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Enhancement of corporate decision making –  
Three essays on ability-based group composition, assessment criteria for  
payment scheme efficiency, and factors for employee pay satisfaction

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# 1 Introduction

## 1.1 Necessity for enhancement and optimization of corporate decision making

*"Policy makers, like most people, normally feel that they already know all the psychology and all the sociology they are likely to need for their decisions. I don't think they are right, but that's the way it is." - Kahneman (2013)*

The quote by Nobel laureate Daniel Kahneman nicely describes one major reason why research in the field of economics and management is inevitable, equipping executives and managers with fundamental insights when making informed and fact-based decisions on behalf of corporate institutions. When people make fast and effortless decisions, these are often based on intuition and heuristics, the so-called "system 1", possibly resulting in low quality decision making. Especially in corporate decision making, executives and managers relying on their intuition might decide faster, however, not necessarily in the best interest of the respective corporate institutions. Thus, whenever possible, it is of the utmost importance to base decisions on comprehensible facts, most likely derived from scientific studies, where scholars are supposed to engage in effortful thinking and to utilize thorough reasoning, the so-called "system 2" (Kahneman, 2003).

Enhancement of decision making has been addressed by many scholars in various research areas, such as optimal compensation of executives (Aggarwal & Samwick, 1999; Cao & Wang, 2013; Dittmann, Maug, & Spalt, 2010), of salesforce (Dai & Jerath, 2013; Raju & Srinivasan, 1996) and military personnel (Carrel & West, 2005; Jaquette & Nelson, 1976), optimal pay-performance sensitivities (Dutta, 2008; Ju & Wan, 2012), optimal alignment of executive compensation with shareholder interests (Dutta & Reichelstein, 1999, 2005; Reichelstein, 1997; Rogerson, 1997), optimal corporate capital structures (John & John, 1993; Krouse, 1972), optimal corporate governance structures (Almazan & Suarez, 2003; Misangyi & Acharya, 2014), optimal R&D policies (Bhaskaran & Krishnan, 2009; Bhattacharya, Gaba, & Hasija, 2015), or optimal portfolio decisions (Bacchetta & van Wincoop, 2010; Miller, 1975). This thesis contributes to the ever-growing knowledge base of scientific literature on the enhancement and optimization of corporate decision making by addressing three specific topics, two precisely defined research endeavors using one laboratory experiments and one meta-analysis, and one literature review aggregating findings from past decades on the issue of employees' fairness concerns when it comes to designing wage payment schemes.

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## 1.2 Research questions and methods

### 1.2.1 The impact of ability-based group matching procedures on moral hazard

Group or team compositions as one of the major issues both for practice and research has been studied from many perspectives (see Mathieu, Tannenbaum, Donsbach, & Alliger, 2014, for an overview on several perspectives and Prendergast, 1999, for an incentive-based view). Beginning with the seminal work by Alchian and Demsetz (1972), Holmstrom (1982), and Newhouse (1973), moral hazard is one of the most fundamental concerns regarding the examination of team work. However, multiple influential factors on the degree of moral hazard have been identified by extant literature. Thus, the found levels of moral hazard in team settings depend on factors such as the institutional setting (see Gächter, 2007, for an overview), fairness preferences (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999), or on the expectations on the behavior of other participants (Fischbacher & Gächter, 2010; Frey & Meier, 2004; Keser & van Winden, 2000).

While the management literature has identified various other important factors such as the group or team members' competencies and personality traits (Barrick, Stewart, Neubert, & Mount, 1998; Barry & Stewart, 1997; Bradley, Klotz, Postlethwaite, & Brown, 2013; Gächter & Thöni, 2005), learning and imitation (Bresman, 2010; Millhiser, Coen, & Solow, 2011), creativity (Miron-Spektor, Erez, & Naveh, 2011), or knowledge sharing (Cummings, 2004; Quigley, Tesluk, Locke, & Bartol, 2007; Rulke & Galaskiewicz, 2000), moral hazard is clearly a key issue in teams.

Many laboratory experiments on the impact of productivity-based matching procedures in the context of relative performance evaluation and tournaments have been conducted (Backes-Gellner & Pull, 2013; Brown, 2011; Casas-Arce & Martínez-Jerez, 2009; Cason, Masters, & Sheremeta, 2010; Hammond & Zheng, 2013; Knoeber & Thurman, 1994; Levy & Vukina, 2004; Schotter & Weigelt, 1992; Sunde, 2009). However, the influence of productivity- or ability-based matching procedures in group production settings has not yet been addressed by any study in a rigorously designed experiment. Only two studies by Fellner, Iida, Kröger, and Seki (2011) and Kölle (2015) consider the impact of productivity-based matching procedures, however, only in VCM-games and with a different focus than on the levels of moral hazard.

While researchers identified motivational factors in groups explaining findings on varying levels of moral hazard, such as efficiency concerns (Charness & Rabin, 2002; Engelmann &



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Strobel, 2004; Reuben & Riedl, 2013), other regarding preferences (Bayer, Renner, & Sausgruber, 2013; Ferraro, Rondeau, & Poe, 2003; Fischbacher & Gächter, 2010; Goeree, Holt, & Laury, 2002; Palfrey & Prisbrey, 1997), or so-called “conditional cooperators” behaving less selfishly when they know or assume that other individuals cooperate as well (Fischbacher & Gächter, 2010; see Gächter, 2007, for an overview), the motivational factor of ability-based group matching procedures has yet been neglected.

Group composition and its effects on contributions to joint group production, helping behavior, or conflict are subject to a huge body of social psychological research. Social categorization, “in-group love” versus “out-group hate”, or “in-group favoritism” are examples showing that the composition of groups strongly affects outcomes (e.g., Böhm, Rothermund, & Kirchkamp, 2013; Weisel & Böhm, 2015), and this even extends to children (Buttelmann & Böhm, 2014). An important insight of the literature on group cohesion is that people are more motivated to cooperate with individuals who share their own attributes (Chandler, Griffin, & Sorensen, 2008; Jones, Pelham, Carvallo, & Mirenberg, 2004). This effect has even been identified for similarities which are basically meaningless such as the name-letter-effect (Nuttin, 1987), social status and productivity (Flynn, 2003), social preferences (Gächter & Thöni, 2005), or birthdays (Miller, Downs, & Prentice, 1998). If even these rather superficial similarities induce cooperation, this seems all the more plausible for similarities based on ability levels. Furthermore, studies on swift trust (Jarvenpaa & Leidner, 1999; Robert, Denis, & Hung, 2009) find that people tend to trust more if their counterparts share attributes with themselves. Transferring and applying those findings to the identified research gap, leads to the first research question:

*(1) Do homogeneous and heterogeneous ability-based matching procedures (i.e., grouping individuals into groups) have a motivational impact on levels of moral hazard in group production tasks?*

This thesis examines this research question with an rigorously designed chosen-effort laboratory experiment with the implementation of two discrete ability types: High-ability types (H) and low-ability types (L). Except for the matching procedure, all other potentially influential factors are kept constant. Participants could have four different roles in the group setting: High-ability type matched with another high-ability type (HH), high-ability type matched with a low-ability type (HL), low-ability type matched with another low-ability type (LL) and low-ability type matched with a high-ability type (LH). Controlling for the potential

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effects of participants' origin of endowments in experiments (Cappelen, Hole, Sørensen, & Tungodden, 2007; Cherry, Frykblom, & Shogren, 2002; List, 2007), in this study represented by the endowed productivity, this thesis conducts the experiment in two different ways how productivity is allocated to participants: Random assignment and earned roles, where participants are allocated to ability groups by chance and where participants are allocated to ability groups based on their performance of an intelligence test, respectively. Thus, this study purely investigates the effect of two extreme cases of possible group matching procedures: Completely homogeneous vs. completely heterogeneous ability-based groups. The experimental design allows for a clear-cut distinction of ability (or productivity) and effort decision. Thus, acknowledging that this restrictive setting ignores many real-life benefits of groups, it is precisely this ignorance that allows the pure investigation the impact of vertical heterogeneity in ability and its motivational effects on moral hazard.

### **1.2.2 Measurements for evaluating the superiority of different payment schemes**

Behavioral economic literature has mostly focused exclusively on the impact of different payment schemes on participant performance (Bonner & Sprinkle, 2002; Garbers & Konradt, 2014). Performance, defined and measured as the subjects' output, as the commonly agreed upon variable of choice when evaluating different payment schemes in laboratory experiment has served as the key figure to infer both theoretical and practical recommendations for organizations. The prevailing opinion in the behavioral economics literature is that payment schemes using performance-contingent rewards (e.g., piece rates) are superior to fixed wage schemes due to higher subject performance elicited in experiments (Condly, Clark, & Stolovitch, 2003; Garbers & Konradt, 2014). Thus, according to the relevant literature, performance-contingent rewards should be integrated in organizational payment schemes (Jenkins, Mitra, Gupta, & Shaw, 1998). Interestingly, however, both dating back and recent studies (e.g., Bailey, Brown, & Cocco, 1998; Ockenfels, Sliwka, & Werner, 2015) note that performance should not be the sole measure to decide on the superiority of payment schemes without further considerations. However, research has not yet addressed this issue specifically, although economists have been discussing and researching optimal contracts for decades in the model-driven economics literature (starting with Coase, 1937; Jensen & Meckling, 1976). Thus, performance as the exclusive measure to assess a payment scheme's effectiveness in organizations might be flawed and spurious, leading to invalid conclusions. It is questionable if higher employee performance under a certain payment scheme does actually

coincide with a higher value of the respective payment scheme for organizations, since only a better cost-efficiency effectuates higher economic value for organizations (Hillman & Keim, 2001).

Surprisingly, even though monetary concerns are deemed as one of the most important factors for economic choices (Charness, 2004), previous studies in the field of behavioral economics have mostly examined payment schemes regarding the influence on performance, not organizational cost. Thus, it is obvious that “we need studies that address the cost-benefit of incentive programs” (Condly et al., 2003, p. 59) to provide more sophisticated and more balanced recommendations for organizations being confronted with the decision to implement payment schemes. Although maximizing corporate value is one of the main objectives of organizations, most research does not concentrate on the cost resulting from employed payment schemes. Since research has found that monetary incentives need to have a certain magnitude to actually influence subject performance (Fehrenbacher & Pedell, 2012; Gneezy & Rustichini, 2000), the question arises whether a performance-contingent payment scheme has a sufficiently high impact on productivity in order to enhance its cost-efficiency, i.e., being a driving force for corporate value.

A large body of literature has attempted to synthesize existing research on payment schemes. Such attempts started approximately 50 years ago with the review of Opsahl and Dunnette (1966) assessing the effects of financial compensation on employee motivation. Their article was the first of many qualitative reviews (e.g., Bonner & Sprinkle, 2002; Camerer & Hogarth, 1990; Ilgen, 1990; Jenkins, 1986) proving the link between payment schemes and performance. More recent attempts to examine the relationship in question are based on quantitative meta-analytical techniques (e.g., Bonner, Hastie, Sprinkle, & Young, 2000; Cameron & Pierce, 1994; Jenkins et al., 1998; Weibel, Rost, & Osterloh, 2010). Beyond examining the rather straightforward link between payment schemes and performance, other interesting aspects of payment schemes have been investigated in reviews such as goal setting and task performance (Locke, Shaw, Saari, & Latham, 1981), task attractiveness and job performance (Judge, Thoresen, Bono, & Patton, 2001), feedback interventions and the effect on performance (Kluger & DeNisi, 1996), or individual versus team-based financial incentives (Garbers & Konradt, 2014). However, the economic impact of different payment schemes has not yet been examined using meta-analytical techniques. To the best of our knowledge, even primary research on this issue is scarce. The relevant measure for any profit-

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based organization is the cost-efficiency of a payment scheme. Recently, Fehrenbacher and Pedell (2012) called for an incorporation of the cost of incentive systems when assessing effects on performance, deeming the issue relevant for future research and leading to the second research question:

(2) *How should different corporate payment schemes be assessed and evaluated and what measures did behavioral economics studies consider when providing managerial recommendations based on research findings?*

This thesis aims to integrate the results of the numerous studies in this field, a task which is more valuable “than adding a new experiment or survey to the pile” (Glass, 1976, p. 4). Specifically, this thesis performs a meta-analysis to examine the impact of piece rate and fixed wage schemes investigated in previous studies on the consistently reported subject performance. Preparing also the corresponding, however not explicitly reported, data on the respective impact of the two payment schemes on the resulting cost-per-unit ratio, the necessary information from the papers, from the data, and from the inquiries to the corresponding authors are collected.

### **1.2.3 Employees' fairness concerns with corporate payment schemes**

Fairness concerns have been identified to be amongst the key drivers of society for millenniums (Plato, 2006). Various human reactions to fairness can even be traced back to human's primate background (Brosnan & de Waal, 2014). Though, fairness concerns are omnipresent, people frequently struggle in elucidating them (Rogers, 2014). Amongst scholars, justice has been subject to controversy. Justice scholars are facing the challenge of not working with an unified and reliable measurement system and a common nomenclature (Colquitt, 2001). For instance, the terms *justice* and *fairness* are sometimes employed interchangeably, sometimes with slightly varying meanings. As suggested by Rawls (1971), however, this thesis utilizes both terms synonymously. Disputes about the relevant factors of organizational justice and the lack of a unified and reliable measurement system “(...) *have hindered theoretical and practical advancement in the literature*” (Colquitt, 2001, p. 396). *Furthermore scholars struggle with the large variety and the heterogeneous content of justice literature. “(...) the large number of studies and the different theoretical perspectives raise the concern that justice scholars may be “losing the forest for the trees”. (...) many central*

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*questions remain either unaddressed or unclear*” (Colquitt, Wesson, Porter, Conlon, & Ng, 2001, p. 427). Recently, studies focused on granular aspects of justice theory, like for instance the triggering of organizational citizenship behavior or counterproductive work behavior by fairness perceptions (e.g., Ambrose, Schminke, & Mayer, 2013; Cole, Carter, & Zhang, 2013; Khan, Quratulain, & Bell, 2014; Rupp, Shao, Jones, & Liao, 2014; Sun, Chow, Chiu, & Pan, 2013; Van Dijke, De Cremer, Mayer, & Van Quaquebeke, 2012). Several studies attempted to integrate research findings into more general concepts. However, most of them rather focus on the integration of sub-aspects, like distributive justice, than on designing a holistic cause-effect relationship model (e.g., Li, Cropanzano, & Bagger, 2013; Poon, 2012; Yang, Treadway, & Stepina, 2013). Though, there have been very few papers analyzing the relations between justice perceptions and outcomes (Whitman, Caleo, Carpenter, Horner, & Bernerth, 2012), Colquitt et al. (2013) attempt to integrate research results into a cause-effect relationship model of fairness. Nevertheless, the model by Colquitt et al. (2013) does not cover all aspects addressed by fairness research. Furthermore, papers trying to integrate isolated research findings into more general fairness models do not explicitly address fairness concerns within payment schemes, but rather aim at describing sub-aspects or single event-based situations (e.g., Bobocel, 2013; Matta, Erol-Korkmaz, Johnson, & Biçaksiz, 2014). In order to address these issues, this thesis aggregates and structures the current status of justice research and displays it in a cause-effect relationship model which aims to provide a holistic overview of already proven implications of fairness concerns on observable behavior in the context of payment schemes. To the best knowledge, this is the first attempt to integrate all relevant research results and to merge these in a model of cause-effect relationships, particularly addressing the impact of fairness concerns, leading to the third research question:

*(3) What are the influential factors identified by previous research when designing corporate remuneration schemes with respect to employees' fairness concerns?*

Developing a fairness model of payment schemes, this thesis pursues the works of Hollensbe, Khazanchi, and Masterson (2008) and Cohen-Charash and Spector (2001). The thesis analyzes the empirical justice literature in order to derive a holistic model regarding the causes and consequences of perceived fairness by employees in a payment scheme context. By summarizing the knowledge about justice concepts in general, linking justice concepts to justice dimension defined by research, introducing the fairness model of payment schemes

displaying the empirically examined implications of fairness concerns on behavior and describing the model in depth, a review of the currently state of extant literature is set up. Based on the developed cause-effect relationship model, research gaps can easily be identified, hypothesis in both field and laboratory studies can be derived, and management practitioners are enabled to grasp quick insights from scientific literature. Finally, a framework on how to address fairness concerns in payment schemes for practitioners is provided and the limitations of the model are elaborated, thereby highlighting necessary future research directions for advancing extant literature and providing well-grounded recommendations for practice.

### **1.3 Contribution and structure of the thesis**

This thesis contributes to the perpetual question how to match employees based on their abilities into groups considering motivational factors to enhance companies' productivity and benefits (1), to the question how to assess and evaluate the superiority of corporate payment schemes from a shareholder perspective (2), and to crucial considerations when designing or adapting corporate remuneration schemes when taking employee fairness perceptions into account (3).

This thesis addresses the raised research questions in the previous sections. The outline is as follows: Chapter 2 empirically investigates the motivational factor and the impact of ability-based matching procedures of individuals into groups in group production tasks on the moral hazard problem with an rigorously designed experiment, filling the research gap of ability-based group composition. Chapter 3 employs a meta-analytic approach to discuss and shed light on the issue assessing and evaluating the superiority of different payment schemes and critically reviews the extant literature, emphasizing the necessity to only carefully derive recommendations based on empirical research when relevant criteria are neither reported nor thoroughly discussed. Chapter 4 provides an overview of influential factors identified by previous research on employees' fairness perception in the context of corporate remuneration schemes, enabling both scholars and practitioners with a integrative cause-effect relationship model to either identify research gaps and derive hypotheses or to grasp aggregated insights from previous research. Chapter 5 concludes by summarizing the main results of the studies and discussing their implications for future research and practice.

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## 2 Ability, group composition, and moral hazard: Evidence from the laboratory<sup>1</sup>

### 2.1 Introduction

Superiors often need to group their subordinates into teams, in which the outcome depends on the ability and the effort of all group members. Presuming that subordinates have different levels of ability and that superiors try to maximize the overall performance of groups, one important question is whether individuals should rather be allocated into groups with homogeneous or heterogeneous ability levels. We have designed a laboratory experiment that allows isolating the impact of heterogeneity with respect to abilities on moral hazard in groups. In line with our hypotheses, we find that both high- and low-ability types invest higher effort in homogeneous groups. Thus, as far as moral hazard is concerned, heterogeneity is counter-productive.

Since the composition of groups or teams is a major issue both for practice and research, it has been studied from many perspectives (see Mathieu et al., 2014, for an overview on several perspectives and Prendergast, 1999, for an incentive-based view). The most fundamental concern with teams is moral hazard – as the output is shared among group or team members, each selfish individual has an incentive to invest inefficiently low effort due to the positive externality of his effort on other team members (Alchian & Demsetz, 1972; Holmstrom, 1982; Newhouse, 1973). The degree of moral hazard is known to depend on multiple factors such as the institutional setting (see Gächter, 2007, for an overview), fairness preferences (Bolton & Ockenfels, 2000; Fehr & Schmidt, 1999), and on the expectations on the behavior of other participants (Fischbacher & Gächter, 2010; Frey & Meier, 2004; Keser & van Winden, 2000).

While moral hazard is clearly a key issue in teams, the management literature has identified various other important factors such as the team members' competencies and personality traits (Barrick et al., 1998; Barry & Stewart, 1997; Bradley et al., 2013; Gächter & Thöni, 2005), learning and imitation (Bresman, 2010; Millhiser et al., 2011) and creativity (Miron-Spektor et al., 2011), and knowledge sharing (Cummings, 2004; Quigley et al., 2007; Rulke & Galaskiewicz, 2000). We will discuss some additional literature in the concluding section, when we assess the value added of our findings.

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<sup>1</sup> This chapter is based on a working paper authored by Dominik Doll and co-authored by Eberhard Feess and Alwine Mohnen. My contribution to the paper is summarized in the Appendix (signed by the authors in the examiners' copies of this dissertation).

Notwithstanding the importance of the more complex factors discussed in the papers just mentioned, we deliberately restrict attention to a clean identification of the impact of ability-based group matching on the degree of moral hazard. To this end, it is constructive to design an experiment that neglects all factors going beyond moral hazard. Specifically, we impose two main experimental restrictions: First, we assume that the total outcome of each group is just the sum of the outcome of its members, i.e., we neglect any kind of synergies and cooperation. Ability is implemented as a vertical differentiation of productivity, so that we ignore all potential benefits arising from horizontally differentiated abilities. Second, participants do not need to perform a real effort task, but decide on effort (investments) in monetary terms, as this allows for a clear-cut distinction of ability (or productivity) and effort, which is notoriously difficult in real effort tasks (see Gächter, Huang, & Sefton, 2015, for an innovative combination of induced and real effort). We fully acknowledge that our restrictive setting ignores many real-life benefits of groups, but it is precisely this ignorance that allows us to investigate the pure impact of vertical heterogeneity in ability on moral hazard.

Before we derive our hypotheses in the next section, let us briefly describe our experimental settings. In all settings, we first consider a benchmark treatment where participants are reimbursed on an individual basis. As effort costs are convex, there exists an effort level that maximizes the payoff as the difference between output and effort costs decreases in the effort level. Since there is no uncertainty and as participants are reimbursed on an individual basis in this first part of the experiment, they can easily calculate the payoff-maximizing effort. There is no room for social preferences as there are no groups, and hence no externalities. We use this part of the experiment solely as a benchmark for analyzing the effort reduction caused by different group compositions.

In the second part, we apply two different assignment (allocation) settings, random assignment of ability levels and “earned-roles”-assignment of ability levels. The main motivation for these two different allocation mechanisms is owed to the literature showing that pro-social behavior is influenced by whether the participants perceive asymmetric situations as “earned” or as an unjustified “windfall” advantage or disadvantage (Cappelen et al., 2007; Cherry et al., 2002; List, 2007). Thus, the relative benefits and drawbacks of heterogeneous and homogeneous groups may be influenced by how the participants are allocated to the different roles.



In the random setting, three types of groups consisting of two people each are randomly formed; two kinds of homogenous groups consisting either only of low or of high ability types, and a heterogeneous group with one low- and one high type. In all groups, each participant bears his own effort costs, while the total output is equally shared among both group members. This induces a moral hazard problem, so that the individually optimal effort of selfish individuals is below the one that maximizes a group's overall payoff. As the total output is simply the sum of the two individual outputs, the optimal effort of selfish individuals is independent of whether groups are homogenous or heterogeneous, because the counterpart's behavior has no impact on the marginal return on effort. Thus, any differences in the efforts in the three different group compositions can exclusively be attributed to the (psychological) impacts of heterogeneity, but neither to (changed) incentives nor to efficiency concerns. This is the main advantage of our restrictive experimental setting.

Due to the assumption that marginal returns are higher for high-ability types than for low types, efficiency requires that high types invest higher effort. Such a design seems reasonable as higher marginal returns are a straightforward way to implement differences in ability levels. Moreover, the fact that high types should invest higher effort does not lead to identification problems for our research question, because we do not compare low and high types, but homogeneous and heterogeneous groups. Thus, we compare effort choices within types, and not between types.

In the earned-roles allocation setting, participants are no longer randomly assigned to high- or low-ability levels. Instead, we perform beforehand Raven's Advanced Progressive Matrices™-test (APM-test, for short) which is a widely accepted test for cognitive ability (Raven, Raven, & Court, 2004). Then, those 50% who performed best are assigned as high-ability types, and this information is revealed to the participants before they perform the APM-test. All treatments are complemented by simple experimental tests and questionnaires, which allow us to investigate potential impacts of personal attributes such as trust and attitudes towards risk on the behavior.

The remainder of our paper is organized as follows: In section 2.2, we derive our Hypotheses and relate those to the literature. Section 2.3 explains the experimental design. Results are discussed in section 2.4. We conclude in section 2.5.

## 2.2 Hypotheses

While there are many laboratory experiments on the impact of productivity-based matching procedures in the context of relative performance evaluation and tournaments (Backes-Gellner & Pull, 2013; Brown, 2011; Casas-Arce & Martínez-Jerez, 2009; Cason et al., 2010; Hammond & Zheng, 2013; Knoeber & Thurman, 1994; Levy & Vukina, 2004; Schotter & Weigelt, 1992; Sunde, 2009), we are not aware of another paper that analyzes the influence of heterogeneity and random versus earned-roles on moral hazard in groups. Fellner et al. (2011) and Kölle (2015) consider the impact of productivity-based matching procedures, but in VCM-games and with a different focus. Hence, we draw our hypotheses from the more general literature on moral hazard in groups and social preferences (Hypothesis 1) and, most importantly, from the theory of team cohesion (Hypothesis 2).<sup>2</sup>

### 2.2.1 Moral hazard in teams and social preferences

Since the first theoretical models on moral hazard (Alchian & Demsetz, 1972; Holmstrom, 1982; Newhouse, 1973), the free-rider problem is at the core of the economic analysis of team production. As the output is shared among team members while effort costs are borne individually, each selfish individual has an incentive to invest effort below the level that maximizes the joint benefit of the team. Many laboratory experiments have documented that free-rider incentives indeed reduce efficiency, and this motivates our Hypothesis 1a below.

The same experiments, however, have also documented that several kinds of social preferences mitigate the susceptibility to moral hazard. For VCM- and trust-experiments, the literature has identified motives such as efficiency concerns (Charness & Rabin, 2002; Engelmann & Strobel, 2004; Reuben & Riedl, 2013) and other regarding preferences (Bayer et al., 2013; Ferraro et al., 2003; Fischbacher & Gächter, 2010; Goeree et al., 2002; Palfrey & Prisbrey, 1997). These motives suggest that we observe effort levels above those which maximize individual payoffs (Hypothesis 1b).

Finally, it has been demonstrated that many individuals (so-called “conditional cooperators”) behave less selfishly when they know or assume that other individuals cooperate as well

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<sup>2</sup> We fully acknowledge that our group setting deviates from “moral hazard in team” (based on Alchian and Demsetz, 1972; Newhouse 1973; Holmström, 1982). Of course, as our production function is additively-separable, one could easily implement separate piece rates, thereby eliminating the free-rider problem. However, we preferred not to use a production function with positive cross partial derivatives as the decisions that maximize individual payments are then interdependent, which makes identifiably a far more difficult issue.

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(Fischbacher & Gächter, 2010; see Gächter, 2007, for an overview). Following these insights, we claim that the own effort level increases in the *belief* on the effort chosen by the partner (Hypothesis 1c).

### **Hypothesis 1: Effort in groups**

*1a) For each of the three group compositions, the effort level is below the effort level with individual payment.*

*1b) For each of the three group compositions, the effort level is above the effort level that would be chosen by selfish individuals.*

*1c) The effort level is increasing in the belief on the effort invested by the other group member.*

Hypothesis 1 should hold for all groups, irrespectively of whether they are homogenous or heterogeneous.

#### **2.2.2 Team cohesion and swift trust**

Hypothesis 2, by contrast, which is at the heart of our analysis and which is based on team cohesion, refers to *differences* in homogenous and heterogeneous groups. Recall that the effort level that maximizes the own expected payoff is completely independent from group composition, and also independent from the other group member's behavior, i.e., the incentive structure is entirely independent of the group composition.

Group composition and its effects on contributions, helping behavior or conflict are subject to a huge body of social psychological research. Social categorization, “in-group love” versus “out-group hate”, or “in-group favoritism” are examples showing that the composition of groups strongly affects outcomes (e.g., Böhm et al., 2013; Weisel & Böhm, 2015), and this even extends to children (Buttelmann & Böhm, 2014). An important insight of the literature on group cohesion is that people are more motivated to cooperate with individuals who share their own attributes (Chandler et al., 2008; Jones et al., 2004). This effect has even been identified for similarities which are basically meaningless such as the name-letter-effect (Nuttin, 1987), social status and productivity (Flynn, 2003), social preferences (Gächter & Thöni, 2005), or birthdays (Miller et al., 1998). If even these rather superficial similarities induce cooperation, this seems all the more plausible for similarities based on ability levels.

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Finally, studies on swift trust (Jarvenpaa & Leidner, 1999; Robert et al., 2009) find that people tend to trust more if their counterparts share attributes with themselves. Transferring those findings to our experimental setting, we expect a lower exposure to moral hazard in homogenous groups. Hence, given the identical incentive structure in our treatments, these insights from the literature on group cohesion and swift trust support the following Hypothesis:

**Hypothesis 2: Effort in homogeneous vs. heterogeneous groups**

*Compared to individual effort decisions, the effort reduction is lower (both for high- and low-ability types) in homogeneous groups.*

For several kinds of laboratory experiments, previous research has shown that pro-social behavior based on team cohesion and fairness may substantially be influenced by whether the participants perceive asymmetric situations as earned or rather as arbitrary (Cappelen et al., 2007; Cherry et al., 2002; List, 2007). For example, subjects place less weight on equality concerns (Burrows & Loomes, 1994; Hoffman & Spitzer, 1985) or are less likely to opt for redistribution (Alesina & Angeletos, 2005; Fong, 2001) in case endowments or roles are earned by experimental tasks. Thus, we consider a treatment where the assignment to high- and low-ability levels is endogenous based on a cognitive real effort task (APM-test). We expect the subjects' decision to be more individually selfish as endowments are legitimate, thus, more in line with economic predictions, when in the treatment with earned roles than in the arbitrary assignment.

**Hypothesis 3: Random assignment vs. earned roles**

*3) Compared to random assignment, the effort reduction in groups is higher when roles are earned.*

**2.3 Experimental design**

We conducted two different settings, one with random assignment to the two productivity levels, and one where the assignment depends on the performance in the APM-test. 186 students participated in eight groups in the setting with random assignment and 188 students in eight groups in the setting with earned roles, so that we have overall 374 participants. Students were recruited at a large German university using the software tool ORSEE (Greiner,

2004). The experiment was conducted with the software z-Tree (Fischbacher, 2007). The experimental sessions lasted about 75 minutes and average earnings amounted to € 12.26. In the experiment, we used Taler instead of Euros, which were then converted with an exchange rate of 1 Taler = 0.04 Eurocent. Participants received a show-up fee of 1 Euro. Each experimental session consisted of nine parts as summarized in Table 2.1. At the beginning of the experiment, participants were only informed that the experiment consists of different steps, but neither about the number of steps nor about the content of subsequent steps.

In the following, we describe the steps for random assignment. The only difference in the earned-role setting is that the APM-test was carried out in Step 2, and that the results in this test determine the assignment to the high- and the low-ability level in the group setting. As for this, the APM-test was already performed in Step 2. In addition, in the earned-role treatments the participants learned that the performance in the APM-test will have further consequences in later stages of the experiment. All other steps of the experiment were then identical to those in treatments with random allocation (study 1).

	<b>Objective</b>	<b>Implementation</b>
<b>Step 1</b>	Elicitation of trust and trustworthiness	Binary trust game
<b>Step 2</b>	Ensuring comprehension of production function	Control questions and two test decisions with feedback
<b>Step 3</b>	Benchmark: Effort decision with individual payment	Individual effort
<b>Step 4</b>	Ensuring comprehension of production function of in groups	Control questions
<b>Step 5</b>	Effort decision with group production	Effort in groups
<b>Step 6</b>	Measuring real ability	APM-test
<b>Step 7</b>	Elicitation of inequality aversion	Inequality test
<b>Step 8</b>	Ex post belief elicitation on average change of participants' effort decisions	Belief elicitation
<b>Step 9</b>	Information on personal attributes and demographics	Questionnaire

**Table 2.1:** Procedure in the treatment with random assignment (study 1)

In *Step 1* of the experiment, each participant was randomly matched with one other participant for the elicitation of trust and trustworthiness. We adopted the binary trust game (McCabe & Smith, 2000), and participants needed to decide once in the role as sender and once via the

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strategy method (Selten, 1967) in the role as receiver. The resulting payoffs were not revealed until the end of the experiment to avoid influences on subsequent decisions. The participants' levels of trust and trustworthiness were then elicited from their roles as sender and receiver, respectively. Albeit not at the core of our analysis, we played the trust game in order to check whether the degree of cooperation in groups is influenced by the individual levels of trust.

In *Step 2*, the participants were familiarized with production functions as used in our main experiment, i.e., with the transformation from monetary effort into monetary output. The production function used in *Step 2* differed both from the high- and from the low-productivity functions in order to avoid framing effects. To ensure the comprehension of the concept, participants had to answer control questions correctly (see Appendix A).

For *Step 3*, half of the participants were randomly assigned to the high- and to the low productivity functions, respectively. Table 2.2 displays the production functions for the two types and shows, for each feasible level of effort, the output (first column) and the net payoff as difference between output and effort in the setting with individual payment (second column). Comparing the outputs for the high and the low type shows that the high type is considerably more productive, and that the payoff-maximizing effort levels are 15 and 13 for high- and low-ability types, respectively. For later reference, the third column for each type shows the part of the net payoff in groups that can be influenced by the own decision (recall that this level is independent of group composition and the partner's behavior).

To avoid misunderstandings, let us emphasize that the participants see only the columns with effort levels and outputs, i.e., they needed to calculate the net payoffs by themselves. For instance, when the high type invests two units of effort in the individual payment setting, then his net payoff is  $7.6 - 2 = 5.6$ . In groups, however, he gets only half of his own output, so that the own payoff generated by the own effort is  $0.5 \times 7.6 - 2 = 1.8$ . In addition, he gets half of the output contributed by his partner, but this part cannot be influenced. The effort levels in groups which maximize the individual payoffs are 10 and 6 for high and low types, respectively.

After two test decisions with feedback provision, participants had to finally decide on their efforts with individual payment. Those decisions serve as the baseline effort decisions, mimicking individual work.

	High types			Low types		
Effort	Output	Payoff <sup>ind</sup>	Variable payoff <sup>group</sup>	Output	Payoff <sup>ind</sup>	Variable payoff <sup>group</sup>
1	3.9	2.9	0.95	2.7	1.7	0.37
2	7.6	5.6	1.80	5.3	3.3	0.66
3	11.1	8.1	2.55	7.8	5.8	0.89
4	14.4	10.4	3.20	10.1	6.1	1.04
5	17.5	12.5	3.75	12.3	7.3	1.13
6	20.4	14.4	4.20	14.3	8.3	<b>1.14</b>
7	23.1	16.1	4.55	16.2	9.2	1.09
8	25.6	17.6	4.80	17.9	9.9	0.96
9	27.9	18.9	4.95	19.5	10.5	0.77
10	30.0	20.0	<b>5.00</b>	21.0	11.0	0.50
11	31.9	20.9	4.95	22.3	11.3	0.17
12	33.6	21.6	4.80	23.5	11.5	-0.24
13	35.1	22.1	4.55	24.6	<b>11.6</b>	-0.72
14	36.4	22.4	4.20	25.5	11.5	-1.26
15	37.5	<b>22.5</b>	3.75	26.3	11.3	-1.88
16	38.4	22.4	3.20	26.9	10.9	-2.56
17	39.1	22.1	2.55	27.4	10.4	-3.32
18	39.6	21.6	1.80	27.7	9.7	-4.14
19	39.9	20.9	0.95	27.9	8.9	-5.04
20	40.0	20.0	0.00	28.0	8.0	-6.00

**Table 2.2:** Production functions for high and for low types

In *Step 4*, the participants were introduced to their respective treatments and received the information whether they were part of the high- or low-ability group. In addition, they learned whether they are matched with the same or with a different type, and the group partner's productivity function was revealed. They were not informed about the possibility of other group compositions in order to avoid indirect effects of disappointment, for instance. Thus, each individual knew solely his own productivity function, the partner's productivity function and the payment structure. In order to ensure the comprehension of the different group settings, we posed several control questions for the payoffs in different effort combinations (Appendix B). Participants could have four different roles in the group setting: High-ability type matched with another high-ability type (HH), high-ability type matched with a low-ability type (HL), low-ability type matched with another low-ability type (LL) and low-ability type matched with a high-ability type (LH). After comprehension was ensured, all participants simultaneously and anonymously decided on their effort levels in *Step 5*.

In *Step 6*, we used the test battery from the APM as an IQ test. Participants had eight minutes for answering 24 questions and earned 6 Taler (€ 024) for each correct answer. In the random treatments, the results from the APM-had no further consequences, but to ensure consistency with the earned-roles treatments, we ran the test in all treatment groups. In addition to consistency reasons, the APM-test allows us to analyze if intelligence as captured by the test is correlated with the willingness to invest effort in groups. This is interesting as there is some evidence that intelligence is positively correlated with other-regarding preferences (Ben-Ner, Kong, & Putterman, 2004; Chen, Chiu, Smith, & Yamada, 2013; Jones, 2008).

The remaining three steps were conducted in order to gain additional potentially interesting control variables for explaining the observed behavior. In *Step 7*, we elicited the degrees of inequality aversion following a procedure adopted by Dannenberg, Riechmann, Sturm, and Vogt (2012). We did so after the main experiment in order to avoid influences on prior decisions. In *Step 8*, participants were asked to estimate the change in their partner's effort reduction, compared to his effort in the setting with individual payments (recall Hypothesis 1c). This belief elicitation was monetarily incentivized in order to gain more reliable results (e.g., Gächter & Renner, 2010; Rutström & Wilcox, 2009).<sup>3</sup> Finally, we collected data concerning Rosenberg's self-esteem scale (Rosenberg, 1965), risk preferences, fairness concerns, and demographics in *Step 9*.

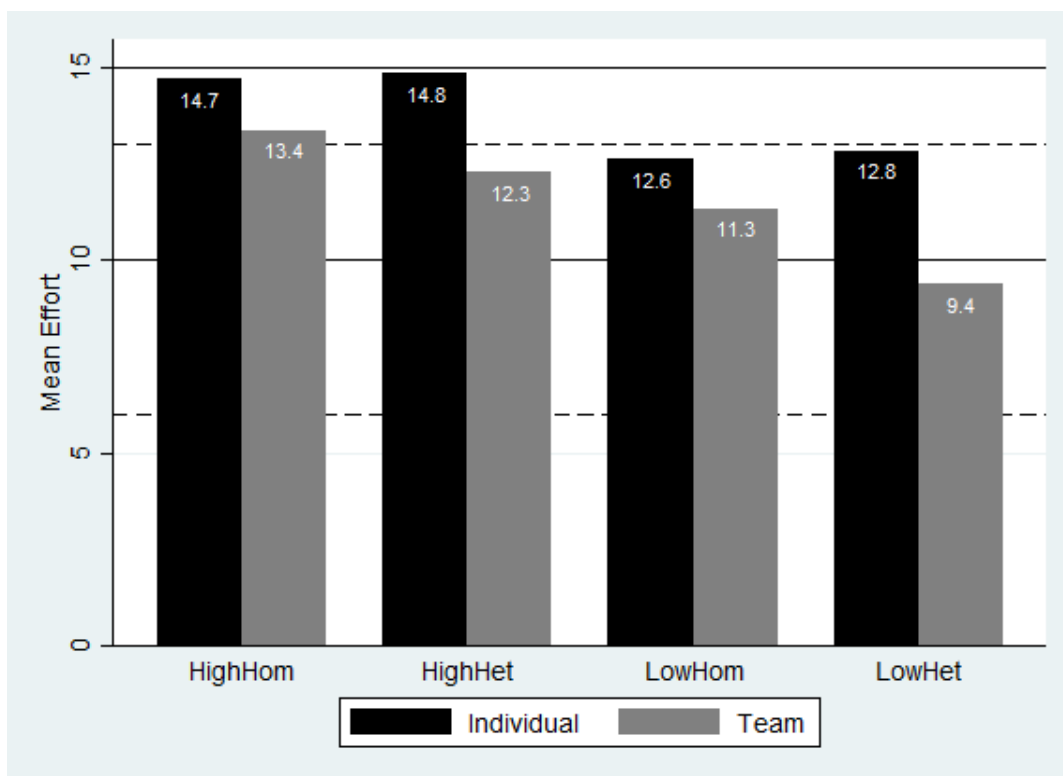
## 2.4 Results

Figure 2.1 and Figure 2.2 depict the average effort levels in the benchmark case with individual payments as well as for the four different situations individuals can be assigned to in the group treatments for the random setting and the earned-roles setting, respectively. Considering first the benchmark case (individual payment) itself, recall from Table 2.2 that the payoff-maximizing effort level is 15 for high types and 13 for low types. In our experiment, the average effort levels for high types in the random assignment (Figure 2.1) were 14.7 and 14.8 for those subsequently assigned to homogeneous and heterogeneous groups, respectively. For low types, the respective effort levels were 12.6 and 12.8, so that the participants' behavior is close to what theory predicts. 80% of all participants invested exactly the optimal effort, which reinforces the impression from the control questions that the

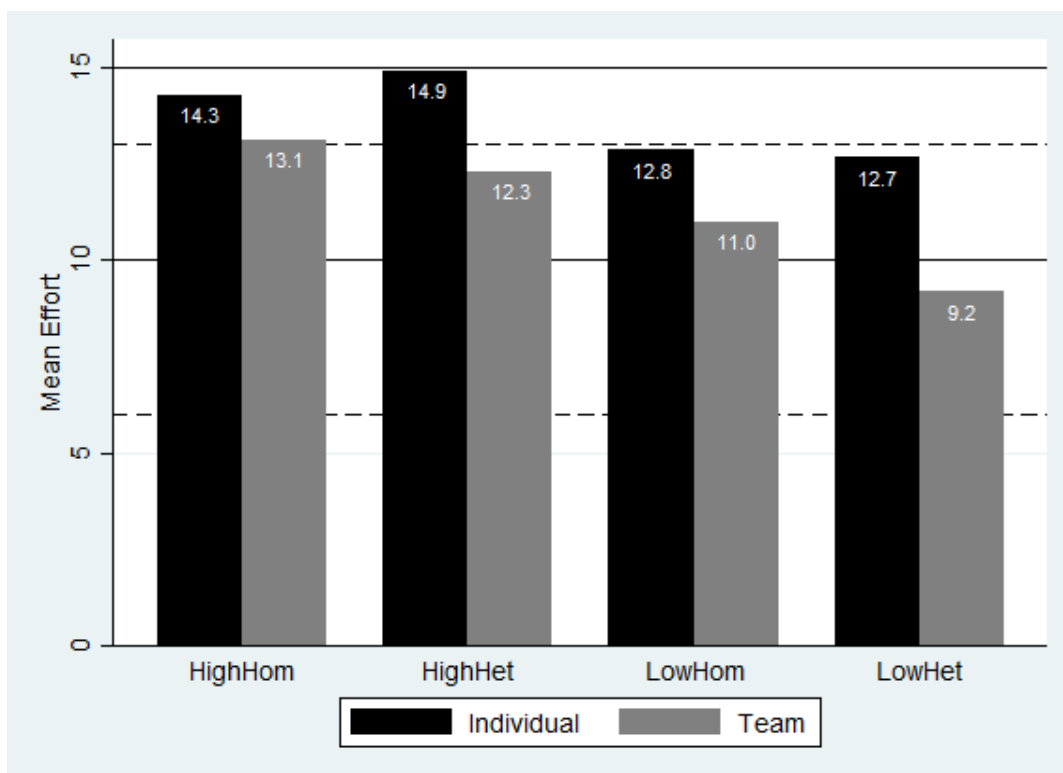
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<sup>3</sup> The belief was incentivized with the following formula:  $\text{payoff} = 20 \text{ Taler} * (1 - |R-r|)$ , where  $R$  represents the subject's belief about the average participant behavior (percentual change of effort reduction in teams compared to individual effort decision and  $r$  represents the actual participant behavior.





**Figure 2.1:** Effort levels in benchmark case and in treatments (random assignment)



**Figure 2.2:** Effort levels in benchmark case and in treatments (earned roles)

experiment was well understood. Figure 2.2 shows the same pattern for the earned-role treatments. Again, the average effort levels in the benchmark case with individual payments are close to the payoff-maximizing levels of 15 for high types and 13 for low types. 80% of the high types and 82% of the low types chose these effort levels.<sup>4</sup>

- *Result 1a: For each of the three group compositions, the effort level is below the effort level with individual payment.*

Figure 2.1 and Figure 2.2 show that all effort levels are below those which maximize the joint payoff of a group, which are still 15 for high types and 10 for low types. The differences of the jointly optimal effort levels and the effort levels actually chosen, i.e. for instance the difference between 14.7 and 13.4 in the random assigned group consisting of two high types, are significant for all group compositions (p-values of 0.000 for both high and low types, based on a one-sample t test). This is in line with Hypothesis 1a which states that the moral hazard problem leads to socially inefficient behavior.

- *Result 1b: For each of the three group compositions, the effort level is above the effort level that would be chosen by selfish individuals.*

The effort levels which maximize *individual* payoffs in group settings are 10 for high- and 6 for low-ability types (recall carefully that those payoff-maximizing effort levels are independent of the group composition and independent of the partner's behavior). Hypothesis 1b is also confirmed as all effort levels are considerably above those that maximize individual payoffs (p-values of 0.000 for both high and low types, based on an one-sample t test).

- *Result 1c: The effort level is increasing in the belief on the effort invested by the other group member.*

In Table 2.3 (random assignment) and Table 2.4 (earned roles) we ran regressions for high types only (Columns 1 and 3), for low types only (Columns 2 and 4), and where both types are jointly considered (Column 5). Columns 3 to 5 contain the variable for subjects' beliefs about the average change in effort decision of others for the group setting. In line with Hypothesis 1c, the belief on the partner's effort reduction is significantly negative at the 1%-

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<sup>4</sup> Correlations between APM-test scores and optimal optima are positive by 0.102 (p-value 0.16) and 0.081 (p-value 0.26) for high and low types, respectively. However, as both correlations are not significant, the claim that this experimental setup allows for a clear-cut distinction of ability (or productivity) and effort cannot be rejected.

level for random assignment: Although the partner's effort does not influence the incentive structure of selfish people, the own effort increases in the belief on the partner's contribution to the joint outcome. For the earned roles setting, Hypothesis 1c is supported at the 5%-level. We also ran regressions with all other variables extracted by questionnaires, which cover demographics such as age or nationality, personality traits such as risk or fairness concerns, and education such as pursued degree or average grade.<sup>5</sup> As all of them turned out to be insignificant and neither influence the size nor on the significance level of our treatment dummy, we do not report these regressions.

- *Result 2: Compared to individual effort decisions, the effort reduction is lower (both for high- and low-ability types) in homogeneous groups.*

The second part of our analysis examines whether group composition affects effort levels. Hypothesis 2 states that, even though the incentive structure is exactly the same, both high- and low-ability types reduce their effort to a larger degree when they are allocated to heterogeneous groups. First, we consider the treatments with random assignment. Second, we provide the results for the treatments with earned roles showing being not significantly different (Result 3).

For random assignment, Figure 2.1 shows that high types choose an average effort of 12.3 in heterogeneous groups, compared to 13.4 in homogeneous groups. The difference for low types is 9.4 compared to 11.3. According to the Wilcoxon rank-sum test, absolute effort reductions are significantly higher for heterogeneous groups with p-values of 0.014 and 0.013 for high and for low types, respectively.<sup>6</sup> Hence, our results support Hypothesis 2: Albeit the incentive structure is the same, the moral hazard problem is more pronounced in heterogeneous groups.

In addition, it is interesting to consider the impact of personality. As for this, we perform three kinds of regressions as shown in Table 2.3, one for high types only, one for low types only, and one where both types are jointly considered. Column 1 and 3 confirm our results from the Wilcoxon rank-sum test as the treatment dummy is significantly positive at the 5%-level: Controlling for the variables shown in Column 3 of Table 2.3, high types in heterogeneous

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<sup>5</sup> The full sample of elicited variables can be extracted from the instructions.

<sup>6</sup> P-values of the Wilcoxon rank-sum test for relative (to the benchmark of individual effort decision) effort reduction are 0.014 and 0.017 for high and low types, respectively.

groups reduce their effort by 1.32 units more compared to high types in homogenous groups. All but one, i.e. belief about the decision of others, of our control variables are insignificant.

Columns 2 and 4 report the identical regressions for low types and confirms the descriptive statistics of the group composition effect for low types: Compared to the effort reduction of low types in homogenous groups, low types in heterogeneous groups reduce their effort by 2.69 units more, significant at the 1%-level. Again, the size of the belief-effect is rather low, but significant, now at the 10%-level. All other control variables remain insignificant. Column 5 finally considers all participants and confirms the findings.

	(1)	(2)	(3)	(4)	(5)
	Effort reduction	Effort reduction	Effort reduction	Effort reduction	Effort reduction
HighHet	1.453** (2.13)		1.316** (1.99)		
LowHet		2.428*** (2.64)		2.689*** (2.94)	
AggHet					1.720*** (3.12)
HighType					-0.294 (-0.53)
APM-Test	-0.00604 (-0.04)	-0.211 (-1.13)	-0.0934 (-0.86)	-0.241 (-1.31)	-0.150 (-1.32)
Trust	-0.829 (-1.08)	-0.00729 (-0.01)	-0.483 (-0.64)	-0.00473 (-0.01)	-0.0803 (-0.14)
Trustworthiness	0.143 (0.18)	-1.340 (-1.31)	0.137 (0.17)	-1.133 (-1.12)	-0.593 (-0.94)
Inequality	0.0335 (0.58)	-0.126 (1.46)	0.0421 (0.75)	-0.131 (-1.54)	-0.0306 (-0.62)
Female	-0.846 (-1.22)	0.0597 (0.06)	-0.946 (-1.41)	0.328 (0.34)	-0.403 (-0.71)
BeliefChange			-0.0301*** (-2.65)	-0.0399* (-1.94)	-0.0317*** (-2.96)
Cons	1.604 (1.01)	5.135** (2.25)	5.173** (2.54)	8.751*** (2.99)	6.710*** (3.84)
N	93	93	93	93	186
F-value	F(6, 86) = 1.01	F(6, 86) = 2.20	F(7, 85) = 1.93	F(7, 85) = 2.48	F(8, 177) = 2.91
p-value	0.4239	0.0507	0.0748	0.0228	0.0045
R <sup>2</sup>	6.6 %	13.3 %	13.7 %	17.0 %	11.6 %
Adj. R <sup>2</sup>	0.0 %	7.3 %	6.6 %	10.1 %	7.6 %

OLS Regressions, t-values in parentheses; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively.

**Table 2.3:** Determinants of effort reduction (random assignment)

	(1)	(2)	(3)	(4)	(5)
	Effort reduction	Effort reduction	Effort reduction	Effort reduction	Effort reduction
HighHet	1.624** (2.04)		1.471* (1.89)		
LowHet		1.783** (2.16)		1.383* (1.71)	
AggHet					1.331** (2.39)
HighType					-1.422* (-1.71)
APM-Test	-0.0468 (0.15)	-0.0579 (-0.28)	0.0216 (0.01)	-0.0546 (-0.27)	-0.0545 (-0.33)
Trust	-0.523 (-0.63)	-1.934** (-2.15)	0.0696 (0.08)	-1.776** (-2.04)	-0.967 (-1.63)
Trustworthiness	-1.788** (-2.02)	0.789 (0.88)	-2.167** (-2.47)	0.300 (0.34)	-0.840 (-1.35)
Inequality	0.182** (2.26)	0.0705 (1.04)	0.185** (2.35)	0.0458 (0.70)	0.0865* (1.77)
Female	-0.701 (-0.71)	-0.313 (-0.38)	-0.481 (-0.50)	-0.0449 (-0.06)	-0.0722 (-0.12)
BeliefChange			-0.0557** (-2.36)	-0.0443*** (-2.70)	-0.0454*** (-3.49)
Cons	0.230 (0.06)	2.069 (1.09)	5.326 (1.20)	6.927*** (2.70)	7.170*** (3.43)
N	94	94	94	94	188
F-value	F(6, 87) = 2.05	F(6, 87) = 1.62	F(7, 86) = 2.64	F(7, 86) = 2.53	F(8, 179) = 3.99
p-value	0.0679	0.1513	0.0160	0.0203	0.0002
R <sup>2</sup>	12.4 %	10.0 %	17.7 %	17.1 %	15.1 %
Adj. R <sup>2</sup>	6.3 %	3.8 %	11.0 %	10.3 %	11.3 %

OLS Regressions, t-values in parentheses; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively.

**Table 2.4:** Determinants of effort reduction (earned roles)

For the earned roles setting, results are close to those with random assignment. Applying the Wilcoxon rank-sum test to the different settings leads to the result that, compared to the benchmark case with individual payments, the absolute effort reduction is larger in heterogeneous groups for high and for low types, both significant at the 10%-level with p-values of 0.069 and 0.087 for high and for low types, respectively.<sup>7</sup> Summing up over both types in both treatments, the effort reduction is on average 124% larger for high types and 86% larger for low types in heterogeneous groups. Thus, the motivational effect is not only significant, but economically meaningful.

Similar to random assignment, results are confirmed by the regression analysis. Controlling for the same variables as before, high types in heterogeneous groups reduce their effort by 1.47 units more compared to high types in homogenous groups. In addition, trustworthiness is now significantly negative by -2.17 at the 5%-level (see Column 3), i.e. high types who are trustworthy reduce their effort to a lower degree; a result that did not appear with random assignment. Apparently, trustworthy individuals as high types are inclined to actually prove their trustworthiness if and only if they believe that their partners have earned their roles. Inequality is now also significantly positive by .18 at the 5%-level, showing that inequality averse-individuals tend to reduce their effort to a larger degree. This is in line with general insights on inequality aversion: The higher the own effort level, the higher is the chance that he partner earns relatively more, and it is well-known that inequality counts more when being the one with the lower payoff.

For low types, however, trustworthiness has no impact at all, but trust becomes significant by -1.78 at the 5%-level: Low types who have high degrees of trust reduce their effort compared to the benchmark case at a lower degree (see Column 4, and recall that we measured trust by the behavior of the sender in the trust game, and trustworthiness by the behavior of the recipient). In order to check whether these effects are mainly driven by homogenous or heterogeneous groups, we also checked the interaction term of trustworthiness and the dummy for the heterogeneous treatment in Column 3 as well as the interaction term of trust and the dummy for the heterogeneous treatment in Column 4, but both of them are close to zero and totally insignificant. Again, Column 5 considers all participants and confirms the findings.

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<sup>7</sup> P-values of the Wilcoxon rank-sum test for relative (to the benchmark of individual effort decision) effort reduction are 0.069 and 0.105 for high and low types, respectively.

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A potential explanation for the lower exposure to moral hazard in homogenous groups could be that participants assume a higher effort level for partners with similar attributes. Such an explanation would be in line with studies on swift trust (Jarvenpaa & Leidner, 1999; Meyerson, Weick, & Kramer, 1996; Robert et al., 2009), which find that people tend to trust more if their counterparts share similar attributes with themselves. In our case, swift trust suggests that individuals assume a lower reduction in their partners' effort level in homogenous groups. And as our regression analysis shows that the reduction in the own effort level decreases when a higher effort level of the partner is assumed, this could explain why effort levels are higher in homogenous groups. However, such an explanation is not supported by our data: First, our regression analyses show that, both for the treatment with random and non-random assignment to roles, the dummy for the group composition remains significant even after controlling for the belief on the partner's effort reduction. And second, we find that this belief on the partner's effort reduction is not significantly different between homogenous and heterogeneous treatments; neither for the windfall treatment nor for the treatment where the role assignment depends on the results of the APM-test.

- *Result 3: Compared to random assignment, the effort reduction in groups is higher when roles are earned.*

Examining whether the assignment procedure has an impact, we also ran regressions where we considered random role assignment and assignment based on the APM-results jointly and where we added a dummy for the non-random assignment. This dummy is insignificant throughout, so that we conclude that the assignment procedure is no crucial issue for our findings (results are available on request).

## **2.5 Conclusion**

Our paper contributes to the knowledge on group and team performance by analyzing the impact of heterogeneous versus homogeneous ability-based group matching on moral hazard, when the outcome is equally shared between group members. In order to identify this effect, we design a laboratory experiment in which the incentive structure is the same in both kinds of groups, and independent of the partner's behavior. The data strongly supports our hypothesis that subjects in homogeneously matched groups are significantly less prone to moral hazard than individuals in heterogeneous groups. This is robust in two respects: It holds for high- and for low-ability types, and also for both kinds of matching procedures. We



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conclude that motivational effects in heterogeneous vs. homogeneous groups are an essential issue in understanding and interpreting pro-social behaviors in group production settings.

Although our paper is about group and team performance and hence mainly part of personnel economics and organization theory, it is also related to public good games (also referred to as voluntary contribution mechanisms, VCM). By contributing to a public good, participants produce positive externalities, thereby increasing the overall payoff at the expense of their own payoff. Research on public goods has focused on the impacts of institutional settings (see Gächter, 2007, for an overview), personality (Fischbacher & Gächter, 2010; Frey & Meier, 2004; Keser & van Winden, 2000), repeated games, and on cooperation conditional on the behavior of other participants (Fischbacher & Gächter, 2010; see Gächter, 2007 for an overview). Heterogeneity of group members is considered with respect to the initial endowments (Chan, Mestelman, Moir, & Muller, 1999; Fung & Au, 2014) or the returns of contributions, but different productivities have only recently been taken into account in VCMs (Kölle, 2015). Our results suggest that heterogeneous group compositions may have similar adverse effects in public good settings as in our group production setting, but this remains to be tested.

The tournament literature has led to the robust result that heterogeneity in productivity levels reduces effort (Backes-Gellner & Pull, 2013; Brown, 2011; Casas-Arce & Martínez-Jerez, 2009; Cason et al., 2010; Hammond & Zheng, 2013; Knoeber & Thurman, 1994; Levy & Vukina, 2004; Schotter & Weigelt, 1992; Sunde, 2009). This finding, however, should not be confounded with our setting. In tournaments, heterogeneity has an impact on incentives, and even the payoff-maximizing efforts of purely selfish participants in tournaments are decreasing in heterogeneity. By contrast, both the payoff-maximizing and the socially optimal effort levels in our setting are identical for homogeneous and heterogeneous groups, so that our results can exclusively be attributed to motivational effects.

While our experimental design is suitable for separating the motivational impact of group composition on the moral hazard problem from changes in the incentive structure, we acknowledge that this comes at the expense of neglecting other important factors analyzed in the literature. An important string of the literature focuses on the impact of personality traits (see the papers mentioned in the introduction). As we have controlled for trust and trustworthiness by playing the canonical binary trust game (McCabe & Smith, 2000), for inequality aversion (Dannenberget al., 2012), for cognitive capability (Raven et al., 2004),

and for attitudes towards risk, our paper could potentially also have contributed in this direction. However, our results are little informative in this respect as, with the exception of trustworthiness which is at least once significant, all of those control variables are insignificant throughout.

Getting back to our motivating example of superiors allocating their subordinates into groups or teams, our results indicate that homogeneous groups are *ceteris paribus* superior as they reduce the susceptibility to moral hazard. The key insight of our experiment is hence that, when neglecting all other factors in order to keep the incentive structure exactly identical, moral hazard is considerably more pronounced in heterogeneous compared to homogenous groups.

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### **3 The cost of incentivizing: A meta-analysis of subject performance vs. cost-efficiency<sup>8</sup>**

#### **3.1 Introduction**

Consider the puzzling insight from the following experiment by Bailey et al. (1998): Subjects have to assemble model kits. Participants in the fixed wage treatment receive \$5.00 per hour and participants in the piece rate treatment receive \$1.80 for each completed unit. On average, participants in the fixed wage treatment complete 4.75 units per hour, whereas participants complete 5.53 in the piece rate treatment. Although the piece rate scheme elicits a higher performance per hour, the mean cost-per-unit ratio is \$1.05 under the fixed wage and \$1.80 under the piece rate scheme. Hence, the piece rate scheme leads to an increase in the cost-per-unit ratio of +71% compared to the fixed wage scheme. If one would only consider the observed performance, the piece rate scheme is clearly advantageous. However, an assessment based on a cost-benefit analysis reverses this conclusion. Thus, the following question needs to be re-raised: “Are organizations wasting their money by using financial incentives?” (Jenkins et al., 1998, p. 778).

Behavioral economic literature, accounting, and psychology has extensively investigated piece rate schemes in comparison to fixed wage schemes and experimental research has mostly focused exclusively on the impact of different payment schemes on participant performance, defined as subjects' output, mostly with stylized experimental tasks (Bonner & Sprinkle, 2002; Garbers & Konradt, 2014). Performance as the commonly agreed upon variable of choice when evaluating certain payment schemes has served as the key figure to infer theoretical as well as practical recommendations for organizations. The prevailing opinion in the behavioral economics literature is that payment schemes using performance-contingent rewards (e.g., piece rates) are superior to fixed wage schemes due to higher subject performance (Condly et al., 2003; Garbers & Konradt, 2014). Thus, following this literature, performance-contingent rewards should be integrated in organizational payment schemes (Jenkins et al., 1998). Interestingly, both early and recent studies (e.g., Bailey et al., 1998; Ockenfels et al., 2015) briefly note that performance should not be the sole measure to decide on the superiority of payment schemes without further considerations. However, research has

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<sup>8</sup> This chapter is based on a working paper authored by Dominik Doll and co-authored by Dominik L. Schall and Elisabeth K. Taucher. My contribution to the paper is summarized in the Appendix (signed by the authors in the examiners' copies of this dissertation).

not yet addressed this issue specifically, although economists have been discussing and researching optimal contracts for decades (starting with Coase, 1937; Jensen & Meckling, 1976). Thus, performance as the exclusive measure to assess a payment scheme's effectiveness in organizations might be flawed and spurious, leading to invalid conclusions. It is questionable if higher employee performance under a certain payment scheme does actually coincide with a higher value of the respective payment scheme for the organization, since only a better cost-efficiency effectuates higher economic value for organizations (Hillman & Keim, 2001).

Surprisingly, previous studies in the field of behavioral economics have mostly examined payment schemes regarding the influence on performance, not organizational cost, even though monetary concerns are deemed as one of the most important factors for economic choices (Charness, 2004). Thus, it is obvious that "we need studies that address the cost-benefit of incentive programs" (Condly et al., 2003, p. 59) to provide more sophisticated and more balanced recommendations for organizations being confronted with the decision to implement payment schemes. Although maximizing corporate value is one of the main objectives of organizations, most research does not concentrate on the cost resulting from employed payment schemes. Since research has found that monetary incentives need to have a certain magnitude to actually influence subject performance (Fehrenbacher & Pedell, 2012; Gneezy & Rustichini, 2000; Pokorny, 2008), the question arises whether a performance-contingent payment scheme has a sufficiently high impact on productivity in order to enhance its cost-efficiency.

A large body of literature has attempted to synthesize existing research on payment schemes. Such attempts started approximately 50 years ago with the review of Opsahl and Dunnette (1966) assessing the effects of financial compensation on employee motivation. Their article was the first of many qualitative reviews (e.g., Bonner & Sprinkle, 2002; Camerer & Hogarth, 1990; Ilgen, 1990; Jenkins, 1986) proving the link between payment schemes and performance. More recent attempts to examine the relationship in question are based on quantitative meta-analytical techniques (e.g., Bonner et al., 2000; Cameron & Pierce, 1994; Jenkins et al., 1998; Weibel et al., 2010). Beyond examining the rather straightforward link between payment schemes and performance, other interesting aspects of payment schemes have been investigated in reviews such as goal setting and task performance (Locke et al., 1981), task attractiveness and job performance (Judge et al., 2001), feedback interventions

and the effect on performance (Kluger & DeNisi, 1996), or individual versus team-based financial incentives (Garbers & Konradt, 2014). However, the economic impact of different payment schemes on cost-efficiency has not yet been examined using meta-analytical techniques and, to the best of our knowledge, even primary research on this issue is scarce. The relevant measure for any profit-based organization is the cost-efficiency of a payment scheme. Recently, Fehrenbacher and Pedell (2012) called for an incorporation of the cost of incentive systems when assessing effects on performance, deeming the issue relevant for future research.

The aim of our study is to integrate the results of the numerous studies in this field, a task which is more valuable “than adding a new experiment or survey to the pile” (Glass, 1976, p. 4). To the best of our knowledge, our meta-analysis is the first study to investigate primary research in the field of payment schemes regarding both outcome measures performance and a cost-efficiency measure, i.e. cost-per-unit measure. Specifically, we perform a meta-analysis to examine the impact of piece rate and fixed wage schemes investigated in previous studies on subject performance and cost-per-unit.<sup>9</sup> Our contribution is threefold: First, considering the necessity of cost-benefit analyses of payment schemes, we quantify the impact of piece rate and fixed wage schemes on participant performance and cost-per-unit in studies in the field of behavioral economics. Second, having provided quantitative evidence, we corroborate the need for future research to not only report participant performance, but to also reflect findings against the highly relevant organizational consideration of the cost-per-unit ratio. Thus, we substantiate the relevance of the question whether providing recommendations solely based on the criterion of performance is always justified and meaningful. Third, we analyze the effects of potential moderators on the cost-efficiency of incentive schemes.

As expected, piece rate schemes generally elicit higher performance than fixed wage schemes. However, we find that piece rate schemes yield lower cost-efficiency than fixed wage schemes, regardless of whether performance is higher under piece rate or fixed wage. This finding questions the prevalent recommendation for organizations to prefer performance-contingent rewards to fixed wage schemes.

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<sup>9</sup> In the first phase of our data retrieval we collected potential studies comparing at least two of the following four payment schemes: fixed wage, piece rate, tournaments, and quota schemes. Due to the limited number of studies available in all other comparison groups, we focus on the piece rate vs. fixed wage comparison only.

## 3.2 Method

Meta-analyses are the application of systematic and scientific strategies to literature reviews (Cornell & Mulrow, 1999). Contrary to narrative literature reviews, they are based on equally precise, rigorous and transparent methods as primary research and apply explicit rules for inclusion and coding of studies. The results of individual studies are summarized using an effect size that varies continuously (Fernandes, Lynch, & Netemeyer, 2014).

### 3.2.1 Search strategy

Compiling relevant literature we used multiple search channels to ensure minimal retrieval bias. First, we conducted a computerized bibliographic search in numerous databases using terms such as incentive system, fixed wage, piece rate, performance, monetary incentive, and pay for performance efficiency. No restrictions on the publication date or any other criteria were made. Second, references provided in pertinent well-known publications (e.g., Bonner et al., 2000; Camerer & Hogarth, 1990; Fessler, 2003; Garbers & Konradt, 2014) were scanned manually for potentially relevant publications. Third, looking at forward and backward citations of relevant papers, further studies were identified. Fourth, in case required information was not extractable from published research reports, the respective author was contacted directly.

In line with Glass, McGraw, and Smith (1981), Lipsey and Wilson (2001), and Rosenthal (1995), we did not exclude any study a priori based on its methodology, but used a posteriori examination of research differences on the results obtained. Yet, studies had to fulfill certain criteria to be included in the analysis. Most obvious, they had to provide the data necessary to compute effect sizes. Mean values of the performance as well as the participant remuneration under both piece rate and fixed wage treatments were required, as this is the focus of our analyses. Experiments comparing one of the two payment schemes to non-rewarded control groups were not included, as a comparison of remuneration-based with non-remuneration-based treatment groups do not allow for a cost-efficiency-based analysis, again, the purpose of our study. Furthermore, in line with other reviews concerning financial incentives (e.g., Bonner et al., 2000; Jenkins et al., 1998), only studies using adult populations (i.e., average age > 16 years) and making actual payments (i.e., no make-believe payments) were considered, thus, no studies with hypothetical payment information. Studies allowing participants to self-select into payment schemes were not used since it has been shown that subjects prefer different payment schemes depending on their ability, resulting in non-

randomized groups. For instance, Lazear (2000) and Parent (1999) find that high ability subjects sort themselves into piece rate rather than fixed wage schemes. Subjects who want to shirk due to moral hazard select themselves into fixed wage rather than piece rate schemes (Chen & Edin, 2002), distorting the identified effects. Finally, only studies employing between- rather than within-subject designs and only studies with real-effort tasks were included, as participants could easily calculate optimal effort levels based on the provided schemes, such as production functions (see Appendix C for an overview of studies used for the meta-analysis).

### 3.2.2 Retrieved studies

The studies included in the meta-analysis partly employ 2x1 (or higher order) factorial experimental designs, with randomized samples of participants being divided into treatment groups (i.e., being subjected to different payment schemes). In those cases the initial samples are treated as two separate units of analysis. Thus, a single study can contribute more than once to the statistical tests conducted. However, the weight with which it contributes to the analysis is determined by its sample size. The final sample used for this meta-analysis consists of 63 units of analysis extracted from 32 studies. To ensure representativeness for all relevant studies on the subject matter, publication bias analyses were conducted using three different methods.<sup>10</sup>

### 3.2.3 Statistical methods

Examining differences in the performance as well as the cost-per-unit ratio between piece rate and fixed wage, the standardized difference between means ( $d$ ) was used, an effect size suitable for the purpose of assessing the difference in outcomes between two groups (Hox, 2008). Therefore, the difference between the mean of the two groups was divided by the within standard deviation. Effect sizes were calculated based on data available in primary research reports or based on data retrieved upon request from the authors. In case standard deviations were not provided and could not be obtained from the authors, they were calculated

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<sup>10</sup> Funnel plots were used to assess the file drawer problem graphically. A symmetric distribution around the true effect size indicates that no bias exists, while a shift towards the right on the bottom of the plot points towards an existing bias Borenstein, Hedges, Higgins, and Rothstein (2009); Greenhouse and Iyengar (2009). The fail-safe N method is used to assess the robustness of the overall observed effect. It suggests a number of missing studies which would need to be retrieved and incorporated in the analysis before the p-value becomes non-significant ( $\alpha = .05$ ), assuming the mean effect size in studies not obtained is zero Rosenthal (1979). The nonparametric trim-and-fill method (Duval and Tweedie (2000b, 2000a)) was used to estimate what the effect size would be if all relevant studies were found and included.

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using commonly applied procedures: Through a range of statistical information (e.g., t-value, F-values), by averaging standard deviations, or by applying the distribution-free estimation method suggested by Hozo, Djulbegovic, and Hozo (2005).

We used a random-effects model, arguing that there is at least some variation in study population parameters in all research domains. Even if that was not the case, differences across studies in methodological factors are always present, which would then lead to differences in study population parameters. Consequently, the assumption of homogeneity of effect sizes has to be false (Hunter & Schmidt, 2004). The studies merely can be assumed to “have enough in common that it makes sense to synthesize the information, but there is generally no reason to assume that they are identical in the sense that the true effect size is exactly the same in all the studies” (Borenstein et al., 2009, p. 69). Since unconditional inferences allow generalizing beyond the compiled studies, the application of a random-effects model is desirable for our study. We assume that the examined study set is a random sample of the population consisting of all possible studies investigating the relationship in question. Thus, the random-effects model is suitable and implemented in our study (Cooper, Hedges, & Valentine, 2009).

The homogeneity between studies is assessed using Cochran’s Q, testing whether the null hypothesis of variance homogeneity can be rejected, i.e., all variance in effect sizes is produced by sampling error alone (Cochran, 1937). Furthermore,  $I^2$  depicts the proportion of total variation in the effect size estimates which is due to heterogeneity rather than chance (Higgins & Thompson, 2002). The between-study variance of the true effect size,  $\tau^2$ , is estimated by the DerSimonian and Laird’s estimator (DerSimonian & Laird, 1986) representing the amount of true heterogeneity, i.e., providing an absolute value for the true variance. In line with other researchers, the Hedges’ correction factor for small sample sizes is not applied (Cooper et al., 2009; Hunter & Schmidt, 2004). However, different sample sizes are assessed by using weighted averages of the computed d-values for estimating the overall effect size.

### **3.2.4 Outcome measures and moderators**

All included studies explicitly provide necessary data for the performance variable. Since we analyze relative differences between two groups within one study, we normalized the provided performance and effort measures. Thus, disregarding possible restrictions of the



translation of effort into performance, we view both as measures of the performance variable examined in our study. Cost-efficiency was not assessed in most primary research. To incorporate the concept of cost-efficiency in our study, a simplified and manageable procedure is inevitable. Costs of payment schemes are manifold, e.g., costs of primary implementation, administration, execution, or monitoring. Those complex conditions of real life settings cannot be assessed in experimental settings (Garbers & Konradt, 2014). Therefore, following Fehrenbacher and Pedell (2012), we simplify the cost measure to only entail the monetary payoff, disregarding other costs, measurement difficulties or quality problems that may occur.

We conducted a moderator analysis in order to explain between study variance, focusing on the moderators goal setting, feedback, and task type, based on previous research which has outlined their importance for our research field (Bonner et al., 2000; Kluger & DeNisi, 1996; Locke & Latham, 2002).<sup>11</sup> All moderator variables were coded binary to account for the purpose of meta-analysis providing an holistic overview. Thus, in depth analyses of more granular insights need to be provided by future research. The moderating effect of task type was examined by classifying task types as creativity-related, e.g., solving puzzles, or non-creativity related tasks, e.g., solving simple calculations. Mixed-models are used in all moderator analyses. Thus, random-effects models are applied to assess the within-subgroup variance. Contrary, when assessing the differentiation between subgroups, those are assumed to be fixed: The groups provided are not a random sample of all possible groups, but cover the extensive options of possible groups for the given analysis. Since the between-study variance is assumed to be the same for the two subgroups, in each moderator analysis  $\tau^2$  is pooled for all conducted analyses. The same argument holds true for all examined control variables and for assessing subgroup differentials.

### 3.3 Results

All meta-analytical results were obtained using the software Comprehensive Meta-Analysis (CMA), version three (Borenstein, Hedges, Higgins, & Rothstein, 2014). The direction of effect was assessed as  $X_2 - X_1$ , with  $X_2$  being piece rate and  $X_1$  being fixed wage. Thus, a negative effect indicates a higher mean value in the fixed wage group, while a positive effect indicates a lower mean value in the fixed wage group. Results are based on 63 units of

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<sup>11</sup> We also conducted analyses for the control variables *experimental information*, *duration*, *course credit*, and *participation fee*, in order to account for differences in the methodology of primary research. However, none of those variables resulted in a change of effect size direction.

analysis, each contributing to the overall result in proportion to the inverse of their variance, a weighting factor related to sample size. We conducted several tests for a possible publication bias of the retrieved studies and find that they are, indeed, representative for the population of all studies.<sup>12</sup>

### 3.3.1 Performance and cost-efficiency

Our results show that overall performance is higher under piece rate than under fixed wage schemes, with a standardized mean difference of .38 ( $p = .00$ ). However, our most striking finding is that the cost-per-unit ratio is also higher under piece rate than under fixed wage payment schemes ( $d = .48$ ;  $p = .02$ ), indicating a superior cost-efficiency of fixed wage schemes, i.e., a lower cost-per-unit ratio than in piece rate schemes (see Table 1). Homogeneity measures indicate variability in effect sizes greater than what would be expected by chance, i.e., by sampling error alone. Cochran's  $Q$  (62 df) yields highly significant  $p$ -values of .00 for both performance ( $Q = 251$ ) and cost-per-unit ( $Q = 1366$ ). Furthermore,  $I^2$  shows that 75% of variation in performance-difference and 96% of variation in cost-per-unit-difference is due to heterogeneity.  $\tau^2$  equals .28 and 2.35 for performance and cost-per-unit respectively.

The intriguing results regarding cost-efficiency are further examined by clustering studies into subsamples with a positive and a negative mean difference in performance ( $\Delta$ -performance positive for studies with higher performance under piece rate schemes). Each subsamples' cost-efficiency is then examined separately and results are presented in Table 3.1. We find that regarding cost-efficiency the subsamples of positive and negative  $\Delta$ -performance do not differ: A test of the overall model gives a  $Q$ -value of .99 (1 df) and a  $p$ -value of .34. The null hypothesis of the two subgroups being equal cannot be rejected on any commonly applied significance level. Thus, results of  $\Delta$ -performance subgroup analyses show that cost-efficiency is always higher under fixed wage than under piece rate, regardless of which payment scheme yields superior performance. Compared to the total sample ( $d = .48$ ), the positive effect is slightly smaller in the positive  $\Delta$ -performance group ( $d = .37$ ) and considerably larger in the negative  $\Delta$ -performance group ( $d = .79$ ).

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<sup>12</sup> Rosenthal's fail-safe  $N$  method (1979) gives high numbers of studies needed to render results non-significant, i.e., 1368 and 654, for the performance and cost-per-unit variable respectively, in relation to the 63 studies included. The trim-and-fill method (Duval and Tweedie (2000b, 2000a)) indicates that no publication bias exists and suggests that no further studies are to be included to obtain unbiased effect sizes. Thus, the effect sizes obtained equal unbiased effect sizes.

Sample	Variable	N	d	SE	Var	ICI	uCI	Z	p-value
Total	Performance	63	.38	.08	.01	.23	.53	4.83	.00
	Cost-per-unit	63	.48	.20	.04	.09	.88	2.41	.02
$\Delta$ -performance positive	Cost-per-unit	46	.37	.23	.05	-.08	.82	1.61	.11
$\Delta$ -performance negative	Cost-per-unit	17	.79	.39	.15	.04	1.55	2.06	.04

d = standardized mean difference, SE = standard error, Var = variance, ICI (uCI) = lower (upper) 95 % confidence interval, Z = Z-test of the null, p-values all two-tailed.

**Table 3.1:** Results for main meta-analysis

### 3.3.2 The influence of goal setting and feedback

Beyond examining differences in means between groups, meta-analyses aim at revealing potential explanations for the variance between studies. As confirmed by homogeneity tests, variability in our study results is not based on chance alone and, thus, might be explained by potential moderators. This study focuses on goal setting, feedback, and task type as possible moderators and analyzes their impact on both the full data set and the  $\Delta$ -performance subsamples (Table 3.2 and Table 3.3 respectively).<sup>13</sup> First, regarding the full data set, we find no significant effect for task type neither for performance nor cost-per-unit. The difference in means between piece rate and fixed wage is not significantly different for the two task type categories (creativity- and non-creativity-related) as shown in Table 3.2. Goal setting and feedback do not moderate the performance difference between piece rate and fixed wage schemes. However, they have an effect regarding the difference in means of the cost-per-unit, resulting in a change in effect size direction if present. If feedback is given (N = 9) there is a negative effect size of -.55 (p = .29), while studies not employing feedback (N = 54) show a positive effect size of .66 (p = .00). While the latter result is significant the former shows confidence intervals which include zero (ICI = -1.57; uCI = .47). Thus, cost-per-unit is higher under fixed wage if feedback is given. Results concerning goal setting are similar: If the moderator is present (N = 15) a negative effect size of -.39 (p = .36) can be observed, while if the moderator is absent (N = 48) we find a positive effect size of .75 (p = .00). The fact that confidence intervals include zero in case of goal setting being present accounts for the effect not being significantly different from zero (ICI = -1.21, uCI = .44). Thus, if goal setting or

<sup>13</sup> Additionally, the variables *experimental information*, *duration*, *goal difficulty*, *course credit*, and *participation fee* were collected for the moderator analysis. However, these variables are subject to subjective assessment (e.g. clustering of experimental information or goal difficulty) or are not relevant due to the final selection of used papers (e.g. course credit is a different type of incentive, thus, we excluded such studies).

feedback is present, the difference in cost-per-unit between piece rate and fixed wage payment schemes is not significantly different from zero.

Variable	Moderator	Group	N	d	SE	Var	lCI	uCI	Z	p-value	
Performance	Feedback	0	54	.35	.08	.01	.18	.51	4.08	.00	
		1	9	.60	.21	.00	.18	1.0	2.79	.01	
		Difference		.25	.27						
	Task type	0	42	.39	.10	.01	.20	.58	3.99	.00	
		1	20	.37	.14	.02	.09	.65	2.61	.01	
		Blank	1	.14	.63	.40	-1.10	1.37	.22	.83	
		Difference		-.02	.92						
	Goal setting	0	48	.41	.09	.01	.24	.59	4.56	.00	
		1	15	.27	.17	.03	-.06	.60	1.63	.10	
		Difference		-.14	.45						
	Cost-per-unit	Feedback	0	54	.66	.21	.05	.24	1.08	3.06	.00
			1	9	-.55	.52	.27	-1.57	.47	-1.05	.29
Difference			-1.20	.03							
Task type		0	42	.21	.25	.06	-.27	.70	.86	.39	
		1	20	.97	.35	.12	.28	1.66	2.74	.01	
		Blank	1	1.88	1.58	2.49	-1.21	4.97	1.19	.23	
		Difference		.76	.14						
Goal setting		0	48	.75	.23	.05	.30	1.20	3.24	.00	
		1	15	-.39	.42	.18	-1.21	.44	-.92	.36	
		Difference		-1.13	.02						

Group 0 (group 1) corresponds to moderator not present (present) for feedback and goal setting. Group 0 (group1) corresponds to non-creativity related (creativity related) tasks, blank = studies not classified, d = standardized mean difference, SE = standard error, Var = variance, lCI (uCI) = lower (upper) 95% confidence interval, Z = Z-test of the null, p-values all two-tailed, Difference = difference in means between group 0 and group 1.

**Table 3.2:** Moderator analysis of performance and cost-per-unit variable

Second, in order to relate our findings concerning moderators to the finding that cost-efficiency does not differ between  $\Delta$ -performance subgroups, we investigate the moderators' influence on those two subgroups separately. In all studies providing feedback to participants, we find performance to be higher under piece rate than under fixed wage payment schemes, i.e.,  $\Delta$ -performance is positive. Similar to the overall moderator analysis, we observe a change in effect size direction if feedback is present. Regarding goal setting, studies are available in both the positive and the negative  $\Delta$ -performance subgroup. Goal setting has no significant effect on the cost-efficiency in the positive  $\Delta$ -performance group; the cost-per-unit is lower in the fixed wage group regardless of whether goal setting is employed. Contrary, in case of a higher performance under fixed wage (i.e.,  $\Delta$ -performance negative) goal setting has a highly

significant effect. A surprisingly high difference in means of  $-5.9$  ( $p = .00$ ) indicates that studies differ widely in their cost-efficiency. If goal setting is applied, cost-per-unit is lower under piece rate treatment, and vice versa (Table 3.3).

Subgroup	Moderator	Group	N	d	SE	Var	ICI	uCI	Z	p-value
<b><math>\Delta</math>-performance positive</b>	Feedback	0	37	.58	.24	.06	.12	1.04	2.46	.01
		1	9	-.55	.47	.23	-1.48	.38	1.16	.25
		Difference			-1.13	.27				
	Goal setting	0	35	.25	.25	.06	-.23	.74	1.02	.31
		1	11	.71	.45	.20	-.16	1.58	1.60	.11
		Difference			.46	.45				
<b><math>\Delta</math>-performance negative</b>	Feedback	0	0	-	-	-	-	-	-	-
		1	0	-	-	-	-	-	-	-
		Difference			-	.03				
	Goal setting	0	13	2.05	.43	.18	1.22	2.89	4.81	.00
		1	4	-3.85	.82	.67	-5.46	-2.24	-4.69	.00
		Difference			-5.90	.02				

Group 0 (group 1) corresponds to moderator not present (present) for feedback and goal setting.  $d$  = standardized mean difference,  $SE$  = standard error,  $Var$  = variance,  $ICI$  ( $uCI$ ) = lower (upper) 95% confidence interval,  $Z$  =  $Z$ -test of the null,  $p$ -values all two-tailed, Difference = difference in means between group 0 and group 1.

**Table 3.3:** Analysis for  $\Delta$ -performance subgroups

### 3.4 Conclusion

Previous studies in the field of behavioral economics examining the superiority of different payment schemes mostly employed performance as the sole assessment criterion. Even though performance-contingent payment schemes often induce a higher performance, their economic implications for organizations have been broadly neglected. Our study illustrates the importance of moving from exclusively examining subject performance under various payment schemes to incorporating a measure of cost-efficiency, i.e., the cost-per-unit ratio. This has been called for by prior research (Condly et al., 2003), but has remained widely unheeded. To the best of our knowledge, our meta-analysis is the first study to investigate primary research in the field of payment schemes regarding both outcome measures performance and cost-per-unit. As expected, piece rate schemes generally elicit higher performance than fixed wage schemes. However, cost-per-unit is also higher under piece rate schemes. Thus, cost-efficiency is lower in piece rate schemes, questioning the prevalent recommendation to employ performance-contingent payment schemes. Intriguingly, the resulting cost-per-unit ratios contradict the common belief of piece rate schemes being superior: The cost-per-unit in piece rate schemes is significantly higher than in fixed wage

schemes. This result holds also true in a subgroup analysis, regardless of whether performance is higher under piece rate or fixed wage, further corroborating our findings.

Our study substantiates the importance to additionally consider cost-efficiency when assessing the superiority of payment schemes. Furthermore, our results cast doubt on the unchallenged notion that the frequently found positive incentive effect on performance (Baker, Jensen, & Murphy, 1988; Jenkins, 1986; Locke et al., 1981) justifies the adoption of performance-contingent payment schemes recommended by experimental studies. Surprisingly, the insights from theories on efficient contract are hardly considered in the studies taken into account in our meta-analysis. We show that this prevalent view might lead to erroneous conclusions regarding the benefits of performance-contingent payment schemes, especially when transferring research to organizational settings.

Furthermore, we examine the impact of the three moderators goal setting, feedback, and task type. We find no significant impact of task type, neither on performance nor on cost-per-unit. However, we find an increasing performance difference between piece rate and fixed wage settings if feedback is provided to subjects. This reverses the superiority of fixed wage schemes compared to piece rate schemes in terms of cost-efficiency. Concerning the moderator goal setting, we find a decreasing performance difference between piece rate and fixed wage schemes if goal setting is present. Similar to feedback, we find a reversal effect concerning the superiority of fixed wages compared to piece rate schemes regarding cost-efficiency. Thus, controlling for the moderators, the globally observed superiority of fixed wage schemes in terms of cost-efficiency would be reversed. As these moderators are frequently used in organizational contexts, this could explain the widespread use of performance-contingent payment schemes in organizations. Having implemented those features, organizations could benefit from both higher employee performance as well as from cost-efficiency gains.

### **3.4.1 Limitations**

Before discussing potential implications of our study, methodical constraints of the current work have to be considered. First, as in all meta-analyses, subjective decisions are made along the way (Guzzo, Jackson, & Katzell, 1987; Wanous, Sullivan, & Malinak, 1989). The distinction of primary research into creativity- and non-creativity-related tasks is based on subjective interpretation and might not be sharp enough. Thus, the fact that the moderator task

type did not show any effect might be due to the blurry classification. In addition, our literature research was subject to natural limitations in time and available search channels. Despite these constraints, a publication bias analysis suggests that the studies found are, indeed, representative of the population of all studies. Second, primary research reports do not provide the reliability estimates for the performance measures employed. Hence, reliability estimates cannot be assessed in the meta-analysis (see also Jenkins et al., 1998). Notwithstanding, concerns related to this issue may be scattered as it has been found that measurement error accounts only for a very small fraction of artifactual variance in meta-analyses (Koslowsky & Sagie, 1994).

Furthermore, while we derive important insights for practice, the generality of our findings and inferences to organizations certainly have limits in several respects. Garbers and Konradt (2014) claim that “perhaps the significance of financial incentives in an experiment is quite different from a real working situation” (Garbers & Konradt, 2014, p. 119) and thus not all findings can be directly applied to organizational settings. Thus, we admit that at the core of our analysis we take a labor-cost-per-unit ratio, neither a variable cost-per-unit ratio nor a total cost-per-unit ratio. Specifically, this work simplifies the cost-efficiency of an incentive system by looking only at the cost-per-unit paid, whereas in reality many more factors influence cost-efficiency. Exemplarily, organizations do also deal with costs associated with recruiting, turnover, or monitoring. In addition, it has to be acknowledged that organizations differ in a variety of dimensions which can influence employee performance without being directly related to cost-per-unit and which are probably less important in experimental than real organizational settings (e.g., teamwork, an organization’s vision, personal identification with organizational goals, organizational commitment, or leadership styles). Those elements are not necessarily independent from the employed incentive systems. For instance, the importance of costly monitoring systems depends on the degree to which employees relate to organizations and are willing to pursue organizational goals. Lastly, different organizational circumstances can also influence the effectiveness of additional performance-based payments which have a direct impact on the cost-per-unit ratio. If employees feel motivated by reasons beyond money, additional payments might not be necessary since a fixed wage might induce a similar performance and, thus, be the more cost-efficient payment scheme. However, if employees show low organizational commitment or a high tendency to shirk, performance-contingent payment schemes might be superior.

### **3.4.2 Practical and managerial implications**

Our study confirms the claim that research on incentive systems which focuses on potentially influential variables (such as payoff magnitude, personal variables, task variables and so forth) could “prove to be valuable in facilitating cost management and designing an efficient reward system, both for organizations and accounting researchers conducting laboratory experiments” (Bonner & Sprinkle, 2002, p. 335). In line, we take the view that a cost-per-unit measure is closer related to organizational objectives than the usually examined performance measures and should therefore be taken into account when designing incentive systems. Thus, investigating the cost-per-unit is a crucial part of creating valuable and cost-efficient payment structures.

Although our general results indicate that paying a fixed wage might be economically beneficial for organizations compared to paying piece rates, we want to refrain from recommending to directly draw such conclusions from our study. We find that additionally implementing goal setting and feedback can reverse the superiority of fixed wage schemes in terms of cost efficiency. If an organization implements these features in its organizational procedures to support its performance-contingent payment scheme, both measures performance and cost-per-unit might be superior under a piece rate scheme.

### **3.4.3 Implications and directions for research**

Our results emphasize the need to not only focus on performance as the sole criterion when assessing payment schemes. Previous research has neglected differences in absolute payments to participants across treatments and the cost-per-unit measure across treatment groups when explaining own or fellow researchers' results. We find that interpreting differences in outcome measures between different studies solely based on performance as assessment criterion can result in erroneous conclusions, especially if actual payments differ or are not explicitly stated in the research reports. We hope that future research will shift from the commonly adopted single-measure focus to a more balanced approach when evaluating the superiority of different payment schemes. Extant literature on contract theory (starting with Coase, 1937; Jensen & Meckling, 1976) and derivable consideration should not be neglected when studies either decide on parameterization of different payment schemes which are to be compared and evaluated. Rationales for the researchers' decision should be provided and results should be discussed on the basis of contract theory to avoid biased or even flawed drawing of conclusions or recommendation.



Studies should be more explicit and precise on their interest of the experimental setting. Researchers must avoid any ambiguity about the purpose of their studies: Does a study address the motivational or coordination problems, are compared payment schemes exchangeable on the basis of efficient contracts or are the parameterizations chosen randomly, does one payment scheme pay strictly higher wages than others in case all participants receive the same fixed payment and only some can earn additional variable payments?

Our study reveals the influence of moderators like goal setting and feedback on the differences in performance and cost-per-unit measures of incentive schemes. However, we are not aware of extensive literature having investigated the underlying mechanisms of the moderators' impact on different payment schemes. Further effort in research is necessary to develop a more detailed understanding of these underlying mechanisms.

Since various motivational and performance influencing factors exist in organizations that are not part of laboratory settings, conclusions from laboratory experiments should ideally be further validated with field studies in order to minimize the probability of spurious conclusions. However, we are well aware that this call might be hard to take as research would have to cooperate with organizations willing to allow field studies within their organizational structures. Furthermore, once more studies are available which investigate performance as well as cost-per-unit differences between other payment schemes (e.g., tournaments or quota schemes), a meta-analytic approach to investigate further differences between more payment schemes will be of utmost interest for research as well as for organizations.

Overall, assessing the organizational objective of profit maximization by exclusively focusing on performance under different payment schemes might lead to erroneous conclusions. Assuming organizations to be profit-maximizing, the suggested cost-per-unit ratio is a measure potentially closer related to this organizational goal than performance measures and, thus, worth investigating further.

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## 4 Employees' fairness perceptions in payment schemes<sup>14</sup>

### 4.1 Modeling implications of employees' fairness concerns in payment schemes

Fairness concerns have been identified to be amongst the key drivers of society for millenniums (Plato, 2006). Various human reactions to fairness can even be traced back to human's primate background (Brosnan & de Waal, 2014). Though, fairness concerns are omnipresent, people frequently struggle in elucidating them (Rogers, 2014). Amongst scholars, justice has been subject to controversy. Justice scholars are facing the challenge of not working with an unified and reliable measurement system and a common nomenclature (Colquitt, 2001). For instance, the terms *justice* and *fairness* are sometimes employed interchangeably, sometimes with slightly varying meanings. As suggested by Rawls (1971), however, we are going to utilize both terms synonymously. Disputes about the relevant factors of organizational justice and the lack of a unified and reliable measurement system *"(...) have hindered theoretical and practical advancement in the literature"* (Colquitt, 2001, p. 396). *Furthermore scholars struggle with the large variety and the heterogeneous content of justice literature. "(...) the large number of studies and the different theoretical perspectives raise the concern that justice scholars may be "losing the forest for the trees". (...) many central questions remain either unaddressed or unclear"* (Colquitt et al., 2001). Recently, studies focused on granular aspects of justice theory, like for instance the triggering of organizational citizenship behavior or counterproductive work behavior by fairness perceptions (Ambrose et al., 2013; Cole et al., 2013; Khan et al., 2014; Rupp et al., 2014; Sun et al., 2013; Van Dijke et al., 2012). Several papers attempted to integrate research findings into more general concepts. However, most of them rather focused on the integration of sub-aspects, like distributive justice, than on designing a holistic cause-effect relationship model (Li et al., 2013; Poon, 2012; Yang et al., 2013). Though, there have been very few papers analyzing the relations between justice perceptions and outcomes (Whitman et al., 2012), Colquitt et al. (2013) attempt to integrate research results into a cause-effect relationship model of fairness. Nevertheless, the model does not cover all aspects addressed by fairness research. Furthermore, papers trying to integrate isolated research findings into more general fairness models do not explicitly address fairness concerns within payment schemes, but rather aim at describing sub-aspects or single event-based situations (Bobocel, 2013; Matta et

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<sup>14</sup> This chapter is based on a working paper authored by Domink Doll and co-authored by Wolfgang Eichler. My contribution to the paper is summarized in the Appendix (signed by the authors in the examiners' copies of this dissertation).

al., 2014). In order to address these issues, we are going to aggregate and structure the current status of justice research and display it in a cause-effect relationship model which aims to provide a holistic overview of already proven implications of fairness concerns on observable behavior in the context of payment schemes. To the best of our knowledge, this is the first attempt to integrate all relevant research results and merge them in a model of cause-effect relationships, particularly addressing the impact of fairness concerns.

The remainder of the paper is structured as follows: First, we summarize what is known about justice concepts in general. Second, we link the justice concepts to justice dimensions defined by research. Third, we introduce our fairness model of payment schemes displaying the empirically examined implications of fairness concerns on behavior and describe the model in depth. Finally, we provide a framework on how to address fairness concerns in payment schemes for practitioners, elaborate on the limitations of our model and thereby highlight necessary future research directions for advancing extant literature and providing well-grounded recommendations for practice.

## **4.2 Justice concepts**

Various justice concepts have been developed over the past centuries. Undisputed, philosophers like Aristotle, Platon, Hume, or Rawls – just to name a few – described some of the very basic considerations which still shape our set of values and build the basis for today's justice scholars. For the purpose of this paper, the topic-relevant concepts are addressed in the following. After a brief explanation of selected psychological reasons why individuals experience injustice, justice rules for the distribution of economic outcomes in payment schemes are introduced. This facilitates a thorough understanding of potential criteria that individuals might apply when judging situations in light of fairness. Considering different fairness concerns, same circumstances might evoke deviating reactions by individuals.

### **4.2.1 Psychological reasons for perceived injustice**

Providing an insight into the predominant psychological reasons which are pertinent to justice concepts, we briefly touch on the relevant frameworks of cognitive dissonance, self-deception, and relative deprivation. This supports the comprehension of potential psychological explanations for the observed actions taken by experimental subjects in the later course of the paper, guiding towards the cause-effect relationship model.

### ***Cognitive dissonance***

Cognitive dissonance is a psychological concept introduced by Festinger (1962, p. 9). Cognitions are anything “(...) *a person knows about himself, about his behavior, and about his surroundings*” and can be thoughts, experiences or general mindsets. Between the elements of cognitions there can be no relation, a relation of consistency or a relation of inconsistency. Let us take a student as an example. He might be convinced of being a rising star in the management world. However, he fails in job interviews. The cognition in his mind of being a rising star and the cognitions he receives from the outside world by rejections in interviews are a relation of inconsistency. Festinger (1962) defines the state of inconsistency between cognition elements *dissonance* and the state of consistency *consonance*. Consequently, the student in the example experiences cognitive dissonance. Individuals try to minimize cognitive dissonances in order to create a condition of maximum consonance (Festinger, 1962). This pursuit of minimizing cognitive dissonance can result in the elimination of perceived injustice by individuals taking respective actions.

### ***Self-deception***

An alternative to take actions to overcome cognitive dissonance is the changing of one's own beliefs and mindset to create a condition of consonance, which is referred to as self-deception. However, people's beliefs in what is fair cannot be changed without costs by psychological distortion since they are “*grounded on and reconciled with some knowledge or experiences*” (Konow, 2000, p. 1077). This leads to the motivational dilemma of cognitive dissonance. On the one hand, individuals want to maximize their personal economic outcomes. On the other hand, they want to be in line with their developed understanding of justice (Diekmann, Samuels, Ross, & Bazerman, 1997). Thus, they have two options: Reframing their believes by exercising self-deception or taking action as described above. In the example of a student, he could fool himself that his respective interviewers are not able to detect his talent for becoming a management genius.

### ***Relative deprivation***

Perception describes the processing of cognitions individuals encounter (Heider, 1958). A discrepancy between what is expected to deserve and what is received is defined as relative deprivation. Relative deprivation theory suggests that a crucial factor in evaluating the own resources is the perception of how one is performing compared to others (Hewstone, Stroebe,

& Jonas, 2012). In the example of a student, after accepting a job offer with a reasonable salary, he could compare his salary with the ones of his fellow students or peers within the company. In case he realizes that he earns less than his peer group, he might feel relatively deprived to them which can trigger some conflict. The student could expect a salary increase provided by the human resource department and deem this to be just. The concept of relative deprivation applies to group situations as well as to individuals comparing themselves with each other. (Spector, 1956, p. 52) states that “*on failing to achieve an attractive goal an individual’s morale will be higher if the probability of achieving the goal had been perceived to be low than if it had been perceived to be high.*” In case a goal was perceivably easy to achieve but a person fails, individuals tend to search for external reasons which might have influenced the unfavorable outcome. The person consequently develops a feeling of having been treated unfair or unjust. (Adams, 1965, p. 272) concludes “*that felt injustice is a response to a discrepancy between what is perceived to be and what is perceived should be.*” Thus, relative deprivation highly influences a person’s fairness perception.

#### **4.2.2 Justice rules for distributing economic outcome**

The central element of economic theory has been the self-interest of individuals who seek to maximize their personal outcomes (Fehr & Schmidt, 1999). Including altruism or reciprocal behavior into economic theories caught the attention of economists only since the beginning of the 1990ies (Rabin, 1993). Individuals might have diverging justice concepts in mind when it comes to decision making. Differing observable behavior in same circumstances could be explained by these individualistic justice concepts. According to Cappelen et al. (2007), three fairness ideals can be identified in the recent political debate as well as in the normative theories: *strict egalitarianism*, *libertarianism*, and *liberal egalitarianism*.

The three distinct fairness ideals can be displayed by equations in a two-person team production setting. The respective equations are depicted in the following paragraphs describing the fairness ideals. Let  $e_i$  be the effort decision by individual  $i$  and  $a_i$  the ability of individual  $i$ . The total production equals  $X(a, e) = x_1(a_1, e_1) + x_2(a_2, e_2)$ , where  $a = (a_1 + a_2)$  and  $e = (e_1 + e_2)$ . Cappelen et al. (2007) assumes that an individual advocates either strict egalitarianism, libertarianism, or liberal egalitarianism. The fair distribution according to the fairness ideal  $k$  can be indexed by  $m_k$  for person 1 and  $X - m_k$  for person 2.

Before we proceed with the derivation of the model, we provide a more detailed introduction to the three fairness ideals that individuals could use as an underlying to assess situations and to align decisions and actions accordingly.

***Strict egalitarianism – The justice rule of equality***

- Strict egalitarianism:  $m^{SE}(a, e) = X(a, e)/2$
- “According to the strict egalitarian fairness ideal, total income should always be distributed equally among the individuals” (Cappelen et al., 2007, p. 819)

“All persons shall be equal before the law” (Basic Law, 2012). Not only in German law the principle of equality is the predominant one. “In relations in which the fostering of maintenance of enjoyable social relations is the common goal, equality tends to be the dominant distributive principle” (Kabanoff, 1991, p. 418). The justice rule of equality attributes an equal amount to each entitled recipient (Cook & Hegtvedt, 1983). Thus, all inequalities owing to different initial endowments or abilities should be eliminated (Cappelen et al., 2007).

***Libertarianism – The justice rule of equity***

- Libertarianism:  $m^L(a, e) = a_1e_1$
- “According to libertarianism, the fair distribution is simply to give each person exactly what he or she produces” (Cappelen et al., 2007, p. 819)

The justice rule of equity is the predominant fairness concept in justice literature. Especially in “cooperative relations within which economic productivity is a primary goal, equity rather than equality tends to be the chief principle of distributive justice” (Kabanoff, 1991, p. 417). In an exchange situation a condition of equity refers to the “equivalence of the outcome/input ratios (...) of all parties involved in the exchange” (Cook & Hegtvedt, 1983, p. 218). Adams (1965) developed his theory of equity in team production settings and provided a framework. According to Adams (1965), individuals aim to balance the output/ input ratio of themselves compared to another individual or a group of individuals. Thus, the ratio of his own output ( $O_o$ ) to his own input ( $I_o$ ) should be equal to the ratio of another’s output ( $O_a$ ) to another’s input ( $I_a$ ). The following three settings could exist:

Perceived inequity

$$\frac{O_o}{I_o} < \frac{O_a}{I_a}$$

Perceived inequity

$$\frac{O_o}{I_o} > \frac{O_a}{I_a}$$

Perceived equity

$$\frac{O_o}{I_o} = \frac{O_a}{I_a}$$

Inputs are the provided and outputs are the received resources in an exchange situation. Resources could be defined as money, goods, services, love, status, or information. The importance and assessment for each resource provided and received might vary across individuals, thus, also objectively equitable situations could be perceived as inequitable. Inputs are provided resources in an exchange. While exchanging work for money, sub-categories of the inputs dimensions can be education, intelligence, experience, training, skill, or seniority but could also be other factors such as personal appearance, health, or possession. Outputs are resources one receives from the exchange (Adams, 1965).

As potential actions of individuals to reduce perceived inequity, (Adams, 1963) describes eight potential reactions an individual might undertake while working towards a condition of perceived equity by reducing perceived inequity:

- (1) Own inputs are low compared to other's and to own outcomes. Individuals can increase inputs.
- (2) Own inputs are high compared to other's and to own outcomes. Individuals can decrease inputs.
- (3) Own outcomes are low compared to other's and to own inputs. Individuals can increase own outcomes. Someone who earns little compared to the colleagues and works comparably much will ask for a pay rise.
- (4) Own outcomes are high compared to other's and to own inputs. Individuals can decrease own outcomes. Someone who earns a lot compared to the colleagues and works comparably little will decrease his salary or donate money to charities.
- (5) In case of inequity, individuals not being able to balance the situation might leave the field.
- (6) In case of inequity, individuals not being able to balance the situation might psychologically distort their own inputs and outcomes, trying to overcome the

prevalent inequity. However, it is difficult to overcome the reality by surreal imaginations and might eventually cause psychological problems.

- (7) In case of inequity, individuals could influence the inputs and outcomes of others, distort them cognitively, or force others to leave the field.
- (8) In case of inequity, individuals change their object of comparison. This is only possible if there is no direct exchange relation.

### ***Liberal egalitarianism – The justice rule of accountability***

- Liberal egalitarianism:  $m^{\text{LE}}(a, e) = \frac{e_1}{e_1 + e_2} X(a, e)$
- “*Liberal egalitarianism, on the other hand, defends the view that people should be held responsible only for their choices*” (Cappelen et al., 2007, p. 819)

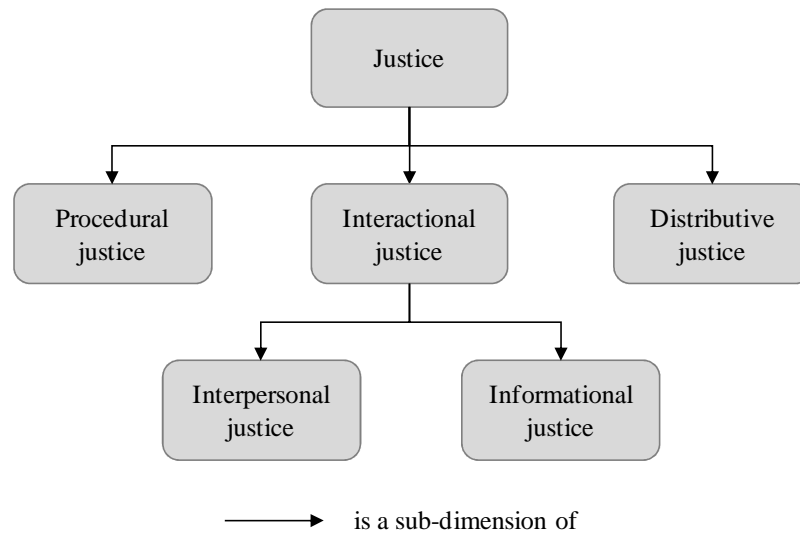
Independent from the abilities of individuals, only their choices made should be the basis for the distribution of the income: “(...) *the accountability principle requires that a person’s fair allocation (e.g., of income) vary in proportion to the relevant variables that he can influence (e.g., work effort) but not according to those that he cannot reasonably influence (e.g., a physical handicap)*” (Konow, 2000, p. 1074). In contrast to libertarianism, not the total inputs per se – the combination of effort decision and ability – are relevant for the distribution, but only the decisions made by an individual. This fairness ideal is also known as the accountability principle described by Konow (1996; 2000).

### **4.2.3 The justice dimensions**

Justice dimensions refer to various sub-aspects of justice one considers in order to assess the overall fairness of a situation. In Figure 4.1 the dimensions of justice are exhibited. On the one hand, the concept of three justice dimensions, namely procedural, interactional, and distributive justice is employed by various papers (Cohen-Charash & Spector, 2001; Colquitt et al., 2001; Cropanzano, Prehar, & Chen, 2002). On the other hand, the concept of four justice dimensions developed by Greenberg (1993) serves as foundation for several papers (Colquitt et al., 2001; Loi, Yang, & Diefendorff, 2009). It derives from the three dimensions model, by splitting up interactional justice into interpersonal justice and informational justice. More recent experimental research proves that the split up of interactional justice provides a better model fit even though interpersonal and informational justice exhibit a strong correlation (Colquitt, 2001; Colquitt et al., 2001). Since this paper aggregates the extant



literature, both results of papers referencing to the three and the four justice dimensions are included in our analysis. In the following the concepts of distributive justice, procedural justice, as well as interactional, interpersonal and informational justice are described.



**Figure 4.1:** The justice dimensions (Source: own figure, based on Cohen-Charash and Spector (2001); Colquitt et al. (2001); Cropanzano et al. (2002); Greenberg (1993); Loi et al. (2009))

### *Procedural justice*

Situations in which outcomes are generated include a process defining how an outcome is derived. One criteria for evaluating the fairness of an outcome for individuals is the fairness of the determining process. This might be a lawsuit as well as the determination of a wage in a payment scheme framework. Therefore, Thibaut and Walker (1975) introduce the dimension of procedural justice. According to Bies and Moag (1986), individuals in a first step assess procedural justice, while evaluating overall fairness.

### *Interactional, interpersonal, and informational justice*

Once an individual determined the procedural justice of a situation, it is evaluating the fairness of the interaction resulting from the applied procedure (Bies & Moag, 1986). Individuals thereby assess the social determinant of fairness (Greenberg, 1993). Both the models of procedural justice by Thibaut and Walker (1975) and Leventhal (1980) fail in separating the procedure itself from its execution (Bies & Moag, 1986). As a consequence, Bies and Moag (1986) introduce interactional justice which evolves from the perception of how individuals treat each other with interpersonal sensitivity. Greenberg (1993) further

subdivides the justice dimension of interactional justice into interpersonal justice and informational justice. Interpersonal justice is determined by the fairness of interactions between persons like for instance all the lines of communication between both colleagues and supervisors. Informational justice is assessed by the extend of the open sharing of information particularly of why things are done as they are done.

### ***Distributive justice***

After having assessed both the procedure and the interaction the individual determining the overall fairness evaluates the outcome itself (Bies & Moag, 1986). The basis of distributive justice is an exchange process of resources which is perceived as just or unjust by the participating parties (Adams, 1965; Homans, 1961). What a person thereby perceives to be fair depends on the justice rules of the individual that have been discussed before. Equal wages for instance lower the motivation of hard working agents (Milgrom & Roberts, 1992). Scholars suggest that the equality treatment fosters unproductiveness in an organizational environment. Abeler, Altmann, Kube, and Wibrals (2010) identify the concept of equity to be superior to the concept of equality in the optimization of overall output of an organization. Abeler et al. (2010, p. 1302) claim that the reason for this effect is that “*agents perceive equal wages for unequal performance as unfair*”.

#### **4.2.4 Going beyond the justice dimensions**

Research has taken a strong focus on the justice dimensions. Most authors such as Colquitt et al. (2001) try to integrate more granular justice perception influencing variables or sub-dimensions into the framework of the justice dimensions. However, the justice dimensions have their limitations. Hollensbe et al. (2008) address these criticisms with their model of organizational fairness perception. They label the four dimensions of justice as *traditional justice rules* and make them part of their model. However, they include further dimensions, which are supposed to be rules influencing either the perceived fairness of the organization, the perceived fairness of the supervisor, or both. Even though the model is able to provide a very granular view on how justice perceptions originate, it does not reflect on the consequences of the perceived justice or injustice.

Cohen-Charash and Spector (2001) address this issue while performing a meta-study on the role of justice in organizations. They include 400 empirical studies and more than 100 theoretical papers in the context of fairness and justice into their analysis. They prove the

three major justice dimensions of procedural, interactional, and distributive fairness to be the predominant ones in the literature (Cohen-Charash & Spector, 2001). However, they identify the need for a holistic analysis beyond the justice dimension. Therefore, they scrutinize papers examining the various interdependencies between justice dimensions and the related various variables, considering both causes and consequences of justice perceptions. However, they are not clearly separated. Cohen-Charash and Spector (2001) rather identify six main categories of variables exhibiting an interaction with the three justice dimensions: *organizational practices and outcomes*, *characteristics of the perceiver*, *work performance*, *organizational citizenship behavior*, *counterproductive work behavior and emotional and attitudinal reactions toward specific outcomes*, *the organization*, and *the leader/supervisor*. Cohen-Charash and Spector's (2001) findings are going to be a pivotal element of our fairness model of payment schemes which is going to be introduced in the subsequent section.

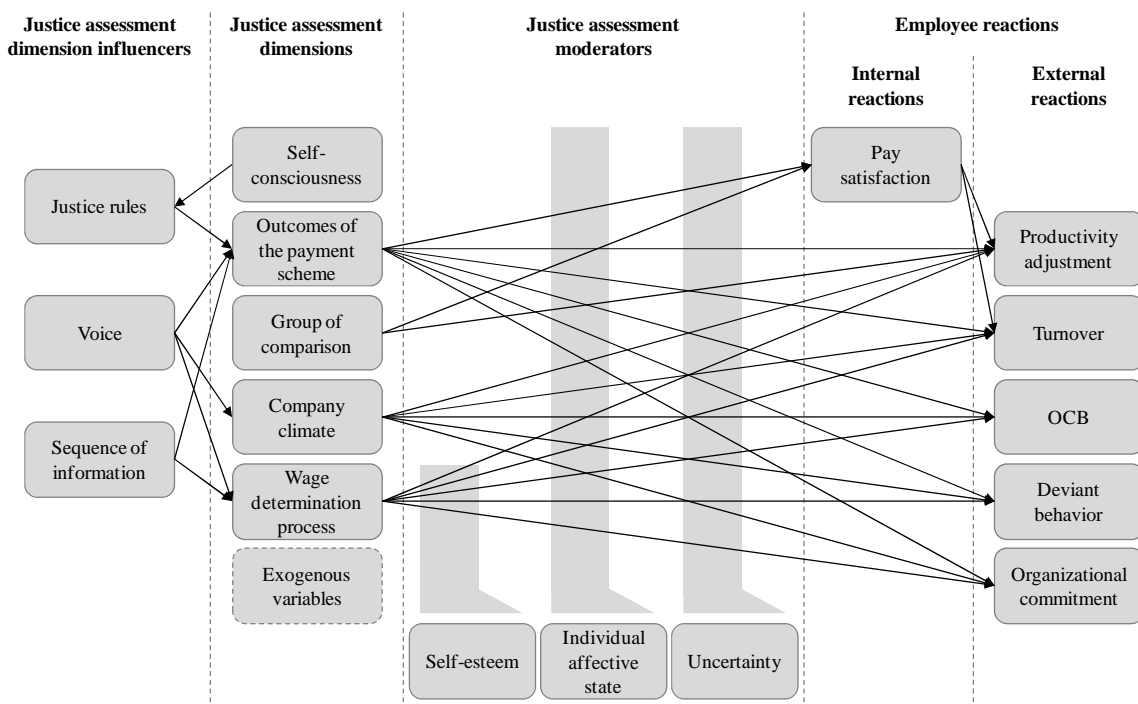
### **4.3 Fairness model of payment schemes**

Developing our fairness model of payment schemes we pursue the works of Hollensbe et al. (2008) and Cohen-Charash and Spector (2001). We analyzed the empirical justice literature in order to derive the, to our best knowledge, first holistic model regarding the causes and consequences of perceived fairness in a payment scheme context. A payment scheme for the purpose of this analysis is a scheme which is set up in order to monetarily regulate the compensation for performed work of employees. The model is displayed in Figure 4.2. After the introduction to the model, the findings in the literature which the model is based upon are provided in the subsequently sections.

People frequently base their decisions rather on justice perceptions than on rational thinking (Cappelen et al., 2007). Hence, justice perception becomes highly relevant in the payment scheme context in which employees display reactions based on decisions which are influenced by fairness considerations. Scarpello and Jones (1996, p. 297) state that "(...) *we still know very little about the standards or principles that individuals use to classify pay procedures as fair or unfair.*" Subsequent to this statement, however, a notable amount of research has been conducted and has contributed to the scientific discussion on the fairness assessments of payment schemes. The model is supposed to provide justice scholars with a structured overview on the current status of research. Furthermore, it might serve as a starting point for further research on the dimensions of the model or for an extension of the model by additional dimensions. In addition, the framework equips human relation managers with a

detailed analysis of fairness assessment factors to be addressed while reviewing their existing or designing a new payment scheme. Resulting consequences from the fairness assessment need to be anticipated.

We identified four distinct variable categories influencing the or resulting from individual justice perception in a payment scheme context, namely *fairness assessment dimension influencers*, *fairness assessment dimensions*, *employee reactions*, and *fairness assessment moderators*. Employee reactions can be divided into internal and external reactions. The fairness assessment dimensions are variables an employee assesses while determining his fairness perception. The fairness assessment dimension influencers affect the manner in which an employee assesses the fairness of the various justice assessment dimensions. Employees assess the fairness of the payment scheme based on the fairness assessment dimensions and are affected by the fairness assessment dimensions influencers. The perceived justice or injustice results in employee reactions which might be desirable or undesirable for the company. External reactions are directly observable, while internal reactions are not observable but might result into subsequent external reactions. The intensity of employees' reactions might be influenced by the fairness assessment moderators which either intensify or weaken potential employee reactions to their respective fairness perceptions.



**Figure 4.2:** Fairness model of payment schemes (Source: own figure)

### 4.3.1 Fairness assessment dimensions

The identified fairness assessment dimensions are *self-consciousness*, *outcomes of the payment scheme*, *group of comparison*, *company climate*, and *wage determination process*. The dimension *exogenous variables* has not been proven empirically yet. However, this dimension is a central element of the respected theory of Konow (2000) which justifies an inclusion into the model to nurture future research on it.

*Self-consciousness* refers to the self-evaluation of employees. The self-evaluation can be realistic which would result in a high level of self-consciousness. If it is not realistic, however, the employee displays a very low level of self-consciousness (Greenberg, 1980). Levy, Albright, Cawley, and Williams (1995) find empirical evidence that feedback results in a higher level of self-awareness. Justice scholars prove self-consciousness to influence justice perceptions directly or indirectly (Greenberg, 1980, 1983; Westerman, Heuett, Reno, & Curry, 2014). The level of self-consciousness influences the justice rules a person sets for himself (Greenberg, 1983). Self-consciousness is the ability of a person to determine who he is and how his actions are perceived by others (Bermudéz, 2000). Consequently it is very similar to the term self-awareness. “*When a person focuses his attention on his own thoughts, feelings or behavior, he is said to be in a state of self-awareness*” (Scheier, 1976, p. 627). A high level of self-awareness results in the desire for an equitable distribution of wages while low self-awareness individuals tend to prefer an equal one (Greenberg, 1983). The finding that high self-aware people allocate in a more extreme manner than low self-aware people are in line with these results (Greenberg, 1980). As a logical consequence, companies favoring an equal wage might try to keep self-awareness low by providing little feedback while companies favoring an equitable payment scheme might create high self-awareness providing ample feedback. However, this logical derivation has not yet been tested empirically. Recent papers find a direct correlation between self-consciousness and fairness perceptions. Positive feedback and, thus, a positive self-consciousness lead to higher perceived justice than negative feedback would do (Westerman et al., 2014).

*Outcome of the payment scheme* represents the justice dimension of distributive justice. Consequently, employees are utilizing this dimension in order to determine whether the actual wage they receive is fair. There is a broad consensus amongst studies that this variable is critical in an employees’ assessment of the fairness of the wage (Abeler et al., 2010; Berkowitz, Fraser, Treasure, & Cochran, 2000; Cohen-Charash & Spector, 2001; Cowherd &

Levine, 1992; Folger & Konovsky, 1989; Scarpello & Jones, 1996; Whitman et al., 2012; Williams, McDaniel, & Nguyen, 2006). These outcome evaluations are highly correlated with distributive justice perceptions (Scarpello & Jones, 1996). Cohen-Charash and Spector (2001) find outcome satisfaction to be correlated with both distributive and procedural justice. As poorly performing employees generally deem an equal payment scheme to be just, high performing employees perceive an equitable payment scheme to be fair. However, the overall output of all individuals is generally higher in an equitable payment scheme scenario (Abeler et al., 2010). These empirical results, providing a normative guideline for justice understanding, have to be analyzed in detail while designing a payment scheme. It might be true that the overall output is always maximized by an equitable payment scheme in the short run. However, in the long run other effects resulting from inequity could hinder future output.

*Group of comparison* is highly relevant for payment scheme fairness assessments by employees (Clark, Masclot, & Villeval, 2010; Harris, Anseel, & Lievens, 2008; Scarpello & Jones, 1996; Sweeney & McFarlin, 2005; Till & Ronald, 2011). Scarpello and Jones (1996) introduce and test three potential comparisons an employee might make while assessing the fairness of his pay. These are external job fairness comparisons, internal job fairness comparisons, as well as internal employee fairness comparisons. External job fairness comparisons are drawn by comparing the own salary with the one of an employee in another company on the same level. During an internal job fairness comparison an employee is comparing his wage to the ones of employees in higher and lower positions within the same company assessing whether the wage gap is fair and justified. While doing an internal employee fairness comparison one employee is comparing his wage to the ones of his peers assessing fairness. The findings of Scarpello and Jones (1996) are recently confirmed by Till and Ronald (2011). As a consequence it might be an option for employers to influence the fairness perception of the employees by guiding them towards the right comparison group. Another important insight for employers is the finding that employees rather base their fairness perception on ordinal than on cardinal comparisons. This means that it matters to employees more which rank they hold on the payroll than the actual wage gap in absolute terms (Clark et al., 2010). Subsequently, huge wage gaps within companies seem irrational. The steps in a payment scheme according to the findings of Clark et al. (2010) should rather be incremental.

*Company climate* refers to the behavior of people within the company, namely how the payment scheme is communicated and how much related information is shared. The information obtained from company officials is a strong influence factor for perceived justice by an employee. Variables measuring this phenomenon are the quality of treatment as well as explanations provided by the leaders and managers (Bies & Moag, 1986). Interactional justice with its sub-dimensions interpersonal and, particularly, informational justice are the relevant justice dimensions connected to the assessment of company climate. Various works have addressed the importance of this dimension in the fairness assessment context (Aquino, Lewis, & Bradfield, 1999; Cohen-Charash & Spector, 2001; Colquitt, 2001; Greenberg, 1993; Till & Ronald, 2011). Greenberg and McCarty (1990, p. 582) suggest that "(...) *the way information about pay is communicated from supervisors to their subordinates may greatly influence the assessments of pay fairness.*" In their meta-study Cohen-Charash and Spector (2001) identify communication to be correlated with distributive justice. An explicit correlation between justice perception and information is only confirmed empirically by Till and Ronald (2011). Therefore, confirmatory empirical research is required. Takeuchi, Chen, and Yin Cheun (2012) find an option to address the issue. They identify a strong correlation between voice and interpersonal justice, which suggests to make communicators aware of conveying the payment scheme in an appropriate manner.

*Wage determination process* refers to the procedural aspect of a payment scheme. Employees utilize this dimension in assessing whether the process of wage determination is fair, in particular the process within the payment scheme and the process of how the payment scheme is designed. Various studies have proven a significant influence of the 'wage determination process' in particular and procedural justice in general on justice assessments (Brebels, De Cremer, & Van Dijke, 2014; Cohen-Charash & Spector, 2001; Colquitt, 2001; Folger & Konovsky, 1989; Scarpello & Jones, 1996; Whitman et al., 2012). This dimension exhibits a strong correlation with institution and authority fairness evaluations (Scarpello & Jones, 1996). In order to generate a payment scheme perceived as fair, employers should both focus on the process of how the payment scheme in general is set up and how its processes determine the eventual salary of the employee. An empirically tested enabler is the one of encouraging and implementing voice of the employees (Cohen-Charash & Spector, 2001). It allows the employee to impact the results and also conveys appreciation for his thoughts which positively influences the employee's justice perception (Moorman, Blakely, & Niehoff, 1998).

*Exogenous variables* are addressed by Konow (2000, p. 1074), who describes them as something “(...) *the person cannot reasonably influence but that may have an impact on output.*” Examples in a payment scheme context might be a part of the bonus which is tied to overall company success. This can hardly be influenced by a single individual. Also external factors affecting the company from outside like competitive pressure or demand volatilities might fall under this category. Konow (2000) implies the exclusion of exogenous variables in the pay determination to be perceived as fair. However, this normative statement on the influence of exogenous variables on the justice perception has not yet been assessed empirically. Also concepts of how to eliminate exogenous effects in payment schemes have not been suggested by the analyzed papers and remain up to future research.

#### **4.3.2 Fairness assessment dimension influencers**

Fairness assessment dimension influencers are variables affecting the way fairness is perceived by employees. Consequently, they influence the fairness assessment dimensions. The three fairness assessment dimension influencers namely are *justice rules*, *voice*, and *sequence of information*.

*Justice rules* as discussed alternate between individuals. Based on the individually underlying justice rules the outcomes of the payment scheme will be assessed differently. A condition of equity generally creates the maximum output in a company environment (Abeler et al., 2010). However, depending on the justice rules applied by the employees, a condition of equity might be considered to be just or unjust. Consequently, other undesired effects might result. On the organizational side perceived justice can be influenced by the applied justice rules of the organization like equity or equality and by the desirability of the outcomes to the employee. For a comparatively poorly performing employee the concept of equality often is perceived to be fairer. A high performing employee, however, regularly perceives the concept of equity to be the more just one. This effect appears due to a self-serving bias which occurs in most individuals in situations related to justice (Diekmann et al., 1997). Thus, it is of utmost interest for the employer to figure out about his employees' underlying justice rules. Based on this knowledge the employer might even undertake actions in order to manipulate the employees' justice rules in order to create the most prosperous outcome for the company provided a given payment scheme.



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*Voice* for the purpose of this paper refers to the encouragement of employee voice behavior by the company. Employee voice behavior regards to “(...) *making innovative suggestions for change and recommending modifications to standard procedures even when others disagree*” (Van Dyne & LePine, 1998, p. 109). Papers confirm a very strong correlation between procedural justice and voice as well as a strong correlation between distributive justice and voice. Furthermore, recent research suggests a very strong correlation between voice and interpersonal justice (Takeuchi et al., 2012). Voice is important to employees, due to the perceived impact they have on outcomes as well as the perceived appreciation of their input (Moorman et al., 1998). Applied on the model this results in a positive influence of voice on the manner of employees assessing outcomes of the payment scheme, wage determination process and company climate.

*Sequence of information*, which resembles the order in which information is obtained is identified to be crucial for employees assessing both outcomes of the payment scheme and the wage determination process by van den Bos, Vermunt, and Wilke (1997). The first available information generally influences the fairness judgment most strongly. This especially applies for the wage determination process. In case employees assess this measure of procedural justice to be fair, the subsequent outcomes are evaluated in a more positive light regarding fairness. Vice versa with the outcomes being announced first and the wage determination process announced second, both aspects are taken into account while evaluating fairness. Hence, it is advisable for employers to disclose a fair wage determination process first, in case the outcomes are not supposed to be perceived as fair by the employees.

### **4.3.3 Employee reactions**

First, we introduce the external reactions *productivity adjustments*, *turnover*, *OCB*, *deviant behavior*, and *organizational commitment*. Second, the internal reaction *pay satisfaction* is discussed.

*Productivity adjustments* are identified to result from fairness assessment by various empirical papers (Abeler et al., 2010; Elovainio et al., 2005; Elovainio, Kivimäki, & Helkama, 2001; Whitman et al., 2012). Productivity adjustments are an adjustment of efforts by the employee in order to increase perceived justice. In their meta-analysis, Whitman et al. (2012) find a strong positive correlation between organizational justice and work effectiveness. The same holds true for all the three dimensions of justice, namely distributive, procedural, and

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interactional justice. This implies that productivity increases in case of a positive fairness assessment of the variables outcomes of the payment scheme, wage determination process and company climate. Konovsky and Cropanzano (1991) on the contrary find that only in case of a negative assessment of the wage determination process work effort is reduced. For a negative assessment of outcomes of the payment scheme or company climate, however, this is not the case. Abeler et al. (2010) refer to an inequitable and therefore perceived unfair payment scheme which resembles the fairness assessment of outcomes of the payment scheme. In case of a negative assessment Abeler et al. (2010) prove a reduction in employees' exerted effort. Also a causal correlation in between group of comparison and productivity adjustment is proven: "(...) *effort at work depends on the individual's own income as well as on what others earn (...)*" (Clark et al., 2010, p. 421). Beyond these aspects there are effects of reduction of productivity which are not triggered by the employee himself. The absence of justice in wage determination process and company climate both triggers stress reactions which result in reduced productivity (Elovainio et al., 2001). A lack of perceived organizational justice has been proven to be responsible for negative health effects resulting in higher absenteeism (Elovainio et al., 2005). An equitable and therefore perceived fair payment scheme enhances product quality (Cowherd & Levine, 1992).

*Turnover* can be driven by justice perceptions. For turnover intentions Cohen-Charash and Spector (2001) find a strong negative correlation with perceived distributive and procedural justice and a negative one with interactional justice. Most recent research suggests a strong causality of the presence of perceived distributive and interpersonal justice by employees on reduced turnover intentions (Ribiero & Semedo, 2014). The payment scheme design should take into account the fairness assessment dimensions of outcomes of the payment scheme, wage determination process, and company climate in order to minimize turnover due to justice perceptions.

*OCB* (organizational citizenship behavior) are "(...) *organizationally beneficial behaviors and gestures that can neither be enforced on the basis of formal role obligation nor elicited by contractual guarantee of recompense. OCB consists of informal contributions that participants can choose to proffer or withhold*" (Organ, 1990, p. 46). OCB is categorized into five empirically distinct dimensions. These are altruism, courtesy, sportsmanship, conscientiousness and civic virtue (Organ, 1988). Most of the OCB behavior is expressed towards colleagues and supervisors. It is referred to as OCB towards individuals (OCBI).

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However, there is also OCB which is exercised directly towards the organization like voluntarily participation in committees. It is referred to as OCB towards the organization (OCBO) (Skarlicki & Latham, 1997). OCB is displayed both when distributive and procedural justice are assessed in a positive manner by the employee (Cohen-Charash & Spector, 2001). Procedural justice is identified to be the reason for satisfaction and a positive view of an employee towards his organization. Individuals react to perceived justice by putting their own short-term interests behind the organization's interests. They engage more in the organization than demanded from them and display OCB (Lind & Tyler, 1988; Moorman et al., 1998; Organ & Moorman, 1993). Consequently, it is related to both the assessment of outcomes of the payment scheme and wage determination process. Recent research, however, focuses on both the procedural and interpersonal aspect of justice. It proves that if one of these aspects is perceived to be just OCB might evolve (Brebels et al., 2014; Colquitt, 2001; Moorman et al., 1998). Subsequently, both wage determination process and company climate would be the relevant fairness assessment dimensions. Moorman et al. (1998) find that perceived procedural justice fosters a feeling of perceived organizational support within employees which incentivizes them to demonstrate OCB. Brebels et al. (2014) determine that procedural justice might result in OCBO if an employee defines himself strongly with regard to the organization. In case he rather defines himself through the relationship to others he might display OCBI. Consequently, while designing a payment scheme with the intention of generating OCB executives should focus on a perceived fair wage determination process. Employers might find tools to guide the self-definition of employees in order to evoke the desired OCB. Also interpersonal justice and therefore the assessment of company climate is relevant. Interpersonal justice and consequently a positive company climate result in helping behavior which is a sub-category of OCB (Colquitt, 2001).

*Deviant behavior* pools reactions such as destroying equipment, doing work incorrectly, spreading rumors and stealing. It is frequently also referred to as counterproductive work behavior (Cohen-Charash & Spector, 2001). “(...) *social groups create deviance by making the rules whose infraction constitutes deviance*” (Becker, 2008, p. 9). All the described dimensions of counterproductive work behavior match this definition. Deviant behavior proves to be strongly driven by the perception of experienced injustice (Aquino et al., 1999; Cohen-Charash & Mueller, 2007; Cohen-Charash & Spector, 2001; Colquitt, 2001; Greenberg, 1993). A negative correlation between distributive and procedural justice with deviant behavior has been proven in the meta-study of Cohen-Charash and Spector (2001).

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The distributive justice correlation is supported by Greenberg (1993) who identifies that an inequitable and therefore perceived unfair pay leads to an increased theft rate. A general assessment of unfairness was furthermore identified as cause of interpersonal counterproductive work behaviors (Cohen-Charash & Mueller, 2007). Between interactional justice and deviant behavior in general a negative causality was identified (Aquino et al., 1999). Reversely, perceived interpersonal and informational justice is identified to reduce theft (Greenberg, 1993). A positive causality is also attributed to perceived procedural justice which results in rule compliance, thus, preventing deviant behavior (Colquitt, 2001). Consequently it might be crucial to take scrutiny on the employee fairness assessment dimensions of outcomes of the payment scheme, wage determination process, group of comparison and company climate while designing a payment scheme, which should prevent deviant behavior triggered by fairness perceptions.

*Organizational commitment* is defined as “*the relative strength of an individual’s identification with and involvement in a particular organization*” (Mowday, Steers, & Porter, 1979, p. 225). It involves three aspects: “(1) a strong belief in and acceptance of the organization’s goals and values; (2) a willingness to exert considerable effort on behalf of the organization; and (3) a strong desire to maintain membership in the organization” (Mowday et al., 1979, p. 225). Compared to satisfaction, organizational commitment is a general attitude towards the organization which is not as volatile as satisfaction. Furthermore, it is directed towards the organization in a more global manner while satisfaction is directed towards specific aspects of the organization or the job (Mowday et al., 1979). Cohen-Charash and Spector (2001) find a correlation between the three dimensions of justice and organizational commitment. However, other papers focus on the causality of procedural justice triggering organizational commitment (Colquitt et al., 2001; Konovsky & Cropanzano, 1991; Wiesenfeld, Swann Jr, Brockner, & Bartel, 2007) and prove the causality in a payment scheme environment (Folger & Konovsky, 1989).

*Pay satisfaction* was identified as the only empirically proven internal reaction. Sweeney and McFarlin (2005) find that both internal within company and external wage comparisons lead to increased pay satisfaction if the result of the comparison is a perceived fair wage. Furthermore, evidence for a positive impact of both distributive and procedural justice is testified (Berkowitz et al., 2000; Williams et al., 2006). However, Folger and Konovsky (1989) claim, based on their experiments, that distributive justice exceeds the influence of

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procedural justice on overall satisfaction and pay satisfaction significantly which is confirmed by Cohen-Charash and Spector (2001). Also the group of comparison as well as informational justice are found to increase pay satisfaction (Till & Ronald, 2011). The influence of the fairness assessment dimensions on pay satisfaction are highly relevant for this paper as pay satisfaction has an effect on the external reactions employers seek to control while designing a payment scheme. An increase in pay satisfaction is held responsible for productivity adjustments namely an increase in organizational outcome (Currall, Towler, Judge, & Kohn, 2005). Furthermore, turnover can be reduced if pay satisfaction is increased (Currall et al., 2005; Williams et al., 2006).

#### **4.3.4 Fairness assessment moderators**

This section elaborates on the three fairness assessment moderators *self-esteem*, *individual affective state*, and *uncertainty*.

*Self-esteem* is identified to be a fairness assessment moderator only for procedural justice and therefore for wage determination process (Cohen-Charash & Spector, 2001). In case of high self-esteem of the employee, perceived procedural justice has a positive effect on organizational commitment. However, within low self-esteem employees this effect cannot be observed (Wiesenfeld et al., 2007). Thus, the effects of perceived fairness in the wage determination process can be nurtured by raising self-esteem amongst employees. In a payment scheme which is perceived to be unfair however, high self-esteem also enforces the negative employee reactions.

*Individual affective state* refers to the current emotional state or mood which an employee is in (Hollensbe et al., 2008). Individual affective state is identified to moderate all kinds of fairness perceptions and therefore all kinds of fairness assessment dimensions. Both positive and negative affective states have been proven to influence fairness perceptions. Negative affectivity related procedures are inversely linked with both procedural and interactional justice (Cohen-Charash & Spector, 2001). Negative affectivity describes the mood and mindset of an individual. High negative affectivity individuals are rather distressed, upset, and dissatisfied with themselves while low negative affectivity individuals are content, secure, and satisfied with themselves (Watson & Clark, 1984). However, there is research contesting a direct relation between negative affectivity and fairness perceptions. Aquino et al. (1999), for instance, find a direct correlation between negative affectivity and deviant behavior within an

organization but do not discover a correlation with fairness perceptions. In case objective information for a fairness assessment is missing, the influence of individual affective state increases (Hollensbe et al., 2008; van den Bos, 2003). Depressive symptoms as a part of individual affective state have also been proven to influence fairness perceptions (Lang, Bliese, Lang, & Adler, 2011).

*Uncertainty* is an incompleteness of information (Smithson, 2012). A person experiencing uncertainty “(...) *has only probabilities of events to work with in making decisions*” (van den Bos & Lind, 2002, p. 4). Uncertainty Management Theory (UMT) links the two important concepts prevalent in organizational behavior theory, namely fairness and uncertainty (van den Bos & Lind, 2002). It suggests that fairness supports people in coping with situations of uncertainty. Beyond that “(...) *uncertainty is a powerful moderating variable for fairness effects, such that fairness effects are magnified in proportion to the level of uncertainty being experienced*” (Lind & van den Bos, 2002, p. 216). Furthermore, UMT suggests that it is irrelevant whether the uncertainty is logically intertwined with the just or unjust treatment in question. The moderating effect will occur in both scenarios (Lind & van den Bos, 2002; van den Bos & Lind, 2002). As a consequence of UMT, it is of utmost importance for organizations to provide their employees with a perceived feeling of justice, especially in uncertain times such as economic crises and recessions, mergers and acquisitions, or times of radical technological changes (Lind & van den Bos, 2002). Company executives should evaluate the prevailing uncertainties within the company and its environment in order to derive the importance of fairness for the employees.

#### **4.4 Implications and limitations**

First, we provide a framework on how to employ the fairness model of payment schemes in a company environment to ensure the practical applicability of our model. Second, we pinpoint the limitations of our model and suggest directions for future research. Finally, we put the results of this paper into perspective while drawing the conclusion.

##### **4.4.1 Implications for human resource management**

In this section we provide a five-step framework on how executives could apply the fairness model of payment schemes in the company environment. It might serve as a tool to apply our cause-effect relationship model both in payment scheme design as well as in the creation of an adequate payment scheme environment, thus, promoting the favorable employee reactions for

the respective company. The approach should employ a backward induction strategy. It primarily determines the desired employee reactions. Subsequently, it investigates the required steps to be taken to achieve these employee reactions by manipulating fairness assessment dimensions, fairness assessment dimension influencers, and fairness assessment moderators.

In a *first step*, executives should determine which employee reactions of the fairness model of a payment scheme should be nurtured and which ones should be prevented. The external reactions have to be analyzed and also the internal reactions triggering the desired and undesired external reactions should be considered. A list of the desired and undesired employee reactions to be triggered or prevented by the payment scheme and its environment should be the result of the analysis.

In a *second step*, the relevant fairness assessment dimensions which influence the employee reactions in question have to be identified. It needs to be explored whether perceived justice or injustice regarding the respective fairness assessment dimension leads to the desired employee reaction or prevents the undesired one. A list of the relevant fairness assessment dimensions and the respective required fairness assessment by the employee should be the result of the analysis.

In a *third step*, the fairness assessment dimension influencers which impact relevant fairness assessment dimensions need to be discussed. Executives might utilize fairness assessment dimension influencers in order to push the fairness perceptions of the employee into the desired direction. A list of the relevant fairness assessment dimensions and the action required to address them in a favorable manner should be the result of this analysis.

In a *fourth step*, the fairness assessment moderators need to be analyzed. A list of the fairness assessment moderators influencing the magnitude of employees' reactions, the current status of the moderator, and the direction as well as the relevance of the moderator should be the result of the analysis.

In a *fifth step*, executives should build upon the information elaborated in step one to step four. Existing or potential payment schemes and their environment should be optimized according to the list of the influential fairness assessment dimensions. Executives should consider how to address the justice assessment dimension influencers in order to channel

employees' fairness assessment in the desired direction. Measures to increase or weaken employee reactions by influencing the fairness assessment moderators should be discussed.

As a result executives should create a payment scheme and an adequate environment, which utilizes fairness perceptions to achieve the goals, pre-defined in the first step.

#### **4.4.2 Limitations for practical implications and directions for future research**

Beside from providing an holistic overview for scholars on the examined implications of justice related variables in payment scheme contexts, the model aims at serving as a handy tool for executives designing payment schemes. However, it has to be considered that the different dimensions of the model and their relations have not been tested in the context of the model itself. Interaction effects of the various variables might be the consequence. Furthermore, most of the aggregated research findings were derived rather in artificial and highly controlled laboratory settings. Providing reality proven recommendations requires a shift from experimental studies to field studies and remains subject to further research.

Cultural differences regarding justice perceptions in a working environment have been addressed in several works (Adams, 1963; Leung & Smith, 1996; Pillai, Williams, & Tan, 2001; Yamaguchi, 2005). However, most studies discussed in this paper are based on U.S. or European studies. Future research should try to replicate the results from these studies in cultures beyond the western hemisphere and enrich the discussion by locally deviating fairness perceptions and subsequent reactions.

This paper might serve as an attempt to provide a structured depiction of extant literature on fairness perceptions and employees' reactions in an holistic model as scholars have been challenged by the large variety and the heterogeneous content of justice literature (Colquitt et al., 2001, p. 427). Additionally, the disputes about the relevant factors of organizational justice and the lack of a unified and reliable measurement system “(...) *have hindered theoretical and practical advancement in the literature*” (Colquitt, 2001, p. 396). Thus, finding a mutual foundation for justice research to enable further theory development and to ensure a straight forward applicability of research results will be the key challenge to be addressed by justice scholars.

Hence, before applying the research results presented in the cause-effect relationship model, it needs to be diligently assessed whether and to which extent the insights are applicable to real



life settings. Nonetheless, “(...), *managers should be aware of the benefits of behaving toward subordinates in a manner perceived as fair*” (Moorman, 1991, p. 854).

#### **4.4.3 Conclusion**

The goal of this elaborate was to aggregate and cluster extant literature in the research field of the implications of employees’ fairness perception in a payment scheme context and to carefully derive a value adding framework encompassing the state-of-the-art research findings. We strived to support scholars with an overview of the so far examined cause-effect relationships as well as to provide human resource department executives with an scientifically well-grounded set of recommendations when current or to be developed payment schemes are to be evaluated.

However, more research is needed to further clarify the influential elements and their potential interactions on employees’ fairness perceptions and to further improve the validity of the derived results from laboratory research in well-designed field studies. Our cause-effect relationship model might serve as an impetus for putting more extensive studies on the research agenda to reveal and understand the possibly still hidden insights into human reactions to fairness concerns in employer-employee relationships, especially in payment scheme contexts.

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## 5 Conclusion and implications for practice

### 5.1 Summary of main results

Examining the impact of heterogeneous vs. homogeneous ability-based group matching procedures in group production tasks with two different rules of allocation productivities to participants (Chapter 2), the impact of two distinct payment schemes compared in previous studies on subject performance as well as on resulting cost-per-unit ratios and the derived recommendations of previous research solely based on the criterion of subjective performance (Chapter 3), and the current state of the extant literature on the issue of employees' fairness perception in the context of remuneration schemes elaborating a holistic cause-effect relationship model both for scholars and practitioners (Chapter 4), this thesis strived to contribute to the ever-growing knowledge base in the fields of economics and behavioral sciences to foster the enhancement of corporate decision making processes. The main results of Chapters 2 to 4 are summarized in the following.

In Chapter 2, the motivational impact of heterogeneous vs. homogeneous ability-based group matching procedures on the displayed levels of moral hazard was examined in two rigorously designed between-subject and chosen-effort laboratory experiments, neglecting all other factors in order to keep the incentive structure exactly identical for all subjects. Participants could have four different roles in the group setting: High-ability type matched with another high-ability type (HH), high-ability type matched with a low-ability type (HL), low-ability type matched with another low-ability type (LL) and low-ability type matched with a high-ability type (LH). The payoff-maximizing and the socially optimal effort levels were exactly the same for both high- and low-ability types, independent from the matching principle. In the first experiment, with a random allocation of participants to the two productivities, the displayed levels of moral hazard were significantly lower in the homogeneous groups, and hold true both for low-ability types on the 1% significance level and on the 5% significance level for high-ability types, respectively.

**Result 1:** *Ability-based matching procedures do lead to different moral hazard levels in homogeneous vs. heterogeneous group and these differences can exclusively be attributed to motivational effects.*

Considering the potential influence by the random allocation rule of the two ability types in experiment 1, the allocation of productivities in experiment 2 was determined by a

intelligence test before the main experimental decision on the chosen effort levels, mimicking an endowed allocation of productivities. Previous research has shown that replacing random allocation by endowment-based procedures where participants "earn" their endowments or roles, participant decisions in both laboratory and field experiment can change profoundly. However, the findings in the second experiment, keeping all experimental settings exactly the same, except for the change of the allocation rule, provided results with the same effect directions, thus, corroborating the findings of the motivational impact of ability-based group matching procedures.

**Result 2:** *The advantage of less moral hazard of homogeneous group matching procedures remain robust, independently from the allocation rule for productivities.*

Thus, as the effort levels for the optimally selfish and the welfare maximizing were identical for homogeneous and heterogeneous group both for the low- and high-ability types, the found different levels of displayed moral hazard were exclusively driven by motivational factors, such as team cohesion and swift trust effects.

Conducting a meta-analysis, Chapter 3 investigated the impact of two payment schemes, namely fixed wage vs. piece rate, on two measures of assessment of the superiority of different payment schemes. Previous behavioral economic, accounting, and psychology studies have almost exclusively used subjective performance as the sole assessment criterion when comparing different payment schemes, concluding that performance-contingent payment schemes are superior to fixed wage schemes. However, from a corporate perspective, not only the employee performance, but more often the cost-efficiency of a payment scheme is of utmost importance. Thus, additionally to the reported performance measure, the cost-efficiency of the payment schemes, i.e., cost-per-unit ratio, was derived. Although piece rate schemes elicit significantly higher performance, an assessment based on the cost-per-unit ratio reversed the most often recommendation for performance-contingent payment schemes, based on the research findings regarding performance differentials. The findings call for a more differentiated discussion of empirical results, also based on the highly relevant criterion of cost-efficiency for organizations.

**Result 3:** *Applying a cost-efficiency measure of assessment, i.e., cost-per-unit, the superiority of piece rate schemes over fixed wage schemes*

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*reverses. Previous recommendations of empirical studies for practice might have been flawed and did almost exclusively refer to performance as the sole criterion when assessing the superiority of different payment schemes.*

Raising this issue and questioning the previously one-sided discussions and following derivation of recommendations both for research and practitioners, this study substantiated the need and importance to additionally consider cost-efficiency when assessing the superiority of payment schemes. Although insights from theories on efficient contracts are one of the major pillars in model economic theory, behavioral studies have hardly discussed and reflected own results in this perspective. Thus, the consideration of more relevant assessment criteria to enhance the discussions of research finding, not prematurely providing potentially flawed and spurious recommendations for practitioners, was proposed as a future alteration for studies as a step forward to enhanced and more useful contributions, especially for practitioners.

Chapter 4 represented the first attempt to provide both researchers and practitioners with a holistic cause-effect relationships model of employee's fairness perception in the context of remuneration schemes. Analyzing the extant literature that explicitly addressed research questions and influential variables of employee's fairness perception in remuneration scheme and its corresponding outcomes, i.e., employee behavior towards peers and the respective organization, previously found relationships were aggregated and visualized by the elaborated framework. The model's purpose was to provide researchers the opportunity to identify research gaps, to develop hypotheses, and to grasp a quick overview for both scholars and researchers on the existing relationships of causes and effects in the context of remuneration schemes driven by employee fairness perceptions.

**Result 4:** *Research has identified various influential factors, both variables and moderators, of corporate remuneration schemes and its processes relevant for employee fairness perceptions. This is the first attempt to collect the respective findings and to aggregate those in an holistic framework.*

## **5.2 Implications for practice and future research**

Keeping the inherent limitations of single and, thus, sometimes too restrictive research questions in mind, the ubiquitous validity of research results derived from stylized research

designs might not always hold in reality and requires examination by additional studies and validation by replicating the studies presented. Nevertheless, the results of this thesis can shed light on the raised research questions and provide valuable insights to several highly relevant issues of corporate decision making, both for practitioners and scholars.

First, the impact of the motivational factor of ability-based group matching procedures on the moral hazard levels was examined in a rigorously designed laboratory experiment proving the significant implications for group composition considerations. When superiors decide on the composition of groups, the advantages of homogeneous groups, regarding the relevant abilities, should at least be taken into account. The results indicate that homogeneous groups are *ceteris paribus* superior as they reduce individuals' susceptibility to moral hazard. If no other considerations, such as composing averagely capable group and teams or providing novices with the opportunity to learn from more experienced and productive colleagues, determine the policy of group matching procedures, the overall output (i.e., lowest levels of moral hazard in group production) for corporate institutions or superiors' cost or profit centers might be the highest with an ability-based matching procedure as moral hazard is considerably more pronounced in heterogeneous group compared to homogeneous groups.

Second, the meta-analytic approach proved that many recommendations concerning the superiority of different payment schemes based solely on the criterion of subject performance might have been flawed and spurious. Taking into account different, for some companies more relevant and vital, criteria, such as a cost-efficiency measure, experimental findings can be interpreted entirely different, reversing researchers' recommendations for practitioners. The findings call for a more careful provision of recommendation based on empirical data, for the inclusion of more than performance-based measures when assessing the superiority of different payment schemes in studies, and for a more balanced discussion of derived results. Practitioners should consider the proposed criticism when designing payment schemes or when tracking and controlling for the benefits of a payment scheme. The reversal of the superiority of the payment schemes based on the used assessment criterion should also sensitize practitioners or members of boards of directors for the importance of the choice about key performance indicators evaluating and incentivizing managers: Managers' decisions can strongly depend on the implemented indicators (e.g., performance vs. cost-efficiency), possibly resulting in entirely different decisions on payment schemes for their respective subordinates or supervised business units.

Third, only few studies have explicitly addressed selected causes and effects of employee fairness perceptions. This thesis contributed with the first aggregation and visualization of previous research findings for both academics and practitioners. Mapping relevant variables and moderators and its proven relationships, enables researchers with the opportunity to identify research gaps and to develop hypotheses based on the relationships between causes and the outcomes driven by employee fairness perceptions. Practitioners confronted with the task to either design new or adapt existent remuneration schemes and willing to take into account the potential impacts of different payment scheme structures or policies are enabled to grasp a quick and useful overview of scientific insights. Additionally, the elaborated model can serve as a tool for practitioners to analyze potential causes for current dissatisfactions or rumors amongst employees based on their fairness perceptions and as well as a tool with the proposed five-step approach concerning the backward induction strategy to either design a new or adapt an existing remuneration scheme according to the desired outcome, i.e., employee fairness perception or employee behavior.

In general, this thesis contributed to the continuously enhancement of corporate decision making, addressing two precisely defined research questions using one laboratory experiments and one meta-analytical approach, and providing one literature review mapping research findings on employee fairness perceptions in an cause-effect relationship model. Engaging in effortful thinking and utilize thorough reasoning, the so-called "system 2" (Kahneman, 2013), this thesis hopefully provided impulses for decision makers, equipping executives and managers with valuable insights and thoughts when making more informed and fact-based decisions on behalf of corporate institutions.

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## Appendices

### Appendix A: Control questions for individual effort decision (chapter 2)

Example of windfall treatment and translated from German (original questions can be retrieved from the authors upon request).

For answering the control questions, you do not receive any payoff.

In the following you find seven comprehension questions. Please answer them and click on the button "Send entries". In case you do not answer all question correctly, you have to answer the questions again. In case you need assistance to answer the questions, please raise your hand and wait for the instructor. For answering the comprehension questions, the following table is provided:

Effort decision	1	2	3	4	5	6	7	8	9	10
Output	3,5	6,8	9,9	12,8	15,5	18,0	20,3	22,4	24,3	26,0
Effort decision	11	12	13	14	15	16	17	18	19	20
Output	27,5	28,8	29,9	30,8	31,5	32,0	32,3	32,4	32,3	32,0

**Question 1:** Assume that your effort decision is 5. What is the resulting cost of your decision?

**Question 2:** Assume that your effort decision is 5. What is your payoff you receive after deducting your related costs?

**Question 3:** Assume that your effort decision is 6. What is your payoff you receive after deducting your related costs?

**Question 4:** Assume that you change your effort decision from 5 to 6. How many Taler do you receive more as payoff by such a change in the decision?

**Question 5:** Assume that your effort decision is 10. What is your payoff you receive after deducting your related costs?

**Question 6:** Assume that your effort decision is 19. What is your payoff you receive after deducting your related costs?

**Question 7:** Assume that you change your effort decision from 10 to 19. How many Taler do you receive less as payoff by such a change in the decision?

## Appendix B: Control questions for effort decision in groups (chapter 2)

Example of windfall treatment (homogeneous matching and high type) and translated from German (original questions can be retrieved from the authors upon request).

For answering the control questions, you do not receive any payoff.

In the following you find four comprehension questions. Please answer them and click on the button "Send entries". In case you do not answer all question correctly, you have to answer the questions again. In case you need assistance to answer the questions, please rise your hand and wait for the instructor. As a recap the calculation formula:

Taler for subject X =  $1/2$  of the resulting payoff based on effort decision subject X +  $1/2$  of the resulting payoff based on effort decision subject Y - cost of effort decision of subject X

For answering the comprehension questions, the following table is provided both to you and the your group member:

Effort decision	1	2	3	4	5	6	7	8	9	10
Output	3,9	7,6	11,1	14,4	17,5	20,4	23,1	25,6	27,9	30
Effort decision	11	12	13	14	15	16	17	18	19	20
Output	31,9	33,6	35,1	36,4	37,5	38,4	39,1	39,6	39,9	40

**Question 1:** Assume that your effort decision is 5 and your group member's is 6. What are your cost you have to bear of these decisions (you only bear your own cost)?

**Question 2:** Assume that your effort decision is 5 and your group member's is 6. What is your payoff after deducting your related costs?

**Question 3:** Assume that your effort decision is 5 and your group member's is 7. What is your payoff after deducting your related costs?

**Question 4:** Assume that your effort decision is 6 and your group member's is 6. What is your payoff after deducting your related costs?

### Appendix C: Primary literature used for the meta-analysis (chapter 3)

List of included studies, estimations/calculations provided only where required, used procedure provided.

#	Study	Estimation/calculation	Procedure used
1	Adams, J. S., & Rosenbaum, W. B. (1962)	SD perf.	Mean aver. SD
2	Al-Ubaydli, O., Andersen, S., Gneezy, U., & List, J. A. (2012)		
3	Bailey, C. B., Brown, L. D., & Cocco, A. F. (1998)		
4	Bailey, C. D., & Fessler, N. J. (2011)		
5	Brüggen, A., & Moers, F. (2007)	SD pay, SD perf.	Mean aver. SD; variance homogeneity
6	Chung, K. H., & Vickery, W. D. (1976)	SD perf.	Mean aver. SD
7	Fabes, R. A., Moran, J. D., & McCullers, J. (1981)		
8	Fatseas, V. A., & Hirst, M. K. (1992)		
9	Fehrenbacher, D. D., & Pedell, B. (2012)	SD pay	Hozo et al. (2005)
10	Fessler, N. J. (2003)	SD perf.	Mean aver. SD
11	Gneezy, U., & Rustichini, A. (2000)		
12	Greiner, B., Ockenfels, A., & Werner, P. (2011)		
13	Hamner, W. C., & Foster, L. W. (1975)		
14	Huber, V. L. (1985)		
15	Johnson, D. A., Dickinson, A. M.; & Huitema, B. E. (2008)		
16	Kvaløy, O., Nieken, P., & Schoettner, A. (2014)	SD perf.	Confidence intervals



#	Study	Estimation/calculation	Procedure used
17	Lee, T. W., Locke, E. A., & Phan, S. H. (1997)		
18	Libby, R., & Lipe, M. G. (1992)		
19	Locke, E. A., Bryan, L. E., & Kendall, L. M. (1968)	SD perf.	Mean aver. SD
20	London, M., & Oldham, G. R. (1977)	SD perf.	Mean aver. SD
21	London, M., & Oldham, G. R. (1976)	SD perf.	Mean aver. SD
22	Matthews, G. A., & Dickinson, A. M. (2000)		
23	Pinder, C. C. (1976)		
24	Pokorny, K. (2008)		
25	Pritchard, R. D., & DeLeo, P. J. (1973)	SD perf.	Mean aver. SD
26	Pritchard, R. D.; Hollenback, J., & DeLeo, P. J. (1980)	SD perf.	Variance homogeneity
27	Sprinkle, G. B. (2000)	SD perf.	Mean aver. SD
28	Tafkov, I. D. (2013)		
29	Terborg, J. R.; & Miller, H. E. (1978)		
30	Toppen, J. T. (1965)	SD perf.	Variance homogeneity
31	Vecchio, R. P. (1982)	SD perf.	Variance homogeneity
32	Wright, P. M. (1990)		

**Appendix D: Contribution to working papers****Working paper 1 (Chapter 2)**

For this experimental study, I was in charge of the design, preparation, and conduction of the experiment. In this paper I was in charge for most of the data analysis, especially the regression analyses and the robustness checks, as well as for writing large parts of the paper.

Dominik Doll (lead author)

Eberhard Feess (co-author)

Alwine Mohnen (co-author)

**Working paper 2 (Chapter 3)**

For this meta-analysis, I was largely in charge of the conceptual definition and purpose of the study. In this paper I was in charge for writing large parts of the paper.

Dominik Doll (lead author)

Dominik L. Schall (co-author)

Elisabeth K. Taucher (co-author)

**Working paper 3 (Chapter 4)**

For this literature review, I was largely in charge of the conceptualization and purpose of the study. In this paper I was in charge for writing large parts of the paper.

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