Action Plan on Sustainable Finance[4]) most probably will increase the demand for CSR information. Also, global growth of assets under management committed to sustainable and responsible investing has been growing tremendously from \$22.9 trillion to \$30.7 trillion, a remarkable increase of 34 percent (GSIA, 2018). Friede, Busch, and Bassen (2015) investigate the relationship of corporate financial performance and corporate social performance provide evidence in a meta-study and find that there is a mild but positive correlation between company economic and social performance.

On the contrary, there is no shortage of reasons to be skeptical about CSR. It has been dubbed as being related to "corporate hypocrisy" (Cho et al., 2015), or has been found indicative of "corporate camouflaging" (Michelon et al., 2016; Moneva, Archel, and Correa, 2006) or "greenwashing" (Seele and Gatti, 2017; Lyon and Montgomery, 2015). Reservations about the reliability of corporate CSR information are substantial (see for instance Chassé and Boiral, 2017, and Orlitzky, 2013). Our initial intuition is that that there is probably a fair amount of unspecific unease and 'making strange' for sustainability and CSR in the finance mainstream community[5].

Despite a host of behavioral research on CSR (see Gödker and Mertins, 2018, for an overview), we still lack understanding as to how exactly CSR affects investment professionals' judgments behaviorally (see Pilaj, 2017, for one of the rare papers which address this question). We are motivated by a simple research question: how to map and categorize meaningfully

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[4] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_en accessed 21 Nov 2020

[5] In a survey among investors, forty-three percent of participants who confessed to not use ESG, stated that they do not use ESG because these issues are not material and do not produce added value (CFA, 2017).

which cognitive and behavioral biases possibly affect investors' perception of, utilization of, and integration of CSR into investment judgments? The purpose of this paper is to point out directions for research and to define hypotheses for future behavioral accounting research on CSR in investment judgments. Specifically, this paper seeks to provide a framework that helps to map cognitive errors and biases affecting investors' responses to CSR. In the tradition of behavioral accounting research this paper asks what is "the influence of accounting information on those receiving the information" [6] (Hofstedt and Kinard, 1970, p. 43), and what are "regularities and irregularities in the coding and receiving of information]" (Becker, 1967, p. 227) – CSR in this paper.

The 'grid' for categorizing cognitive errors and biases used in this paper builds on Hirshleifer's (2001) framework. Hirshleifer's (2001) paper contains one of the most suitable frameworks to orient to because of its detailed and comprehensive taxonomy of behavioral phenomena in the context of finance. His framework contains five distinct categories, of which four are useful for this paper which we translate into assumptions as represented in table 1, namely, A. heuristic simplification, B. self-deception, C. emotions and self-control, and D. social interactions[7]. Within this framework, we intuit about potential cognitive and behavioral effects that possibly affect investment professionals' utilization of CSR and define hypotheses for CSR-related behavioral research in the future. We have chosen those cognitive errors and

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[6] Our accounting definition includes environmental and social performance aspects as has been posited as a meaningful extension of corporate accountability (Deegan, 2014). We argue that CSR is effectively accounting information, albeit in a modern sense such as e.g., associated with the notion of information that speaks to "particular patterns of organizational visibility" (Burchell et al. 1980, p. 5). The important term here is accountability i.e., to whom is a business accountable (Collier, 2015), with accountability deriving from the original meaning of the word account as, inter alia, "a narrative or record of events, a reason given for a particular action or event, a report relating to one's conduct, or to give satisfactory reasons or an explanation for actions" (Collier, 2015, p. 5).

[7] Hirshleifer's (2001) fifth category – "Modelling Alternatives to Expected Utility and Bayesian Updating" –we do not consider a category of the type of the preceding four, as it addresses a research-analytical question which is why we omit it in the adaptation of his framework for our purposes.

biases for which we could find sufficient evidence in the literature on general occurrence or on cases in investment judgments without CSR.

----- insert table 1 here -----

To the best of our knowledge, a specific framework of biases related to CSR in investment decisions has not yet been compiled. Nevertheless, some caveats about our intuitions and subsequent hypotheses are in place. First, we concede that some of our guiding assumptions may seem somewhat pointed, but this makes it easier to hypothesize the irrational in investors' behavior in order to investigate it. Second, we only investigate only a selection of biases. Hirshleifer's (2001) framework alone, for instance, contains almost 40 different errors and biases. Presumably, there may be other errors and biases in connection with CSR that might occur among investment professionals and might be worth researching. We suggest that more research on CSR from a behavioral perspective is necessary because it can provide us with a better understanding of the interrelationships between judgments, biases and CSR. It would be helpful to understand which impediments to sustainability adoption could be removed if one would only understand where financial market actors 'drop out behaviorally', given, for instance, the political pressure with which sustainability currently is being enforced in financial markets[8]. With this paper we are contributing towards that goal. Last, it should be reiterated that not all of the hypotheses that we provide, might lend themselves to easy or straightforward empirical or experimental testing. Section 4 will discuss this point in more detail.

The paper proceeds as follows. Section 2 briefly presents Hirshleifer's (2001) framework that is used to map psychological constraints while section 3 provides intuitions

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[8] The European Commission does not shy away from explicitly instrumentalizing the finance industry by reorienting capital flows towards sustainable investments: "Sustainable finance at EU level aims at supporting the delivery on the objectives of the European Green Deal by channeling private investment into the transition to a climate-neutral, climate-resilient, resource-efficient and just economy, as a complement to public money." (https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/what-sustainable-finance_en, accessed at 13 Sep 2020).

about cognitive errors and behavioral biases that possibly occur in investor information processing. Section 4 puts some of our hypotheses into perspective and section 5 concludes the paper.

2. A Framework for Categorizing Cognitive and Behavioral Biases

To provide some structure to our discussion about cognitive and behavioral biases, we utilize a systematization or framework. Many of the well-known texts in the field of Behavioral Economics or Behavioral Finance contain extensive samples and lists of errors and biases, even though most authors seem to avoid the terms 'framework', 'systematization' or 'taxonomy'[9]. Arkes (1991) organizes biases according to their causes in i) psychophysically based errors, ii) association-based errors, and iii) strategy-based errors. His categorization is compatible with the now popular distinction between System I and System II cognition, i.e., intuitive, automatic decision making, and conscious and deliberative decision making (Kahneman, 2011; Stanovich, 1999)[10]. Hogarth (1987, Hogarth and Makridakis, 1981) suggest a general-purpose taxonomy that is helpful because it assigns different biases to the phases of information processing for judgment, i.e., biases that arise in the information acquisition, information processing, output, and outcome (feedback) phases (see for instance Hogarth, 1987, p. 207 and pp. 216-222). For our work on judgments of investment professionals with or without CSR, however, Hogarth's

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[9] In addition to research mentioned in FN2, such systematizations can be found, for example, in Remus and Kotteman (1986), Arkes (1991), Payne, Bettman, and Johnson (1993), Arnott (1998), Raghubir and Das (1999), Hirshleifer (2001), Montier (2002), Friesen and Weller (2006), Carter, Kaufmann, and Michel (2007), Baron (2008), Bazerman and Moore (2009), Baker and Nofsinger (2010), Ackert and Deaves (2010), Hastie and Dawes (2010), Bhandari and Hassanein (2012), Hilbert (2012), Daxhammer and Facsar (2017); in articles in handbooks such as Griffin et al. (2012), Gigerenzer (2004), or Larrick (2004); and of course in the relevant volumes by Kahneman and Tversky (e.g. Kahneman, 2011; Gilovich, Griffin, and Kahneman, 2002; Kahneman, Slovic, and Tversky, 1982). Van Vugt, Griskevicius, and Schultz (2014) provide a "stone age biases framework" for assessing environmental behavior.

[10] Arkes' (1991) first two categories contain errors that are more likely to occur in automatic and unconscious decision making, while the third category contains errors that are more likely to occur in conscious decision making (Larrick, 2004).

(1987; Hogarth and Makridakis, 1981) framework lacks two features that we consider very important. First, this concerns aspects related to the social environment of the capital market, e.g., what role does it play that investors usually do not make decisions in a vacuum, but in a market where the behavior of other investors is informative and hence becomes part of the information environment investors can learn from[11]. Second, this concerns the level of confidence of the judge (e.g., of her own knowledge, of her knowledge of the domain, of her ability to process information), especially overconfidence, which are only featured indirectly featured as 'illusion of control', and 'success/failure attribution' in Hogarth (1987). Excessive confidence i.e., overconfidence, however, is intuitively a possible cause for ignoring or off-handed handling of information with which one is not familiar e.g., CSR.

In this paper we use the framework of Hirshleifer (2001) from his seminal Journal of Finance paper "Investor Psychology and Asset Pricing" (see fig. 1 below for an overview of categories and concepts of his framework). In this paper, he posits that "heuristic simplification, self-deception, and emotional loss of control provide a unified explanation for most known judgment and decision biases [and that this] framework can provide guidance as to which biases identified in experiments represent general mechanisms, and which are conditional side-effects" (p. 1541). Hirshleifer (2001) explains heuristic simplification with "cognitive resource constraints [that] force the use of heuristics to make decisions [whereas] cognitive resource constraints [are] limited attention, processing power, and memory" (p. 1540). Hirshleifer's (2001) explanation suggests the operation of a force that prompts heuristics. In this paper, we follow Kahneman's (2011) conjecture that laziness it is the hallmark of system II, of course, dual- process theories of reasoning with system I and II being a meanwhile common distinction (Evans, 2012) which we do not discuss in detail in this paper, though. Self-deception, the second

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[11] In section 3.4. following Bentley, Earls, and O'Brien (2011), we will introduce the terms μ and q to distinguish between learning from fundamental information and social learning.

category in Hirshleifer's (2001) framework is motivated by the conjecture that "individuals are designed to think they are better (smarter, stronger, better friends) than they really are. Truly believing this helps the individual fool others about these qualities" (p. 1540).

----- insert figure 1 here -----

The third type of bias is related to emotional loss of control when individuals "are subject to emotions that can overpower reason" (p. 1540). Hirshleifer (2001) also adds another meaningful category to his framework, *social interactions*. Hirshleifer and colleagues in later papers repeatedly cite social interactions as a potentially fruitful future dimension of Behavioral Finance, (see e.g., Hirshleifer and Teoh, 2009; especially Hirshleifer, 2020). Hirshleifer's (2001) categories are operationalized as represented in table 2a and 2b, in order to derive hypotheses.

----- insert table 2a here -----

----- insert table 2b here -----

3. Hypotheses on Cognitive Limitations and Behavioral Biases With CSR

3.1. Heuristic Simplification/Cognitive Laziness

3.1.1. Saliency Bias

Salience describes the phenomenon that not all elements within a set of information receive the same level of attention (Higgins, 1996, p. 156). Salience mechanisms are key to understanding occurrence of biases in information processing: "The issue of bias in information acquisition can be conceptualised by enquiring when and why information becomes salient to an individual" (Hogarth, 1987, p. 209). Salience helps coping with the information load by

directing attention towards information that is (or seems) important and relevant to the task at hand and directs attention away from information that is deemed or effectively is less relevant (Bosman, Kräussl, and Mirgorodskaya, 2017). Because of this directing of attention, salience allows for rapid diagnostics (Gabaix, 2019), and thus helps investors to save time and effort (Rook & Caldecott, 2015; Hirshleifer et al., 2004). Salience not just divides attention, but also leads individuals to attribute meaning and importance according to how prominent or conspicuous information is; the more salient an item as the more important it is perceived (Hirshleifer and Teoh, 2003). The saliency bias is closely related to and fosters cognitive laziness, "a reluctance to invest more effort than is strictly necessary" (Kahneman, 2011, p. 31).

Cognitive laziness causes irrational decisions when decisions are based on salient, instead of diagnostic information (Sharma and McCarthy, 2018; Payne et al., 1993). Salient information tempts individuals to confuse its volume, prominence, and its frequency of occurrence with importance and relevance, thereby absorbing effort and expense from less salient, yet potentially relevant information. Because familiar information tends to be more salient than unfamiliar (Yalcin et al., 2016; Ambler et al., 2002), it is possible that CSR's lack of familiarity, hence lack of salience, is mistaken to mean that it is irrelevant or immaterial for investment decision-making. To what extent an information item is familiar is affected by a) how common or conventional it is, b) how often it is encountered, and c) how prototypical it is for an event or situation (Giora, 2003).

We posit that CSR is still relatively uncommon and unconventional to most investors. The main characteristic of a convention is that "[e]veryone conforms, everyone expects others to conform, and everyone has good reason to conform" (Young, 1996, p. 105). Conventions are based on customary behavior that has become expected (Biggart and Beamish, 2003). Also, CSR is not encountered as frequently and often as financial information. In the current reporting environment, opportunities for investors to encounter CSR are fewer than those to encounter

financial information (unless investors search for CSR directly or come across CSR when foraging information). Under 'normal' circumstances, investors have a good chance of not encountering CSR at all - unless being provided with CSR when e.g., CSR and financials are integrated into the same report. (In both cases, though, investors still have the opportunity to deliberately overlook CSR). Lee et al. (2018) define this as the origin of the salience bias, namely that "humans tend to rely on information that is explicitly shown to them rather than information that is presented implicitly" (p. 2). Finally, CSR does not have the same 'look and feel' as financial information i.e., it is untypical. Often, CSR comes in prose and is non-numerical, so that it lacks the strength and assertiveness of numerical information (Kadous, Koonce, and Towry, 2005), and seemingly lacks objectivity (Espeland and Lom, 2015). In its usual way of disclosure, CSR is exemplary of soft information, that is, difficult to express numerically, perceived as non-objective but subjective (Liberti and Petersen, 2017; Engelberg, 2008). Therefore, CSR is difficult to integrate into conventional financial modelling (Meitner, 2017)[12].

According to normative assumptions about rational decision-making, investors use *all* relevant information when making a judgment (Mullainathan and Thaler, 2000; Röckemann, 1995; Sharpe, 1991); also, investors feed on information, which makes them prototypical "informavores" (Miller, 1983). Under rational auspices, one would expect investors to deal with CSR before they discard it as untopical and hence ignorable (Smithson, 1985). However, we conjecture that most investors have not dealt with CSR to an extent that they can make a qualified judgment about whether it can be ignored or not. In fact, we suspect that the laziness of investors not only leads them to reject something they know little about, but that not paying

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[12] Fifty-five percent of investment professionals participating at a survey claimed that a lack of quantitative ESG information presented a significant limit to their organization's ability to use non-financial information (CFA, 2017, p. 18). Fifteen percent of participants of the same survey argued that they did not take ESG factors into account when making investment decisions because of an inability to integrate ESG into their quantitative models (CFA, 2017, p. 27).

attention to CSR could lead to a vicious circle: "a [decision maker] who initially believes that a truly important dimension is unlikely to matter will not attend to it, and consequently will not learn whether it does matter" (Hanna, Mullainathan, and Schwartzstein, 2014, p. 1312). This statement may be apt to describe the fate of CSR in financial markets: those who have never taken the effort to assess decision-usefulness of CSR will probably not notice that they might be failing to perceive information that can possibly elucidate the relationship e.g., between good social performance and good economic performance (see e.g., Friede, Busch, and Bassen, 2015), or the relationship between a company's cost of debt and its social performance (Bauer and Hann, 2010; Hoepner et al., 2016).

H1: Investors are cognitively lazy and disregard CSR because CSR is not as salient i.e., familiar, typical, or common as financial information, that is, they are prone to a saliency bias.

3.1.2.   Anchoring and Insufficient Adjustments

Judgmental situations require individuals to form an opinion, to infer, to find something out, to gain an impression, to draw a conclusion, and so on, but individuals do typically not arrive at such judgmental situations with a blank mind but rather with expectations, premonitions, ideas, feelings, guesses, hopes, anticipations, in short: they harbor a specific understanding based on similar cases in memory[13]. "[Our mind] not only receives information but actively seeks information which it attempts to incorporate within existing notions and thought patterns. Through experience, people develop an understanding of the world. Furthermore, they use that

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[13] Case-based Decision Theory posits that cases that we pull up from memory do not even have to be real or cases that we ourselves experienced: "past cases can be e.g., references and cases of others, or memories of others" (Gilboa and Schmeidler, 1995, p. 608).

understanding to select information, to interpret it (i.e., give it 'meaning') and to anticipate events" (Hogarth, 1987, p. 135).

Assessing a situation means looking for some kind of pattern at play, i.e., what to *expect*: "[t]he economist who deals with model selection to explain data, the investor who looks for trends in financial market behavior, and the executive who plans their next marketing campaign all have the same question: 'After all I have seen, what rule (or 'theory' or 'model') should I use to predict future observations? (Gilboa, Samuelson, and Schmeidler, 2015, p. 49). Expectancies are useful because "they provide useful information rapidly and with little demand on processing resources" (Roese and Sherman, 2007, p. 93). People have a strong tendency to seek information that is consistent with their expectancies, their anticipations, their thoughts and associations: "Information that is clearly inconsistent with expectancies will be recognized as such. But for the most part, expectancies will guide the processing of information such that evidence will be interpreted in line with what is expected to occur" (cf. Olson, Roese, and Zanna, 1996, p. 228). Expectations are only one, but an important class of anchors.

Hastie and Dawes (2010) argue that people anchor on themselves when they bring strong expectations to a situation, or when they infer beliefs and behavior of others by anchoring on their own attitudes and beliefs. In a similar fashion, people are often anchored on the past (Angeletos and Huo, 2018; Hastie and Dawes, 2010), or the status quo (Givi and Galak, 2019; Eidelman and Crandall, 2009). Anchoring is not per se a flawed decision strategy. People need to start somewhere when making an estimate and there is some intelligence in finding the right anchor to start with and adjusting it towards the estimate (Griffin et al., 2012). What morphs a useful heuristic into a bias is that individuals typically do not adjust enough: "Underadjustment (…) may result from a failure to look for counterevidence, a failure of actively open-minded thinking (...) we tend to be biased in favor of our present beliefs (…). We do not take sufficient account of evidence against them" (Baron, 2008, p. 380). Whatever the anchor may be – present

beliefs, defaults, previous judgments, an opinion shared by the majority of members of a profession, a common method prescribed by professional orthodoxy – it typically proves remarkably resistant to counterevidence or logical challenges: "Attempts to integrate new information may find the individual surprisingly 'conservative', that is, willing to yield ground only grudgingly and primed to challenge the relevance, reliability, or authority of subsequent information or logical considerations" (Nisbett and Ross, 1980, pp. 41-2). Typically, the anchor receives disproportionate attention because it is focused on first (Chapman and Johnson, 2002).

In 3.1. we have assumed that investment professionals are cognitively lazy because they disregard information that is not familiar i.e., not salient. In the context of anchoring, a similar mechanism with CSR might occur, which could also be related to the quality and nature of CSR, but which shows itself in a different way. If CSR is not salient, then it has a harder time attracting the attention of investment professionals, i.e., noticing CSR by the investment professional requires an extra effort that she might not afford. In the anchoring heuristic, however, the investment professional may be open to take CSR into account but when she does, her adjustment to her previous judgement, assumedly primarily based on financials, is not strong enough. This is the core of our hypothesis.

Lack of adjustment of a previous judgment can be explained with cognitive laziness because adjusting away from an anchor is effortful (Ackert and Deaves, 2010). Suppose that an investor has made a positive judgment about a company. Now imagine that the investor receives a CSR rating report that portrays the company as an operator of plants that spew huge quantities of pollutants into rivers. Let us assume that the report predicts that the company will be subject to massive litigation costs, so that its value and share price may be severely impacted. Consequently, the investor would be well advised to revise her positive judgment. Anchoring will occur when she will not revise her original judgment or not revise it sufficiently upon receiving CSR information that would require her to do exactly that.

H2: Because investors are cognitively lazy, they are susceptible to an anchoring effect that shows through reluctance to change previous judgements or their usual way of evaluating companies when new, unknown or temporally or spatially separated information such as CSR arrives.

3.2.   Self-Deception/Overconfidence

According to Kahneman (2011), the financial industry has a particular penchant for overconfidence: "Given the professional culture of the financial community, it is not surprising that large numbers of individuals in that world believe themselves to be among the chosen few who can do what they believe others cannot" (Kahneman, 2011, p. 217).[14]. We assume that for an investor who is overconfident and thinks that she is knowledgeable, skillful, has above-average command of investment-relevant information, has smart intuitions and reliable conclusions, and so on, CSR possibly has little appeal. Overconfidence might lead the investor to overrate her private information (own analysis, judgments, hunches, premonitions, expectations, ideas) over objective public information, a phenomenon that has been described as when investors have "a strong belief in the effectiveness of their own intuition as opposed to

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[14] Although for the purposes of this paper the generic term overconfidence seems sufficient, in the literature a distinction is made between three types of overconfidence: overestimation, overplacement, and overprecision (Prims and Moore, 2017; Moore and Schatz, 2017; Moore, Tenney, and Haran, 2015). Overestimation is thinking that you are better than you really are. Overplacement, also referred to as "superiority illusion" (Sharot and Garrett, 2016), or "superiority bias" (Hoorens, 1993) is thinking that you are better than others. Overprecision is an excessive faith in the information that you hold or that is available to you.

Moore and Healy (2008) argue that overestimation, overconfidence and superiority bias can but do not necessarily have to occur simultaneously. An investor would show signs of underestimation if she assumed that seldom she was correct with her forecasts, but de facto gives accurate forecasts more often than she is aware of. She would also show signs of inferiority bias (as the opposite of superiority bias) if she believed that she was below average forecast performance when in fact she was often better than her peers, hence above average and superior. And yet, she would be subject to overprecision if she believed – like most of her peers in the investment community – that extrapolating future share prices of a stock based on accounting information about the stock's underlying's past success was exactly the right method to tell her the truth about an asset (Kahneman, 2011).

Also, we posit that the superiority bias does not require self-aggrandizing behavior as e.g., in transferred ignorance (Vogt, 2012). It also occurs when e.g., an investor thinks that none of the investors in a market including herself were particularly good at predicting share price but stills feels that she others are even worse than her.

statistical rules, even when there is strong evidence to the contrary" (Malmendier and Taylor, 2005, p. 5).

In conventional economic models that assume rationality of actors, the decision maker "is empowered with superintelligence whose cognitive ability allows him to gather, evaluate and process all relevant information" (Abhayawansa and Aleksanyan, 2018, p. 6). Rational economic decision-makers "make choices so as to maximize a utility function, using the information available, and processing this information appropriately. Individuals' preferences are assumed to be time-consistent, affected only by own payoffs, and independent of the framing of the decision" (DellaVigna, 2009, p. 315). In such a model, information is processed in its entirety according to clear and unalterable criteria of relevance and materiality: "The optimal choice (…) takes place when all the relevant information about various options is collected, absorbed and properly processed, and logical conclusions are drawn from it" (Etzioni, Piore, and Streeck, 2010, p. 378). Specifically, economic actors not only invest in information that increases their knowledge and understanding of the decision at hand, but when they integrate the acquired information, they "make these calculations accurately [and] any departures from accuracy are the product of random error that would in turn wash out in the grand statistical pool" (Issacharoff, 1998, p. 1732)[15].

Baron (2008) argues that preference for a 'personal view or note' in judgments (e.g., insisting on 'gut feeling' when objective cues like statistically evident facts would suggest otherwise), is a sign of overconfidence in one's "own powers of judgment" (p. 371). Preference

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[15] A normatively compliant investment judgment would effectively be calculated following the WADD rule (weighted additive rule) (Shah and Oppenheimer, 2008). A WADD-compliant i.e., a fully rational investor would first identify all relevant pieces of information, then assess the weights of each cue (meaning that she would have to know or know how to determine the importance of each piece of information), and finally integrate i.e., calculate the values for each of the alternatives to be judged upon. The WADD is computed as $\sum = W_i N_i$, where W_i represents the individual's weight for the ith attribute, and N_i represents the numeric value for the alternative under consideration on the ith attribute (Chu and Spires, 2000, p. 261).

for personal criteria of judgment also occur in *clinical judgment*, as opposed to *actuarial judgment* (Meehl, 2013; Grove et al., 2000; Dawes, Faust, and Meehl, 1989). Clinical judging (which, despite its names, takes place in virtually all professions) tends to be based on subjective, informal, intuitive arguments, or private information. Clinical are not inferior to actuarial judgments because of the criteria that judges choose but rather from judges inconsistently applying these criteria i.e., inter- and intrasubjective inconsistency. Research studies (Meehl 1967, 1959, 1957; Dawes, 1994, 1971; Dawes, Faust, and Meehl, 1989) have shown that simple, linear algorithms based on criteria experts use in their clinical judgments, tend to produce more consistent judgments than the experts given the same data[16].

Montier (2005) argues that the investment management industry acts predominantly clinically, although it pretends to judge actuarially. He posits that investors give more weight to their intuitions than to align judgment with results from statistical models, albeit only to subsequently exalt this trick into an art[17]. Straying from statistical methodology has been explained with e.g., ignorance for the validity of indicators or insensitivity for redundancies in cues and regression effects (Rodgers, 2006); lack of attention which may be voluntary or involuntary (Goldstein, 2004; Weber and Johnson, 2009); or cognitive overload (Sweller, Ayres and Kalyuga, 2011; Rose, Roberts and Rose, 2004; Kotovsky, Hayes and Simon, 1985).

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[16] Bootstrapping i.e., capturing cue utilization and judgment policy of a judge and building them into an algorithm or linear equation, in many cases produces more accurate judgments than those of the human judge: "across a fairly broad array of judgmental tasks, a linear and compensatory model (multiple regression analysis) has consistently provided at least as faithful a representation of human inference as have other models tried to date" (Goldberg, 1971, p. 459). Those results also held for several other professions and domains including financial domains such as security analysis and investment decision-making (Slovic, 2001, 1972; Mear and Firth, 1987; Ebert and Kruse, 1978; Slovic, Fleissner, and Bauman, 1972), and credit lending (Kim, Chung, and Paradice, 1997; Goldberg, 1976).

[17] Economics and finance have been fighting hard to become a 'serious science' (Fabozzi, Focardi, and Jonas, 2014), to reach an esteem like physics or medicine. However, when investors as they often do proclaim that 'investing is an art'. this is symptomatic for an industry whose practices are predominantly consensus-based rather than research-based, i.e., based on collective assumptions and social conventions rather than arrived at scientifically (Buie and Jeske, 2011).

Straying, we posit, could be caused by investors seeking to ease the cognitive effort of having to integrate and calculate a large number of cues (see Payne et al., 1993; Rieskamp and Hoffrage, 1999) – an argument that we have produced before under 3.1. and 3.2., when we suggested that cognitive laziness was a root cause for disregard for CSR.

Fiske and Taylor (2017) argue that the cognitive miser is not motivated by sloppiness or superficiality, but by the desire to achieve rapid, adequate understanding. Intuition saves time compared to statistical calculation. Hogarth' (2005) shopping cart example is often quoted to illustrate this argument.[18] Judging the value, size, or dimension of an event or item in a casual way is not only always much quicker than performing a detailed analysis, it might also serve to underline the individual's casual and unconcerned way of judging, where precision has no role to play. Such as casual and unconcerned way of judging might be misunderstood as competent behavior in the external perception: "overconfident individuals have a behavioral signature that, to observers, looks like actual competence. This helps explain why overconfident individuals are seen by others as competent, even when they lack competence. In fact, overconfident individuals more convincingly displayed competence cues than did individuals who were actually competent" (Anderson et al., 2012, p. 35).

Despite that investor might act as cognitive miser (Fiske and Taylor, 2017), the quality and nature of CSR in itself might amplify a tendency for clinical judgments. As was pointed out in section 3.1., the majority of investors is still taken to be largely unfamiliar with CSR because CSR has a different 'look-and-feel' from financial information (prose style, non-

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[18] A shopper finds herself presented with an extremely high bill at the supermarket checkout. Her initial estimate of how much to pay had been much lower by way of judging how *full* the shopping trolley looked. Hogarth (2005) posits that judging the actual load of the shopping trolley by adjusting from a typical bill is effectively an anchoring-and-adjustment process. Capturing 'how full' the shopping trolley is, does not have to be precisely correct for gaining a 'feel' of the ultimate price to be paid at the check-out; approximately right will do. According to Hogarth (2005) the equation looks like $E = \alpha \cdot z$, where E represents the expected grocery bill, z stands for a typical bill, and α indicates the estimated filling height of the shopping trolley, the statistical way of determining the grocery bill is effectively a linear equation of the kind $\sum = \beta_i X_i$, i = 1,.......k, where $\beta = 1$, and X represents the prices of k items.

monetized if at all quantified), it is encountered far less frequently than financial information, and it is not typical for the type of information that is used in headlines or in analyst stock recommendations. Also, overconfidence possibly occurs because CSR captures a rather sterile material, and one that does not lend itself to off-hand judgments. According to their own self-image, investors are number-oriented people, but not number crunchers, that is, they commit to letting themselves being guided by evidence in monetary terms, but not by pedantism (Reichert, 2010). Actuarial, careful judgment does not stand for superior, grandiose ideas such as those attributed to "star investors" like Warren Buffett, which many investors emulate[19]. Given its technical substance matter, CSR is not for the kind of boastful and perhaps slightly narcissistic investment behavior that seeks to signpost intellectually rigorous investment recommendations. CSR information, e.g., greenhouse gas emissions, supply chain management issues, or gender diversity, is comparatively complex, yet at the same time more cumbersome and meticulous to work with than financial line items. Achieving a good command of CSR would require investors to get deeply involved in it. This doesn't match the image of smart investment professionals who don't struggle and agonize over analyzing investments meticulously, but are used to evaluating investments on the fly.

H3: Investors are overconfident about their intuitive judgmental capabilities, and do not want to apply themselves to CSR information that requires a meticulousness that differs significantly from intuitive and 'grand scheme' judgments that the profession tacitly believes are hallmarks of their own grandiosity and smartness.

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[19] An anecdote about Warren Buffett says that many market participants doubted his sanity when in 2010 he suddenly started to buy shares of railroad companies. Later, his ingenuity was admired when it turned out that Buffett had identified what he termed "an economic castle protected by economic 'moats'" (https://investmentu.com/warren-buffetts-railroad/, accessed 13 Sep 2020). A moat in the parlance of Warren Buffett means "a business' ability to maintain competitive advantages over its competitors in order to protect its long-term profits and market share from competing firms" https://bit.ly/3aa5QdS accessed 13 Sep 2020).

A plain assumption for the issue discussed in this paper might be that unless CSR cannot speak about moats, it will fail to provide the ammunition for grand and bold investment ideas. On the contrary, Oppenheimer (1984) shows that one of the founding fathers of modern financial analysis, Benjamin Graham, consistently calculated his investments using something like two handful of accounting- and share-based parameters such as P/E, dividend yield, price/book, to which he applied a standardized weighting-scheme – a prime example of actuarial judgment.

3.3.   Emotion and Self-Control/Aversion to Ambiguity

This section is not concerned with *the extent to which* investors perceive CSR, but rather *how* they perceive it, especially its quality and reliability. Following Hirshleifer (2001) who posits that "people are averse to ambiguity, causing irrational choices" (p. 1550), we base our hypothesis on the assumption that investors generally have an aversion to ambiguity, and that this aversion in particular also affects CSR.

Ambiguity reveals itself in how individuals react to information that is perceived as complex, confusing, indeterminate, incomplete, and unfamiliar (McLain, Kefallonitis, and Armani, 2015). Ambiguity was defined as "a lack of clarity or consistency in reality, causality, or intentionality. Ambiguous situations are situations that cannot be coded precisely into mutually exhaustive and exclusive categories. Ambiguous purposes are intentions that cannot be specified clearly. Ambiguous identities are identities whose rules or occasions for application are imprecise or contradictory" (March, 1994, p. 178).

Ambiguous situations prompt individuals to find explanations for them (Angus-Leppan, Metcalf, and Benn, 2010), that is, making sense of them. The effort of sensemaking might cause individuals to orient to organizational norms and values, or professionally conventional ways of treating the situation at hand (Weick, 1995). Ambiguity shows in several characteristics of situations or events for instance when several yet conflicting interpretations of a situation or event are possible, or when different values among players clash so that actors withdraw to personal values or professional orthodoxy (Weick, 1995).

Ambiguity aversion in finance occurs when investors associate the "absence of an identifiable parameter of the decision problem (…) with higher risk and the possibility of hostile manipulation" (Hirshleifer, 2001, p. 1550). We posit that CSR fits this lack of identifiability for several reasons. First, CSR is a concept with a variety of different and contested meanings and definitions (Matten and Moon, 2005), and this conceptual equivocality essentially "makes

it problematic as a practice" (Angus-Leppan et al., 2010, p. 190). Second, and apart from how companies define CSR, stakeholders may notice that there is a difference between what corporates purport to do, e.g., decide rationally on deliberation and systematic procedures with one purpose and one voice, while in organizational reality several seem to be loosely coupled and the organization resembles an ensemble of coalitions and different groups; this, Angus-Leppan et al. (2010) argue, shows especially in the lack of coordination between finance and CSR. This argument is essential for our hypothesis: there does not seem to be connectivity between the purpose of a company and its CSR activities: "there is no established logical linkage between CSR and profit and that most shareholders invest in a company not to make a difference in society but to gain a sizeable financial return on investment" (Lee, 2008, p. 54), so that CSR activities and subsequent disclosure about it might fit neatly into one of Weick's (1995) characteristics for ambiguity, namely "inconsistent features, relationships, or demands" (p. 93).

Even for investors who are motivated to invest sustainably or utilize CSR when making investment decisions, CSR might still be ambiguous. Several researchers posit that companies use ambiguity as a strategic tool for their CSR communication (Scandelius and Cohen, 2016; Morsing and Langer, 2007; Davenport and Leitch, 2005). The term *strategic ambiguity* was coined by Eisenberg (1984), who thus set a counterpoint against a relatively apolitical understanding of corporate communication that posits clarity and unambiguity as the leading principles. Eisenberg (1984) operates with a quite different basic assumption according to which companies report to a large number of stakeholders who confront the companies with requirements that are sometimes diametrically opposed to each other, thus incurring conflicting goals that lead to conflicts of objectives that cannot be resolved at all with communicative strategies based on clarity and unambiguity. Eisenberg (1984) suggests that organizations create the necessary leeway for coping with conflicting demands by consciously reporting in a vague

and ambiguous, i.e., strategic, manner. "Eisenberg argues that while clarity is an important aspect of communication, it might be more pragmatic to avoid being too specific in contexts where multiple contradicting goals exist" (Scandelius and Cohen, 2016, p. 3489).

Strategic ambiguity allows for flexibility which brings with it several benefits. Companies can buy time which they need for undergoing change while at the same time being able to report to stakeholder groups progress (Leitch and Davenport, 2002). If companies keep their reports vague, it is easier for them to get out of trouble later by simply denying interpretations of stakeholders (Eisenberg, 1984). Vague wording makes it easier for companies to implement organizational changes than if they publish their intentions in detail and in full openness, thus jeopardizing their privileged positions vis-à-vis the workforce or unions in the event of staff cuts, for example, or giving competitors the opportunity to adjust their tactics accordingly (Scandelius and Cohen, 2016).

Mi et al. (2018) dubbed CSR "corporate slogan". The Financial Times posits that "Companies are quick to herald their good deeds to the public, whether it is a carefully crafted PR exercise showing support for local schools, ways they have reduced their carbon footprint, or implementing measures to improve diversity at all levels of the organisation. But there seems to be a mismatch between what a company may say it does in terms of CSR, and what it actually does, meaning investors are right to want to interrogate further" (Kyriakou, 2017). We suppose that investors may not even want to interrogate management because CSR information is so unclear and equivocal – ambiguous – that they don't want to look at CSR.

Orlitzky (2013) argues that CSR creates noise 1. through its lack of clarity and definiteness, and 2. through its lack of reliability due to information asymmetry between preparer and user. If CSR is ambiguous because the definition of items in CSR reports are unclear, allow for more than one interpretation, are novel, or contradictory, then there is a fair chance that investors will be uncertain how to use them. Moreover, preparers have discretion

over what to report under the rubric of CSR (including which pieces of information to omit), and how detailed and granular to report. Because binding and strict standards of the quality of accounting standards such as IFRS are not in place for CSR reporting, investors possibly mistrust the reliability of CSR. Apart from this, CSR reporting does not really answer to societal needs of supporting life-sustaining ecological systems, and integration of CSR into corporate management systems so that "concern for ecology has become sidelined" (Milne and Gray, 2013, p. 13). Hence, CSR reporting may not only be unreliable but also ineffective (compared to its stated objectives).

It was suggested that when investors do not receive clues that allow them to determine the quality of information, they tend to treat such information as ambiguous (Epstein and Schneider, 2008). Also, there is evidence that ambiguous information, i.e., information that lacks clarity, reduces stakeholder trust - trust on which CSR communication relies in order to avoid confirming the already wide-spread impression that CSR is just greenwashing or corporate deception anyway (Scandelius and Cohen, 2016).

H4: Investors perceive CSR as ambiguous, that is unclear and equivocal, and because of their aversion to ambiguous information, they disregard CSR when making investment judgments.

3.4. Social Interactions/Social Learning

Humans learn *individually*, denoted μ (Bentley, Earls, and O'Brien, 2011), e.g., from collecting, weighing and combining information, and arriving at a conclusion or judgment all by their own, and humans learn *socially,* denoted q (Bentley, Earls, and O'Brien, 2011), through observing (Kendal et al., 2018) or copying others' behavior (Boyd and Richerson, 1985; Laland, 2004), effectively imitating others (Kendal et al., 2018; Rieucau and Giraldeau, 2011; Bentley, Earls,

and O'Brien, 2011)[20]. Sources of investors' μ are company disclosure, financial news, and other pieces of information from non-human sources (Hofstedt and Kinard, 1970), while investors' q, on the contrary, is information gleaned from observing other investors' actions and inferring their beliefs, convictions and investment ideas.

Boyd and Richersen's (1985) *Costly Information Hypothesis* states that learning from the behavior of others saves individuals costs from finding and processing information (Kendal et al., 2005), including costs associated with wrongly acquired information (Laland, 2004). Clearly, actors in financial markets observe and watch each other's behavior, seeking to infer others' beliefs and what drives others' actions (Hirshleifer, 2015[21]), because others' behavior in one's environment is informative (Linardi, 2017), and purposive because it helps individuals to improve the impact or accuracy of their own decisions (Sarin & Weber, 1993).

Keynes (1997 [1936]), in his famous beauty contest metaphor, insinuates that investors are barely interested in the fundamental information of an asset. Instead, their objects of interest are the opinions of other investors, what other investors believe, what other investors believe other investors believe, etc. Ultimately, Keynes' (1997 [1936]) assumption means that fundamental information - the source of individual learning μ – for investors typically plays a minor, possibly no role at all: "future price [of an asset, RF] depends upon future market beliefs

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[20] Copying is so ubiquitous in modern societies that we are scarcely aware of it because essentially all cultural rules we live by have been learned from others (Ormerod et al., 2013). Other scholars (e.g., Laland, 2004; Boyd and Richerson, 1985, 1996) have pointed out that our modern societies depend to such a degree on sophisticated technology which no-one is capable inventing on their own, that we do not have any other choice than to copy.

[21] Hirshleifer (2015) suggests that behavioral economics and behavioral finance research should be complemented with social economics and social finance research. He suggests that in this new paradigm studies should focus on, inter alia, how information flows in capital markets are affected through the communication of groups of actors and how financial ideologies – e.g., build from financial memes (Hirshleifer and Teoh, 2009) – evolve and spread from actor to actor or group to group. Hirshleifer made that point first time in his 2001 Journal of Finance paper (that serves as the framework for this paper). Jointly with Teoh (2009), he elaborated on social influence by utilizing the concept of meme (that originates from Dawkins, 1989) which might be an idea, both simple like e.g., P/E ratio, or complex e.g., Efficient Market Hypothesis. As a cluster, financial memes become *financial ideologies*. In his 2020 presidential speech, Hirshleifer elaborates his ideas about 'Social Finance' further and introduces the concept of "fables" which effectively are ideas about hypothetical actions to be tested in experimental set-ups.

which may be right or wrong but have no necessary relation to fundamental values" (Kurz, 2008, p. 780).

What influence would CSR disclosure possibly have on individual learning, if the majority of investors were skeptical of CSR and rejected CSR as a form of greenwashing (Seele and Gatti, 2017; Lyon and Montgomery, 2015), as corporate hypocrisy (Cho et al., 2015), or as potentially noise-generating (Orlitzky, 2013)? An individual investor could decide for herself to not utilize CSR, because she received feedback from the market that she interpreted as meaning that she was doing the same as other investors. However, the investor could wind up learning the wrong behavior if other investors were "clueless" (Heyes, 2016, p. 204). Misperceiving others' public behavior as "genuine representations of their private thought" (Bicchieri, 2006, p. 187) is termed *pluralistic ignorance* i.e., systematically overestimate the similarity of motives, thoughts, attitudes, and beliefs of similar others (Bicchieri, 2006), akin to a false consensus effect (Koonce et al., 2011, p. 214), or anchoring on one's own behavior when estimating the judgment and the underlying beliefs of others (Fiske and Taylor, 2017, p. 199). Hirshleifer (2020) dubs mistaken belief of others' motives *visibility bias* e.g., when investors only see trades and actions other investors, but cannot observe other investors not trading or taking action.

For individual investors it is not easy finding out to what extent other investors use CSR. The investment firm network PRI (Principles for Responsible Investing) proxies extent to which ESG has become mainstream with the number of its signatories who represent an impressive $60 trillion assets-under-management (AuM). Misleading, say Kotsantonis, Pinney, and Serafeim (2016). The Global Sustainable Investment Alliance (GSIA) reports that only approximately ⅓ of all PRI Signatories' AuM were managed sustainably[22]. A survey among

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[22] But even the Global Sustainable Investment Review of the GSIA (2018) provides some figures that report a relatively high level of sustainable investing, such as, that the share of sustainable investments in total asset under-

investment professionals produced the stunning result that of 1,600 participants only 27% do not use ESG information, in other words: roughly ¾ do[23]. A simple heuristicFor the individual investment professional, it may not be easy to make a subjective assessment of whether and to what extent mainstreaming sustainability has already established itself in the market. Given the skepticisms about CSR – greenwashing (Seele and Gatti, 2015), unreliability (Orlitzky, 2013), lack of familiarity as we posit in section 3.1. – we base our hypothesis on the assumption that investment professionals are more likely to consider CSR utilization levels in the market as low rather than high, and therefore assume that CSR is little or not used at all outside niches such as SRI or ethical investors.

> H5: Investors are uncertain to what extent other investors use CSR, are therefore uncertain themselves what to make of CSR, and hence unlikely to get much involved in CSR.

A slightly different type of motivation for learning from others' behavior is maintaining *social proof*, which denotes orienting one's behavior towards the behavior or thinking of others, in order to "infer the value of a course of action" (Rao, Greve, and Davis, 2001, p. 502). If social learning is about doing what others do because they are taken to be right, social proof is about doing what others do because one will not be criticized for doing something other than they. The underlying principle that people apply in situations of social proof is the same as in social learning, namely the apprehension (or misapprehension) that a behavior must be more correct (sensible, rational, justifiable) the more other actors are practicing or performing the behavior (Rao, Greve, and Davis, 2001).

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management in Europe has decreased from an impressive 58.8% (2014) to "only" 48.8% (2018), while in the same period it has increased from 16.6% to 63.2% in Australia/New Zealand.

[23] Intuitively and in our own experience, a rate of 73% of ESG users looks unrealistically high. We assume that a response bias was at work i.e., the majority of respondents were ESG-driven investors while those who care little for ESG did not participate in the survey – speculations which we cannot prove.

An investor may find it hard to explain e.g., stock price performance with CSR, for example, carbon emissions, supply chain management incidents, or gender diversity, given a general uncertainty about other investors' stance towards CSR, as we hypothesized in H5. Because an investor might feel that it is the norm in the financial community to account for successful investments *economically*, for example with earnings or dividend yield, she might "feel compelled to conform" (Bicchieri, 2006, p. 188), and avoid seemingly 'esoteric' reasons from the CSR camp – even if she is convinced that integrating CSR in her investment decision is a good thing.

H6: Investors who are certain that CSR use is the right thing to do, are embarrassed being seen using CSR because the social norm in finance for a professional is to argue economically.

3.5. Interaction of Biases

It is unlikely that behavioral biases occur or operate in isolation. Rather, interplays may occur in which one or more cognitive and behavioral biases are involved, that reinforce each other through mutual influences. Also, it would be possible that some of these errors and biases possibly react antagonistically, e.g., cancel each other out. For instance, Fernandez et al. (2011) investigate investor herding behavior and find that several biases exert influence on whether investors herd or not, e.g., the illusion-of-control-bias favors herding, overconfidence reduces herding, self-attribution bias reduces herding, while the hot-hand-fallacy encourages herding, and the gambler's fallacy inhibits herding. Apart from Fernandez et al.'s (2011) study, in extant behavioral economics or behavioral finance literature there is scant research on interactions of biases[24].

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[24] Most of the research on interaction of biases has been conducted in clinical psychology, predominantly in the study of depressions (e.g., Everaert and Koster, 2020; Everaert, Duyck, and Koster, 2014; Beck, 2008; Hirsch, Clark, and Mathews, 2006). Hirsch et al. (2006) developed the *combined cognitive bias hypothesis* which builds on evidence that cognitive biases occur at several stages of information processing of clinically depressed e.g.,

Our candidate bias for being tested as some sort of "master bias" serving as the starting point of hypothetical errors and biases with CSR in professional investment judgments, is overconfidence. That is hardly a far-fetched choice. Kahneman (cf. Shariatmadari, 2015) argues that overconfidence "is built so deeply into the structure of the mind that you couldn't change it without changing many other things". Werner DeBondt and Richard Thaler (1995) declare overconfidence to be the most robust insight of the psychology of judgments. This is in line with Malmendier and Taylor (2015) who posit that "[o]ther biases can be thought of as aspects of overconfidence, or ways in which overconfidence can manifest itself" (p. 6). Also, overconfidence "gives other decision-making biases teeth. (…). An excessive faith in the quality of our judgment (…) leads us to rely on our own judgment too much, despite its many flaws" (Moore, Tenney, and Haran, 2015, pp. 3-4). No doubt overconfidence is a particularly prominent psychological factor that can assume the role of a root cause for other biases, or an effect, i.e., overconfidence can similarly be an independent variable or a dependent variable (Hoffrage, 2017). We examine three relationships between the biases that we discussed in the prior sections (see Fig. 3 below).

❶ *Overconfidence increases the saliency effect.* In section 3.1., we hypothesized that investors are cognitively lazy and rather turn to familiar and therefore salient information. CSR, we hypothesized, is not salient because most investors are not familiar with it. To become a victim of salience bias, however, an investor does not have to be overconfident. Strictly speaking, salience effects do not require excessive self-confidence. Bordalo, Gennaioli and Shleifer (2013, 2012) show that what stands out depends on the context in which an object or information is presented. Conspicuousness "is an important attention mechanism that allows people to focus their limited resources on a subset of the available sensory data" (Bordalo,

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attention, interpretation, memory. The combined cognitive bias hypothesis states that several cognitive biases are associated although it is not yet clear to what extent the occurrence of a single bias or multiple biases is predictive of depressive symptoms (Everaert, Koster, and Derakshan, 2012).

Gennaioli and Shleifer, 2012, p. 1244). An extensive literature on graphical information (e.g., Parson and Sedig, 2014; Vessey, 1991; Desanctis and Jarvenpaa, 1989) shows that graphical presentation allows information to stand out and thus influence decision makers. An overconfident investor, we hypothesize, becomes even more lazy and selective about what information she uses: "Excessive self-confidence can be an obstacle to effective professional decision-making [because] too sure we know the right answer, we become insensitive to new insights or alternative perspectives" (Bazerman and Moore, 2009, p. 37).

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❷ *Overconfidence potentially increases the anchoring effect i.e., decreases adjustment.* We hypothesize that an overconfident investor will believe that her information is telling her the truth (overprecision), so that in essence she will tend to be even more anchored on her model and/or information than a non-overconfident investor (i.e., well-calibrated, Budescu and Du, 2007). Also, we assume that attention and hence detecting salient information will be determined by directive factors such as motivation or goals (Bruner, 1948); self-esteem and a tendency to "prove it to herself and others" may be a strong directive factor for an overconfident investor while a non-overconfident actor will obtain more self-esteem by conforming to values of other actors (Akerlof, 2017). Also, both overprecision and overestimation amplify confirmation biases that lead one to take into account only information that seems to confirm one's hypothesis, i.e., confirmation bias. Kleinmuntz (1990) argues that "[t]he problem for most people is that overconfidence (…) leads to overweighting of the importance of occurrences that confirm their hypotheses. This results in their ignoring or not collecting information that may be unfavorable to their hypotheses" (p. 298). If an investor's estimates turn out accurate, they confirm her judgment, and her selection of the information set. For those estimates which turn

out incorrect, and unless the investor is willing to learn, it will do for her to explain them away with bad luck or some factors in the market that cannot be predicted ("I was right all along but the market took a funny turn"). In the extreme, investors might forego learning from feedback completely, when a self-attribution bias kicks in, i.e., "the tendency for people to attribute success or good outcomes to their own abilities, while blaming failures on circumstances beyond their control" (Ackert and Deaves, 2010, p. 114). Overconfidence and self-attribution are related as static (overconfidence) and dynamic (self-attribution) counterparts (Hirshleifer, 2001). Self-attribution bias refers to overestimating one's private information which is caused by past investment success (Merkle, 2017; Daniel et al., 1998).

❸ *Overconfidence increases distaste for unfamiliar or unknown information.* An overconfident investor may develop an even stronger sense of distaste for information that is not hers, and that looks as if it could not become part of her information environment. CSR, we hypothesize would fall into that category. An investor who believes that the information she is consulting for investment decisions, e.g., her private information, is superior to the market's current information, and who still trusts her intuition more than any statistical methods, will have good reasons to reject information she does not know and/or does not use.

❹ *Overconfidence decreases social learning.* A shared understanding among financial actors seems to be that there is 'good' information, and 'bad' information. Good information is what is diagnostic or relevant for investment decisions, while bad information is noise (Russo and Shoemaker, 1989; Black, 1986). While overconfidence favors the salience bias and anchoring due to cognitive laziness, and also distaste for ambiguous and noisy information, we argue it tends to reduce biases associated with social learning, especially when social learning is a euphemism for copying others' behavior. Because overconfidence is likely to seduce investors to give too much weight to their own information, and consequently too little weight to other information that is publicly available (Hirshleifer, 2001; Daniel et al., 1998), an

overconfident investor does not care too much about what other investors might believe or which information others use. Overconfident investors rather act following their own information and ignore others (Bernardo and Welch, 2001).

By the same token, we speculate that an overconfident investor will not pay too much attention to what the majority of investors think of CSR. On the contrary, one might suspect that an overplacing investor will reject CSR even more, if the majority of other investors seem to use it. Hence, an interesting question for future research could be whether an overconfident investor starts using CSR if she learns that many other investors are using CSR. Another exciting question is whether overconfident investors are unsettled by CSR and assume that the other investors are even more unsettled by CSR, i.e., show a superiority bias. Dittmann et al (2014) define overconfidence as "individuals believe that only the other participants in the game make mistakes" (p. 18). This could be a starting point for investigating overconfidence in connection with social transmission (Hirshleifer, 2020).

H7: Overconfidence amplifies biases related to the saliency effect, anchoring and insufficient adjustment, distaste for unfamiliar information, and social learning in the context of investors' rejection of CSR.

4. Discussion

In the following, we will sketch some ideas for testing our hypotheses experimentally. The first two hypotheses were based on the assumption that investment professionals are cognitive misers (Fiske and Taylor, 2017) who (H1) depend on the salience i.e., familiarity of the information they use or conspicuousness (Guido, 2001; Jarvenpaa, 1990). A set-up for testing our hypothesis could be to increase the degree of conspicuity of CSR in order to examine whether CSR becomes salient when presented graphically, e.g., in a graphic. For instance, Cook

and Smallman (2008) find that graphical layouts significantly reduce biases that occur with text, although biases are not completely eliminated.

The second hypothesis within the category of heuristic simplification (H2) is based on the question of whether the attention of investors is possibly so heavily influenced by financial values or previous judgements that adjustments that would be suggested by CSR information do not take place sufficiently. We hypothesized that this could effectively be a case of anchoring and insufficient adjustment. A potential set-up for exploring this hypothesis can be found in a relatively recent development in the area of corporate reporting, namely an integrated report. This approach, promoted by the International Integrated Reporting Council (IIRC) aims at aligning corporate reporting to six capitals (e.g., financial, manufactured, intellectual, human, social and relationship, and natural), thus overcoming the separation between financial and non-financial corporate reporting. Integrated reporting is considered a major evolutionary step in corporate reporting (Jensen and Berg, 2012; Eccles and Krzus, 2010) because it attempts to address the current state of corporate reporting where financial and non-financial disclosures are separate and often published at different times during the reporting period. A simple question for an experimental set-up could be whether investors who are first exposed to financial information will anchor on them, so that CSR disclosure presented subsequently at a different time would not be taken into account sufficiently.

In Hirshleifer's (2001) category named 'self-deception', we propose overconfidence as the leading bias and assume that investors are inherently overconfident. A potential set-up for researching our overconfidence hypothesis could look similar to Menkhoff, Schmeling, and Schmidt's (2012) treatments. They tested professional financial market participants' overconfidence in an online experiment in which subjects had to give estimates for two stock indices, provide confidence intervals, and rate their own performance and information, and those of other participants. If this set-up is applied to the application of CSR, various aspects

emerge. If investment professionals were to have an asset valued over several rounds, and the results of the previous rounds were published, e.g. an average valuation in the "market", then investment professionals would not only have fundamental information about the asset, but also the market average as additional information and could presumably compare their own valuation with the market valuation and determine how they would position themselves in terms of their own performance and in comparison to the market - and to what extent their own confidence would be justified.

Our fourth hypothesis is built on the notion that investors react to CSR's ambiguity. Not knowing what to do with CSR because of confusion due to too many interpretations (Weick, 1995, p. 91), may cause an individual to reject information. A set-up for testing this hypothesis could focus on what investors are prepared to pay for information that resolves ambiguity. For instance, investors are given a prediction task for which they are given sets of information. The sets of information are not conclusive but leave subjects with residual ambiguity about the future state they are tasked to predict. They can buy additional pieces of information that help them to reduce ambiguity i.e., their uncertainty. Snow (2010) shows that ambiguity-reducing information has a positive value for investors who are ambiguity-averse, and that the value of ambiguity-reducing information increases with the level of ambiguity and with greater ambiguity aversion. The more investors were willing to spend on ambiguity-reducing information the higher the level of perceived ambiguity.

Our hypotheses for social transmission – H5 and H6 – are probably the most exciting ones for developing ideas for experimental set-ups, especially when combined with our final hypothesis (H7) according to which investors' inherent overconfidence enhances or partially cancels other biases. The gist of both hypotheses is that in situations of uncertainty or faced with ambiguous evidence that allows for several and possibly competing interpretations, people

have the tendency to look for what others might be thinking of the situation, or how others behave (Cialdini, 1984).

Hypothesis 5 is that investors are unlikely to get involved with CSR due to an uncertainty what to make of CSR which is caused by an uncertainty about whether other investors use CSR. If investors who do not use CSR because are uncertain as to whether other investors use CSR suddenly learn that other investors do use CSR after all, or that a negative sentiment about CSR in the market changed to the positive – would they start using CSR? This question could, for example, be combined with the treatment we have outlined for overconfidence i.e., an artificial market in which market feedback is available e.g., an average value computed from the market aggregate.

In combination with H7, which presupposes an inherent overconfidence, it would be possible to test the reaction of investors to the market feedback e.g., the average. Would overconfident investors who positioned themselves as skeptical towards CSR, or who were uncertain at the beginning of the treatment give up their position if they learned that they were 'outnumbered' by CSR users? How large would have to be the proportion of CSR users in a treatment before CSR skeptics would begin re-considering CSR? In essence, results from such treatments potentially could provide important learnings for policymakers and NGOs interested in promoting the integration of sustainability aspects into investment decisions. At its core is the (as of yet unproven) notion that financial markets will tilt towards sustainability if the majority of investors integrate sustainability and other investors can learn socially from them.

The other hypothesis we present in the category of social transmission assumes that investors avoid CSR because they fear making a fool of themselves in a community of practice that is geared to financial evidence. Curley, Yates, and Abrams (1986) provide evidence from experiments that increasing the number of people watching or observing a decision-maker making a judgment increased her ambiguity aversion. Curley et al. (1986) dub this phenomenon

"other-evaluation, [which occurs when] a decision maker, in making a choice, anticipates that others will evaluate his or her decision; and, so, makes the choice that is perceived to be most justifiable to others" (p. 230). Trautmann, Vieider, and Wakker (2008) posit that the perception that others are more competent, or knowledgeable, i.e., effectively an inferiority bias, leads people to become more averse to ambiguity: "If people choose an ambiguous option and receive a bad outcome, then they fear criticisms by others" (p. 226). If we experimentally give investors companies to judge, say, two treatments, one with CSR, the other one without, how would the number of (possibly fictitious, possibly real) watchers modify their judgments? Would they judge differently if they knew others were watching whether they would use (allegedly) ambiguous CSR?

5. Conclusion

The information that we focused on in this paper – CSR – is a relatively new type of information compared to accounting-based financial information. Behavioral finance and behavioral accounting have studied for decades how investors process (predominantly but not exclusively) accounting-based financial information, and which deviations from rationality occur i.e., whether and to what extent investors incur cognitive and behavioral biases. There is no reason why CSR should not be researched under similar conditions and with a similar objective.

Based on David Hirshleifer's (2001) framework for understanding decision biases, this paper has provided seven hypotheses in four categories of cognitive and behavioral biases that may occur when professional investors are encountering CSR. In addition, this paper has provided some sketches as to how these hypotheses may be researched in (supposedly) experimental research set-ups. This paper hence provides a framework for future research that supports understanding how cognitive biases may impact investors using CSR. The current political and societal expectations towards financial markets are such that they should play a

leading role in mitigating climate change, safeguarding biodiversity, combatting social inequality to name a few topics subsumed under the label of sustainability. How cognitive and behavioral biases impede CSR adoption of investors hence remains a vital issue for future research.

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Table 1
Four guiding assumptions of this paper
Based on categories from the Hirshleifer's (2001) framework.

Categories from Hirshleifer's (2001) framework	Guiding Assumptions of this paper
A. Heuristic simplification	Investors might be cognitively lazy, being distracted by salient i.e., conspicuous or familiar financial information about a firm, and not looking for relevant yet less salient CSR information.
B. Self-deception	Possibly, investors are overconfident in their judgmental capabilities and do not want to be restricted by information that seems tedious and seems to require meticulous analysis – such as CSR.
C. Emotions and self-control	Investors tend to avoid information they are not familiar with – especially when – and this seems to be the case with CSR – the information is ambiguous.
D. Social interactions	Investors find it difficult to find out to what extent other investors find CSR useful or good, and this makes them uncertain.

Table 1: Four guiding assumptions of this paper, based on categories from the Hirshleifer's (2001) framework.

Figure 1
Hirshleifer's (2001) Framework of Cognitive Errors and Biases

A. Heuristic simplification/laziness
A.1. Attention/Memory/Ease-of-processing
– Priming
– ▶ **Salience**
– Availability
– Halo effect
– Illusion of truth
– Cue competition
A.2. Narrow framing/Mental Accounting/Reference effects
– Framing
– Money illusion
– Preference reversals
– Context effects
– Mental accounting
– Disposition
– ▶ **Anchoring**
– Regret avoidance
– Omission bias
– Loss aversion
A.3. Representative heuristic
A.4. Belief updating, combining effects
– Conservatism
– Strengths (extremeness) vs. weight (reliability/precision of information)

B. Self-deception
– ▶ **Overconfidence**
– Ex-post rationalization
– Biased self-attribution
– Sunk cost effect
– Hindsight bias
– Confirmatory bias
– Seeking confirmatory information

C. Emotions and Self-control
C.1. Distaste for ambiguity
– ▶ **Aversion to ambiguity**
C.2. Mood/Feelings
– Risk aversion
– Regret aversion
– Loss aversion
C.3. Time preferences and self-control
– Time inconsistency
– Hyperbolic discounting

D. Social Interactions
– Conformity effect
– Availability cascades
– Fundamental attribution error
– False consensus effect
– The curse of knowledge
– ▶**Social learning***

Hirshleifer's (2001) framework of cognitive errors and biases as applied in this paper to the study of biases of investment professionals when encountering CSR. Cognitive errors and behavioral biases studied in this paper are marked with a ▶ and in bold. Entries with an * are cognitive errors or behavioral biases that do not appear in the original Hirshleifer (2001) framework but have been identified and assigned to the categories by the author of this paper. Hirshleifer's (2001) category „E. Modelling Alternatives to Expected Utility and Bayesian Updating" is missing from the figure as it is not considered relevant to our study. Graphical representation by the author of this paper.

Table 2a

Four guiding assumptions of this paper, based on categories from the Hirshleifer's (2001) framework, and six hypotheses.

Categories as in Hirshleifer (2001)	Main characteristic	Hypotheses
A. Heuristic simplification	Cognitive laziness	H1: Investors are cognitively lazy and ignore CSR because CSR is not as salient (i.e., familiar, typical, common) as financial information, that is, they are prone to a saliency bias. H2: Because investors are cognitively lazy, they are susceptible to an anchoring effect that shows through reluctance to change previous judgements or their usual way of evaluating companies when new, unknown or temporally or spatially separated information such as CSR arrives.
B. Self-deception	Overconfidence	H3: Investors are overconfident about their intuitive judgmental capabilities, and do not want to apply themselves to tedious and technically complicated CSR information that does not lend itself as easily as financials to the intuitive and 'grand scheme' judgments that the profession tacitly believes are hallmarks of their own grandiosity and smartness.
C. Emotions and self-control	Aversion to ambiguity	H4: Investors perceive CSR as ambiguous, that is unclear and equivocal, and because of their aversion to ambiguous information, they disregard CSR when making investment judgments.
D. Social interactions	Social learning	H5: Investors are uncertain to what extent other investors use CSR, are therefore uncertain themselves what to make of CSR, and hence unlikely to get much involved in CSR. H6: Investors who are certain that CSR use is the right thing to do, are embarrassed being seen using CSR because they feel that the social norm in finance for a professional is to argue economically.

Table 2b:

Additional category and additional hypothesis, source: own.

Additional Category	Main characteristic	Hypothesis
E. Interaction of biases	Overconfidence as an amplifier of biases A, C, D	H7: Overconfidence amplifies biases related to cognitive laziness (saliency effect, anchoring and insufficient adjustment), aversion to ambiguity, and social learning in the context of investors' rejection of CSR.

Fig. 2.
Interaction of hypothesized biases.
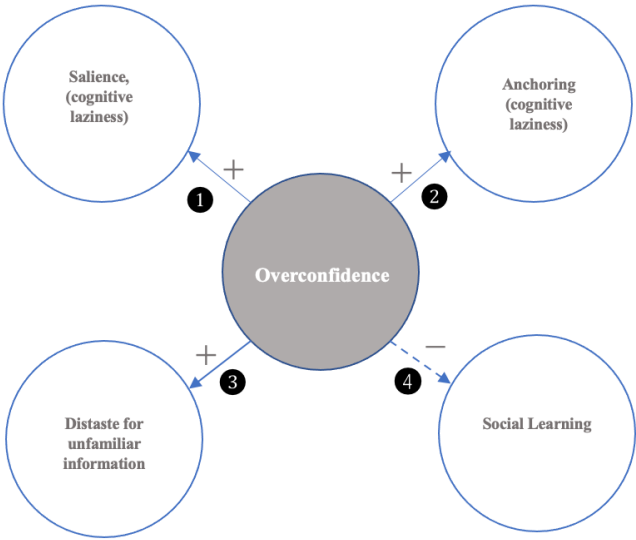
Denotes positive influence; ----► Denotes negative influence. ↗ denotes increase, ↘ denotes decrease.
❶ Overconfidence ↗ Salience. ❷ Overconfidence ↗ Anchoring. Overconfidence ↗ ❸ Distaste for unfamiliar information. ❹ Overconfidence ↘ Social learning.
Graphic illustration Ralf Frank.

Timing Effects of Corporate Social Responsibility Disclosure: an Experimental Study with Investment Professionals*

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Timing Effects of Corporate Social Responsibility Disclosure: an Experimental Study with Investment Professionals

Abstract

Companies disclose increasingly more corporate social responsibility (CSR) related information. However, CSR information is not always treated entirely rationally by capital market participants. In an experiment using experienced investment professionals, we investigate how the timing of CSR disclosure influences firm valuations by professional investors. The results suggest that CSR disclosure in a stand-alone report, temporally disconnected to firm's financial disclosure, may lead to asymmetric anchoring, whereby simultaneous disclosure of CSR and financial information in an integrated report prevents anchoring in investors' judgement. Investors' asymmetric anchoring is induced by differences in cognitive effort invested in CSR information processing, which depends on whether CSR information signals future profits or losses. Our results contribute to the debate on disclosure standards for CSR information and the use of CSR information by professional investors.

1.   Introduction

The corporate social responsibility (CSR) movement has been one of the most significant developments in capital markets in recent years (Moser and Martin 2012). By December 2014, more than $45 trillion in assets, under management by over 1300 asset management firms and institutional investors, were backed the Principles for Responsible Investment of the United Nations (UN PRI). The Global Sustainable Investment Alliance (GSIA 2015) reports for 2014 that the market of sustainable investments accounts for 30,2% of all professionally managed assets. Correspondingly, the question of how capital market participants assess disclosed CSR information has increasingly attracted the attention of researchers (e.g. Capelle-Blancard and Monjon 2012; Glac 2009, 2012; van Duuren, Plantinga, and Scholtens 2016). In this study, we investigate how the timing of CSR disclosure influences professional investors' firm valuations. We, therefore, vary the timing of CSR disclosure in relation to the firm's financial disclosure in two experiments. In each experiment CSR information is provided either sequentially via a stand- alone CSR report that is distributed after the disclosure of financial data or simultaneously with the firm's financial disclosure similar to an integrated report.

Broad empirical evidence from capital markets supports the notion that CSR factors matter to a company's financial performance (Dhaliwal, Radhakrishnan, and Tsang 2012; Friede, Busch, and Bassen 2015; Margolis, Elfenbein, and Walsh 2007; Orlitzky, Schmidt, and Rynes 2003; Revelli and Viviani 2015), and to its cost of capital, thus, a measure of the company's perceived riskiness at the capital market (Bauer and Hann 2010; Hoepner et al. 2014). Consequently, if CSR information is considered as value relevant for firm valuation, even so-called mainstream investors who are not specialized in 'ethical' or 'socially responsible' investing should incorporate this information. Empirical evidence supports this notion. For example, Petersen and Vredenburg (2009) provide evidence that there are CSR variables that have a consequential impact on the capital market's valuation for institutional

investors. Moreover, experimental results from Reimsbach and Hahn (2015) emphasize the important role of third-party disclosure for investment- related judgements in the case of disclosed negative sustainability information. However, it may simply be that the timing and manner in which CSR disclosure is presented affects how CSR information is processed by investors.

According to traditional finance theories, the question of whether financial and CSR data are published sequentially or simultaneously is irrelevant as long as the information content is identical. However, due to limited capabilities of information acquisition and processing, the way information is disclosed can substantially affect judgments and invest- ment decisions of financial statement users (e.g., Kennedy, Mitchell, and Sefcik 1998; Libby, Bloomfield, and Nelson 2002; Maines, McDaniel, and Harris 1997). Drawing on evidence that investors' reaction to disclosed financial information can be affected by the anchoring heuristic (e.g. Amir and Ganzach 1998; Dietrich et al. 2001; Kennedy, Mitchell, and Sefcik 1998), we argue that, when CSR reports are temporally disconnected from financial reports, investors may anchor on their initial financial performance judgments when assessing CSR information. As a consequence, investors may underreact to CSR information when it is disclosed subsequently in a stand-alone report compared to when CSR information is provided in an integrated report format.

To investigate the effects of CSR disclosure timing on professional investors' firm valuation, we use two experiments in which corporate CSR information provides value-relevant information about future cash flows. In both experiments, investors either receive financial and CSR information sequentially, i.e., temporarily disconnected from each other or they receive it simultaneously. In Experiment 1, we analyze a setting in which CSR information can be a positive signal about potential future growth opportunities. In Experiment 2, we analyze a

setting in which CSR can be a negative signal about potential future risks. For both experiments, we use experienced European mainstream investment professionals as participants.

The experimental results show that the timing of CSR information can indeed influence an investor's assessment of this information. Specifically, when investors receive positive CSR information signaling potential future growth (Experiment 1), they do *not* react to this information when it is provided *temporarily disconnected* from the financial information. This is because investors have already evaluated the firm based solely on financial data, indicating strong anchoring on the initial evaluation. In contrast, investors receiving financial and CSR data *simultaneously* seem to include the positive CSR information into their valuations and generate higher firm valuations than investors with sequential information. However, when investors receive negative CSR information signaling potential future risks (Experiment 2), they almost fully overcome any anchoring effect from initial valuations based on financial information only. Specifically, investors receiving CSR information temporarily disconnected from the financial information react negatively to the negative CSR information and adjust their valuations to nearly the same level as those investors receiving CSR and financial information simultaneously. Thus, the anchoring effects of initial valuations based on financial information only seem to be asymmetric.

Our results contribute to the current debate on investors' decision-making behavior in the context of CSR (e.g. Glac 2009, 2012; McLachlan and Gardner 2004; Webley, Lewis, and Mackenzie 2001; Williams 2007). Specifically, we contribute on the debate about 'good' CSR disclosure that facilitates information processing free of cognitive biases and, particularly, on integrated reporting (Eccles and Krzus 2010; Serafeim 2014).

Additionally, we contribute to the literature on stock market reactions to CSR news and, particularly, the asymmetry in reactions to positive and negative news (Karpoff, Lott, and Wehrly 2005; Klassen and McLaughlin 1996). By providing evidence that in individual firm

valuations, professional investors are better able to overcome anchoring effects when new CSR information is negative rather than positive, our findings may help to explain empirical observations of asymmetric stock market reactions and indicates that stock reactions to CSR news may be biased as well.

Finally, our results can contribute to the debate about the use of CSR information for professional investment valuation (Deegan and Rankin 1997; Teoh and Shui 1990). Our results suggest that professional investors who do not specialize in CSR take value-relevant CSR data into account, albeit differently and depending on its disclosure format.

The remainder of the paper is structured as follows: Section 2 reviews the relevant lit- erature. Section 3 presents theory, methodology and results of Experiment 1 and Section 4 presents theory, methodology and results of Experiment 2. Section 5 reports results of robustness tests for both experiments. Section 6 concludes.

2. Literature Review

According to traditional finance theories, financial markets are informationally efficient, i.e., security prices fully reflect all available information (Fama 1970, 1991). In such markets, security returns are assumed to reflect common risk factors and – after adjusting for risk – systematic abnormal returns should not be possible (Fama and French 1993; Sharpe 1964). In informationally efficient markets, CSR information – if value-relevant – should always be correctly reflected in prices and there should be no differences in risk-adjusted valuations of investors. This also implies that the question of whether financial and CSR data are published sequentially or simultaneously is irrelevant as long as the information content is identical because the market processes information rationally.

In contrast, a broad research stream from behavioral finance has provided evidence that financial markets are not informationally efficient, providing possibilities e.g., to base strategies

on past returns have been found to yield significant abnormal security returns (e.g. De Bondt and Thaler 1985; Jegadeesh and Titman 1993). This research is based on behavioral research in accounting and finance investigating individuals' limited ability in rationally processing information and its influence on investment decisions (Barberis and Thaler 2003; Birnberg 2011). For example, respective work has uncovered that decision frames, determined by the formulation of the problem as well as by the norms, habits and personal characteristics of the individual, play an important role in financial decision making (Barberis and Thaler 2003; Kahneman and Tversky 1979, 453). Regarding the use of CSR information, event studies demonstrate that stock markets react to CSR information announcements (Hamilton 1995; Shane and Spicer 1983) – and more so to negative CSR information (Karpoff, Lott, and Wehrly 2005; Klassen and McLaughlin 1996). Moreover, archival studies have documented that good corporate social performance leads to more favorable investment recommendations from financial analysts (Ioannou and Serafeim 2010) and that CSR reports increase the accuracy of analysts' earnings forecasts (Dhaliwal, Radhakrishnan, and Tsang 2012).

However, some evidence suggests that CSR information is not always treated fully rationally. First, so-called socially responsible stocks can earn anomalously high returns (Derwall et al. 2005; Derwall, Koedijk, and Ter Horst 2011; Kempf and Osthoff 2007; Statman and Glushkov 2009). This anomaly may indicate that CSR information is value-relevant but without enough information available it is not efficiently reflected in stock prices 'mispricing hypothesis' (Mănescu 2011). Given that market participants are limited in their processing capabilities, another strand of literature argues that not all value-relevant information is reflected in stock prices because investors do not fully under- stand CSR information 'errors-in-expectations hypothesis' (Edmans 2011) which would contradict the hypothesis of informationally efficient markets. In this vein, Elliott et al. (2014) find that, when investors are exposed to CSR information without direct value-relevance, their firm valuation judgments are

influenced by affective reactions. We add to research on the question of rational treatment of CSR information by investigating on an individual basis whether investment professionals anchor on previous valuation assessments and may not fully include CSR information into their valuations when it is published temporarily separate from financial information.

Second, an increasing literature shows that positive and negative CSR information have a differentiated impact on investors' valuation. Event studies find that positive stock price reactions after good news are smaller than negative reactions after bad news (Karpoff, Lott, and Wehrly 2005; Klassen and McLaughlin 1996). While this asymmetry may result from the different content of good and bad CSR information (Krüger 2009), it may also imply that positive CSR signals are assessed differently. Adding to this research stream, we investigate whether investment professionals are able to better overcome the effect of financial valuation anchors when CSR information is negative than when it is positive.

In fact, few studies have investigated private investors' assessment of CSR information. Drawing on cognition literature, Glac (2009, 2012) shows the important role of mental frames in investors' decision-making under the influence of disclosed CSR information. Investors who reason based on higher levels of cognitive moral development tend to have a more 'integrated frame', meaning that they integrate CSR information in their investment decision. We extend this research by investigating whether the simultaneous disclosure of financial and CSR information as, for example, in an Integrated Report in which financial and non-financial information such as CSR are reported together by companies (Eccles and Krzus 2010, 2015), lead to more consideration of CSR information for investment decisions.

In terms of information use, Bird et al. (2007) show that negative and positive CSR information are not processed in the same way by investors. While this research provides first important insights about investors' CSR information processing in the context of firm valuation, determinants of the underlying processes are still not well understood – especially

not for professional investors. Moreover, controlled experimental evidence on the processing of CSR information and the reaction to CSR disclosure is sparse. One study uses a controlled experiment to investigate whether corporate CSR disclosure impacts professional investors' firm valuation and investment decision in equity financing (Crifo, Forget, and Teyssier 2015). Additionally, Reimsbach, Hahn, and Gürtürk (2017) provide evidence for an assurance effect in sustainability disclosure. Experimentally investigating investors' information processing, they indicate that assurance of sustainability information positively affected investors' evaluation of a firm's sustainability performance and led to higher investment-related judgments. Importantly, they find that this assurance effect attenuates in the case of integrated reporting compared to separate reporting. In contrast to prior research, we use equally credible and value-relevant positive and negative CSR information and study investors' potentially different reactions due to anchoring on prior financial valuations.

3. Experiment 1 – Theory, Methodology, and Results

3.1. Theory Development

Experiment 1 investigates a setting in which CSR information points to future opportunities and growth potential and thus future firm profits. From an information economics perspective, identical information should lead to identical valuations independent of its timing. Thus, firm valuations should be unaffected by whether CSR information is pro- vided in an integrated report, i.e., simultaneously with financial disclosure, or in stand- alone reports, i.e. temporarily disconnected from financial disclosure. However, information processing and judgments can be strongly affected by the organization and presentation of information (Kahneman, Slovic, and Tversky 1982; Slovic 1972). In the case of CSR information disclosure in a stand-alone report, we argue that investment professionals may be affected by the anchoring-and-adjustment heuristic (Tversky and Kahneman 1974). Specifically, they may form their initial

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valuation based on available financial data and may then not fully adjust their valuation when subsequent CSR information is disclosed. That means the initial valuation based on a firm's financial information represents a self-generated anchor for the CSR information processing. In such a case, the adjusted valuation including CSR information would be systematically biased towards the valuation based on financial data only.

The anchor on financial information may have a strong effect on investment professionals' firm valuation. For example, empirical as well as experimental findings underline the important role of market and reference prices for the assessment of the fundamental value of a firm through anchoring-and-adjustment (Chang, Luo, and Ren 2013; Marsat and Williams 2013). Additionally, prior findings on analyst behavior provide evidence that self-generated prior forecasts represent strong anchors for further forecasts and lead to underreactions (Amir and Ganzach 1998) and that anchoring and adjustment become especially likely when anchors are potent, as in the case of a previous prediction (Czaczkes and Ganzach 1996). Cognitive psychology indicates that self-generated anchors lead to insufficient adjustments in judgement, as a result, investors adjust their valuation from their self-generated anchor but stop as soon as they reach a plausible range of values. (Epley and Gilovich 2001, 2005).[1] Owing to mainstream investment professionals' relative unfamiliarity with CSR information, their range of plausible firm valuations including ESG information is likely to be large, indicating a particularly strong effect of financial performance anchors in the assessment of CSR information.

In contrast, providing CSR information at the same time as financial information as, for example, in an integrated report, may mitigate the timing effect. The reason is that investors would assess financial and CSR information at the same time and, consequently, they are less likely to anchor on the financial performance judgements when assessing CSR information.

Thus, we hypothesize that, when CSR information provides a positive signal about a firm's potential future profits, investors do not fully adjust their initial financial valuation when CSR information is provided temporarily disconnected from the financial information to the same level as in the case of simultaneous information provision. Consequently, we predict:

H1: *If CSR information represents a positive signal and implies an upward adjustment of firm valuation, the valuation of investors using receiving CSR and financial information simultaneously will be higher than that of investors receiving CSR information temporarily disconnected from financial information.*

3.2. Methodology

3.2.1. Overview of the Experiment

Participants in the experiment read a case asking them to evaluate a firm. The materials focused on the firm's financial and CSR performance. In line with the view that CSR information can reflect future growth opportunities (Goss and Roberts 2011; Lev, Petrovits, and Radhakrishnan 2010), we developed a case in which CSR performance exhibited positive signals about future opportunities and growth potential and thus about future firm performance. To create an environment that is most appropriate to test our predictions, we provided the participants with corporate financial information representing mediocre performance. Since the value of nonfinancial information is particularly high if it indicates future opportunities or risks that tend to deviate from current financial performance (Ittner, Larcker, and Meyer 2003), this combination maximizes the likelihood of a valuation adjustment based on CSR data[2].

3.2.2. Participants

Participants of the two experiments do not statistically differ as to their professional experience or occupation (all p's > 0.20). Therefore, we describe them together. Table 1 summarizes the characteristics of our final subject sample. Participants of the two experiments were 65 European mainstream investment professionals, most of whom were sell- side analysts or fund

managers. None had a specialization or functional focus on CSR, and all of them had entered into the experiment voluntarily. As displayed in Panel B of Table 1, 88% had spent at least five years in the investment business, which indicates considerable experience in using financial statements and in firm valuation. Mean work experience was 12.65 years. According to Moser and Martin (2012), one of the most important limitations of CSR experiments is the uncertainty about the generalizability of results because participants are usually not professionals in the corresponding field. By using experienced professional investors instead of (undergraduate) students, our experiment overcomes this limitation. Our participants were from different European countries and from many financial institutions. Thus, importantly, our participant group does not reflect the view of a single financial institution on CSR issues.

----- insert table 1 here -----

Thirty-two investment professionals participated in Experiment 1. Access to the subjects was granted by DVFA, a professional association of investment professionals headquartered in Germany. From the investment professionals included in DVFA's database, only those investment professionals were invited to participate in the experiment who – according to DVFA's filings – are professionally engaged with analysis and/or valuation of, or investing in corporates, like, e.g., equity and/or corporate bond analysts, equity and corporate bond investment managers, and corporate valuation experts. Three participants did not finish the experiment, leaving a final sample of 29 participants for Experiment 1.

The experiment was conducted and administered online. The major benefit of conducting the experiment via the internet is the access to our subject pool of highly experienced investment professionals (Harrison and List 2004). While online experiments introduce the possibility that uncontrolled factors might affect the results (Charness, Haruvy,

and Sonsino 2007), we made every attempt to ensure experimental control. Therefore, we attentively controlled the pool of participants, which is an important requirement for internet-based experiments (Birnbaum 2004; Charness, Haruvy, and Sonsino 2007). Participants were identified by their professional profile description, such as sell-side/buy-side, equity analyst, or fund manager, and were contacted through heads of equity research or heads of departments, who received a set of anonymous web addresses that they distributed randomly among their employees. They gained access to the experiment through a personal password embedded in the web link leading to the experiment (Birnbaum 2004). Participants could neither forward the link nor enter the experiment more than once. These procedures reduce the danger of sampling biases. The low dropout rate in our experiments minimizes concern about self-selection (Reips 2002). Moreover, participants were asked to read care- fully the experimental instructions described below.

3.2.3. Design and Procedure

The experiment uses a 1 × 2 (simultaneous vs. temporarily disconnected information) between-subjects design. Thus, the factor manipulated is the timing of CSR disclosure. Either financial and CSR information were provided simultaneously in one report and eli- citing one value judgment for the respective firm (simultaneous information provision) or after the participants had made a first valuation based on previously available financial information (temporarily disconnected information provision). Importantly, the order of the information display was kept constant: financial data were always displayed before CSR data as a valuation based on CSR data only would not meaningfully indicate total firm performance.

In the condition with temporarily disconnected information, participants were asked to submit a valuation of the firm after reviewing the financial data. This initial valuation rep- resents the self-generated anchor. After that, they received CSR information, and then they were

asked whether they wanted to adjust their valuation and, if so, what the new valuation would be. When reviewing the CSR information, participants could also go back to the financial data. In simultaneous information provision condition, they were provided with financial and CSR information simultaneously and, after reviewing them, were asked to submit a single value judgment.

The cases were developed by the authors on the basis of data from a real-world company in the consumer goods and power tools industries. Data were adjusted to meet the requirements of the experiment and to make the company unidentifiable. We constructed the cases in the following way. First, to ensure the relevance of the financial data, we included an income statement and a cash flow statement containing the most relevant positions. Furthermore, we added selected performance ratios per unit of output to make comparisons of financial data easier across periods. Overall, we provided 33 financial items. We did not include stock market data because they reflect market expectations and may disturb fundamental valuations. We provided participants with three years of financial data and the annual percentage changes to enable the assessment of performance over time. To ensure the relevance of the selected financial data, we discussed this information with five senior fund managers, who did not participate in the experiment, and made slight adjustments after these discussions.

Second, we had to ensure that the CSR information was relevant to firm valuation. Otherwise, a potential neglect of CSR information may simply be due to its irrelevance for firm value and could not be traced back to the reporting format. Owing to mainstream investment professionals' relative unfamiliarity with this kind of data, this task was more challenging. The criteria ranked in the pretest were taken from the Global Reporting Initiative's (GRI) Sustainability Reporting Standard G3 in the most recent version at the time of conducting the test i.e., version 3.1. The 63 criteria are those contained in the section Environmental, Social, Human Rights and Society. Indicators from the category Economical which also form part of

the G3 standard were omitted as companies for legal reasons typically report economic data in the primary financial statements. Fifteen senior investment professionals with significant expertise in CSR, none of whom participated in the experiment, rated the value-relevance of these items on a Likert scale from 1 ('not important at all') to 6 ('very important'). The appendix shows the results of this assessment. For the experiment, we selected the 13 items (seven environmental, two social, and four governance) that more than 75% of the pretest participants indicated were 'important' or 'very important' and that could be expressed numerically. As for the financial data, participants received three years of CSR data and the annual percentage changes. Additionally, to facilitate comparisons across periods, they received CSR performance ratios per unit of output or input. Providing per-unit CSR information is a common practice in CSR reports. Finally, we checked the realism of the case with the five senior fund managers, who had also provided feedback on the financial data.

3.2.4. Dependent Measures

As in prior studies, participants were asked to evaluate the firm (e.g. Hopkins, Houston, and Peters 2000; Maines and McDaniel 2000). As we did not provide stock data, we did not ask for a stock price estimation but rather elicited a value judgment on a scale ranging from 0 ('absolutely not investable') to 100 ('top investment'). To control for the connection between our dependent variable and the categories our participants are usually exposed to in their real-life decisions, we also asked for a fair and appropriate investment recommendation of the firm (from 'strong buy' to 'strong sell').[3] Despite the small number of recommendation categories (five), the Pearson correlation between the value judgment and the recommendation is significantly positive ($r = 0.47$, $p < 0.001$). We conclude that our dependent variable closely reflects the recommendations our participants would give in similar real-world settings and thus has a high external validity.

Our primary dependent variables in both experiments are participants' firm valuations. As explained above, in the conditions with temporarily disconnected information, participants made an *initial valuation* based only on financial data and then, after receiving additional CSR information, made a *final valuation*. In the simultaneous information conditions, participants only made a single *valuation*. Thus, importantly, when comparing the *final valuation* in the disconnected information condition and the *valuation* in the simultaneous information condition, the information content is kept stable. However, when comparing the *valuation* in the simultaneous information condition to the *initial valuation* in the disconnected information conditions, the influence from prior valuations is kept constant at no influence. That is, comparing these two valuations reveals the reaction to CSR information without bias from prior valuations.

To control for the effects of individual differences in the attitude towards CSR information, we asked participants to indicate, on the post-experiment questionnaire, their agreement with the following statement on a Likert scale from 1 ('fully disagree') to 7 ('fully agree'): 'Corporate sustainability is an important concept for long-term value creation.'

We also measured the perceived difficulty of valuation with and without CSR information (*difficulty without CSR, difficulty with CSR*) and the perceived realism of the cases (*realism*) on the same Likert scale. Finally, we measured the time participants spent to complete the whole experiment, their occupation and their work experience in years (*tenure*). Table 2 summarizes our measures and their definitions.

3.3. Experiment 1 – Results

Before we analyze our dependent variables, we first explore our control variables. They show a mean score for the *realism* of 5.48, which is highly satisfactory. Mann Whitney U-tests reveal no significant difference across experimental conditions in terms of *realism, difficulty with*

CSR, difficulty without CSR, and participants' *tenure* (all *p*'s > .20). Moreover, the mean perceived importance of CSR information for value creation (*value creation*) is 5.66. Importantly, this variable does not differ significantly across conditions (Mann–Whitney, $z =$ 0.08, p = .94).

----- insert table 2 about here -----

Table 3 and Figure 1 summarize the results of Experiment 1. Since in the temporarily disconnected information report condition, the *initial valuation* is solely based on financial information, comparing the *initial valuation* in the disconnected information condition to the *valuation* in the simultaneous information condition reveals how investment professionals reacted to the positive CSR information when it was provided simultaneously with the financial information and they had not made any prior valuation.

----- insert table 3 about here -----

Figure 1 and Table 3 show that participants' valuations are, on average, 10.70 higher in the simultaneous information condition (45.20) than the *initial valuation* in the disconnected information condition (34.50), and Panel B of Table 3 shows that this difference is significant (*t*-test, p = 0.068).[4] Thus, investment professionals react to positive CSR signals when they are provided simultaneously with financial data as, e.g. in an integrated report.

----- insert figure 1 about here -----

However, Table 3 and Figure 1 also provide evidence that, when subjects receive the additional positive CSR information in the temporarily disconnected information condition, *no* participant adjusted his or her valuation. Thus, in the disconnected information condition, the *final valuation* that is based on both financial and CSR information corresponds exactly to the *initial valuation* that is only based on financial information.

To test H1 predicting that, with a positive CSR signal, the valuations of financial statement users using simultaneous information will be higher than the valuations of financial statement users using disconnected CSR and financial information, we run a *t*-test between the *final valuation* in the disconnected information condition and the *valuation* in the simultaneous information condition. Panel B of Table 3 shows that firm valuation is significantly higher in the simultaneous information condition than in the disconnected information condition (45.20 vs. 34.50, $p = 0.068$), even though the same information is underlying both valuations. This finding supports the predicted timing effect due to investment professionals' anchoring on initial financial disclosure in H1.

4. Experiment 2 – Theory, Methodology and Results

4.1. Theory Development

Experiment 2 investigates a setting in which CSR information exhibits negative signals about future firm performance. We conduct this experiment to test whether a timing effect also exists for negative CSR information that signals potential future losses. This is important as prior research in general provides evidence about asymmetric effects of positive and negative CSR disclosures in a broad range of research. For example, individuals seem to respond differently to good and bad economic information (Soroka 2006) and tend to learn differently from positive and negative financial information (Kuhnen 2015). Additionally, empirical studies show that negative CSR information leads to stronger stock market reactions than positive CSR

information (Karpoff, Lott, and Wehrly 2005; Klassen and McLaughlin 1996), and Crifo, Forget, and Teyssier (2015) find professional private equity investors reacting more strongly to bad than to good CSR practice disclosure.

Building on behavioral research, we argue that investment professionals may overcome the timing effect from Experiment 1 due to loss aversion, making them invest more cognitive effort in CSR information processing. This can be supported by research indicating that self-generated anchors can be overcome by devoting increased cognitive resources to the task (Epley and Gilovich 2006).[5] Following Kahneman and Tversky (1979), individuals may be loss averse, i.e. potential losses loom larger to them than potential gains. Thus, their amount of cognitive resources and effortful thinking is likely to be large when new information signals the risk of future losses (De Bondt and Thaler 1995; Koonce, McAnally, and Mercer 2005; Koonce and Mercer 2005). Consequently, we expect investment professionals' effortful thinking to be activated more when they are faced with negative rather than positive temporarily disconnected CSR information.

This implies that, when the CSR information is negative and temporarily disconnected from financial information, investors may be able to overcome the anchoring effect of their initial financial valuation by devoting sufficient cognitive resources to the valuation adjustment. Consequently, it is unclear whether in the case of negative CSR information, providing CSR information simultaneously with financial information leads to lower valuations than temporarily disconnected financial and CSR information. Thus, we state the following research question:

RQ1:   *If CSR information represents a negative signal and implies a downward adjustment of firm valuation, will the valuation of investors receiving CSR and financial information simultaneously be lower than the valuation of investors receiving CSR information temporarily dis- connected from financial information?*

4.2. Methodology

To explore whether temporarily disconnected CSR information leads to anchoring effects when CSR information is *negative*, we develop a case in which CSR performance exhibits negative signals about future risks and future firm performance, in line with the view that CSR information can indicate future risks (Dhaliwal et al. 2011; Paine 2000). In addition, we provide participants with corporate financial information representing good performance.

Apart from this change in the information content, Experiment 2 is identical to Experiment 1. Case materials were identical to Experiment 1 except for manipulations of the financial and CSR data and corresponding adjustments in the description of the firm's background. The instructions are available from the authors upon request. All procedures and measured variables remain the same. Thirty-three investment professionals participated in Experiment 2. Two participants did not finish the experiment, leaving a final sample of 31 participants.

4.3. Results

Again, we first explore our control variables. Perceived case realism is also high at an average score of 5.10 for this experiment. Again, there is no significant difference across conditions in terms of *difficulty without CSR, difficulty with CSR*, *realism* and participants' professional experience (*tenure*) (Mann–Whitney, all p's > 0.20). Finally, mean perceived importance of CSR information for value creation (*value creation*) is 5.20, and this variable does not differ significantly across conditions (Mann–Whitney, $z = 0.07$, $p = 0.95$).

Table 4 and Figure 2 report the results from Experiment 2. Again, comparing the *initial valuation* in the temporarily disconnected information condition and the *valuation* in the simultaneous information condition shows that negative CSR information leads to lower firm valuations when the information is assessed by participants who have not provided any prior valuation. Specifically, Figure 2 and Panel A of Table 4 show that, with negative CSR

information provided simultaneously like in an integrated report, investment professionals'

valuations are, on average, 18.56 lower than when they have the same financial information

without any additional CSR information (57.31 vs. 75.87). As reported in Panel B of Table 4,

the difference is significant (*t*-test, p = 0.010). This finding supports our evidence from

Experiment 1 that mainstream investment professionals react to CSR signals when value-

relevant CSR information is provided at the same time as financial data.

Furthermore, Table 4 and Figure 2 provide evidence that, after receiving negative CSR

information, participants in the temporarily disconnected information condition adjust their

firm valuation downwards (60.67 vs. 75.87). Panel B shows that this decrease is significant (*t*-

test, *p* = 0.008). Moreover, the final valuation of subjects in the disconnected information report

condition is close to investors' valuation provided in the simultaneous information condition

(60.67 vs. 57.31). Thus, when the CSR signal is negative, investment professionals seem to

nearly entirely overcome the anchoring effect due to different timing of the information.

----- insert table 4 here -----

To formally analyze RQ1, we ran a *t*-test between *final valuation* in the disconnected

information condition and the simultaneous information condition. Panel B of Table 4 shows

that the firm valuations in the two conditions are not significantly different from each other

(60.67 vs. 57.31, p = 0.682). This result is consistent with the conjecture that participants

expend sufficient cognitive effort when analyzing negative CSR information signaling the risk

of future losses to overcome the anchoring on their initial valuation based solely on financial

information.

----- insert figure 2 about here ----

5.   Robustness Checks

Experiment 1 has provided evidence that, when positive CSR information signals a potential for future profits, investment professionals strongly anchor on their initial financial valuation. Experiment 2, in contrast, shows that when negative CSR information signals potential losses, professional investors do not exhibit significant anchoring effects. We will explore the robustness of these results with additional analyses. Specifically, Table 5 includes the results of additional OLS regressions using participants' final firm valuation based on all information (financial and CSR) as the dependent variable. Panel A reports the results for Experiment 1 (positive CSR information) whereas Panel B reports the results for Experiment 2 (negative CSR information). To control for heteroscedasticity in the regressions, we calculate robust standard errors using the Huber-White (sandwich) estimator.

First, an important factor that can influence the evaluation of CSR information is investors' attitude towards CSR information as an indicator for future value creation (Arnold et al. 2017). Moreover, this attitude is likely to be highly dispersed among investment professionals (Deegan and Rankin 1997; Dowell, Hart, and Yeung 2000). The random assignment of participants to the two experiments and different conditions allowed us to control for individual differences in participants' attitude towards CSR information. However, analyzing individual differences in the subjects' perceived importance of CSR information for firm valuation may still provide insights into the results of the two experiments. The more participants agree that CSR information can indicate future value creation, the more weight they should give this information in firm valuation. Thus, when CSR information is positive (negative), subjects' valuations should be the higher (the lower), the more importance participants attribute to CSR information. Model (1) in Panel A (positive CSR information) and Panel B (negative CSR information) of Table 5 report our results. As independent variables, we use an indicator variable *simultaneous information* (equal to 1 when CSR and financial information were

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provided simultaneously and 0 if not) and the participants' perceived importance of CSR as a concept for future value creation (*value creation*).

Second, Models (2) and (3) in both Panels of Table 5 add additional variables to control for further investor heterogeneity. For Model (2), we categorized our participants' occu- pations as sell-side analysts, fund manager or other occupation and added dummy vari- ables for sell-side analyst occupation (*d_analyst*) and fund manager occupation (*d_fundmanager*) into the regressions. For Model (3), we additionally added *tenure* to the regressions. The resulting regressions are described as follows:

$$\text{final firm valuation}_i = \alpha + \beta_1 \times \text{simultaneous information}_i + \beta_2 \times \text{value creation}_i + \varepsilon_i \quad (1)$$

$$\text{final firm valuation}_i = \alpha + \beta_1 \times \text{simultaneous information}_i + \beta_2 \times \text{value creation}_i$$
$$+ \beta_3 \times d\_analyst_i + \beta_4 \times d\_fundmanager_i + \varepsilon_i \quad (2)$$

$$\text{final firm valuation}_i = \alpha + \beta_1 \times \text{simultaneous information}_i + \beta_2 \times \text{value creation}_i$$
$$+ \beta_3 \times d\_analyst_i + \beta_4 \times d\_fundmanager_i + \beta_5 \times \text{tenure}_i + \varepsilon_i \quad (3)$$

The results reported in Table 5 show the robustness of our hypotheses tests. Specifically, in Panel A (positive CSR information), the *simultaneous information* coefficient remains positive and significant in all models ($p < 0.10$ in all cases), further supporting H1. In Panel B, the *simultaneous information* coefficient is insignificant in all models ($p > 0.50$ in all cases). These results represent additional evidence for our conjecture that in the case of negative CSR information, investment professionals overcome the anchoring effect nearly entirely.

Additionally, the results of all models in Table 5 show that the *value creation* coefficient is significantly positive when the CSR signal is positive (Panel A: $p < 0.10$ in all cases) and significantly negative when the CSR signal is negative (Panel B: $p < 0.01$ in all cases). This result is in line with our expectations that investors who believe more in the informativeness of CSR information about a firm's value creation put more weight on this information when valuing the firm. Models (2) and (3) in both Panels, however, show that neither an investors' occupation nor his/her tenure affects firm valuation significantly ($p > 0.10$ in all cases).

Our results also refute an alternative explanation for the asymmetric timing effect observed in the two experiments. While some authors suggest that good CSR performance signals future growth opportunities and profits (Balakrishnan, Sprinkle, and Williamson 2011; Dhaliwal et al. 2011; Lev, Petrovits, and Radhakrishnan 2010), other findings indicate that firms may overspend on CSR activities (Izzo and Magnanelli 2012). That is, a potential explanation for participants not adjusting their valuations in Experiment 1 after receiving positive CSR information may be that they perceive this information as redundant as it signals overspending and only provides an additional explanation for the firm's low financial performance. However, this line of reasoning could not explain why positive CSR information would induce *higher* valuations in the simultaneous information condition. Thus, the significantly higher valuations in the simultaneous information condition do not support an explanation based on overspending. Furthermore, we would expect participants who do not judge sustainability as important for long-term value creation (low scores on *value creation*) to adjust their valuations *downward* if good CSR performance signals overspending. Instead, no participant, independent of his or her value creation score, adjusted his or her valuation in Experiment 1. Again, this favors the anchoring explanation for the observed timing effect.

6.   Conclusion and discussion

We investigate how CSR disclosure timing influences firm valuation by professional mainstream investors. Overall, the results suggest that CSR disclosure temporarily disconnected from a firm's financial disclosure, e.g. a stand-alone CSR report, may lead to

asymmetric anchoring, whereby simultaneous disclosure of CSR and financial information such as in an integrated report, prevents anchoring effects in investors' judgements.

In particular, our first experiment provides evidence that, when *positive* CSR information is disclosed in a temporally disconnected way, professional investors strongly anchor on their initial valuations based solely on financial data. In contrast, our second experiment indicates that they nearly fully overcome this anchoring on initial financial valuations when *negative* CSR information is disclosed temporarily disconnected from financial information. Robustness checks further show that neither investors' personal attitude regarding the value-relevance of corporate sustainability nor personal characteristics such as occupation or tenure affect our main findings. Our results contribute to the debate on 'good' CSR disclosure to facilitate information processing free of cognitive biases and, particularly, on integrated reporting (Eccles and Krzus 2010; Serafeim 2014).

Additionally, we contribute to the literature on stock market reactions to CSR news and, particularly, the asymmetry in reactions to positive and negative news (Karpoff, Lott, and Wehrly 2005; Klassen and McLaughlin 1996). We provide evidence that professional investors anchor asymmetrically on self-generated anchors from financial valuations as they do not react to positive CSR information. But they overcome their anchoring nearly entirely when negative CSR information is disclosed. This is consistent with the view that losses loom larger than gains for investors (De Bondt and Thaler 1995; Kahneman and Tversky 1979) and that, consequently, potential losses lead to more effortful thinking that reduces the effects of self-generated anchors (Epley and Gilovich 2005).

Finally, our results can contribute to the debate about the use of CSR information for professional investment valuation (Deegan and Rankin 1997; Teoh and Shui 1990). Our results suggest that professional investors who do not specialize in CSR take value-relevant CSR data into account, albeit differently and depending on its disclosure format.

Our study is subject to some limitations. First, we restricted the financial and CSR information to a subset of information that is usually contained in financial statements and CSR reports so that participants could complete the task in a reasonable amount of time. This restriction may limit the generalizability if, in more complex environments, professional investors focus on information categories they are more accustomed to, such as financial data. Future research could examine how more complex environments affect the use of CSR information.

Second, there exists no objective firm value in our experimental cases. However, accounting reports carry information that is only subjectively valuable, and even if a market price existed, one could not conclude definitively that it reflected the true firm value. Thus, similar to other experiments based on accounting information, our results are qualified in that we cannot measure *absolute* levels of biases but only *relative* levels across experimental conditions (Sedor, 2002).

Finally, our two experiments are not perfectly comparable, as the two designs use different financial information sets. Nonetheless, we use these experimental designs to ensure a realistic environment in which positive and negative CSR information is relevant to our participants.

Notwithstanding these limitations, our results offer important insights to investment professionals as well as standard setters about how professional investors process CSR information and how the timing of CSR disclosure may distort firm valuations.

7. Compliance with Ethical Standards

ethical standards. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

Notes

1. In general, recent research has shown that such self-generated anchors trigger psychological processes different from those activated by experimenter-provided anchors (Mussweiler and Strack 1999, 2000). While experimenter-provided anchors lead to an enhanced accessibility of anchor-consistent information (Mussweiler and Strack 1999), self-generated anchors lead to insufficient adjustments (Epley and Gilovich 2001).

2. Importantly, however, financial data did not signal financial distress in the case with positive CSR information. We avoided this because financial distress likely represents a special case that is hard to generalize.

3. We made this request even though we did not provide stock data about the firm. In the exper- iment, we emphasized that we were aware that such a recommendation would typically require some information on stock data and asked participants for an educated guess without having these data.

4. For all statistical tests reported, p-levels are one-tailed for directional predictions and two- tailed otherwise.

5. For example, forewarning of an anchoring bias and increased incentives are likely to activate effortful thinking, and prior research has shown that both reduce anchoring effects for self- generated anchors (Epley and Gilovich 2005).

Disclosure statement

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Table 1.

Subject Sample of Experiments 1 and 2.

Panel A: Participants by Occupation	
Occupation	%
Sell-side analyst	50.00
Fund manager	23.33
Other type of analyst (buy-side, fixed income, credit)	6.67
Equity strategist	5.00
Other (e.g. advisor, head of research)	15
Panel B: Participants' Work Experience in Investment Business	
Years of Work Experience	%
Less than 5 years	11.67
5 – 10 years	15.00
11 – 15 years	46.67
15 – 20 years	16.67
More than 20 years	10.00

Note: Final sample includes 60 experiment participants for both experiments.

Table 2.
Summary of Measures

Measure	Description
Initial valuation	Initial value judgment made by participants including financial information only in the disconnected information condition on a scale ranging from 0 ('absolutely not investable') to 100 ('top investment')
Final Valuation	Final value judgment made by participants including both financial and CSR information in the disconnected information condition on a scale ranging from 0 ('absolutely not investable') to 100 ('top investment')
Valuation	Value judgment made by participants based on both financial and CSR information in the simultaneous information condition on a scale ranging from 0 ('absolutely not investable') to 100 ('top investment')
Final firm valuation	Value judgment made by participants including both financial and CSR information on a scale ranging from 0 ('absolutely not investable') to 100 ('top investment'). It corresponds to final valuation in the disconnected information condition and to valuation in the simultaneous information condition.
Simultaneous information	Dummy variable equal to 1 in the simultaneous information condition
Value creation	Participants' agreement to the statement 'Corporate sustainability is an important concept for long-term value creation.' on a Likert scale from 1 ('fully disagree') to 7 ('fully agree').
Realism	Participants' agreement to the statement 'The valuation case was realistic.' on a Likert scale from 1 ('fully disagree') to 7 ('fully agree').
Difficulty without CSR	Participants' agreement to the statement 'The valuation task without ESG data was difficult.' on a Likert scale from 1 ('fully disagree') to 7 ('fully agree').
Difficulty with CSR	Participants' agreement to the statement 'The valuation task with ESG data was difficult.' on a Likert scale from 1 ('fully disagree') to 7 ('fully agree').
d_analyst	Dummy variable equal to 1 when the participant's occupation is sell-side analyst and zero else
d_fundmanager	Dummy variable equal to 1 when the participant's occupation is fund manager and zero else
tenure	Participants' work experience in years

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Table 3. Experiment 1 – results.			
Panel A: Descriptive statistics			
	Disconnected Information *initial valuation*	Disconnected Information *final valuation*	Simultaneous Information *valuation*
Mean	34.50	34.50	45.20
Median	*30.00*	*30.00*	*50.00*
(Standard deviation)	(19.56)	(19.56)	(17.87)
No. of observations	14	14	15
Panel B: t-tests			
Disconnected information *initial valuation* vs. Simultaneous information *valuation*			t = 1.54, p = 0.068*
Disconnected information *initial valuation* vs. Simultaneous information *final valuation*			n/a
H1: Disconnected information *final valuation* vs. Simultaneous information *valuation*			t = 1.54, p = 0.068*

Note: In the condition disconnected information, *initial valuation* is the initial value judgment made by the participants including financial information only. *Final valuation* is the final value judgment made by the participants including both financial and CSR information. In the condition with simultaneous information, *valuation* is the only value judgment participants made based on both financial and CSR information. In the disconnected information condition, *initial valuation* is equal to *final valuation* because no participant adjusted his/her value judgment after receiving the positive CSR signal.

Figure 1.
Experiment 1 – Mean firm valuations.

Note: In the condition disconnected information, initial valuation is the initial value judgment made by the participants including financial information only. Final valuation is he final value judgment made by the participants including both financial and CSR information. In the condition with simultaneous information, valuation is the only value judgment participants made based on both financial and CSR information.

<table>
<tr><td colspan="4" align="center">**Table 4.**
Experiment 2 – results.</td></tr>
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Panel A: Descriptive statistics			
	Disconnected Information *initial valuation*	Disconnected Information *final valuation*	Simultaneous Information *valuation*
Mean	75.87	60.67	57.31
Median	*75.00*	*60.00*	*61.00*
(Standard deviation)	(12.06)	(16.78)	(26.79)
No. of observations	15	15	16
Panel B: t-tests			
Disconnected information *initial valuation* vs. Simultaneous information *valuation*			t = 2.46, p = 0.010***
Disconnected information *initial valuation* vs. Simultaneous information *final valuation*			t = 2.85, p = 0.008***
H1: Disconnected information *final valuation* vs. Simultaneous information *valuation*			t = 0.41, p = 0.682

Note: In the condition with disconnected information*, initial valuation* is the initial value judgment made by the participants including financial information only. *Final valuation* is the final value judgment made by the participants including both financial and CSR information. In the condition with simultaneous information, *valuation* is the only value judgment participants made based on both financial and CSR information.

Figure 2. Experiment 2 – Mean firm valuations.

Note: In the condition disconnected information, initial valuation is the initial value judgment made by the participants including financial information only. Final valuation is he final value judgment made by the participants including both financial and CSR information. In the condition with simultaneous information, valuation is the only value judgment participants made based on both financial and CSR information.

Table 5.

Timing effects and perceived importance of CSR in investors' final valuation.

Dependent variable	Final firm valuation including financial and CSR information		
Independent variables	Model (1) Coefficient (Standard error)	Model (2) Coefficient (Standard error)	Model (3) Coefficient (Standard error)
Panel A: Experiment 1 – Positive CSR Signal			
Simultaneous information (0/1)	10.60* (6.88)	11.65** (6.76)	10.11* (7.33)
Value creation	4.26** (1.88)	3.94* (2.02)	4.11** (2.11)
d_analyst		–1.42 (8.15)	–0.75 (8.33)
d_fundmanager		4.01 (8.38)	6.40 (8.08)
tenure			–0.54 (0.50)
Constant	21.09* (11.57)	11.46 (13.34)	17.73 (14.50)
Observations	29	29	29
R^2	0.14	0.15	0.18
Panel B: Experiment 2 – Negative CSR Signal			
Simultaneous information (0/1)	–4.11 (7.68)	–3.65 (7.43)	–3.34 (7.39)
Value creation	–5.33*** (2.12)	–7.02*** (2.55)	–7.14*** (2.72)
d_analyst		–1.49 (10.45)	–1.98 (9.98)
d_fundmanager		–18.67 (12.14)	–19.21 (11.87)
tenure			–0.17 (0.66)
Constant	84.67*** (10.31)	102.29*** (14.29)	105.05*** (18.36)
Observations	31	31	31
R^2	0.13	0.23	0.24

Note: Standard errors are shown in parentheses. *, **, ***denote significance at the 10%, 5%, and 1% levels, respectively. Significance levels are one-tailed for variables with a directional prediction and two-tailed otherwise. The regression uses the Huber-White (sandwich) estimator to calculate robust standard errors. The dependent variable is equal to final valuation in the temporarily disconnected information condition and equal to valuation in the simultaneous information condition. Thus, the coefficient of simultaneous information reflects whether participants reach different value judgments when CSR information is provided simultaneously vs. temporarily disconnected from financial information. Value creation is the participants' agreement to the statement 'Corporate sustainability is an important concept for long-term value creation.' Thus, the coefficient of value creation reflects the effects of participants' individual perceived importance of CSR information on firm valuations. d_analyst is a dummy variable equal to 1 when the participant's occupation is sell-side analyst and zero else. d_fundmanager is a dummy variable equal to 1 when the participant's occupation is fund manager and zero else. tenure is the participant's tenure in years.

Appendix

Results of the pre-test assessment of value relevance of GRI indicators.

	GRI Indicator compliant with Application Level A+	1 not important at all	2 not that important	3 partly important	4 rather important	5 important	6 very important	5+6 in %	Comment	#
1	SO2 Percentage and total number of business units analyzed for risks related to corruption.	0	0	0	0	5	8	100,0%		1
2	SO4 Actions taken in response to incidents of corruption.	0	0	0	0	6	7	100,0%	Narrative item, cannot be quantiied, therefore eliminated	
3	EN16 Total direct and indirect greenhouse gas emissions by weight	0	0	0	1	3	9	92,3%		2
4	EN28 Monetary value of significant fines and total number of non-monetary sanctions for noncompliance with environmental laws and regulations.	0	0	0	1	6	6	92,3%		3
5	SO8 Monetary value of significant fines and total number of non-monetary sanctions for noncompliance with laws and regulations.	0	0	0	1	5	7	92,3%		4
6	EN17 Other relevant indirect greenhouse gas emissions by weight	1	0	1	0	7	4	84,6%		5
7	EN21 Total water discharge by quality and destination.	0	0	2	0	6	5	84,6%		6
8	EN26 Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation.	0	0	0	2	3	8	84,6%	Narrative item, cannot be quantiied, therefore eliminated	
9	PR9 Monetary value of significant fines for noncompliance with laws and regulations concerning the provision and use of products and services.	0	0	1	1	4	7	84,6%		7
10	EC2 Financial implications and other risks and opportunities for the organization's activities due to climate change.	0	0	0	3	7	5	80,0%		8
11	EN3 Direct energy consumption by primary energy source.	0	0	0	3	3	7	76,9%		9
12	EN22 Total weight of waste by type and disposal method.	0	1	1	1	6	4	76,9%		10
13	EN23 Total number and volume of significant spills	0	0	1	2	3	7	76,9%		11
14	HR6 Operations identified as having significant risk for incidents of child labor, and measures taken to contribute to the elimination of child labor.	0	0	0	3	5	5	76,9%		12
15	LA7 Rates of injury, occupational diseases, lost days, and absenteeism, and number of workrelated fatalities by region.	0	1	0	2	4	6	76,9%		13
16	EN19 Emissions of ozone-depleting substances by weight	0	0	2	2	5	4	69,2%		
17	EN20 NO, SO, and other significant air emissions by type and weight.	0	0	2	2	4	5	69,2%		
18	FP13 Total number of incidents of non-compliance with laws and regulations, and adherence with voluntary standards related to transportation, handling, and slaughter practices for live terrestrial and aquatic animals.	1	0	1	2	6	3	69,2%		
19	HR7 Operations identified as having significant risk for incidents of forced or compulsory labor, and measures to contribute to the elimination of forced or compulsory labor.	0	0	0	4	5	4	69,2%		
20	SO3 Percentage of employees trained in organization's anti-corruption policies and procedures.	0	1	0	3	5	4	69,2%		

Results of the pre-test assessment of value relevance of GRI indicators. Continued.

	GRI Indicator compliant with Application Level A+	1 not important at all	2 not that important	3 partly important	4 rather important	5 important	6 very important	5+6 in %	Comment	#
21	SO5 Public policy positions and participation in public policy development and lobbying.	0	1	0	3	6	3	69,2%		
22	EN4 Indirect energy consumption by primary source.	0	0	0	5	6	2	61,5%		
23	EN12 Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas.	0	1	2	2	6	2	61,5%		
24	HR4 Total number of incidents of discrimination and actions taken.	0	0	4	1	4	4	61,5%		
25	LA2 Total number and rate of employee turnover by age group, gender, and region.	0	0	1	4	3	5	61,5%		
26	EN2 Percentage of materials used that are recycled input materials.	0	0	3	3	5	2	53,8%		
27	EN8 Total water withdrawal by source.	0	1	2	3	5	2	53,8%		
28	FP1 Percentage of purchased volume from suppliers compliant with company's sourcing policy.	0	1	2	3	6	1	53,8%		
29	LA1 Total workforce by employment type, employment contract, and region.	0	0	1	5	3	4	53,8%		
30	LA4 Percentage of employees covered by collective bargaining agreements.	0	0	2	4	4	3	53,8%		
31	PR1 Life cycle stages in which health and safety impacts of products and services are assessed for improvement, and percentage of significant products and services categories subject to such procedures.	0	3	2	1	4	3	53,8%		
32	EC4 Significant financial assistance received from government.	1	2	3	1	6	2	53,3%		
33	EN11 Location and size of land or waters owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.	0	1	3	3	5	1	46,2%		
34	HR1 Percentage and total number of significant investment agreements that include human rights clauses or that have undergone human rights screening.	0	1	2	4	3	3	46,2%		
35	HR2 Percentage of significant suppliers and contractors that have undergone screening on human rights and actions taken.	0	1	2	4	3	3	46,2%		
36	LA8 Education, training, counseling, prevention, and risk-control programs in place to assist workforce members, their families, or community members regarding serious diseases.	0	1	3	3	3	3	46,2%		
37	LA10 Average hours of training per year per employee by employee category.	0	1	3	3	3	3	46,2%		
38	LA14 Ratio of basic salary of men to women by employee category.	0	1	1	5	5	1	46,2%		
39	EC1 Direct economic value generated and distributed, including revenues, operating costs, employee compensation, donations and other community investments, retained earnings, and payments to capital providers and governments.	0	1	3	5	3	3	40,0%		
40	EC3 Coverage of the organization's defined benefit plan obligations.	1	0	3	5	4	2	40,0%		

Results of the pre-test assessment of value relevance of GRI indicators. Continued.

	GRI Indicator compliant with Application Level A+	1 not important at all	2 not that important	3 partly important	4 rather important	5 important	6 very important	5+6 in %	Comment	#
41	EN27 Percentage of products sold and their packaging materials that are reclaimed by category.	0	0	4	4	4	1	38,5%		
42	FP3 Percentage of working time lost due to industrial disputes, strikes and/or lock-outs, by country.	0	1	4	3	2	3	38,5%		
43	FP5 Percentage of production volume manufactured in sites certified by an independent third party according to internationally recognized food safety management system standards.	0	1	5	2	3	2	38,5%		
44	FP8 Policies and practices on communication to consumers about ingredients and nutritional information beyond legal requirements.	1	1	4	2	3	2	38,5%		
45	HR5 Operations identified in which the right to exercise freedom of association and collective bargaining may be at significant risk, and actions taken to support these rights.	0	0	2	6	2	3	38,5%		
46	LA13 Composition of governance bodies and breakdown of employees per category according to gender, age group, minority group membership, and other indicators of diversity.	0	1	1	6	1	4	38,5%		
47	SO1 Nature, scope, and effectiveness of any programs and practices that assess and manage the impacts of operations on communities, including entering, operating, and exiting.	0	1	4	3	4	1	38,5%		
48	EC6 Policy, practices, and proportion of spending on locally-based suppliers at significant locations of operation.	1	2	5	2	2	3	33,3%		
49	EC6 Policy, practices, and proportion of spending on locally-based suppliers at significant locations of operation.	1	2	6	1	2	3	33,3%		
50	EN1 Materials used by weight or volume.	0	0	6	3	3	1	30,8%		
51	FP2 Percentage of purchased volume which is verified as being in accordance with credible, internationally recognized responsible production standards, broken down by standard.	0	1	4	4	2	2	30,8%		
52	FP6 Percentage of total sales volume of consumer products, by product category, that are lowered in saturated fat, trans fats, sodium and added sugars.	0	2	3	4	2	2	30,8%		
53	FP7 Percentage of total sales volume of consumer products, by product category sold, that contain increased fiber, vitamins, minerals, phytochemicals or functional food additives.	1	0	6	2	2	2	30,8%		
54	FP12 Policies and practices on antibiotic, antiinflammatory, hormone, and/or growth promotion treatments, by species and breed type.	1	1	4	3	2	2	30,8%		
55	LA5 Minimum notice period(s) regarding operational changes, including whether it is specified in collective agreements.	0	2	2	5	3	1	30,8%		
56	PR3 Type of product and service information required by procedures, and percentage of significant products and services subject to such information requirements.	0	3	4	2	3	1	30,8%		
57	EC7 Procedures for local hiring and proportion of senior management and workforce hired from the local community at locations of significant operation.	1	5	5	0	3	1	26,7%		
58	FP9 Percentage and total of animals raised and/or processed, by species and breed type.	1	4	3	2	2	1	23,1%		
59	FP10 Policies and practices, by species and breed type, related to physical alterations and the use of anaesthetic.	1	3	4	2	1	2	23,1%		
60	FP11 Percentage and total of animals raised and/ or processed, by species and breed type, per housing type.	1	3	6	0	2	1	23,1%		
61	PR6 Programs for adherence to laws, standards, and voluntary codes related to marketing communications, including advertising, promotion, and sponsorship.	0	2	4	4	2	1	23,1%		
62	FP4 Nature, scope and effectiveness of any programs and practices (in-kind contributions, volunteer initiatives, knowledge transfer, partnerships and product development) that promote healthy lifestyles; the prevention of chronic disease; access to healthy, nutritious and affordable food; and improved welfare for communities in need.	0	5	2	4	1	1	15,4%		
63	EC8 Development and impact of infrastructure investments and services provided primarily for public benefit through commercial, inkind, or pro bono engagement.	1	4	5	4	0	1	6,7%		

How Graphics Can Influence Investment Professionals' Valuations under Time Pressure: Evidence from an Eye-Tracking Study

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How Graphics Can Influence Investment Professionals' Valuations under Time Pressure: Evidence from an Eye-Tracking Study

Abstract:

When disclosing and communicating information in dynamic and interactive events outside of highly regulated financial reporting and disclosures, firms often distribute investor and analyst presentations as supporting materials. Firms enjoy substantial leeway to design these such that they can help to give a positive impression of the firm in the short time window of these events. In an experimental study with investment professionals, we investigate whether adding a graphic connecting (positive) non-financial performance driver to financial performance outcomes instead of simply describing this connection in words, can direct investors' attention to specific, positive key performance indicators and impact subsequent investment decisions. Building on theory suggesting that graphics are particularly salient and accessible, and impact investors' information processing, we hypothesize and find that graphics can direct investors' attention to positive key performance indicators, which can then lead to higher assessments of a firm's investment attractiveness. Eye-tracking data further supports the underlying theoretical process. Our results are important because they suggest that investors can be guided, if not manipulated by graphics when put in a situation of time pressure where cognitive resources are limited.

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I. Introduction

In addition to mandated and highly regulated financial reporting, firms often rely on additional disclosure channels to communicate information and key performance indicators (KPI) to capital providers, such as road shows, investors'/analysts' days, investor/analyst site visits, or conference presentations and calls. Typically, firms distribute presentations as supporting materials to convey condensed information communicating a certain narrative. These investor or analyst presentations (IAP) grant firms substantial leeway in their design that can help to provide a positive impression of the firm in the short time window of these presentations and to support their narrative. This allows impression management by firms maximizing their value from reporting (Beattie and Jones 1992, Arunachalam, Pei, and Steinbart 2002), for example by highlighting well-performing KPI (Amer 2005; Hillenbrand and Schmelzer 2017; Brown, Elliott, and Grant 2017). Since visual representations are a typical element of these IAP, an interesting question is whether and how firms can design and use them in their strategic and opportunistic reporting. Specifically, we aim to investigate whether adding a graphic connecting (positive) non-financial performance driver to financial performance outcomes instead of simply describing this connection verbally, can direct investors' attention, highlight a certain narrative regarding a company's potential to create value, and impact subsequent investment decisions.

In contrast to reporting that is regulated regarding content and format, in these IAP, firms' disclosure has more of a voluntary nature, which can include the presentation of information on non-GAAP aspects. For example, firms can emphasize items on intangible asset productivity such as customer or employee satisfaction (Lev and Gu 2016), intellectual capital (Nikolaj 2003; Abdolmohammadi 2005), or Corporate Social Responsibility (Margolis, Elfenbein, and Walsh 2009; Huang and Watson 2015; Friede, Busch, and Bassen 2015). Recent trends have increased firms' possibilities to use their discretion: assessing intangible assets, intellectual

capital, or a firm's ESG potential have become more important in making investment decision. Fitting this trend, so-called Integrated Reporting, relating non-financial to financial performance received more attention (Eccles and Krzus, 2014, 2010; IIRC, 2013) and provide a setting, in which firms can try to maximize their gains from less regulated and voluntary disclosures when communicating with potential investors via IAP.

IAP are "the executive summary of a company's financial communication output" (DVFA, 2010, p. 5), provide an opportunity for firms to paint a positive and vivid picture of the company supported by appealing visuals. In our study, we focus on a specific aspect of these IAP, namely the interaction of the disclosed elements, specifically the interaction of graphics and numerical data. We analyze whether investors' attention can be directed to certain KPI highlighted by a graphic connecting non-financial performance indicators with financial performance indicators. Displaying this connection graphically and emphasizing positive KPI might create the impression of a well-functioning chain of value creation (Kaplan and Norton 1992; Banker, Chang, and Pizzini 2004). Since graphics can increase the salience of specific information items (Bordalo, Gennaioli, and Shleifer 2012a, 2012b), they can constitute powerful tools of persuasion (Jarvenpaa 1990; Arunachalam et al. 2002), and may (unduly) influence investors' behavior. On the one hand, visual representations can assist information processing (Lurie and Mason 2007; Cardinaels 2008) because they can facilitate information processing, e.g., by creating vivid mental representations (Nisbett and Ross 1980; Hales, Kuang, and Venkatamaran 2011) and decreasing the cognitive effort required as they use less attentional resources (Loewenstein, Sunstein, and Golman 2014; Hillenbrand and Schmelzer 2017). This might improve firms' reporting and investment decisions as prior research posits that investors do not pay sufficient attention to non-financials (Juravle and Lewis 2008). On the other hand, because they are cognitively easier accessible, they can attract undue attention and interfere with investors' decision making when firms use them in their disclosure (Shah and Oppenheimer

2007; Glazer, Steckel, and Winer 1992). Not always may investors be able to decipher these reporting tactics and to discount disclosures adequately (Coram, Monroe, and Woodliff 2009; Hobson and Kachelmeier 2005; Fanning, Agoglia, and Piercey 2015).

Graphics may be particularly influential when cognitive resources are scarce or depleted, e.g. when making decisions under time pressure. Under time pressure, information processing typically accelerates, and individuals become more selective (Payne, Bettman and Luce 1996; Pietsch and Messier 2017; Kocher and Sutter 2006). This may be particularly common in the domain of investment decisions in dynamic and interactive events where IAP are employed. Further, financial markets are more than ever a high-speed environment where even "millisecond advantages" (Nursimulu and Bossaerts 2014; Busse and Green 2002) matter so that investment professional are under a general pressure to process and evaluate information quickly. Thus, we predict that visually highlighting the link between performance driving performance indicators and financial performance indicators increases the salience of the underlying value creation process. When positive performance indicators are highlighted in a graphic, we expect this to result in higher assessments of a firm's investment attractiveness.

To test our theory we conduct a 1x2 between-subjects experiment with experienced investment professionals from Europe. This is an important feature of our study because prior related research has used non-professional investors as participants (Clor-Proell, Proell, and Warfield 2014; Hales et al. 2011; Rennekamp 2012; Tan, Wang, and Zhou 2014), and the study of Tan et al. (2014) suggests that investment experience might mitigate biases related to the ease of information processing. We manipulate whether a firm discloses a graphic connecting some particularly positive non-financial with some particularly positive financial performance indicators before participants review a table containing quantitative financial and non-financial information and assess the firm as an investment opportunity. We verbally inform all

participants prominently about the strategic and, thus, informational content of the graphic to isolate the effect of a adding a graphic and to keep information between conditions constant.

In order to examine the underlying process and to gain insights into their information acquisition we use eye-trackers to measure participants' attention and analyze on which areas of interest (AoI) participants focus their attention. This provides us with a direct measure of attention and any potential attention guiding effect by a graphic used to manage impressions. So far, accounting research has primarily used eye-trackers to analyze balanced scorecard settings with an internal decision-making focus. For example, they have been used to analyze the role of accountability in investment decisions (Dalla Via, van Rinsum, and Perego 2019 and for performance evaluation (Kramer and Maas 2020; Chen, Jermias, and Panggabean 2016). Dalla Via et al. (2016) report eye-tracking data supporting their argument that –compared to outcome accountability– process accountability requires more information search effort from managers making an investment decision, which increases investment decision quality. Kramer and Maas (2016) find that managers' prior experiences matter when they evaluate subordinates' performance; however, they do not find evidence that attention patterns predict evaluation outcomes. Chen et al. (2016) find that managers spending more time on strategically linked performance measures evaluate subordinate's performance more consistent with strategic objectives of the business unit. The authors' findings suggest that top-down reasons, e.g., knowledge about strategy is more important than presentation format: however, in our study, we keep the former constant and focus on potential salience effects of reported elements. Our research is further related to recent research that has developed an interest in analyst's behavior and found that the attention towards financial and non-financial information in management earnings forecasts may depend on whether historical performance is low or high and whether news are positive or negative (Bozzolan, Joos, and Rubaltelli 2017).

Results support our predictions. Participants spend more time on positive KPI when highlighted in a graphic, which leads to higher assessments of the firm's investment attractiveness. Further, we find no evidence that the salience of some non-financial performance indicators spills over to other non-financial performance indicators not highlighted in a graphic. While our design does not allow us to distinguish whether graphics lead to more or less accurate assessments of a firm's investment attractiveness and whether rather the firm or the investors would profit from the firm's reporting decision, our study shows how firms can use graphics to direct attention towards positive KPI. Graphically displaying the link between positive potential non-financial performance drivers and financial performance indicators –e.g. through graphical representations or by enhancing (degrading) positive (negative) aspects through the design of the visualization (Beattie and Jones 1992; Nisbett, Zukier, and Lemley 1981; Jones 2011) – can, therefore, potentially influence investors' decisions.

While one important area is specifically IAP, our study can also be informative for other disclosures where firms might rely on visual elements to communicate their performance, e.g., on websites, in video clips or the design of stand-alone or integrated CSR reports (Ettredge, Richardson, and Scholz 2003; Bollen, Hassink, and Bozic 2006; Jones 2011). Hence, we also contribute to the emerging debate on the value and potential benefits, but also on potential problems of integrated reports for investors' decision-making (e.g., Eccles and Saltzman 2011; Abeysekera 2013; Busco 2014). Finally, our research may also inform standard setters and policymakers whether and how to regulate firms' disclosures and specifically the use of graphical elements (Brown et al. 2017).

II. Theory and Development of Hypotheses and Research Question

In addition to standardized financial reporting according to GAAP (e.g., IFRS or US GAAP), firms are allowed to voluntary disclose information on their activities that are not highly

regulated, e.g. in the context of investor/analyst days (Kirk and Markov 2016), conference calls (Brochet, Kolev, Lerman 2018), or conferences (Green et al. 2014a; Green et al. 2014b). Typically, firms distribute IAP as supporting materials to convey condensed information communicating a certain narrative and to present the firm in a positive light. They combine elements from the regulated part of a company's financial reporting with non-GAAP reporting elements and allow management to comment on these KPI and embed them in a narrative. Thus, when reporting (non-)financial[1] performance, firms have discretionary room to present themselves in the best way possible to manage impressions (Kleinmuntz and Schkade 1993; Beattie and Jones 1992; Arunachalam et al. 2002; Jones 2011) – on the one hand, with regard to the content, on the other hand with regard to the form and design of these IAP.

Inter alia, they can decide to make specific pieces of information more salient (Jarvenpaa 1990; Brown et al. 2017; Bordalo et al. 2012a, 2012b). This does not necessarily have to be detrimental as it could allow investors to arrive at a more accurate valuation of the firm. For example, a study in which salience of fair value changes was not the result of a firm decision, but exogenously imposed by the experimenters shows that making these changes more salient allows to better incorporate disclosed measurement differences into judgments because it eases cognitive effort (Clor-Proell et al. 2014). However, firms could also use their discretionary room to influence investors' judgments unduly. For example, they could decide to reduce the salience of other information to hide it or make non-diagnostic information more salient, e.g. to profit from a dilution effect (Nisbett et al. 1981). In the case of IAP, these reporting decisions would not be exogenous, but strategic and endogenous, and investors would need to factor in the firm's strategic reporting decisions.

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[1] We refer to those contents of firm reports that are not governed by accounting standards as non-financials because they are not part of the primary financial statements. However, by this, we do not claim that non-financials do not affect financials or that they are irrelevant.

Investors may be affected by salient elements in IAP because individuals restricted by bounded rationality may use these as heuristic cues to cope with large amounts of information (Shah and Oppenheimer 2007). Attention is a finite resource (Hirshleifer, Lim, and Teoh 2011; Weber and Johnson 2009) and can be scarce good in decision making in general, and in financial markets in particular (Falkinger 2008; Loewenstein et al. 2014; Hillenbrand and Schmelzer 2017; Driskill, Kirk, and Tucker 2020). Increasing salience can have positive or negative effects on investors' decisions (Hirshleifer and Teoh 2003; Glazer et al. 1992). On the one hand, salient elements can help investors to focus on the important items. On the other hand, they can use attentional resources that are not available for alternative tasks and can lead to ignoring other (relevant) information.

Time pressure may intensify the problem of scarce attentional resources and can play a role in events accompanied by IAP. Prior research has found that time pressure influences information processing and decision making (Payne, Bettman, and Luce 1996; Busemeyer and Johnson 2004). For example, time pressure can affect the amount of information searched for and used in a given time (Zur and Beznitz 1981; Payne et al. 1996) and it lets individuals accelerate the execution of the decision process (Edland and Svenson 1993), which could potentially lead to inferior results. Additionally, under severe time pressure, individuals were found to utilize information selectively: they may spend less time on gathering information and use less information than was available (Maule, Hockey, and Bdzola 2000), which may also have a negative impact on decision quality (Kocher and Sutter 2006).

One way to guide the attention of the audience could be the use of graphics to illustrate and emphasize certain elements. For example, Brown et al. 2017 provide evidence that presenting non-GAAP earnings information as an image after participants review earnings measures (e.g., on social media or a corporate website) may affect how investors process and rely on adjusted earnings metrics. Due to the human condition, graphical or visual information

is particularly salient and attracts attention: depending on the IAP creators' intentions, graphics, therefore, may make it easier or more difficult to understand and interpret information (Cardinaels 2008; Hillenbrand and Schmelzer 2017; Arunachalam et al. 2002). On the one hand, displaying information graphically may facilitate information processing and decision-making; on the other hand, making a specific access to information easy might obstruct alternative approaches (Kleinmuntz and Schkade, 1993) and could result in an overweighting of less diagnostic information (MacGregor and Slovic 1986; Lurie and Mason 2007; Nisbett et al. 1981). Graphics are more vivid than numerical information (e.g. presented in tables) and are more directly translatable in mental representations. Hales et al. (2011) show how vividness can matter in an investment context as vivid information is processed more easily than less vividly presented and less salient information (Nisbett and Ross 1980; Keller and Block 1997; Lurie and Mason 2007).

As it is easier to form mental representations from graphics and to access them (Kahneman 1973), they can also create positive feelings of fluency (Oppenheimer 2008; Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, and Simons 1991). Individuals prefer to place more weight on information that is easy to process (Gluck and Bower 1988; Goodie and Crooks 2004; Shah and Oppenheimer 2007) and tend to consider information that is more fluent, i.e. cognitively easier to process to be true (Reber and Schwartz 1999). Applying this theory to the readability of financial disclosures, Rennekamp (2012) shows that the easiness with which information is processed can play an important role in investment decisions.

Graphics may even be more likely to play an important role under time pressure. In a related eye-tracking study from consumer decision-making, Pieters and Warlop (1999) found that consumers under time pressure accelerate visual scanning and increase the attention spent on pictorial information compared to brand information. Thus, graphics can have important

behavioral effects. In this sense, they are not neutral, but a tool of persuasion and likely only used by firms if the message conveyed is in their interest (Amer 2005; Jones 2011).

Firms may choose to add graphics to their performance reporting to make certain elements more salient and increase their weight (Mandel and Johnson 2002). For example, firms may choose to increase the salience of particularly positive performance indicators they believe or want investors to believe to lead to positive future financial performance. Particularly under time pressure, investors might be particularly vulnerable for heuristics, e.g. relying on salient elements. Hence, time-pressured investors following the guidance of this graphics could decide to direct more attention to this displayed and emphasized link between suggested driving performance indicators and future financial success. We expect that –compared to investors without this guidance– investors provided with a graphic of a key driver model might attribute a higher importance to this link in their information processing. If the components of this link were chosen to create the best impression of the firm's future success (i.e. by emphasizing positive performance indicators), an increased importance of these items would then be expected to increase the firm's attractiveness as investment.

H1: *Making a key driver model with positive performance indicators graphically salient guides investors' attention to this model.*

H2: *Making a key driver model with positive performance indicators graphically salient increases a reporting firm's attractiveness as investment.*

To understand better what attracts attention when a key driver model with positive performance indicators is made salient, we further want to examine which non-financial drivers exactly receive more attention. On the one hand, only the specific performance indicator made graphically salient might receive more importance in the investor's mental representation and, therefore, matter more in the investment decision. I.e., investor would only think more about the elements included and explicitly mentioned in the graphic. On the other hand, investors could extend their attention to other potential non-financial key drivers when they are triggered

to think about a broader model of value creation. The reason for this is that the mental representation of a specific element and the category it belongs to can merge when a specific element from a category is made more salient and is perceived to be a good proxy for the whole category (Bless and Schwarz 2010). Thus, making a key driver model salient might not only increase the importance of the specific performance indicators in the graphic, but might also increase the importance of non-financial key drivers in general: therefore, it might also affect non-financial performance indicators not included in the graphic.

In our research questions, we want to explore whether a graphically salient key driver model has a rather narrow effect on the non-financial performance indicators included in the graphic or whether this effect spills over to indicators not included in the graphic.

RQ: Does making a key driver model with positive performance indicators graphically salient increase the attention directed to non-financial performance indicators in general or is this limited to the specific performance indicators made salient?

III. Method

Design

To analyze whether the use of a graphic in an IAP can direct investor attention, we manipulate in an 1x2 between subjects experiment whether an IT firm discloses a graphic (Figure 1) displaying a key driver model[2] together with its performance information ("Graphic" condition) or not ("No graphic" condition).

--- insert figure 1 here ---

Specifically, participants in the "Graphic" condition were first provided with a graphic linking possible non-financial key drivers ("Employee Engagement", "Employee Retention", and

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[2] For the design of our instrument, we were inspired by the corporate reporting homepage of SAP (SAP 2016), a German software blue chip. Within the section on strategy, SAP offers visitors a visual representation of the "Connectivity of Financial and Non-Financial Indicators" and how these indicators may be interrelated.

"Customer Satisfaction") to financial performance indicators ("Total Revenue" and "Operating Profit") before reviewing a more comprehensive table containing a selection of performance indicators. Importantly, this graphic does not contain new information, but provides only a visual representation of the firm's strategic beliefs. In order to analyze only the effect of a graphic, it is essential not to vary information between conditions. At this point of the study, participants from both conditions were already prominently informed in the section of the instructions containing information about the firm's background that the firm believed that employee satisfaction, customer satisfaction and other non-financial performance indicators are important drivers of financial success. Thus, we only manipulate the existence of a graphic depicting this link and keep the information about the firm's strategic beliefs constant across conditions.

All participants are then provided with a table containing a selection of performance indicators and their development over the two previous years (cf. Appendix). On the left half of this table, participants are provided with information about the performance in the two financial categories "financial key performance indicators" and "shares and dividend". On the right half of the table, they are provided with information about performance in the two non-financial categories "employees and customers"[3] and "environmental".

In order to test our theory, the performance indicators made salient in the graphic show – on average– a more positive performance compared to the performance indicators not made salient. Specifically, the former show an improvement of around 13% whereas the latter show an improvement of around 3%. This way, if participants were affected by the existence of the graphic, they should get a more positive impression of the firm as investment opportunity than participants without a graphic's guidance. In order to have our participants make a decision under time pressure, the time limit to gather information about the firm was set to 120s in the

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[3] We refer to this category in our later analyses as SOCIAL.

condition without the graphic ("No graphic") and to 135s in the condition showing the graphic

("Graphic"). This time limit induced a feeling of time pressure, but provided participants with

enough time to form a first impression of the firm.[4] As our dependent variable, we asked

participants for their assessment of the firm's investment attractiveness.

To ensure the suitability of our instrument and our design choices we had run a pilot study

with seven investment professionals who did not participate in the subsequent experiment.

Based on their feedback, we made minor adjustments to our experimental materials.

Participants

Our participants are investment professionals who participated at a summer school of a

European financial analysts' association. They were asked to participate in a short valuation

exercise involving eye-trackers. From our initial sample of 26 participants, we had to exclude

seven participants from the analyses, mainly because of technical calibration failures. Table 1

provides information about our final sample of 19 participants.[5]

--- insert table 1 here ---

On average, participants had 8.3 years of experience in investment valuation and a total work

experience of 13.4 years. They mainly worked as investment consultants or advisors (36.8%),

financial analysts (31.6%), or fund managers (15.8%): 15.8% were classified as "Other".[6]

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[4] On average, participants in the "No graphic" condition spent 92.7s –approximately 30s less than the maximum possible time– on the table containing the performance information. Participants in the "Graph" condition spent 86.9s reviewing this table. Furthermore, when asked how confident they were about their assessments of the investment attractiveness and of the financial and non-financial performance, participants were quite confident (no measure was significantly smaller than 4, the midpoint of our scale: all $t < .89$, $p > .41$).

[5] Inferences do not change when the analyses for which eye-tracking data are not required include the five participants discarded due to calibration problems.

[6] Participants are classified based on the occupation they indicated on the post-experiment questionnaire. Participants indicating "other occupation" and providing details about their occupation are re-classified into another specific category when possible.

Eye-Trackers

To track participants' eye-movements, we used mobile devices (*Eyegaze EyeFollower* by *interactive minds*). These eye-trackers measure participants' gaze points at a 120Hz rate with a typical average bias error of .45°. Four cameras are built into a small box onto which a standard 24" LCD monitor is fixated. Both the monitor and the camera box are connected to a notebook recording the eye-tracker data. Two of these cameras follow the head movements and direct the other two cameras to track the eye-movements by measuring eyeball reflections. These devices allow participants to move their head freely without being disturbed by any additional equipment.

Detailed Procedures

After participants had agreed to participate in our study, they were randomly assigned to a condition and seated in front of the eye-trackers in a separate, moderately lit room at the conference site. In front of their eye-tracker, participants found the printed experimental materials showing a short introduction to the study. Participants were told that their task was to evaluate an IT firm as an investment opportunity. Most importantly, all participants were informed that the firm believed "that, in general, employee satisfaction, customer satisfaction, and other non-financial performance indicators are important drivers of financial success and therefore use[d] an Integrated Report to provide information on its financial and non-financial KPIs." Thus, information about the firm's strategic beliefs regarding the importance of (some) performance drivers was kept constant across conditions. Participants were then informed that they first had to complete a short procedure to calibrate the eye-trackers individually, before they had limited time to review the firm's reported performance data. Participants in the "Graphic" condition were also informed how to navigate back and forth between the graphic and the performance data table. All participants also learned that and how they could finish the

exercise before their time was up ("No graphic" condition: 120s, "Graphic" condition: 135s). Participants then started the calibration procedure. Properly and thoroughly calibrating the participants is key to gathering reliable eye-tracker data and research accuracy. Hence, we use only successfully calibrated participants.

After the calibration, only participants in the "Graphic" conditions saw a graphic (Figure 1) containing the visual representation of a key driver model as would be typically used in presentations or on websites. Importantly, the heading over this graphic gave no indication that there was any empirically tested foundation for the firm's beliefs about the possible links between non-financial and financial performance indicators. Specifically, under the heading "Connecting financial and non-financial performance", participants could read the sentence: "In general, we believe that non-financial performance indicators are important drivers of financial success", which only repeated the information already provided in the instructions to participants from all conditions.

Next, all participants were provided with a selection of the firm's performance data and participants had limited time to review the data and assess the firm's investment attractiveness. After they provided this assessment, participants filled out a short PEQ.

As a small token of appreciation, participants could provide us with their email address at the end of the otherwise anonymous participation to receive a heat map showing which information they focused on when they were working on the task.

Measures

To test our hypotheses and research question regarding the attention of investors, we measure the time spent inside different areas of the table containing the information about the firm's (non-)financial performance as recorded by the eye-trackers. To facilitate the analysis of eye-movements, the eye-trackers' software (*Nyan*) can be configured to measure, calculate and

export the total time spent inside so-called areas of interests (AoI). Depending on the desired analysis, different AoI can be defined. For our analyses, we define rectangular AoI: Figure 2 shows an overview over these AoI.

--- insert figure 2 here ---

Time spent is commonly used as proxy for attention (Findley and Gilchrist 2003; Casini and Maçar 1997; Wedel and Pieters 2008; Holsanova 2011; Chen et al. 2016): Table 2 shows an overview over our key measures.

--- insert table 2 here ---

Our main variables regarding investors' attention spent (Table 2, Panel A) are TABLELEFT, the time spent on the left half of the data table containing the financial performance indicators, and TABLERIGHT, the time spent on the right half of the data table containing the non-financial performance indicators. As the key driver model suggests that the latter drive future financial performance, we use the attention for the non-financial performance indicators to measure the attention for the key driver model creating value. However, in addition to the absolute time spent, it is important to compare the time spent relative to the entire time for retrieving information. Thus, we define two additional relative measures for the non-financial KPI: the time spent either relative to the time overall spent on the page (TABLERIGHT_REL_PAGE) or relative to the time spent on all the AoI (TABLERIGHT_REL_AOI). Further, we are interested in the two AoI within the larger AoI TABLERIGHT: SOCIAL, the time spent on the category employees and customers, and ENV, the time spent on the category environmental. For additional analyses, we define further AoI inside the AoI containing the four categories of performance indicators according to our table. We refer to the name and description of the performance indicators as LABEL and to the quantitative information describing the performance as PERF.

Our main dependent variable regarding the assessment of the firm's investment attractiveness is INV, which is our participants' assessment of the attractiveness (on a scale between 0 and 100) of our firm as an investment opportunity (Table 2, Panel B).

IV. Results

Descriptive Statistics

We start reporting our results by providing descriptive statistics for the key measures in our experiment (Table 3, Panel A and B).

--- insert table 3 here ---

Participants in the "Graphic" condition seem to have spent more time on the half of the table with non-financial KPIs than participants in the "No Graphic" condition (27.98s vs. 21.65s). Results for the relative time measures show a similar pattern (time relative to page: 32% vs 23%, time relative to all AoI: 38% vs. 26%). The opposite is the case for the half of the table with the financial KPI. "No graphic" participants seem to have spent more time reviewing data in this half (59.66s vs. 49.78s). These results are in line with H1 predicting that making a key driver model with positive performance indicators graphically salient guides investors' attention to this model. Moreover, they seem to suggest that participants not only increased the time spent on the non-financial KPIs, but also shifted importance away from the financial KPIs.

H2 predicts that making a key driver model with positive performance indicators graphically salient increases a reporting firm's attractiveness as investment. Consistent with H2, participants in the "Graphic" condition assigned a higher score (68.17) than participants in the "No graphic" condition (56.43).

With regard to our RQ, there does not seem to exist a difference between the "No graphic" and "Graphic" condition regarding the time spent on the environmental KPI (7.79s vs. 7.69s). The difference in attention between conditions regarding the time spent on non-financial

performance indicators seems to be driven by the time spent on the social KPIs ("No graphic" condition: 12.21s, "Graphic" condition: 17.05s). This is the category containing the three non-financial KPI included in the graphic. Thus, the graphic appears to have only an effect on the specific KPIs shown in the model and does not seem to produce a spillover effect.

Heat maps (Figure 3, Panel A and B) help to visually illustrate these results. The heat maps are based on the participants' aggregated eye-tracker data and show the areas of the performance data table on which the participants focused the most. Hereby, red color indicates a higher intensity, or a higher amount of time spent inside the respective areas.

--- *Figure 3* ---

While the left side of the table in general seems to have received more attention than the right side, the heat map of the participants in the "Graphic" condition shows a higher intensity inside the AoI SOCIAL. No differences seem to exist for the AoI ENV.

Tests of Hypotheses

H1 predicts that making a key driver model with positive performance indicators graphically salient guides investors' attention to it. To test H1, we use time as measured by the eye-trackers as proxy for attention. As the right half of the table contained the non-financial performance indicators allegedly driving financial performance, we compare how much time participants in the "Graphic" condition spent on the right half of the table to the time spent by participants in the "No graphic" condition (Table 4, Panel A).

--- insert table 4 here ---

Directionally consistent with our expectation, participants in the "Graphic" condition spent more time on the right half (27.98s vs. 21.65s), but this difference misses conventional levels of statistical significance closely (t = 1.22, p = .12, one-tailed).

However, it is also important to compare the participants' behavioral differences between the two conditions based on relative values to learn something about the share of the time they spent on different AoI. Therefore, we additionally compare two relative measures, namely the time spent relative to either the time overall spent on the page or to the time spent on all the AoI. Results show that differences for these relative measures are statistically significant (time relative to page: 32% vs 23%, $t = 2.01$, $p = .03$; time relative to all AoI: 38% vs. 26%, $t = 2.02$, $p = .03$; one-tailed). Taken together, these results support H1.

As shown in the descriptive results, the graphic does not only seem to attract more attention per se, but also seems to draw attention away from the left half of the table containing the financial performance indicators ("Graphic" condition: 49.78s, "No Graphic" condition: 59.66s; difference statistically not significant: $t = 1.01$, $p = .33$, two-tailed). Thus, in addition, we test whether attention was rather directed on the right half of the KPI table dependent on whether participants were provided with the graphic first (Table 5).

--- insert table 5 here ---

Our independent variables are a dummy variable for the side of the KPI table (0 for left and 1 for right), a dummy for the manipulation whether participants saw the graphic (0 for the "No graph" and 1 for the "Graph" condition) and the interaction thereof. A significant positive interaction coefficient would support the idea that attention is redirected by the graphic. Again, we use different measures for our dependent variable: absolute time spent, time spent relative to either the time overall spent on the page or to time spent on all the AoI. They all show a consistent pattern and the expected positive coefficient (absolute time: $\beta = 16.21$, $p = .07$; time relative to page: $\beta = .18$, $p = .04$; time relative to all AoI: $\beta = .23$, $p = .02$, one-tailed). These further results are in line with the theoretical reasoning behind H1.

H2 predicts that making a key driver model with positive performance indicators graphically salient increases a reporting firm's attractiveness as investment. We test H2 by

comparing the investment attractiveness between the "No graphic" and "Graphic" conditions as assessed by participants. Participants in the "Graphic" condition assigned a higher score (68.17) than participants in the "No graphic" condition (56.43). A t-test shows that this difference is statistically significant (Table 4, Panel B: t = 1.76, p < .05, one-tailed).

H1 and H2 together predict a mediation such that a graphic increases the attention for elements of a key driver model, which then results in a higher assessment of investment attractiveness when these key drivers are positive. Hence, we test this underlying theory with a system of equations that are estimated using Zellner's "seemingly unrelated regressions" (SUR) model (Zellner 1962; Greene 2012). The corresponding model is depicted in Figure 4.

--- insert figure 4 here ---

In line with our theory, a graphic containing a key driver model (i.e. GRAPH = 1) directs investors' attention to the half of the table with the non-financial performance indicators TABLERIGHT (β = 6.33, p < .10, one-tailed). This increased attention spent on the positive non-financial performance indicators then increases investment attractiveness INV (β =.45, p = .05, one-tailed). The statistically insignificant coefficient (β = 8.86, p = .15, two-tailed) between GRAPH and INV suggests a full mediation.

To obtain a better understanding of the graphic's effect, we continue by analyzing our RQ. We want to explore whether a graphic increases attention directed to non-financial performance indicators in general or only to the specific ones included in the graphics. Our descriptive results suggest that the difference with regard to the attention directed at non-financial KPIs is mainly driven by differences in the AoI SOCIAL. This is the category containing the three non-financial KPI included in the graphic. T-test results (Table 4, Panel A) show that –consistent with our general theory– participants in the "Graphic" condition spent more time inside the AoI SOCIAL than "No graphic" participants (17.05 vs. 12.21: t = 1.41, p-value = .09, one-tailed). Again, results become stronger when the dependent variable is not the

absolute time spent, but the time spent relative to the time spent on the total page or on all AoI: untabulated t-tests show that p-values (one-tailed) in these cases are .02 (t = 2.19) and .02 (t = 2.29). As already expected from reviewing the descriptive results, there is no difference for the AoI ENV (7.79 vs. 7.69, t = .04, p-value = .97). These results do not support the idea of a spillover effect. Rather, they suggest that only the KPI included in the graph receive more attention by investors. The results of the analysis of RQ are interesting because they suggest that firm's may highlight specific KPI very selectively without having to worry too much about any spillover effects.

Supplemental Analyses

Earnings vs. Shares

Following the theoretical explanation that a graphic can increase the salience of the specific performance indicators included in it, it is interesting to follow up with an analysis of the financial performance indicators included in the graphic. Specifically, they were "Total Revenue" and "Operating Profit": we classify them as belonging to the category of performance indicators for earnings and assign them an AoI EARNINGS. According to our theory and prior findings, this AoI might also receive more attention by participants in the "Graphic" condition.

For the absolute time, there are no differences between conditions ("No graphic": 14.01 vs. "Graphic": 14.67, t = .162, p = .87, two-tailed). However, again, it might be important to look at the time spent on EARNINGS in relation to the time spent on the AoI FINKPI. Relative to the time spent inside the whole AoI FINKPI, time spent inside EARNINGS is slightly higher in the "Graphic" condition than in the "No graphic" condition (38% vs. 32%). However, this difference misses conventional levels of significance closely (t = 1.23, p-value = .12, one-tailed, untabulated). This difference might be marginal because earnings numbers in general already receive a high interest by investors, which would limit the potential of a graphic to guide

attention. Thus, making them salient might not lead to a strong increase of investors' attention spent on well-known and established performance indicators, but rather with less established performance indicators: we expect the latter to be increasingly included stronger in emerging integrated reporting.

Interestingly, there seems to be another difference with regard to attention for other financial performance indicators. From reviewing the heat maps, it seems that –compared to participants in the "Graphic" condition– participants in the "No graphic" condition were more interested in data inside of the AoI SHARES. The connection to our main theory could be that investors without guidance from a visualization of the key driver model could be mainly interested in information about stock market data, e.g. performance indicators in our category on shares and dividends. Participants having seen a graphic, however, might be thinking less about stock market data and more about the driving factors leading to an increase in a firm's earnings.

In line with this idea, the AoI SHARES received more attention by "No graphic" participants than by "Graphic" participants (14.14s vs. 10.05s). Untabulated results show that this difference, however, is statistically insignificant with absolute time spent as dependent variable (t = 1.03, p-value = .32; two-tailed). Still, a difference seems to exist in the AoI PERF (the area where the quantitative performance information is shown) inside SHARES ("No Graphic" vs. "Graphic": 8.11s vs. 4.27s, t = 1.53, p = .15, two-tailed, untabulated). Again, it might be important to examine relative measure in addition to the absolute time spent. Indeed, p-values decrease to levels indicating marginally significant differences for the time spent either relative to the time overall spent on the page or relative to the time spent on all the AoI (PERF inside SHARES: 8.9% vs. 4.5% and 10.5% vs. 5.0%, both t > 1.94, p –values < .07, two-tailed, untabulated). These results are consistent with our theory that investors think more about the link of non-financial key drivers and financial performance measures after this model was made

visually salient than when this was not the case. Investors without this visual guidance rather seem to be interested in stock market related data.

Alternative Explanation: Increased Interest

An alternative explanation for our results could be that a graphic only increases the general interest in the firm and its reporting, which might motivate participants to spend more cognitive effort and to scrutinize the firm more. This might question our explanations at least for the absolute time measures. While, in general, relative measures corroborate our theory at least as good as absolute measure, we add a supplemental analysis to address this potential alternative explanation. We analyze whether the graphic increased the overall time spent by our participants on the page showing the KPI table. This could be the case because a graphical representation might have raised the general interest for the firm and because these participants had slightly more time available (135s instead of 120s). However, untabulated results show that there are no statistically significant differences for time spent on the table page between the "No graphic" and "Graphic" condition –neither for the total time spent on the whole page nor for the time spent only on the table containing the AoI (time on page: 92.71s vs. 86.86s, time on all AoI: 81.30s vs. 77.76s; both $t < .55$, $p > .58$, two-tailed). Directionally, participants in the "No graphic" condition even seemed to have spent slightly more time. If the graphic only increased the general interest in the firm and its reporting, we would expect participants in the "Graphic" condition to spend more time than participants in the "No Graphic" condition.

V. Conclusion

In an experiment, we show how a graphic in IAP can influence professional investors' decisions under time pressure: it can guide investors' attention towards positive KPI to increase their salience and subsequently increase investors' assessment of a firm's investment attractiveness.

By collecting and analyzing eye-tracker data, we can corroborate our theory that participants spent more time on the AoI containing the highlighted and particularly positive KPIs. Consistent with our theory, assessments of a firm's investment attractiveness are higher when specific positive KPIs are made salient. Furthermore, we find no evidence that the increased salience produces a spillover of attention to other non-financial KPI not highlighted in our graphical representation.

Our results are important for firms because they highlight how firms can employ graphics to persuade investors to invest in them. Graphically displaying the link between positive potential non-financial performance drivers and financial performance indicators can increase the salience of certain reporting elements and direct investors' attention, which may then influence investors' decisions. Our results further suggest that firms can target their audience's attention to specifically selected pieces of information. While one important area is specifically IAP, our study can also be informative for other disclosures where firms might rely on graphical elements to communicate their performance, e.g. on websites or video clips.

As the firms' discretion can improve or worsen investors' decision, our study's results are important for investors because they need to be aware that they may be unduly influenced by firms' reporting decisions. This may be particularly problematic when their cognitive resources are scarce, e.g., under time pressure or when they experience stress on their job.

Our research also contributes to the emerging discussion on how the link between financial and non-financial information should be presented (e.g., Eccles and Saltzman 2011; Abeysekera 2013; Busco 2014) and may feed into the discussion how to achieve standardization of financial reports also in less regulated disclosures. While there may exist problems when investors' attention is unduly influenced, guiding attention might be considered useful when it helps to convey important information about a firm that would go unnoticed without guidance. Thus, our research also contributes to a long-standing discussion on the usefulness of non-

financial information for investors' decision-making, e.g., intangibles, intellectual capital, or Corporate Social Responsibility. It may inform standard setters and policymakers whether and how to regulate firms' disclosures and specifically the use of graphical elements (Brown et al. 2017).

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FIGURE 1

Graphic

Connecting financial and non-financial performance

In general, we believe that non-financial performance indicators are important drivers of financial success
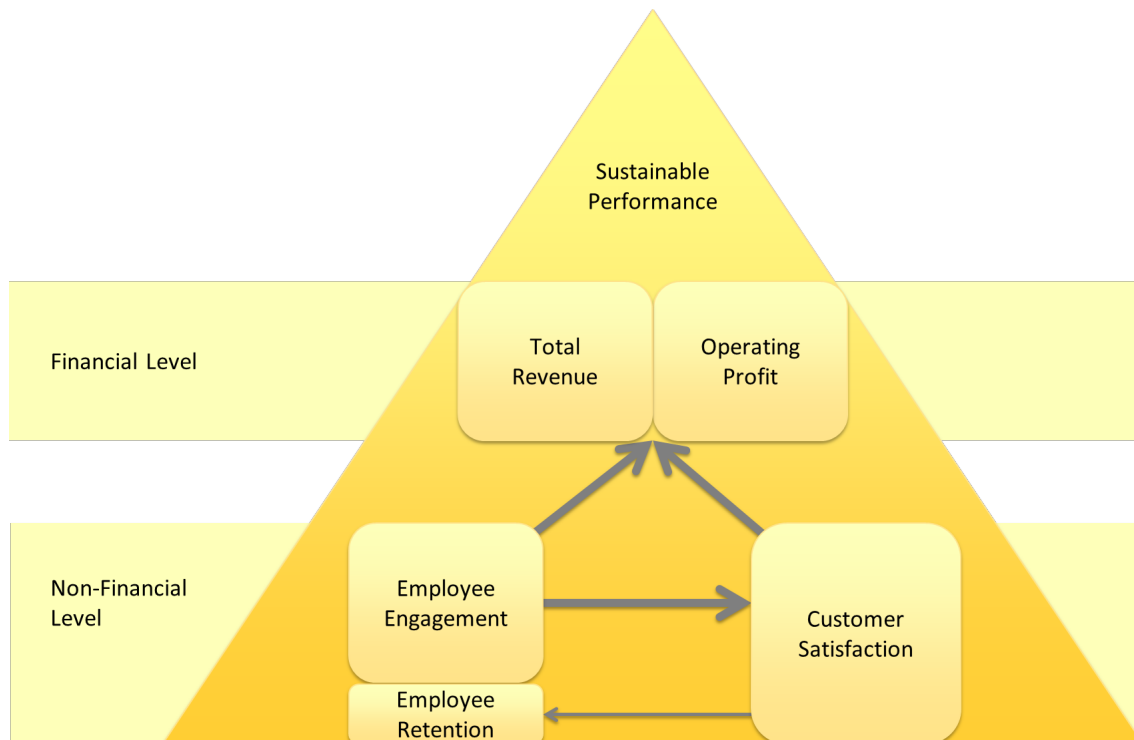
FIGURE 2

**Definitions of
Areas of Interests (AoI)**

← LABEL →	← PERF →		← LABEL →	← PERF →

"TABLELEFT"

Financial key performance indicators

"OPS"
(Software subscription revenue, Cloud subscription revenue, Software and software-related service revenue)

"EARNINGS"
(Total revenue, Operating profit, Operating margin, EBIT, EBIT margin)

"ASSPROD"
(Free cash flow, Net liquidity, Days' sales outstanding , Equity ratio, R&D expenses, R&D expenses in % of total revenue)

"FINKPI"

Shares and dividend

"SHARES"
(Weighted average shares, Earnings per share, Dividend per share, Share prices at year-end, Market capitalization)

"TABLERIGHT"

Employees and Customers

"SOCIAL"
(Number of employees at year-end, Personnel expenses per employee, Employee engagement in %, Business Health Culture Index in %, Women in %, Female managers in %, Employee retention in %, Customer Satisfaction: Net Promoter Score, Customer Retention: Ratio of New Customers to Lost Customers in %)

Environmental

"ENV"
(Greenhouse gas emissions, Greenhouse gas emissions per employee, Greenhouse gas emissions per revenue, Total energy consumed, Energy consumed per employee, Renewable energy sourced in %, Data center energy consumed, Data center energy per employee)

Notes:

This table outlines the different areas of interests (AoI) used in the analysis. "TABLELEFT" consists of information about both the Financial Key Performance Indicators ("FINKPI") and the Shares and Dividend ("SHARES"). The former category is further broken down in "OPS" (referring to operative KPIs and comprising *Software subscription revenue*, *Cloud subscription revenue*, and *Software and software-related service revenue*), "EARNINGS" (referring to earning KPIs and comprising *Total revenue, Operating profit, Operating margin, EBIT*, and *EBIT margin*), and "ASSPROD" (referring to asset productivity and comprising *Free cash flow, Net liquidity, Days' sales outstanding (DSO), Equity ratio, Research and development expenses,* and *Research and development expenses in % of total revenue*). "TABLERIGHT" consists of non-financial performance information about "SOCIAL" issues relating to employees and customers and environmental ("ENV") issues. Horizontally, an AoI consists of the AoI *LABEL* (description of the KPI) and the AoI *PERF* (numerical performance information). Furthermore, note that the headers were only included in the AoI "TABLELEFT" and "TABLERIGHT".
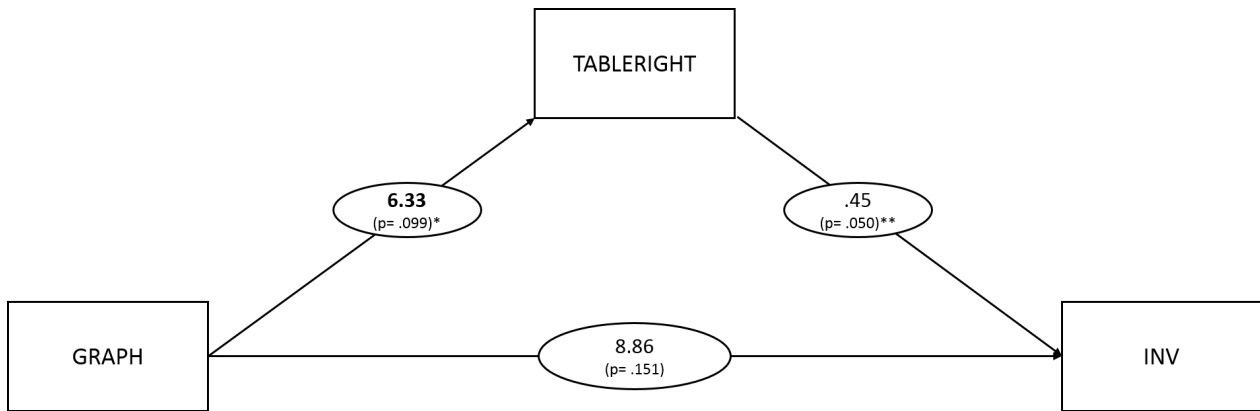
FIGURE 3

Heat Maps of the
KPI Table by Condition

Panel A: "No graphic" Condition

Panel B: "Graphic" Condition

FIGURE 4

Path Model

Notes:

GRAPH is coded 1 when participants have seen a graphic and 0 otherwise. TABLERIGHT is the time spent [in s] on the right half of the table containing the non-financial performance indicators. The dependent variable INV is the investment attractiveness as assessed by our participants [scale from 0 to 100].

***, ** and * denote significance at the 1 percent, 5 percent and 10 percent levels, respectively. P-levels are one-tailed for directional predictions and two-tailed otherwise.

TABLE 1

Sample Description

Panel A: Number of Participants

Study Completed	**Total**	**n = 26**
Exclusions	**Total**	**n = 7**
	Reason for Exclusion	
	Restart due to technical problems	n = 1
	Participant with no work experience	n = 1
	Participants could not be calibrated	n = 5
Final sample	**Total**	**n = 19**
	"No graph"	n = 7
	"Graph"	n = 12

Panel B: Participants by Occupation

Occupation	*%*
Investment consultant or advisor	36.8
Financial analyst	31.6
Fund manager	15.8
Other (i.e., corporate finance, treasury management)	15.8

Panel C: Participants' Experience in Investment Valuation

Years of Investment Valuation Experience	*%*
Less than 5 years	44.4
5 to 9 years	16.7
10 to 14 years	16.7
15 to 19 years	5.6
20 years and more	16.7

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TABLE 2

Measurement
of Key Measures

Panel A: Important Areas of Interest (AoI)

TABLELEFT	Time [in s] spent on the left half of the performance data table containing the financial performance indicators.
TABLERIGHT	Time [in s] spent on the right half of the performance data table containing the non-financial performance indicators.
TABLERIGHT_REL_PAGE	Time [in s] spent on the right half of the performance data table relative to the time overall spent on the page.
TABLERIGHT_REL_AOI	Time [in s] spent on the right half of the performance data table relative to the time overall spent on all the AoI.
SOCIAL	Time [in s] spent on the category *Employees and Customers*.
ENV	Time [in s] spent on the category *Environmental*.

Panel B: Investment Attractiveness

INV	How do you evaluate ProIT as an investment opportunity on a scale from 0 to 100 (with 0 being 'poor investment' and 100 being 'excellent investment')?

TABLE 3

Mean, *Median* (Standard Deviation) for Key Measures and Number of Observations by Condition

	"No graphic"	"Graphic"
Panel A: Important Areas of Interest (AoI)		
TABLELEFT[a]	59.66	49.78
	68.03	*53.17*
	(19.24)	(21.29)
TABLERIGHT[b]	21.65	27.98
	21.90	*29.49*
	(11.80)	(10.44)
TABLERIGHT_REL_PAGE[c]	.23	.32
	.23	*.30*
	(.10)	(.11)
TABLERIGHT_REL_AOI[d]	.26	.38
	.23	*.35*
	(.10)	(.13)
SOCIAL[e]	12.21	17.05
	9.29	*19.05*
	(8.67)	(6.30)
ENV[f]	7.79	7.69
	8.44	*6.87*
	(5.24)	(4.49)
Panel B: Investment Attractiveness		
INV[g]	56.43	68.17
	50.0	*65.0*
	(19.73)	(9.65)
Number of Observations	7	12

Notes:

All attention measures refer to the time spent inside the respective AoI and are measured in seconds.

[a] TABLELEFT: Time [in s] spent on the left half of the performance data table.

[b] TABLERIGHT: Time [in s] spent on the right half of the performance data table.

[c] TABLERIGHT_REL_PAGE: Time [in s] spent on the right half of the performance data table relative to time spent on the page.

[d] TABLERIGHT_REL_AOI: Time [in s] spent on the right half of the performance data table relative to time spent on all AoI.

[e] SOCIAL: Time [in s] spent on the category *Employees and Customers*.

[f] ENV: Time [in s] spent on the category *Environmental*.

[g] INV: Assessment of the attractiveness of our firm as an investment opportunity [on a scale from 0 to 100].

TABLE 4

T-test Results for Key Measures

		"No graphic"	"Graphic"
Panel A: Attention Measures			
TABLELEFT[a]	Mean	59.66	49.78
	t-test	t= 1.008, p= .328	
TABLERIGHT[b]	Mean	21.65	27.98
	t-test	t= 1.218, p= .120	
TABLERIGHT_REL_PAGE[c]	Mean	.23	.32
	t-test	t= 2.006, p= .031**	
TABLERIGHT_REL_AOI[d]	Mean	.26	.38
	t-test	t= 2.023, p= .030**	
SOCIAL[e]	Mean	12.21	17.05
	t-test	t= 1.407, p= .089*	
ENV[f]	Mean	7.79	7.69
	t-test	t= .043, p= .966	
Panel B: Investment Attractiveness			
INV[g]	Mean	56.43	68.17
	t-test	t= 1.756, p= .049**	

Notes:

All attention measures refer to the time spent inside the respective AoI and are measured in seconds.

[a] TABLELEFT: Time [in s] spent on the left half of the performance data table.

[b] TABLERIGHT: Time [in s] spent on the right half of the performance data table.

[c] TABLERIGHT_REL_PAGE: Time [in s] spent on the right half of the performance data table relative to time spent on the page.

[d] TABLERIGHT_REL_AOI: Time [in s] spent on the right half of the performance data table relative to time spent on all AoI.

[e] SOCIAL: Time [in s] spent on the category _Employees and Customers_.

[f] ENV: Time [in s] spent on the category _Environmental_.

[g] INV: Assessment of the attractiveness of our firm as an investment opportunity [on a scale from 0 to 100].

***, ** and * denote significance at the 1 percent, 5 percent and 10 percent levels, respectively.

P-levels are one-tailed for directional predictions and two-tailed otherwise.

TABLE 5

Regression Results:
Attention for Non-financial Performance Information

Dependent Variable	TIME		
	Model (1)	**Model (2)**	**Model (3)**
Time Measure	**ABSOLUT**	**REL_PAGE**	**REL_AOI**
Constant	**59.66*****	**.64*****	**.74*****
(p)	(.000)	(.000)	(.000)
TAB_RIGHT	**-38.01*****	**-.41*****	**-.48*****
(p)	(.000)	(.000)	(.000)
GRAPH	**-9.87**	**-.09***	**-.12****
(p)	(.159)	(.074)	(.044)
TAB_RIGHT*GRAPH	**16.21***	**.18****	**.23****
(p)	(.069)	(.038)	(.022)
N	19	19	19

Notes:

***, ** and * denote significance at the 1 percent, 5 percent and 10 percent levels, respectively. P-levels are one-tailed for directional predictions and two-tailed otherwise. Results are based on a long dataset with standard errors clustered for participants (19 clusters). ABSOLUT refers to the time spent the half of the performance data table measured in s. REL_PAGE refers to the time on table half relative to the total time spent on the table page. REL_AOI refers to the time on table half relative to the total time spent on all AoI. TAB_RIGHT is 0 for data reported in the left half of the table (financial KPIs) and 1 for data in the right (non-financial KPIs). GRAPH is 0 for participants in the "No graphic" condition and 1 for participants in the "Graphic" condition.

ProIT Performance Summary [Note: Word copy of the html table used for the data collection.]
€ millions, unless otherwise stated

Financial key performance indicators	2012	2011	Change in %
Software subscription revenue	1'282	1'031	24.3
Cloud subscription revenue	780	583	33.8
Software and software-related service revenue	3'178	2'830	12.3
Total revenue	5'240	4'444	17.9
Operating profit	1'301	1'220	6.6
Operating margin in %	24.8	27.5	-9.6
EBIT	1'429	1'284	11.3
EBIT Margin	27.3	28.9	-5.6
Free cash flow	820	833	-1.5
Net liquidity	367	409	-10.3
Days' sales outstanding (DSO)	75	60	25.0
Equity ratio (total equity in % of total assets)	53	55	-3.5
Research and development expenses	563	485	16.2
Research and development expenses in % of total revenue	10.8	10.9	-1.5

Shares and dividend	2012	2011	Change in %
Weighted average shares, basic in millions	297	297	0.0
Earnings per share in €	2.6	2.9	-10.0
Dividend per share in €	1.0	1.1	-9.1
Share prices at year-end in €	48.7	40.9	19.2
Market capitalization in € billions	14.5	12.1	19.2

Employees and Customers	2012	2011	Change in %
Number of employees at year-end (based on Full-Time Equivalents FTE)	16'106	14'944	7.8
Personnel expenses per employee – excluding share-based compensation (FTE)	110	107	2.8
Employee engagement in %	88.6	75.0	18.1
Business Health Culture Index in %	66	65	1.5
Women in % (FTE)	30	30	0.0
Female managers in %	19.4	18.7	3.7
Employee retention in % (FTE)	96.0	88.6	8.4
Customer Satisfaction: Net Promoter Score	8.0	7.1	12.7
Customer Retention: Ratio of New Customers to Lost Customers in %	14.4	14.0	2.9

Environmental	2012	2011	Change in %
Greenhouse gas emissions in kilotons	123	122	0.8
Greenhouse gas emissions per employee (FTE) in tons	7.6	8.2	-6.5
Greenhouse gas emissions per € revenue in grams	23.5	27.5	-14.5
Total energy consumed in GWh	220	215	2.3
Energy consumed per employee (FTE) in MWh	13.6	14.3	-4.9
Renewable energy sourced in %	49.5	47.0	5.
Data center energy consumed in GWh	40	39	2.6
Data center energy per employee (FTE) in KWh	2'725	2'824	-3.5

The Benefits and Limits of Market Feedback for Investment Professionals' Valuations and Market Estimations: The Case of Corporate Social Responsibility Disclosure

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The Benefits and Limits of Market Feedback for Investment Professionals' Valuations and Market Estimations: The Case of Corporate Social Responsibility Disclosure

Abstract

How investors take market feedback into account and revise beliefs and valuations is a central assumption in all capital market models. In an experiment using investment professionals as participants, we investigate how investment professionals' initial valuations and estimations of market valuations are affected by cognitive biases and how they react to market feedback when corporate social responsibility (CSR) information is disclosed and when it is not disclosed. We find that when investment professionals do not have information about others' valuations, the disclosure of CSR information increases their estimation error of average market valuation and the span of potential market valuations but does not increase the overconfidence in the accuracy of their own as opposed to market valuations. Market feedback then has the benefit of reducing estimation errors of market valuations and more so when CSR information is disclosed. However, market feedback even increases investment professionals' beliefs in the accuracy of their own valuations and more so when CSR information is disclosed. Our study contributes to bridge the gap between understanding individual investors' valuations and aggregated market prices.

1. Introduction

How investors take market feedback into account and revise beliefs and valuations is a central assumption in all capital market models (Bouchaud, Doyne Farmer, and Lillo, 2009; Shleifer, 2000; Grossman and Stiglitz, 1980). However, little is known about how investors *actually* take expectations about other capital market participants' valuations into account when coming up with their own valuations as well as about how they take feedback about others' valuations into account when revising their valuations. We investigate these questions in an experiment by studying how investment professionals estimate other professionals' valuations when making their own valuations and how they integrate feedback on others' valuations when revising their valuations both when corporate social responsibility (CSR) information about a firm is disclosed and when it is not disclosed.

Many capital market models assume that investors process information rationally (e.g., Etzioni, Piore, and Streeck, 2010; DellaVigna, 2009; Gilovich and Griffin, 2002). Specifically, rational expectations equilibria assume that investors adjust their own valuations to take the information inferred from others' valuations rationally into account (e.g., Hommes and Wagener, 2009; Daniel, Hirshleifer, and Subrahmanyam, 1998). In contrast to this assumption, overwhelming evidence suggests that investors are prone cognitive biases when processing information (Ackert and Deaves, 2010; Baker and Nofsinger, 2010; Glaser, Nöth, and Weber, 2004). In fact, more recent capital market models incorporate investors' cognitive biases into their model of an investor and analyze market equilibria that can emerge when investors do not act rationally (e.g., Odean 1998, Hirshleifer 2001).

Prior experimental work mostly focuses either on individual investor decisions when valuing firms (e.g., Elliott, Rennekamp, and White, 2015; Hales, 2007; Hunton and McEwen, 1997) or on market equilibria emerging from the aggregation of many investors' trading behavior or valuations (e.g., LeBaron, 2012; Hommes, 2011). However, little is known at the

individual investor level about how they consider (potentially deviating) valuations of other market participants when establishing their own firm valuations and how they take feedback about others' valuations (average and span of valuations) into account when revising their own beliefs and estimations. However, providing evidence about such behavior and estimations is important as it bridges the gap between individual investor valuations on the one side and aggregated market results based on investors' valuations on the other side. Our study bridges this gap. Specifically, as we will outline in more detail below, we posit that market feedback can help investors *reduce* their false consensus bias when valuing firms and estimating market valuations without any information about other capital market participants (hereafter: initial valuations). However, we also suggest that market feedback likely increases the bias in investors' valuations that is due to investors' overconfidence in their own vs. other valuations. Thus, market feedback may help investors overcome valuation and estimation errors but is simultaneously limited in its ability to overcome overconfidence as an important investor bias (Hirshleifer, 2001).

We study the disclosure of CSR information in our study because despite the disclosure of CSR information likely increases the variation in investors' valuations and judgements about investment attractiveness. The reason for this is twofold: First, the majority of prior research provides evidence that positive (negative) CSR performance is associated with more positive (more negative) future financial performance, thereby linking CSR performance to financial performance (see Brooks and Oikonomou 2018; Lu and Taylor 2016; Friede, Busch, and Bassen, 2015; Margolis, Elfenbein, and Walsh 2009; Orlitzky, Schmidt, and Rynes 2003 for reviews of such literature). However, even though the majority of evidence draws this positive association, not all findings support it, leaving room for positive (negative) CSR performance being a signal for wasted (saved) resources (Devinney, 2009; Mackey, Mackey, and Barney, 2007; Siegel, 2009). Recent work even questions the causality between the positive association

often found between CSR and financial performance (Awaysheh, Heron, Perry and Wilson 2020).

Second, prior work has also provided evidence that, when CSR information is disclosed, valuations and investments are also affected by investors' nonfinancial motives. Specifically, investors tend to invest the more (less) in firms with positive (negative) CSR performance, the more they value the societal benefits of CSR activities *beyond* any expected financial effects (Riedl and Smeets 2017; Martin and Moser 2016). Importantly, prior work also links the financial and nonfinancial aspect of CSR investing and shows that the interpretation of the link between CSR and financial performance can also be influenced by investors' personal beliefs in the societal benefits of CSR (Arnold, Hörner, Martin and Moser 2020). That means, whether the association between financial and CSR performance is sees as positive or negative by an investor may also be affected by his personal attitude towards the societal effects of CSR. Taken together, this suggests that in the presence of CSR disclosure, the variation of investors' firm valuations likely increases and so does the potential effect of cognitive biases on investors' initial valuation as well as on the way they take market feedback into account.

In our theory, we suggest that when investors make their valuations and estimate market valuations, overconfidence is likely to influence their judgements (Daniel and Hirshleifer 2015). In fact, overconfidence has been dubbed one of the most severe problem in judgment and decision-making (Malmendier and Taylor, 2015; Plous, 1993).[1] We posit that when valuing firms and estimating other capital market participants' valuations, investors' overconfidence can take two directions. First, investors are likely prone to a so-called false consensus bias (Ludwig and Nafziger 2011; Taft 1955). That means, they likely over-rely on their own belief and disregard other people's actual preferences and beliefs when predicting others' behavior.

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[11] In the field of finance and investment, overconfidence has been, for example, shown to lead individuals to trade excessively (Barber and Odean, 2000; Lambert, Bessiere, and N'Goala, 2012), to take higher risks (Nosić and Weber, 2010; Merkle, 2017), or to diversify insufficiently (Merkle, 2017; Goetzmann and Kumar, 2008), or to take success from past investments for granted (Hilary and Menzly, 2006).

In this regard, overconfidence in their own judgements leads investors to not sufficiently take other potential perspectives into consideration when predicting others' behavior and beliefs (Daniel and Titman 1999). Second, investors may generally arrive at the conclusion that their own assessment of firm value is more accurate than other investors' assessment (Odean 1998, Hirshleifer 2001).

Based on these two effects, we predict that, owing to the false consensus bias, investors' estimation error when making their initial valuations and estimating both the average market valuation and the span of potential market valuations is larger when CSR information is disclosed than when it is not disclosed. The reason is that while the variety in own valuations likely increases when CSR information is disclosed, investors are unlikely to correctly anticipate this increased variety in valuations owing to their false consensus bias. As a consequence, estimation errors of the average market valuation and of the estimated span of valuations likely increase. For a third hypothesis, we develop theory to predict the effect of CSR disclosure on investors' overconfidence about their own valuation relative to others' valuations. While increased variation in valuations may contribute to make individuals more overconfident about their own valuations (Abreu and Mendes, 2012; Hales, 2009; Harris and Raviv, 1993), this can only be the case when they are sufficiently aware of this increased variation in valuations. If this is not (fully) the case, as implied by the false consensus bias, it is unclear whether investors' overconfidence about their initial valuations will indeed increase when CSR information is disclosed.

Additionally, we develop hypotheses about how investors take market feedback about the actual average market valuation and the span of valuations into account when revising their own valuation and their estimations of market valuations. Specifically, we develop theory to predict that market feedback reduces investors' false consensus bias (Engelmann and Strobel 2000). Because the false consensus bias was likely larger in initial valuations and estimations

when CSR information is disclosed, we predict that the decrease in estimation error of both the average market valuation and the span of valuations decreases more strongly after market feedback when CSR information is disclosed than when it is not disclosed. Finally, however, we also predict that market feedback is unlikely to reduce investors' overconfidence regarding the accuracy of their own valuation compared to others' valuations. Additionally, when investors become aware of the increased variation in valuations when CSR information is disclosed, this increased variety can serve as a justification for investors to not strongly adjust their own valuation based on the feedback about others' valuations. As a consequence, the distance between their own valuation and the estimated market valuation can even increase after-market feedback, in contrast to what is usually assumed when investors receive information about others' valuations (Kurz, 2008).

We investigate our research question in an experiment using investment professionals with an average professional experience of more than six years as participants. We manipulate between participants whether they are provided with only financial information about a firm or financial information and CSR information. Participants in both conditions provide an initial judgment of the investment attractiveness of the firm as well as estimates of both the mean valuation of all other participants in the condition and the span of valuations. We then inform participants about the mean valuation and the span of valuations. Subsequently, participants indicate again the firm's investment attractiveness and estimate others' valuations as well as the span of valuations.

Our results are broadly in line with our predictions. We find that CSR disclosure increases both the estimation error of the average valuation and the span of valuations. However, CSR information does not increase the distance between investors' own initial valuations and their estimated market valuations. These results are in line with a strong false consensus bias and the fact that investors are likely unaware of the increased variety in

valuations when CSR information is disclosed. We also find evidence that market feedback decreases investors' estimation error of the average market valuation and the span in valuations more strongly when CSR information is disclosed than when it is not disclosed. Finally, however, we find that market feedback *increases* the distance between investors' own initial valuations and their estimated market valuations more strongly when CSR information is disclosed. Thus, convinced by the accuracy of their own assessments, investors expect mainly other market participants to adjust their valuations but do not (strongly) adjust their own. Supplemental analyses provide evidence about our underlying theoretical process.

Our paper makes several important contributions. First, we provide evidence about investment professionals' treatment of market feedback as an important step between individual firm valuations and aggregated market reactions. While the use of market feedback is an important part of all capital market model, few researches exists as to how exactly investors adjust their own valuations and their estimations of others' valuations when receiving information about others' valuations. We provide evidence that market feedback has the benefit of reducing investors' false consensus bias in their valuation but is limited in reducing—or even further increases—investors' overconfidence about the accuracy of their valuations. These findings can serve as important insights for future concepts of capital markets.

Second, our paper informs theory and practice about how the disclosure of CSR information affects investment professionals' valuations and estimations of others' valuations. Specifically, by providing evidence that investors are unaware of the increased variety in firm valuations when CSR information is disclosed and do not strongly adjust their valuations even after receiving feedback about others' (deviating) valuations, our paper shows that the treatment of CSR information in valuations may be more strongly influenced by individual biases than the treatment of financial information.

Finally, as we conduct our experiment with experienced investment professionals, our results can be useful for banks and investment firms in understanding how their financial analysts and fund managers can make systematic errors in their valuations and estimations of capital market reactions. Specifically, our results suggest that it may be helpful to take measures against investment professionals' overconfidence about their valuations despite contradicting market feedback, particularly when CSR information is an important part of the valuation.

2.   Theory and Hypotheses Development

Setting

To study our research questions, we use a setting where, in addition to financial performance information, CSR information is or is not disclosed. We chose to use a setting with and without CSR disclosure as both positive and negative CSR information are often interpreted differently by different investors. Specifically, positive (negative) CSR information is often interpreted as positive (negative) signal about long-term financial performance of the firm (Brooks and Oikonomou, 2018; Dhaliwal et al., 2011; Aguilera et al., 2007). In contrast, positive (negative) CSR information can also be seen and interpreted as a signal about overspending (not overspending) and harming shareholder wealth (Yu and Zhao, 2015; Barnea and Rubin, 2010). Recent work also provides some evidence that the positive correlation between CSR and financial performance found in many studies (for overviews see, e.g., Brooks and Oikonomou 2018; Verbeeten, Gamerschlag, and Möller, 2016; Berthelot et al., 2012), may not have an underlying causal effect (Awaysheh, Heron, Perry and Wilson 2020). Additionally, prior work provides evidence that investments based on CSR information can also be driven by investors' personal beliefs in the societal benefits of CSR beyond any financial effects (Arnold et al. 2020; Martin and Moser 2016) and investors' other-regarding attitudes (Riedl and Smeets 2017). As a consequence, the disclosure of CSR information likely generates a larger variety in firm

valuations which allows us to study investment professionals' reaction to (more dispersed) market feedback.

We use a setting in which investors make an initial valuation and estimate market valuations as well as the span of valuations occurring at the market when only having financial performance information (and, when CSR information is disclosed, also CSR performance information) but no information about any market valuations. This allows us to investigate, in a first step, how investors form their initial beliefs about market valuations and how they contrast with their own valuations. In a second step, investors receive feedback about actual average market valuations and valuation spans and, based on this feedback, can revise their own valuation as well as their estimations of market valuations and valuation spans. This allows us to study how investors take market feedback into account. Particularly, it allows us to examine whether investors revise their own valuations based on information about the valuations of other investors' valuations, an input that is central to capital market models.

Importantly, we did not implement a market setting with trading and a market price emerging in equilibrium as we are more interested in investors' fundamental valuations and, thus, perceptions of the "true" long-term investment attractiveness. Market prices are formed based on "average" investors' beliefs that are not always correct and, thus, market prices may deviate from "true" fundamental values (Kurz, 2008; Shiller, 2000). As a consequence, we forwent the implementation of a market with investor trading and concentrated on individual valuations and estimations. Such a setting is more appropriate to study our research question.

Hypotheses Development

Initial Valuations and Estimations

Our first hypothesis is related to investment professionals' estimation error when forming their beliefs about the average market valuation before receiving any feedback about other market

participant's actual valuations. In such a situation, the average market value can never be known but investors need form expectations about other investors' motives, characteristics or expertise (Sunder 1995, Stahl and Wilson 1995). Prior research has provided evidence that in such situations, individuals are likely prone to a so-called false consensus bias, i.e., they over-rely on their own belief and disregard other people's actual preferences and beliefs when predicting others' behavior (Ludwig and Nafziger 2011; Taft 1955; Van Boven and Loewenstein 2003). The false consensus bias is driven by individuals' (over-) confidence in their own estimations (Moore, Tenney, and Haran, 2015; Lord, Ross, and Lepper, 1979). Specifically, as individuals are rather convinced about the conclusions they reach from their own considerations and calculations, they do not sufficiently take into consideration other potential perspectives when predicting others' behavior and beliefs (Weizsäcker, 2003; Daniel, Hirshleifer, and Teoh, 2002; Camerer, 1995).

In our setting, the disclosure of negative CSR performance likely generates a higher variety in potential opinions about what this negative CSR performance implies for financial performance and about the attractiveness of this investment for other capital market participants. While some investors may be convinced that negative CSR performance has no effect on future financial performance or may even signal that the firm is not overspending on CSR (Aguilera et al., 2007), other investors likely see negative CSR performance as a negative signal about future risks or reduced financial performance in future (Price and Sun, 2017; Groening and Kanuri, 2013). Importantly, contingent on investment professionals' personal beliefs in the societal benefits of CSR, it may also be that investors' perceived attractiveness of the investment decreases *beyond* any estimated effect of the negative CSR on financial performance (Arnold et al., 2020).

The increased variety of investment attractiveness when CSR performance is disclosed is, however, unlikely to be rationally taken into account when investors make their initial

valuations and estimate other market participants' valuations. As we explained above, the false consensus bias leads individuals to over-generalize their own preferences and beliefs when making predictions about others. Thus, when the variety in individual valuations increases, investors' estimations of other market participants' valuations likely increases as well. This has two consequences: First, the estimation error of the *average* market valuation is likely to increase when CSR information is disclosed than when it is not disclosed owing to the increase in individual valuations and corresponding biases in estimations of the market average. Second, investors' estimations of the *span* in market valuations is likely to increase as well. The reason is that, again, investors are unlikely to sufficiently adjust their estimations of the span in valuations for the increased variety in valuations because they are biased towards their own beliefs and calculations. In line with our theory, prior research demonstrates that estimations of price dispersion typically tend to be too conservative (Bessiere and Elkemali 2014, Barron, Byard, and Kim 2002) and that increased volatility has only minor effects on estimated stock price intervals (Budescu and Du 2007). This indicates an erroneous assumption of the precision of one's knowledge (Glaser, Langer, and Weber, 2013; McKenzie, Liersch, and Yaniv, 2008).

As a consequence, we state hypotheses H1 and H2 as follows:

H1: *Investment professionals' estimation error of average market valuation is larger when CSR information is disclosed than when it is not disclosed.*

H2: *Investment professionals' estimation error of the span in market valuations is larger when CSR information is disclosed than when it is not disclosed.*

While investors are likely biased towards their own valuations when estimating market valuations, they are still likely to come up with average market valuations *differ* from their own valuations. Specifically, investors likely believe that the average market participant comes to different conclusion regarding the investment attractiveness of an asset than him- or herself. Such belief is likely grounded in an investor's overconfidence about his or her own valuation.

Specifically, the so-called better-than-average effect suggests that investors, on average, tend to think that they have above-average capabilities in forecasting an asset's value and, thus, its investment attractiveness (Moore and Schatz 2017, Thaler 2000). This expectation is also in line with prior work on capital market participants (e.g., Barber and Odean 2000, Gort and Wang 2010).

However, it is unclear so far whether the disclosure of CSR information increases investors' overconfidence in their own valuations and, thus, the distance between their own valuation and the estimated market valuation. Some prior research suggests that increased information uncertainty can increase investors' overconfidence (e.g., Jiang, Lee, and Zhang 2005). However, when—as predicted in H1 and H2—investors fail to sufficiently anticipate the increase in the variety in valuations when CSR information is disclosed owing to their false consensus bias, it could be the case that the distance between their own and the estimated market valuation does not increase when CSR information is disclosed. In other words, when CSR information is disclosed, investors' overconfidence could be directed towards believing that everyone else should come up with rather similar valuations rather than believing that the own valuation is even better than the average market valuation than when CSR information is not disclosed. Because we are not able to make a clear directional prediction in this case, we state Hypothesis H3 in its null form.

H3: *Investment professionals' own valuation does not deviate more strongly from their estimated average market valuation when CSR information is disclosed than when it is not disclosed.*

Valuations and Estimations after Market Feedback

When investors receive feedback about market valuations, they should, according to rational expectations equilibria, adjust their own valuations to take the information inferred from others' valuations into account (Hommes, 2011; Muth, 1961). This updating relates to two different aspects. On the one hand, they need to think about the new information they can infer from

others' valuations about their own valuations. On the other hand, investors also need to update their beliefs about market valuations and about how other investors at the market may react to the market feedback. We start with our predictions about the latter and will subsequently turn to our prediction with regard to the former.

As we explained above, investors' initial estimations of market valuations were, in the absence of information, governed by a consensus bias. Some prior suggests that the false consensus bias is not reduced by the presence of additional information (Krueger and Clement 1994). However, in this case, the false consensus bias related to a set of socially desirable or undesirable personality characteristics. Thus, adjusting estimations could threaten an individual's self-image (Sherman and Cohen, 2006). This is unlikely to be the case when market valuations are considered. In this vein, other research finds that the false consensus bias can be strongly reduced when representative information is given, particularly when decisions and judgments are not morally relevant (Engelmann and Strobel 2000).

If this is the case, representative market feedback, as provided in our case, should help investors overcome their false consensus bias when estimating market valuations. This has also been observed when investors assess heterogeneity of beliefs or disagreement (Hong and Stein, 2007) or coordinate price forecasts (Hommes, 2011; Füllbrunn, Rau, and Weitzel, 2014), Thus, investors may not accurately infer other capital market participants' beliefs from price, but likely attend to the average as a more reliable predictor about average opinion than their own private signal (Allen, Morris, and Shin 2006).

Because when CSR information is disclosed, we predicted initial estimations errors to be larger than when CSR information is not disclosed, the decrease in estimation errors after market feedback should also be larger when CSR information is disclosed. The reason is that in both cases, the average initial market valuation and the initial valuation span provide unambiguous reference points for investors. We are unable to predict whether, after market

feedback, investors' error when estimating average market valuation and valuation spans is still larger when CSR information is disclosed than when it is not disclosed or may even become statistically indistinguishable as it is unclear whether feedback is sufficiently strong to fully overcome the increase in initial estimation error when CSR information is disclosed. However, our theory allows us to predict that the decrease in estimation error should be stronger when CSR information is disclosed than when it is not disclosed. We state the following two predictions for investors' estimation errors after market feedback:

H4: *The decrease in investment professionals' estimation error of average market valuation after receiving market feedback is larger when CSR information is disclosed than when it is not disclosed.*

H5: *The decrease in investment professionals' estimation error of the span of market valuation after receiving market feedback is larger when CSR information is disclosed than when it is not disclosed.*

Finally, however, when investors are overconfident regarding the quality of their own valuations, market feedback may not necessarily lead to a revision of their *own* valuations. Specifically, it is likely that one of the essential assumptions of rational expectations equilibria, i.e., the inference of information from other capital market participants' valuations, is distorted by investors' overconfidence in their own valuations. That means, the conservatism in adjusting one's own valuations adapting it to the market valuation is used as a belief distortion (Huck and Weizsäcker 2002), can lead to investors' underreaction to market feedback. (e.g., Jegadeesh and Titman 1993; Chan Jegadeesh, and Lakonishok, 1996).

Their own overconfidence is then likely to lead investors to overweight their own valuation and to underweight information that can be gleaned from other investors' behavior (Abreu and Mendes 2012, Epley, Keysar, et al. 2004, Moore and Kim 2003). One of the main reasons for this could be that other investors are likely judged as not thinking as deeply about available information as oneself (Camerer, Ho, and Chong 2004). This, eventually, leads

investors to underestimate the extent to which they could learn from the behavior of others (Hong and Stein 2007). As a consequence, the distance between their own valuation and the estimated market valuation can even increase after market feedback.

This effect is likely stronger when CSR information is disclosed than when it is not disclosed. The reason is that, as explained above, when CSR information is disclosed, the variety in valuations likely increases. This increased variety can have two effects: First, as variety increases, adjusting the own valuation to a smaller extent than the estimation of market valuation likely leads to an increased distance between own and estimated market valuations. Second, increased variety in other market participants' valuations likely serves as an additional justification to investors to adjust their own valuation to a lower extent as, owing to the increased variety, the market price likely loses relevance as a reference point. In other words, after market feedback about others' valuations is provided, investors' overconfidence is less likely directed towards believing that everyone else makes similar valuations—as this assumption has been rejected by the market feedback—but rather towards supporting the belief that the own conclusions drawn about the valuation are better than others' conclusions. And this is likely more the case when CSR information is disclosed than when it is not disclosed. As a consequence, we state the final hypothesis:

H6: *The increase in the distance between investment professionals' own valuations and their estimated average market valuation after receiving market feedback is larger when CSR information is disclosed than when it is not disclosed.*

3. Method

Participants

As discussed in more detail below, we conducted a two-stage mixed factorial design experiment to investigate our research question. As prior work often contends that financial accounting experiments and, particularly, experiments investigating disclosure of CSR information are

often limited in terms of their generalizability, because participants tend to be university students or sophomores i.e., non-professional investors (e.g., Libby, Bloomfield, and Nelson 2002; Moser and Martin 2012), we overcome this limitation by using investment professionals as participants. We received access to these participants at a conference of a European association for investment professionals. Overall, 49 participants participated in our experiment. Three participants did not provide all estimations after receiving market feedback. Therefore, we exclude them from our final sample.[2] Table 1 reports occupations and professional experience of the participants in our final sample.

---Insert Table 1 about here---

As reported in Table 1, Panel A, most of the participants were financial analysts or fund managers. None of them had a specialization or functional focus on CSR. All of the subjects entered into the experiments voluntarily and were randomly assigned to either treatment. As shown in Table 1, Panel B, 63% had more than two years of professional experience.[3] The average professional experience was 6.1 years. Thus, we view our participants as appropriate participants to serve as sophisticated investors. Participants were from a variety of European countries, and from many financial institutions. Thus, we avoid that the view of a single financial institution on CSR issues is reflected in our group of subjects.

Design

We manipulate between participants the presence/absence of CSR disclosure. This manipulation results in a financial information only (FIO) condition and a CSR and financial

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[2] Including these participants into our analyses does not change any inferences drawn our hypotheses. All participants excluded from the final sample are in the financial information only condition.

[3] One participant did not indicate his/her professional experience on the post-experiment questionnaire.

information (CFI) condition. In the CFI condition, participants had access to financial information relevant for an investment decision and additional disclosures regarding the firm's CSR activities. In the FIO condition, participants only had access to the financial information. We decided to use the disclosure of CSR information as the interpretation of CSR information with respect to its financial consequences for firms still varies substantially among investors (Cordeira and Tewari, 2015; Cho, Lee, and Pfeiffer, 2013). Additionally, prior work has provided evidence that the estimations of these financial consequences may vary according to investors' personal beliefs in the societal benefits of CSR (Arnold et al. 2020). Thus, disclosure of CSR information represents a suitable setting in which we can analyze the effects of investors' cognitive biases on their responses to market feedback.

Within participants, we manipulated the presence/absence of market feedback. That is, participants first provided their initial valuations and estimations of market valuations without having any information about other participants' valuations (initial valuations - market feedback absent). After providing these valuations and estimations, they received feedback about actual average market valuations as well as about the minimum and maximum valuation and then were asked to provide new valuations and estimations (valuations after market feedback). Further details regarding all conditions and the procedures used to collect the data are provided below.

Overview of the Experiment

The setting as well as financial and CSR information were adapted and modified from prior research (Arnold, Bassen, and Frank, 2018). The original cases were developed based on real-world company information and were adapted to make the company unidentifiable.

Financial information was provided to participants in both the FIO and the CFI condition. It included both an income statement and a cash flow statement with most relevant

items. Additionally, we included select performance ratios per unit of output to make comparisons of financial data easier across periods. In total, the financial section included 33 financial positions. The financial information package contained three years of financial data and annual percentage changes to facilitate the assessment of performance over time. Relevance of the selected items was discussed with five senior fund managers, who did not participate in the experiment. Feedback after the discussions with these fund managers led us to slightly adjust the selection of items.

In the CFI condition, participants received additional information about the firm's CSR performance. We decided to provide CSR information that is likely directly relevant to firm valuation. Otherwise, subjects' reactions to CSR could be a result of the information's irrelevance and hence would not allow to gather inference on valuations and estimations of subjects when CSR was provided. Similar to Arnold et al. (2018), we selected the 13 CSR items (seven environmental, two social, and four governance) that were judged as 'important' or 'very important' by more than 75% of subjects in a pretest. Similar to financial data, subjects received three years of CSR data and the annual percentage changes, and, in addition, they received CSR intensity ratios per unit of output or input. Providing per-unit CSR information is a common practice in CSR reports.

We designed our experiment such that the CSR performance of the firm was rather negative. The reason we chose this experimental design was it presents a rather conservative design choice with respect to our hypotheses. Specifically, prior work provides evidence that investors process negative CSR information more rationally than positive CSR information (Arnold et al. 2018). Additionally, the risk increasing effects of negative CSR information is seen less ambiguously by investors than the risk decreasing effects of positive CSR information (Mishra and Modi 2013). Thus, our design choice of implementing rather negative CSR

information represents a conservative choice related to the potential variation of investors' estimations about the effects on firm value.

Procedures

Participants of the experiment were randomly allocated to two rooms, one for the FIO and one for the CFI condition. At the beginning of the experiment, an experimenter informed participants that their task is to value an asset and provide some additional estimations. Participation was voluntary and participants could have left at any point if they had desired to do so. However, none of the participants left after receiving his or her information.

Participants then received a booklet containing the instructions and explanations about the experiment. Specifically, the booklet contained some general information about anonymity and procedural information (for example, about not communicating with each other during the session). Additionally, it included a narrative summary of the company (business information), the financial information and, in the CFI condition, additional information on CSR performance.

Participants then provided their first valuations and estimations of market valuations. Specifically, they were asked to indicate the (i) attractiveness of the investment on a scale from 0 (poor investment) to 100 (excellent investment). We term this investment attractiveness measure *own valuation* in the following. Participants were then asked to provide (ii) their estimate of the average valuation of all participants in the room (*estimated average market valuation*) and (iii) an estimation of the range of valuations of the participants in the room by indicating the estimated maximum and minimum valuation. From the latter estimations we calculate the valuation span by subtracting from the estimated minimum from the estimated maximum value (*estimated valuation span*). All estimations remain entirely private to the participants except for the initial *own valuation* that was collected from every participant by

one of the experimenters after everyone had completed their initial evaluations and estimations. However, individual valuations were also not revealed to any other participant.

After everyone had completed his/her initial valuations and estimations, participants were asked to show the experimenters their *own valuation* privately. The experimenter collected these individual valuations and then revealed to everyone in the room the average, minimum and maximum *own valuation*. After participants received this feedback about others' valuations (market feedback), they were asked to provide a new—and potentially new—own valuation and new estimations of the average, minimum and maximum market valuations.

After entering the new valuations and estimations into their booklets, participants answered an additional post-experimental questionnaire. After completing this questionnaire, they were dismissed. In a voluntary, subsequent session at the conference, participants were debriefed about the experiment.

4. Results

Initial Valuations

Table 2 reports descriptive statistics on our main variables as well as the t-tests used for the tests of H1-H3. As reported in Table 2, the average *market valuation* significantly decreases from 70.14 in the case without negative CSR information to 59.60 in the case with negative CSR information (t=1.76, p = 0.04).[4] This negative reaction is consistent with investment professionals anticipating negative long-term financial consequences from negative CSR information (Du, Bhattacharya, and Sen, 2011; Cordeiro and Tewari, 2015). However, Table 2 also shows that, consistent with our underlying theory, that the additional CSR information also increase the variety in valuations. First, a Levene test provides evidence that the standard

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[4] P-levels reported in this paper are one-tailed for directional expectations and two-tailed otherwise.

deviation of the market valuation increased under CSR information (26.06 vs. 13.47, t=11.65, p<0.01). Second, Table 2 also shows that *valuation span*, i.e., the difference between the maximum and the minimum valuation in each group of investment professionals increases from 50 in the case without CSR information to 90 in the case with CSR information. This result is an important prerequisite for our theory.

---Insert Table 2 about here---

Table 2 also reports that *estimated average market valuation* in both conditions are quite close to the average *market valuations* and, in fact, not significantly different from them on average (FIO: 73.10 vs. 70.14, t=1.29, p=0.21, CFI: 61.32 vs. 59.60, t=0.51, p=0.62). However, the mean value of the *estimated average market valuation* hides individual estimation errors we predicted in H1. In fact, Table 2 shows that the *estimation error market valuation* is positive in both conditions and significantly increases when CSR information is disclosed (CFI vs. FIO: 15.48 vs. 10.66, t=1.84, p=0.04). This result supports H1.

Additionally, the development of H2 argues that investment professionals are unlikely to fully anticipate the increased variety in valuations owing to their own cognitive biases. Consequently, H2 predicts a larger estimation error of the valuation span when CSR information is disclosed than when it is not disclosed. In line with this prediction and underlying theory, Table 2 shows that the *estimated valuation span* increases under CFI compared to FIO, but only insignificantly so (51.36 vs. 43.57, t=1.26, p=0.22). This strongly contrasts with the strong increase in the actual valuation span (90 vs. 50). As a consequence, the *estimation error valuation span* strongly and significantly increases in the CFI condition (40.24 vs. 15.00, t=5.15, p<0.01). This result supports H2.

Finally, H3 was stated in its null form and predicted no effect of CSR information on the distance between own valuation and the estimated market valuation. In fact, Table 2 shows that distance own/estimated market valuation is larger in the CFI condition than in the FIO condition, but not significantly so (12.12 vs. 7.81, t=1.45, p=0.15).

Taken together, it seems that without market feedback, investment professionals seem to be strongly driven by their conformation bias when estimating market valuations and fail to anticipate an increase in the variety in valuations. As a consequence, their also do not expect any larger difference between their own market valuation and others' average market valuation when CSR information are disclosed than when they are not disclosed.

Valuations after Market Feedback

Table 3 reports descriptive statistics and t-tests for our main variables after the investment professionals received market feedback about minimum, average and maximum valuations. In both conditions, average market *valuation does* not change strongly compared to the initial valuations (FIO: 70.43 vs. 70.14, t=0.35, p=0.73; CFI: 56.08 vs. 59.60, t=1.88, p=0.07). While this is not necessarily inconsistent with participants not including market feedback into their own valuations, Table 3 shows that, in line with our theory, the variation in valuations does not substantially decrease and, in the FIO condition, even slightly increases. The standard deviation of *market valuation* is still significantly larger when CSR information is disclosed than when it is not disclosed (24.59 vs. 13.59, t=9.18, p<0.01). Additionally, when CSR information is not disclosed, the *valuation span* even increases after market feedback (60 vs. 50) while it remains stable at a high level when CSR information is disclosed (90 vs. 90).

---Insert Table 3 about here---

Again, the mean *estimated average market valuations* are close to—and not significantly different from—the actual mean market valuation in both conditions (FIO: 72.81 vs. 70.43, t=0.72, p=0.48; CFI: 56.56 vs. 56.08., t=0.10, p=0.92). Again, however, the average estimation may conceal individual estimation errors. The *estimation errors market valuation* remain positive but decrease substantially in both conditions compared to the initial valuations (FIO: 4.54 vs. 10.66; t=3.25, p<0.01; CFI: 6.66 vs. 15.48, t=4.11, p<0.01). This is in line with our theory underlying H4. Additionally, a t-test shows that the *estimation error market valuation* after market feedback is no longer significantly different in the two conditions (4.54 vs. 6.66, t=1.38, p=0.17), i.e., the estimation error seems to decrease more strongly in the CFI condition than in the FIO condition. This provides initial evidence for H4 predicting that the estimation error of the average market valuation decreases more when CSR information is disclosed than when it is not disclosed. We test the stronger decrease in estimation error predicted in H4 by regressing estimation error market valuation on an indicator variables *CSR* (equal to 1 when CSR information was disclosed and 0 when it was not), an indicator variable *feedback* (equal to 1 when market feedback was provided and 0 for the initial valuations) and the interaction of both variables. From H4, we expect the interaction term to be significantly negative, indicating a stronger decrease of this error when CSR information is disclosed. Model 1 in Table 4 reports the results.

---Insert Table 4 about here---

Table 4 shows that the coefficient of CSR, reflecting the effect of CSR information when *feedback* equals 0, is significantly positive (4.82, p=0.03). Additionally, it shows that the coefficient of feedback, reflecting the effect of market feedback when *CSR* equals 0, is significantly negative (-6.12, p<0.01). Finally, the coefficient is negative but insignificant (-2.70. p=0.18). Thus, H4 is only directionally supported.

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H5 predicts that the estimation error of the valuation span also decreases more when CSR information is disclosed than when it is not disclosed. Table 2 reports that even after market feedback, *estimation error valuation span* remains significantly larger when CSR information is disclosed than when it is not disclosed (24.36 vs. 14.28, t=1.93, p=0.06). However, more importantly, while in the FIO condition, the decrease in *estimation error valuation span* is small and insignificant (14.28 vs. 15.00, t=0.23, p=0.82), the decrease in the CFI condition is substantially larger and significant (24.36 vs. 40.24, t=3.06, p<0.01). This provides initial evidence for H5. We test H5 by regressing *estimation error valuation span* on the same independent variables as in the test of H4. With respect to H5, we expect the interaction term to be significantly negative. Model 2 of Table 4 reports our results. As shown in the table, the interaction term is indeed negative and significant (-15.17, p<0.01), indicating that the estimation error decreased more strongly when CSR information was disclosed than when it was not disclosed. This result support H5.

Finally, H6 predicts that the distance between the own and the estimated market valuation increases more when CSR information is disclosed than when it is not disclosed. Table 3 shows that *distance own/estimated market valuation* indeed increased after market feedback relative to the initial valuations and particularly so when CSR information is disclosed (FIO: 9.81 vs. 7.81, t=0.95, p=0.36; CFI: 18.32 vs. 12.12, t=2.53, p=0.02). This provides initial evidence for H6. We formally test H6 by regressing *distance own/estimated market valuation* on the same three independent variables as in our tests for H4 and H5. Related to H6, we expect the interaction term to be positive and significant. Model 3 in Table 4 reports the results. As shown in the table, the interaction term is positive and marginally significant (4.20, p=0.10). Thus, H6 is marginally supported, indicating that when CSR information is disclosed, market feedback makes investment professionals adjust market valuations but not their own valuations.

Supplemental Analysis

False Consensus Bias

In our theory development, we argued that when estimating the average market valuation, investment professionals are prone to a false consensus bias, i.e., they over-rely on their own belief and disregard other people's actual preferences and beliefs when predicting others' behavior (Ludwig and Nafziger 2011; Taft 1955; Van Boven and Loewenstein 2003). Because their own valuations are more widely dispersed when CSR information is disclosed, this false consensus bias leads to a larger estimation error with regard to the average market valuation in this case.

To test this underlying theory, we regress *estimated average market valuation* on *market valuation*, an indicator variable for CSR provision (equal to 1 if CSR data is provided) and the interaction of the two terms. The results are reported in Model 1 of Table 5.

---Insert Table 5 about here---

Table 5 shows that the own value strongly influences what investors think about others' average valuations (0.633, p < 0.01), consistent with a false consensus bias. The interaction term is not significant (-0.12, p = 0.56), indicating that the false consensus bias is not significantly different when CSR information is disclosed than when it is not disclosed. This provides evidence in favor of our theory that a false consensus bias combined with a wider spread in own market valuations decrease investment professionals' estimation quality of average market valuation when no market feedback is provided.

Additionally, our theory underlying H4 predicts that the false consensus bias is reduced by market feedback which leads to larger decrease in estimation error when CSR information is disclosed than when it is not disclosed. We test this underlying theory by re-running the regression but substituting *estimated average market valuation* after market feedback as the dependent variable. Model 2 in Table 5 reports the results.

In fact, after market feedback, the coefficient of *market valuation* is no longer significant (-0.02, p=0.87), indicating that investment professionals' own valuations no longer significantly affected their estimations of the average market valuation. Additionally, the interaction term is also not significant (0.12, p=0.39), indicating that the influence of the own valuation on the estimated average valuation was not significantly different when CSR information was disclosed. This result is also in line with our theory and provides evidence that feedback reduced investors' false consensus bias, thereby improving their estimation of average market valuation.

Overconfidence

In our development of H6, we argued that investment professionals' overconfidence may lead them to adjust market valuations but not their own, thereby increasing the distance between market valuations and their own valuations. On the post experiment questionnaire, we asked participants about their perceived confidence when they made their estimations about others' valuations. To test whether this perceived confidence affected the change in the distance between their own and the market valuation, we first calculate the absolute change in these distances after-market feedback. Then, we regress this change on participants' indication of their confidence. While we find that when CSR information is not disclosed, the effect of investment professionals' confidence on the change in the distance is significantly positive (2.16, p=0.05), the effect is insignificant when CSR information is disclosed (-0.29, p=0.79). Thus, when CSR information is not disclosed, the distance between their own valuation and the estimated average market estimation increases, the higher the confidence is. However, this is not the case when CSR information is disclosed. Thus, our theory only received partial support.

5. Conclusion

How investors take market feedback into account and revise beliefs and valuations is a central assumption in all capital market models. While many capital market models assume that investors process information rationally, overwhelming evidence suggests that investors are prone cognitive biases when processing information (Ackert and Deaves, 2010; Kent and Nofsinger, 2010). In an experiment using investment professionals as participants, we investigate how investment professionals' initial valuations and estimations of market valuations are affected by cognitive biases and how they react to market feedback when CSR information is disclosed and when it is not disclosed.

Consistent with a false consensus bias, we find that when investment professionals do not have information about others' valuations, CSR disclosure increases both the estimation error of the average valuation and the span of valuations. However, as investment professionals do not seem to be aware of the increase in valuation variety when CSR information is disclosed, CSR information does not increase the distance between investors' own initial valuations and their estimated market valuations.

Additionally, we find that market feedback has the benefit of decreasing investors' estimation error of the average market valuation and the span in valuations and more so when CSR information is disclosed than when it is not disclosed. However, as market feedback makes investment professionals aware of the larger variety in valuations when CSR information is disclosed, it contributes to increasing investors' beliefs in the accuracy of their own valuations relative to market valuations when CSR information is disclosed.

Our paper makes several important contributions. First, it provides evidence about investment professionals' treatment of market feedback as an important step between individual firm valuations and aggregated market reactions. Specifically, we show that market feedback has the benefit of reducing investors' false consensus bias in their valuation but is limited in

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reducing—or even further increases—investors' overconfidence about the accuracy of their valuations. These findings can serve as important insights for future concepts of capital markets.

Second, we inform theory and practice about how the disclosure of CSR information affects investment professionals' valuations and estimations of others' valuations. Our evidence suggests that investors are unaware of the increased variety in firm valuations when CSR information is disclosed and, thus, indicates that the use of CSR information in valuations may be more strongly influenced by individual biases than financial information.

Finally, our results can be useful for banks and investment firms in understanding how their financial analysts and fund managers can make systematic errors in their valuations and estimations of capital market reactions. Our findings suggest that it may be helpful to take measures against investment professionals' overconfidence about their valuations despite contradicting market feedback, particularly when CSR information is an important part of the valuation.

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Table 1

Description of Final Sample

Panel A: Participants by Occupation	N	%
Investment consultant/advisor	10	21.7%
Financial analyst	15	32.6%
Fundmanager	14	30.4%
Other (Corporate Finance, M&A, Investment banker)	7	15.2%
Total	46	100%

Panel B: Participants' Professional Experience (Years)		
≤ 2 years	16	34.8%
> 2 years and ≤ 5 years	13	28.3%
> 5 years and ≤ 10 years	9	19.6%
> 10 years	7	15.2%

Table 1. Occupation and experience of subjects over both treatments

Table 2

Initial Valuations

Descriptive Statistics and T-Tests

	FIO Mean (Standard dev.)	CFI Mean (Standard dev.)	t-test (p-value)
Market valuation	70.14 (13.47)	59.60 (26.06)	t = 1.76 (p = 0.0863)
Valuation span	50.00	90.00	-
Estimated average market valuation	73.10 (12.60)	61.32 (17.62)	t = 2.64 (p = 0.0117)
Estimation error market valuation	10.66 (7.77)	15.48 (9.70)	t = 1.84 (p = 0.0732)
Estimated valuation span	43.57 (16.44)	51.36 (25.30)	t = 1.26 (p = 0.2162)
Estimation error valuation span	15.00 (8.80)	40.24 (22.55)	t = 5.15 (p < 0.0001)
Distance own/estimated market valuation	7.81 (7.45)	12.12 (11.79)	t = 1.448 (p = 0.1547)
No. of observations	21	25	

Table 1 shows measurements for H1 which concerns the estimation of the span of valuations in the market. TRUESPAN is the effective span of valuation in the treatments between the minimum and maximum valuation provided by subjects. OWNSPAN is the average value of subjects' own valuations of minimum-maximum valuations in the treatments i.e. $\frac{\sum \ individual \ estimated \ span}{n}$. SPANDIFF shows the mean of differences between the effective market valuation span (TRUESPAN) and individual subjects' estimations of the market span calculated as $\frac{\sum(|individual \ estimated \ span - truspan|)}{n}$. SPANDIFF, hence, reflects the magnitude of individual errors of estimating the span of actual valuations.

Table 2 shows measurements of for H2 which concerns subjects' estimation of the average market valuation. ACTUAL AVERAGE MARKET VALUATION is the mean of all valuations of subjects in the treatments, whereas ESTIMATED AVERAGE MARKET VALUATION reflects the mean of subjects' estimations of the aggregate market valuation. DISTMARKET is a variable that provides the average estimation error in the market by calculating | ACTUAL AVERAGE MARKET VALUATION – VALUATION ESTIMATE OF OTHERS |.

Table 3

Valuations after Market Feedback

Descriptive Statistics and T-Tests Period 2

	FIO Mean (Standard dev.)	CFI Mean (Standard dev.)	t-test (p-value)
Market valuation	70.43 (13.59)	56.08 (24.59)	t = 2.50 (p = 0.0168)
Valuation span	60.00	90.00	-
Estimated average market valuation	72.81 (5.79)	56.56 (8.83)	t = 7.22 (p < 0.0001)
Estimation error market valuation	4.54 (3.63)	6.66 (6.17)	t = 1.38 (p = 0.1735)
Estimated valuation span	46.67 (12.97)	66.04 (23.12)	t = 3.57 (p = 0.0010)
Estimation error valuation span	14.28 (11.86)	24.36 (22.68)	t = 1.93 (p = 0.0614)
Distance own/ estimated market valuation	9.81 (11.43)	18.32 (14.58)	t = 2.17 (p = 0.0353)
No. of observations	21	25	

Table 3 shows our variable for measuring the average distance between subjects' own valuation and their valuation estimation of the aggregate market valuation. The variable is calculated as follows:
$$\text{VALUEDIST} = \frac{\sum |OWNVALUE - ESTIMATED\ MARKET\ AVERAGE|}{n}.$$

Table 5 shows measurements for H4 which concerns subjects' estimation of the average market valuation after revelation of the results from round one. ACTUAL AVERAGE MARKET VALUATION is the effective average of all valuations of subjects in the treatments, whereas ESTIMATED AVERAGE MARKET VALUATION reflects the average of subjects' estimations of the aggregate market valuation. DISTMARKET is a variable that provides the average estimation error in the market by calculating | ACTUAL AVERAGE MARKET VALUATION – VALUATION ESTIMATE OF OTHERS |.

Table 6 shows our variable for measuring the average distance between subjects' own valuation and their valuation estimation of the aggregate market valuation. The variable is calculated as follows:
VALUEDIST = ∅ (| OWNVALUE – ESTIMATED AGGREGATE MARKET VALUE |).

Table 4

Effects of Market Feedback on Estimation Errors and Distance between Own and Estimated Market Valuations

	Model 1 Estimation error market valuation	Model 2 Estimation error valuation span	Model 3 Distance own/ estimated market valuation
Constant	10.6626	15.0000	7.8095
	(1.7019)	(1.9275)	(1.6321)
	<0.01***	<0.01***	<0.01***
ESG	4.8207	25.24	4.31
	(2.5910)	(4.9353)	(2.8828)
	0.03**	**<0.01*****	**0.07***
Feedback	-6.1222	-0.7143	2.0000
	(1.8917)	(3.1020)	(2.1228)
	<0.01***	0.82	0.35
ESG*Feedback	-2.7011	-15.1657	4.2000
	(2.8733)	(6.0835)	(3.2534)
	0.18	**<0.01*****	**0.10***
Adj. R^2	0.26	0.26	0.11
N	92	92	92

Notes: The table displays results of two OLS regressions. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, p-levels are one-tailed for directional predictions and two-tailed otherwise.

Table 5

Confirmation Bias Before and After Market Feedback

Estimated average market valuation	Model 1 Before market Feedback	Model 2 After Market Feedback
Constant	28.6930	74.2262
	(12.7143)	(8.9060)
	0.03**	<0.01***
Market Valuation	0.6330	-0.0201
	(0.1782)	(0.1243)
	<0.01*	0.87
ESG	1.8937	-23.2622
	(13.8329)	(9.6933)
	0.89	0.02**
Market Valuation *ESG	-0.1174	0.1199
	(0.1970)	(0.1391)
	0.56	0.39
Adj. R^2	0.58	0.54
N	46	46

Notes: The table displays results of two OLS regressions. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$, p-levels are one-tailed for directional predictions and two-tailed otherwise.

APPENDIX – Experimental Materials

Exhibit 1. Booklet for experimental (CFI) treatment. NB. The booklet for baseline treatment (FIO) is identical except for the section on CSR that is not contained.

Thank you for taking the time to participate at this valuation exercise which will approx. take 40 minutes of your time.

Instructions:

1. This activity is anonymous. We will not be able to link your name to any of the answers you will give.
2. Please go through the valuation exercise in one go and do not interrupt the exercise.
3. Please go through the materials in the order presented. Do not read ahead! Referring back to previous material is allowed. Do not change your answers to previous questions if you refer back to previous materials.
4. You may want to use a pocket calculator and/or a sheet of paper/pen for conducting the exercise.
5. Do not discuss this material with any other participant while completing the exercise. If you have any questions while we are going over the instructions, or during the exercise, please raise your hand and we will answer your question in private. Please do not talk with anyone other than the instructor after this point.
6. The valuation exercise consists of two parts. Everyone will have 25 minutes for the first part. That means, even if you finish early, please remain seated until the 25 minutes are over and the second part of the exercise starts.
7. Once you have finished the exercise and answered the questions please re-main seated. Do not leave the room until invited to do so!
8. Please start now.

PART I

Electronics Co. International

Background

Electronics Co. International (ECI) is an international manufacturer of electronic components. ECI was founded in 1973 and is based in continental Europe. ECI's product lines hold above average market share positions in many of its markets. With products marketed in over 50 countries and approximately half of their revenues from outside Europe, ECI has increased their global outreach in the last 20 years and grown from a mid-sized European to a truly international player.

The company's Automotive segment provides a range of electronic components such as circuit boards, controllers and dashboard instruments to a variety of automotive suppliers and automotive manufacturers. This segment sells its products directly through direct sales forces to key account customers. The company's Sensor Technol-ogy segment sells its products indirectly to other manufacturers of electronic compo-nents.

ECI offers a broad range of electronic components. However, from its inception until today the company is best known for intelligent wiring harnesses (IWH) which have been pivotal for the past 10 years' 'electronification' of cars with applications such as sensor-based tire pressure check, automated breaking inducement, distance control and the like. ECI's IWH segment accounts for 55-60% of the company's total produc-tion output and almost 70% of its revenues. On several occasions in the past, ECI ex-amined expanding their IWH product line to truck and heavy equipment applications and defense industries, but discarded the idea as these industries are essentially large-scale projects which would require ECI to safeguard large scale re-financing. This was felt too risky as it might dilute ECI's profitability and also have implications on capital commitment.

Despite a difficult economic climate and less global car sales in 2009 and 2010, ECI enjoyed two extremely successful years with demand for their products increasing. In fact, demand increased so much that ECI's European production facilities would not hold sufficient capacities to cope orders on hand. ECI could manage the production bottleneck by shifting manufacturing capacities from their Europe sites to assembly and low-skill manufacturing sites in Pakistan and Korea.

Electronics Co Int. Financial Statements for the Year ending 31 Dec 2011

Income Statement ('000€)

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Revenues					
Total Revenues	1.289.567	1.399.023	1.549.567	8,5%	10,8%
Cost of Sales					
Total Cost of Sales	-761.400	-808.486	-867.884	6,2%	7,3%
Gross Profit	528.167	590.537	681.683	11,8%	15,4%
Gross Margin	41,0%	42,2%	44,0%	1,25	1,78
Operating Expenses					
General & Administrative Expenses	-98.785	-102.615	-119.982	3,9%	16,9%
Sales & Marketing Expenses	-148.645	-159.510	-158.766	7,3%	-0,5%
Research & Development	-29.876	-45.661	-42.323	52,8%	-7,3%
Total Operating Expenses	-277.306	-307.786	-321.071	11,0%	4,3%
Operating Income	250.861	282.751	360.612	12,7%	27,5%
Operating Margin	19,5%	20,2%	23,3%	0,76	3,06
Interest Payments	-6.061	-11.370	-10.802	87,6%	-5,0%
Earnings before Taxes	244.800	271.381	349.810	10,9%	28,9%
Taxes	-29.055	-35.442	-55.427	22,0%	56,4%
Earnings/Net Profit	215.745	235.939	294.383	9,4%	24,8%
Profit Margin	16,7%	16,9%	19,0%	0,13	2,13

Cash Flow Statement (in '000€)

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Earnings	215.745	235.939	294.383	9,4%	24,8%
Non-cash Adjustments					
Depreciation	11.876	24.970	34.671	110,3%	38,9%
Other Adjustments	43	-16	39	-137,2%	343,8%
Net Cash Provided from Operations	227.664	260.893	329.093	14,6%	26,1%
Net Cash Provided from Financing	-3.129	-2.128	-977	-32,0%	-54,1%
Investing in Property, Plant & Equipment	-38.977	-78.444	-144.312	101,3%	84,0%
Change in Cash and Equivalents during Year	185.558	180.321	183.804	-2,8%	1,9%
Cash and Equivalents, beginning of year	68.788	254.346	434.667	269,8%	70,9%
Cash and Equivalents, end of year	254.346	434.667	618.471	70,9%	42,3%

Performance Ratios (in €)

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Revenue/Unit	209,61	212,30	217,84	1,3%	2,6%
Cost of Sales/Unit	123,76	122,68	122,01	-0,9%	-0,6%
Gross Profit/Unit	85,85	89,61	95,83	4,4%	6,9%
Sales & Marketing Expenses/Unit	24,16	24,20	22,32	0,2%	-7,8%
Administrative Expenses/Unit	16,06	15,57	16,87	-3,0%	8,3%
R&D/Revenue (%)	2,32%	3,26%	2,73%	0,95	-0,53
Net Profit/Unit	35,07	35,80	41,38	2,1%	15,6%

Company Statistics

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Units produced	6.152.320	6.589.970	7.113.459	7,1%	9,6%
FTE	5.200	5.350	5.900	2,9%	10,3%

Electronics Co Int. Environmental, Social & Governance Performance (ESG) for the Year ending 31 Dec 2011

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Percentage of business units analyzed for risks related to corruption	42,50%	41,20%	39,00%	-1,30	-2,20
Monetary value of significant fines for noncompliance with laws and regulations total in €k (incl. provision and use of products and services + non-compliance with environmental laws and regulations)	899	1.033	12.045	14,91%	1066,02%
Monetary value of significant fines for noncompliance with laws and regulations concerning the provision and use of products and services in €k	231	158	599	-31,60%	279,11%
Monetary value of significant fines for non-compliance with environmental laws and regulations in €k	569	602	9.875	5,80%	1540,37%
Direct consumption of electricity in terajoules	955	1.052	1.456	10,16%	38,40%
Total volume of significant spills in litres	1255	841	4999	-32,99%	494,41%
Total absence from scheduled work in %	2,60%	2,90%	4,10%	0,30	1,20
Total discharge of water without treatment or recycling in '000m³	710,0	844,0	1108,0	18,87%	31,28%
Percentage of operations identified as having significant risk for incidents of child labour	12,00%	16,50%	32,50%	4,50	16,00
Financial implications for the organization's activities due to climate change in €k	257.304	462.266	580.305	79,66%	25,53%
NOX emissions by weight in kilograms	441.000	512.360	788.000	16,18%	53,80%
Total weight of waste in metric tons (excl. waste that has been internally or externally recycled)	19.000,0	20.890,0	26.980,0	9,95%	29,15%
CO2 emission in '000 metric tons	64	71	83	10,94%	16,90%

ESG PERFORMANCE RATIOS

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Business units analyzed for risks related to corruption as number of FTEs	2.210	2.204	2.301	-0,26%	4,39%
Monetary value of significant fines for noncompliance with laws and regulations total in €k (incl. provision and use of products and services + non-compliance with environmental laws and regulations) as % of net profit	0,42%	0,44%	4,09%	0,02	3,65
Monetary value of significant fines for noncompliance with laws and regulations concerning the provision and use of products and services in €k as % of net profit	0,29%	0,13%	0,32%	-0,16	0,19
Monetary value of significant fines for non-compliance with environmental laws and regulations as % of net profit	0,72%	0,51%	5,27%	-0,21	4,76
Direct consumption of electricity in kWh/unit produced	79,5	83,5	107,0	5,03%	28,26%
Total volume of significant spills in litres per unit produced	0,20	0,13	0,66	-37,44%	414,50%
Total absence from scheduled work as mandays/FTE	6,8	7,5	10,7	11,54%	41,38%
Total water discharged without treatment or recycling in litres/unit produced	115,40	128,07	145,53	10,98%	13,63%
Operations identified as having significant risk for incidents of child labour as number of FTEs	624,0	882,8	1.917,5	41,47%	117,22%
Financial implications for the organization's activities due to climate change in €k as % of revenues	25,0%	40,0%	45,0%	15,00	5,00
NOX emissions by weight in gram/unit produced	71,7	77,7	103,5	8,47%	33,12%
Total weight of waste in g/unit produced	3.088,27	3.169,97	3.543,72	2,65%	11,79%
Total CO2 Emission in g/unit produced	10,40	10,77	10,90	3,57%	1,19%

Company Statistics

	FY 2009	FY 2010	FY 2011	+/- 09/10	+/- 10/11
Units produced	6.152.320	6.589.970	7.613.459	7,1%	9,6%
FTE	5.200	5.350	5.900	2,9%	10,3%

Question 1:

How do you evaluate Electronics Co Int. on a scale from 0 to 100 (with 0 being 'poor investment' and 100 being 'excellent investment')?

Question 2:

This question refers to the evaluation of **all other participants** in this valuation exercise who are **in the same room as you are**.

Please provide us with your opinion about the average evaluation of Electronics Co Int. from the other participants:

What is the **average evaluation** of Electronics Co Int. from **all other participants in this room** on the scale from 0 to 100 (with 0 being 'poor investment' and 100 being 'excellent investment')?

As it is likely that not all other participants have provided exactly identical evaluations on Electronics Co Int., please also provide us with your opinion about **the spread of the participants' evaluations**.

In particular, we would like to know your estimation of **the highest and the lowest evaluation of all participants** (including yourself) for Electronics Co Int. in this room.

Please complete the following two statements:

The lowest evaluation given by all participants (including myself) in this room is

The highest evaluation given by all participants (including myself) in this room is

Please also indicate your agreement with the following statement:

I am very confident about the three estimations I made on this page.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Fully disagree   Fully agree

END OF PART I

PLEASE CLOSE YOUR EXERCISE BOOKLET SO THAT THE INSTRUCTOR CAN SEE THAT YOU HAVE FINISHED THE FIRST PART OF THE VALUATION EXERCISE.

PART II

Question 3:

You have just been shown the **average evaluation as well as the lowest and the highest evaluation** of all participants for Electronics Co Int.

This information may or may not correspond to the estimations you made before. Given this additional information about the other participants' evaluations, you will now have the opportunity to **revise the evaluation** which you provided for Electronics Co Int. in Question 1.

You may refer back to re-check your evaluation. You are also allowed to refer back to the information provided about Electronics Co Int.

Please indicate your revised evaluation in the box below. If you do not want to change your original evaluation please enter the same evaluation in the box as before (Question 1).

Please recall that your answers will remain completely anonymous and that we will not be able to link your answers to identity.

My revised evaluation for Electronics Co Int. on a scale from 0 to 100 (with 0 being 'poor investment' and 100 being 'excellent investment') is:

Question 4:

Again, we are also interested in your opinion about the **revised evaluations** of all other participants who are **in the same room as you are**.

Please provide us with your opinion about the average revised evaluation of Electron-ics Co Int. Recall that after receiving the additional information, all participants – just as you – could either adjust their evaluations or not.

What is the **average revised evaluation** of Electronics Co Int. from **all other participants in this room** on the scale from 0 to 100 (with 0 being 'poor investment' and 100 being 'excellent investment')?

Again, please also provide us with your expectations about the spread in the revised evaluations of Electronics Co Int. from all participants.

Please complete the following two statements:

The lowest revised evaluation given by all participants (including myself) in this room is

The highest revised evaluation given by all participants (including myself) in this room is

Please also indicate your agreement with the following statement:

I am very confident about the three estimations I made on this page.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Fully disagree   Fully agree

Additional questions:

Thank you for having participated in the valuation exercise. Finally, we would like to ask you to provide a few personal details. The answers to these questions are only relevant for statistical purposes. Recall that your answers will remain completely anonymous and that we will not be able to link your answers to identity.

What is the number of years of your experience with equity valuation and/or investing?

What is your occupation?

Sell-side analyst

Buy-side analyst

Equity strategist

Fund manager

Asset manager

Portfolio manager

Other, please specify: _____

Please indicate your agreement with the following statements:

Corporate sustainability is an important concept for long-term value creation.

1	2	3	4	5	6	7

Fully disagree   Fully agree

CSR data (environmental, social and governance data) provide important contribu-tions to thorough company valuation.

1	2	3	4	5	6	7

Fully disagree   Fully agree

The valuation task was difficult.

1	2	3	4	5	6	7

Fully disagree   Fully agree

The valuation case was realistic.

1	2	3	4	5	6	7

Fully disagree   Fully agree

I was highly motivated to participate in this exercise.

1	2	3	4	5	6	7

Fully disagree   Fully agree

Selbstdeklaration bei kumulativen Promotionen im Fachbereich Sozialwissenschaften (§6 (3) PromO)

Konzeption / Planung: Formulierung des grundlegenden wissenschaftlichen Problems, basierend auf bisher unbeantworteten theoretischen Fragestellungen inklusive der Zusammenfassung der generellen Fragen, die anhand von Analysen oder Experimenten/Untersuchungen beantwortbar sind. Planung der Experimente/ Analysen und Formulierung der methodischen Vorgehensweise, inklusive Wahl der Methode und unabhängige methodologische Entwicklung.

Durchführung: Grad der Einbindung in die konkreten Untersuchungen bzw. Analysen.

Manuskripterstellung: Präsentation, Interpretation und Diskussion der erzielten Ergebnisse in Form eines wissenschaftlichen Artikels.

Die Einschätzung des geleisteten Anteils erfolgt mittels Punkteinschätzung von 1 – 100 %, wobei die Skalierung von A-C wie folgt zu verstehen ist:

Die Eigenleistung liegt bei 67-100%:   A

Die Eigenleistung liegt bei 31-66%:   B

Die Eigenleistung liegt bei 5-30%:   C

Paper 1

A Research Agenda for Behavioral Biases' Effects on Investors' Responses to CSR Disclosure *(Ralf Frank)*

Konzeption/Planung	A
Durchführung	A
Manuskripterstellung	A

Paper 2

Timing Effects of Corporate Social Responsibility Disclosure: An Experimental Study with Investment Professionals *(Markus C. Arnold, Alexander Bassen, Ralf Frank)*

Konzeption/Planung	B
Durchführung	A
Manuskripterstellung	C

Paper 3

How Graphics Can Influence Investment Professionals' Valuations under Time Pressure: Evidence from an Eye-tracking Study *(Christoph Hörner, Ralf Frank)*

Konzeption/Planung	A
Durchführung	C
Manuskripterstellung	B

Paper 4

The Benefits and Limits of Market Feedback for Investment Professionals' Valuations and Market Estimations: The Case of Corporate Social Responsibility (Markus C. Arnold, Alexander Bassen, Ralf Frank)

Konzeption/Planung	C
Durchführung	B
Manuskripterstellung	A

Die vorliegende Einschätzung in Prozent über die von mir erbrachte Eigenleistung wurde mit den am Artikel beteiligten Koautoren einvernehmlich abgestimmt.

Frankfurt am Main/04.01.2021
_____
Ort/Datum

_____
Unterschrift Doktorand/in