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## Working Paper Hierarchical similarity biases in idea evaluation: A study in enterprise crowdfunding

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# KIEL Working Paper

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# ABSTRACT

# HIERARCHICAL SIMILARITY BIASES IN IDEA EVALUATION: A STUDY IN ENTERPRISE CROWDFUNDING

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To be successful innovators, organizations must select the best ideas for implementation. Extant research shows that idea selection is distorted by a number of biases, but has failed to consider hierarchy, a key element of organizations. We examine how hierarchical distance between an idea's creator and its evaluator affects evaluation outcomes and thus advance three competing theoretical predictions based on homophily, competition, and status. To test our predictions, we use a unique dataset from an enterprise crowdfunding initiative at Siemens where 265 employees evaluated 77 ideas by allocating corporate funds, resulting in 20,405 evaluation dyads. We find that idea evaluations are more favorable if the idea creator is hierarchically similar to the evaluator, thus supporting the homophily perspective. Idea novelty amplifies this bias, inducing more social evaluations. Our findings are robust to various specifications and tests, and are absent in a subsample where idea creators remained anonymous. We contribute to the idea evaluation research and inform organizational idea selection process designs.

**Keywords:** idea evaluation, idea selection, crowdfunding, hierarchy, homophily, status, competition **JEL classification:** D91, M19, O31

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#### **1** Introduction

It is crucial for organizations to generate new ideas, whether for product or service innovations or for better ways of organizing. Often it is even more important to identify and select good ideas and distinguish them from bad ones (Åstebro and Elhedhli 2006, Sutton 2010, Boudreau et al. 2016).

Idea selection is encumbered by uncertainty about an idea's true value, once implemented, but also by biases that are superimposed on considerations of expected idea quality and that systematically distort people's assessments, leading to misjudgments, the implementation of mediocre ideas, and – ultimately – lower organizational performance. Such biases have been identified in a wide range of innovation contexts. For instance, scientists tend to give lower evaluations to research proposals closer to their own expertise (Boudreau et al. 2016). Venture capitalists favor teams similar to themselves in training and professional experience (Franke et al. 2006). Circus professionals rate others' ideas less accurately if they lack experience in creating ideas themselves (Berg 2016), and employees undervalue ideas that originate outside their own business unit (Reitzig and Sorenson 2013).

However, this growing literature on idea selection and attendant biases has neglected the hierarchical structure of organizations as a source of potential idea misevaluation. This is surprising, given that hierarchies are key to organizations (Anderson and Brown 2010, Magee and Galinsky 2008) and affect a wide range of aspects of organizational life. Any employee assessing a new idea will invariably notice the idea creator's hierarchical position and will likely compare it to their own position. Hierarchical differences are likely to prompt specific assumptions and cues about an idea creator, which – in turn – may affect idea evaluations, introducing evaluation bias. Understanding how and why hierarchical distance affects idea evaluations above and beyond idea quality is key to design idea evaluation systems that promote the selection of most valuable ideas.

We investigate the proposition that evaluations of ideas are biased by the idea creator's hierarchical position relative to the idea creator's hierarchical position. We also consider whether and how this hierarchy bias interacts with the idea's characteristics, particularly novelty.

We consider three competing mechanisms to theorize the effect of hierarchical distance on idea evaluation. (1) By the *homophily mechanism* (e.g., McPherson et al. 2001, Lazarsfeld and Merton 1954), we expect that hierarchical proximity between idea evaluators and idea creators engenders more favorable idea evaluations. Evaluators will evaluate these idea creators and their ideas more favorably if they are similar to themselves. (2) In contrast, by the *competition mechanism* (e.g., Marino and Zábojník 2004), hierarchical similarity should lead to less favorable idea evaluations. In this perspective, evaluators tend to support ideas from hierarchically more distant creators who pose less of a threat to their own position and resources. (3) By the *social status* 



*mechanism* (e.g., Magee and Galinsky 2008), we expect idea evaluations to improve with the idea creator's hierarchical position; evaluators will ascribe more competence to idea creators higher up in the organizational hierarchy and will therefore value their ideas more highly.

To test and compare these three mechanisms, we use a unique dataset from an enterprise crowdfunding initiative at Siemens, one of the world's largest industrial manufacturing companies. Facilitated by information technology, idea evaluation is not limited to top management or specialists, but is performed by employees throughout the organization. This Siemens initiative can be seen as part of a greater trend towards democratizing idea selection and opening it to stakeholders (King and Lakhani 2013, Reitzig and Sorenson 2013, Reitzig 2011, Birkinshaw 2017). Besides enterprise crowdfunding, examples of this trend include bottom-up idea evaluation systems (Reitzig 2011), intra-organizational idea markets (Soukhoroukova et al. 2012), employee idea evaluation communities (Hutter et al. 2017), and employee crowdvoting schemes (Onarheim and Christensen 2012).

Siemens encouraged its employees to participate in its Quickstarter platform and provided €500,000 to allocate among ideas. Seventy-seven ideas were submitted by employees from the corporate R&D department (to whom we refer to as idea creators) and were subsequently evaluated company-wide by 265 employees (to whom we refer to as idea evaluators), each of whom could allocate a budget of €3,160. This yielded 20,405 investment decision dyads nested in 77 ideas, with each dyad representing one idea evaluation. To control for underlying objective idea quality, we used idea-level random-effects and fixed-effects designs. We also assessed the effect of idea novelty, as rated by Siemens experts, on the relationship between hierarchical distance and idea evaluation. We conduct several robustness checks to rule out alternative explanations.

Our findings support the homophily mechanism and refute the two alternatives of competition and social status. That is, independently of idea quality, idea evaluators prefer ideas from idea creators who are hierarchically close to themselves. We also find that this bias is more pronounced for more novel ideas.

Our study contributes to the literature on idea evaluation and selection (Elsbach and Kramer 2003, Reitzig and Sorenson 2013, Criscuolo et al. 2017, Boudreau et al. 2016) in several ways. First, our finding of hierarchy-based misevaluation introduces an additional source of bias that extends our understanding of idea evaluation in organizations. As hierarchies are fundamental in organizing, it is crucial to understand how hierarchical differences between idea creators and idea evaluators distort evaluations and engender misjudgments. Second, our finding that hierarchy bias is more pronounced for more novel ideas indicates that uncertainty prompts individuals to rely more strongly on social evaluations, thus magnifying distortions. Third, we contribute to



research on the organizational design of "open" internal idea selection processes by showing that hierarchy affects idea selection even in settings that should operate supposedly absent of formal hierarchy.

#### **Idea Evaluation Biases** 2

Idea generation, selection, and implementation are key to organizations (e.g., Crawford and Di Benedetto 2011). To remain competitive, organizations call on their employees but also on external inventors, stakeholders, and innovation communities to produce multiple new ideas. Thus, selecting the best of these ideas for implementation is a mounting challenge for organizations (Bayus 2013, Bjelland and Chapman Wood 2008, Piezunka and Dahlander 2015, Ozer 2009, Toubia and Florès 2007).

By definition, ideas that are novel to the organization differ from established ideas (Berg 2016) and are associated with uncertainty (Mueller et al. 2012). Existing evaluation standards may not accommodate the novelty and uncertainty inherent in new ideas (Licuanan et al. 2007). Thus, idea evaluators may look for additional cues and information to guide their assessments, thereby introducing a source of potential bias (Mueller et al. [in press] 2017). In the following, we distinguish between evaluator-based, idea-based, and context-based sources of bias.

Evaluator-based biases are rooted in the person of the idea evaluator. They are grounded in their attributes, for instance, experience, knowledge, and relationships. For example, evaluators assess the quality of others' ideas more accurately if they are idea creators themselves (Berg 2016), even while favoring their own ideas (Berg 2016, Onarheim and Christensen 2012, Hooshangi and Loewenstein 2016). At the same time, expertise in a subject matter leads evaluators to be more critical, i.e. experts assign systematically lower scores compared to non-experts (Boudreau et al. 2016). This may be a reason why consumers have been found to be as good as experts (Magnusson et al. 2016, Mollick and Nanda 2016) or even better (Kornish and Ulrich 2014) concerning the prediction of ideas' market success. Further, relationships between an idea evaluator and an idea creator can bias evaluations; for instance, homophily (McPherson et al. 2001, Lazarsfeld and Merton 1954) suggests that evaluations will be more favorable if both belong to the same group, particularly if this group is a minority (Greenberg and Mollick 2017).

Idea-based sources of bias distort the evaluation of ideas with specific attributes. For instance, idea evaluators tend to prefer ideas of intermediate novelty (Criscuolo et al. 2017, Boudreau et al. 2016) as well as ideas presented within a tangible scenario (Reitzig and Sorenson 2013, Froehlich et al. 2016).

Context-based biases result from the conditions in which an evaluator makes their decision. For instance, an evaluator's current workload affects their evaluations (Criscuolo et al. 2017), as does organizational structure.



Thus, evaluators tend to favor ideas that come from their own location (Criscuolo et al. 2017) or business unit (Reitzig and Sorenson 2013).

These three sources of evaluation bias can act in parallel and may interact. For instance, the evaluator-based bias created by personal expertise interacts with the idea-based bias against high novelty: experts are especially likely to undervalue novel ideas because such ideas draw on knowledge structures other than those in which the experts are entrenched (Boudreau et al. 2016, Moreau et al. 2001, Dane 2010).

#### 3 Linking Hierarchical Distance and Idea Evaluation

In this section, we discuss three competing mechanisms derived from different theoretical perspectives to explain how hierarchical distance between an idea creator and an evaluator biases idea evaluation in organizations.

Tables and figures

Table 1 summarizes the perspectives and their predictions.

Insert Table 1 about here

#### 3.1 Homophily

The homophily mechanism suggests that idea evaluators assess ideas more positively when the creator is hierarchically closer to themselves.

Homophily is the tendency to favor people who are similar to oneself (McPherson et al. 2001, Lazarsfeld and Merton 1954). Homophily theory argues that a certain extent of homophily may be induced as a result of limited opportunities for interaction, for instance, in a given office in the workplace; but, fundamentally, individuals may also have psychological preferences to choose similar others (McPherson and Smith-Lovin, 1987).

The research has investigated various dimensions of similarity, including race, gender, age, occupation, religion, education, and shared values, attitudes, and beliefs (e.g., Burt 1991, Moody 2001, McPherson et al. 2001, Lazarsfeld and Merton 1954). More recently, research has examined homophily dimensions such as same business unit, function, office, salary band (Kleinbaum *et al.*, 2013), formal status, academic field (Kossinets and Watts, 2009), and tenure (Reagans, 2005). Contextual factors, such as identification with a given attribute and limited size of the group sharing this attribute, strengthen homophilous behavior (Reagans 2005). Thus, the



identification with a given hierarchal level may increase the tendency for employees on all hierarchical levels to prefer others with similarly positions.

There are several reasons *why* people "like to associate with like", including, for instance, greater ease of communication, understanding, trust, easier evaluation of behavior, and a feeling of solidarity (Ruef et al., 2003; Kossinets and Watts, 2009; Festinger, 1957; Mollica *et al.*, 2003; Wimmer and Lewis, 2010). Hierarchical similarity has been shown to support tie formation (Han 1996), which is crucial for advice-seeking, knowledge-sharing, and learning (Lazega and van Duijn 1997, Škerlavaj et al. 2010, Hwang et al. 2015).

Concerning idea evaluation, while hierarchical similarity has not yet been studied in the literature, structural (i.e. horizontal) distance has been shown to render an idea more likely to be approved (Reitzig and Sorenson 2013).

Based on the notion of homophily, as noted, we predict a bias favoring ideas from creators who are hierarchically close to an idea evaluator. The greater the hierarchical distance between an idea creator and an idea evaluator is, the less favorable the idea evaluation. We expect this bias' magnitude to be the same for upward and downward evaluation.

#### 3.2 Competition

Competition can be a strong driver of decision-making and is among the core principles of economic behavior. It emphasizes that individuals pursue selfish motives whenever they are in a position to influence the allocation of resources between themselves and others. In relation to our research question, the competition mechanism suggests that idea evaluators will consider how the evaluation result affects their own position and will seek to secure their resources (Marino and Zábojník 2004).

In organizations, competition is particularly intense among employees on the same hierarchical level. They compete for the same resources such as budgets, attention from leaders, and promotion opportunities and are thus reluctant to support one another's ideas. They will evaluate ideas from hierarchically close idea creators less favorably than is merited, while assessing ideas from hierarchically distant idea creators more favorably; the least favorable evaluations will be assigned to ideas from creators at the same hierarchical level as the evaluator because this is where the competition is most intense.

#### 3.3 Social Status

Status, i.e. the extent to which an individual is respected by others, can be imputed based on various characteristics such as gender, age, race, education, expertise, or hierarchical position (Magee and Galinsky 2008, Berger et al. 1972). Status shapes performance expectations, which – in turn – affect performance evaluation (Ridgeway and Correll 2006). Status characteristics and expectation states theory (Ridgeway and



Correll 2006, Berger et al. 1972) explain how individuals ascribe performance expectations to other individuals with specific status characteristics. They expect individuals with high status to perform better than individuals with low status, because individuals with higher status are perceived to be more competent (Fiske et al. 2002). Thus, idea evaluations are likely to be biased owing to status performance expectations evoked by the signals rooted in individuals' status: independently of their true competence, individuals with higher status tend to be evaluated more favorably.

In an organization, the social status perspective predicts that hierarchical distance between an idea evaluator and an idea creator engenders an idea evaluation biases. Hierarchies incorporate strong status cues as "levels in the hierarchy [...] can be called the status classes of the organization" (Berger et al. 1972). Individuals are likely to ascribe higher competence and expertise to idea creators higher up in the hierarchy and will therefore tend to overvalue ideas from idea creators hierarchically above themselves, while undervaluing ideas from idea creators below themselves. This bias can be expected to increase with hierarchical distance.

#### 4 Empirical Strategy

#### 4.1 Research Context

Our data comes from an enterprise crowdfunding initiative conducted at Siemens, a large multinational electronics firm, between February 1 and March 7, 2016. We chose this context for our analysis because it satisfied many of our sampling criteria: First, we required a context in which idea creators and idea evaluators were embedded in the same hierarchically structured organization, and in which there was both downward and upward evaluation. Second, our research question demanded that the idea creators' identities (or at least the hierarchical positions) be observable by idea evaluators. Third, we needed a substantial number of (preferably independent) decisions on new business ideas.

The initiative consisted of an ideation phase and an investment phase. The ideation phase lasted five weeks, during which any employee from the corporate research department could submit one or more project ideas to an internal online platform. The minimum requirements for a project proposal included the target funding amount, descriptions of deliverables, tasks, and milestones, the creator's name, and the creator's department. Further, creators could upload pictures, videos, and other information on the proposal as well as their own portrait photograph. There was no restriction on the project topics and no pre-upload vetting of ideas. The idea suggestions could be viewed but not evaluated during the ideation phase. Seventy-seven project proposals were submitted by 77 idea creators.



The investment and evaluation phase followed immediately after the ideation phase. Approximately 470 Siemens employees signed up to become evaluator-investors and 265 employees eventually invested in the project proposals<sup>1</sup>. They received a personal budget of  $\notin$ 3,160 each; the total budget was approximately  $\notin$ 500,000. This amount could be allocated among the 77 ideas in  $\notin$ 1 increments. Once an investment was made, there was no possibility to revoke it.

#### 4.2 Measurement

#### 4.2.1 Dependent Variable

Our main dependent variable was IDEA EVALUATION, which captures the total amount allocated by an evaluator to a specific idea. It ranges from €0 to €3,160 in steps of €1.

#### 4.2.2 Independent Variables

For hierarchical distance, we measured the number of hierarchical levels between a given idea creator and an idea evaluator (Hill et al. 2012). For this, we exploited the organizational code displayed next to the idea creator's name on the crowdfunding platform and that indicated the number of steps between the idea creator and the chief execute officer (CEO). We verified all codes in the sample by comparing them to the organizational charts. HIERARCHICAL DISTANCE (ABSOLUTE) captures the absolute difference between the creator's number of steps to CEO and that of the evaluator's. We also built a dichotomous variable, UPWARD EVALUATION (1 if the idea creator is hierarchically above the evaluator, and 0 otherwise). Similarly, we built a dichotomous variable, DOWNWARD EVALUATION (1 if the idea creator is hierarchically below the evaluator, and 0 otherwise).

Next, we listed our control variables, starting with controls at the dyad level and then turning to idea-level controls. We controlled for STRUCTURAL DISTANCE, i.e. the horizontal distance between any given idea evaluator and creator (0 = the same department; 1 = the same business unit; 2 = the same division; 3 = more distant), because group affiliation can bias idea evaluation (Reitzig and Sorenson 2013). We also controlled for location (SAME COUNTRY) (1 if yes, 0 otherwise) and gender (SAME GENDER) (1 if yes, 0 otherwise), using information drawn from the company's human resource directory. Further, we controlled for potential herding behavior by including the variable SHARE FUNDED, which measured the amount of funding an idea received relative to its target budget at the time of investment.

In our idea-level random-effects specification, we used novelty and quality as idea-level independent variables. To assess these, we assembled a panel of seven Siemens experts, since the topics spanned the breadth of the Siemens portfolio and included technical product ideas. The raters had substantial technical experience, were

<sup>&</sup>lt;sup>1</sup> We address potential selection effects in §5.2.



subject to Siemens' confidentiality clauses, knew the Siemens environment, and were assigned to seeking and selecting innovative ideas at the time. For instance, some panelists worked as portfolio managers, while others worked in organizational units cooperating with startups as part of Siemens' open innovation activities. None of the experts had participated in the contest or possessed any information about outcomes. Each idea was independently rated by at least four experts. As suggested by Amabile (1996), we randomized the order of the ideas. To assess IDEA NOVELTY, we used the consensual assessment technique (Amabile 1996). The instructions to the experts read "Please rate each idea's novelty, i.e. its (1) uniqueness, (2) originality, (3) paradigm-breaking characteristics" (Dean et al. 2006, Riedl et al. 2010, 2013, Feldmann and Gimpel 2016), using 7-point Likert scales (with 7 = extremely novel). Similarly, we asked raters to assess overall IDEA QUALITY on a 7-point Likert scale.

We also controlled for the language used in each idea description, since it may affect idea evaluation (Reitzig and Sorenson 2013, Haas et al. 2015, Ludwig et al. 2014). We used the linguistic inquiry and word count tool LIWC (Tausczik and Pennebaker 2010) to control for factors which have been shown to affect idea evaluation (Reitzig and Sorenson 2013), i.e. each idea's number of words (COMPLEXITY) and emotionality (NEGATIVE TONE). Since the ideas were described in English, we used the English LIWC package.

Insert Table 2 about here

#### 5 Findings

#### **Main Results** 5.1

We will now present our core findings and a number of alternative specifications. Our principal goal is to examine whether idea evaluations are biased upward or downward, compared to objective idea quality, owing to the comparative hierarchy positions of the idea creator and the idea evaluator. We used idea-level randomeffects or fixed-effects analyses to control for the variance inherent in the ideas. The descriptive statistics can be found in Table 3.

To model IDEA EVALUATION, we used tobit regression with random effects for the idea level (xttobit in Stata), including the abovementioned idea-level controls, and lower and upper bounds of €0 and €3,160 respectively. Tobit is suitable, since the dependent variable most often takes the value €0 (no budget spent on an idea) or €3,160 (entire budget spent on this idea). Random-effects estimates are preferable with tobit regression, since fixed-effects estimates are inconsistent (Greene 2004). Table 4 reports the results.



To test which of the suggested mechanisms drove our results, we explored which of the patterns illustrated in Table 1 were present in our data. To do so, we first explored the main effect of hierarchical distance. For support of the homophily perspective, we expect a negative effect, since higher hierarchical distance is associated with a lower evaluation for both upward and downward evaluation. For support of the competition perspective, we expect a positive effect, since higher hierarchical distance would be associated with higher evaluation for both upward evaluation. For the status perspective, we expect a null finding, since the "arms" (i.e. the effects) for upward and downward evaluation would likely cancel each other out. Analyzing hierarchical distance's effect, we see that hierarchical distance (ABSOLUTE) has a negative and significant effect on IDEA EVALUATION (see Model 1), which speaks in favor of the homophily perspective.

Focusing on idea-level effects, we see that overall idea quality does positively affect evaluation, which makes intuitive sense. In line with others (Boudreau et al. 2016), we found that novelty is negatively associated with IDEA EVALUATION. We also found that idea formulation has an effect on evaluation decisions: complex ideas are evaluated less favorably, while – surprisingly – ideas that are formulated in a negative tone are evaluated more favorably.

Turning to the dyadic control variables, we see that SHARE FUNDED affected evaluation decisions in a non-linear fashion, likely owing to the fact that evaluators don't provide additional funding once an idea has been fully funded. Like Reitzig and Sorensen (2013), we found that horizontal proximity in the organization positively affects idea evaluation, while SAME GENDER is insignificant.

Next, we turned to interaction analysis to further investigate which theoretical perspective explained the patterns in our data. We modeled an interaction between HIERARCHICAL DISTANCE (ABSOLUTE) and the direction of the evaluation, which indicates the effect of hierarchical distance of upward or downward evaluation compared to the baseline category. In further support of the homophily perspective, we expect both effects to be significant and negative. That is, for both upward and downward evaluation, increasing hierarchical distance between an idea creator and an idea evaluator is associated with less favorable evaluations (see Model 2).

Figure 1 illustrates this interaction, plotting the marginal effects at sample means and conditional on censoring (i.e. being above 0). We found that the slopes for both upward and downward evaluation are significant and negative (p = 0.000). The negative effect is stronger, but the difference is not significant, as shown by the overlapping confidence intervals in Figure 1.

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Insert Figure 1 about here

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Insert Table 3 about here

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We used different models to replicate these findings. First, we calculated an idea-level fixed-effects poisson model with standard errors clustered in ideas. We found the same results as in the tobit model. Second, we controlled for the fact that evaluator-creator pairs are clustered in both ideas and evaluators. We don't expect systematic differences in evaluation behavior across evaluators, as all evaluators have the same budget. Nonetheless, we used the Stata clus\_nway routine (Kleinbaum et al. 2013) to estimate two-way robust standard errors (Cameron et al. 2011) for idea evaluators and ideas. We estimated a tobit model for *IDEA EVALUATION* and found that the results remained qualitatively the same as in the original model. The same was true for a poisson model with idea creator and idea evaluator fixed effects and two-way robust standard errors clustered in ideas and evaluators. Third, we used a dichotomous specification of our dependent variable (1 if an evaluator allocated any budget to an idea, and 0 otherwise). For this analysis, we used idea-level fixed-effects logit regression (xtlogit in Stata) to control for idea quality. The number of ideas dropped to 58, as ideas can be considered only if they are funded by some but not all evaluators. In this model, hierarchical distance was negatively and significantly related to the likelihood of funding an idea. The interaction with the direction of evaluation was not significant, indicating that the hierarchical distance effect was the same in strength and direction for upward and downward evaluations.

#### 5.2 Robustness Checks

We will now present three robustness checks to show that our results are not driven by confounding variables related to the evaluators' hierarchical levels, perceived personal similarity, and self-selection of evaluators.

First, we introduced dummy variables to control for the effect of an evaluator's hierarchical position. After all, evaluators may evaluate ideas differently depending on whether they are higher or lower in the hierarchy. Still, our results remained qualitatively the same.

Second, we checked whether evaluations were driven by perceptions of similarity between an idea creator and an idea evaluator in terms of ethnicity, age, tenure, or educational background. To obtain these variables, we used their LinkedIn profiles, from which we extracted age and tenure directly and obtained codes of ethnicity



and education. For ethnicity, we used the definitions and procedures included in the U.S. Department of Education Final Guidance on Maintaining, Collecting, and Reporting Racial and Ethnic Data. For educational background, we coded whether each individual had a technical/engineering training, management training, or other. We then built two measures indicating whether or not any given idea creator and idea evaluator were the same in terms of their ethnicity and education. For age and tenure, we used the absolute difference as a similarity measure. Since we only found this information for a subset of 192 evaluators and 22 idea creators, we had to estimate our models with a smaller dataset (n = 5,376). When we entered these variables into our regressions as additional control variables, the findings remained robust and qualitatively the same.

Third, we checked our models for the concern that the set of idea evaluators may suffer from self-selection bias as they themselves chose to get involved, which makes participation not random and could have affected their evaluations. To overcome this concern, we present evidence that the evaluator population does not differ significantly from the population of Siemens employees. Concerning the evaluation platform design, the system would be closed once the overall budget of €500,000 had been spent. Any evaluator who had not spent their personal budget at the time would not be able to do so. As it turned out, the overall budget was spent after six hours of evaluation time<sup>2</sup>, and only 56% of the registered evaluators could get involved. We assume that, concerning their motivations to participate, the employees who signed up but did not participate (we call them potential evaluators) were on average more similar to the employees who did not sign up (i.e. the Siemens population) than to those who signed up and participated (i.e., the evaluators). Assuming that these potential evaluators are very similar to the general Siemens population, we argue that if the selection between potential evaluators and evaluators does not bias our results, then the selection between the Siemens population and the evaluators is also likely to be unbiased. To check for a selection effect between potential evaluators and evaluators, we used a Heckman selection model (Heckman 1976) and calculated the inverse mills ratio for all 470 employees who registered. We used the time zone in which an individual is located as an exclusion restriction. As the idea evaluation started at 11:30 am UTC+1 (Central European Time), being more remote from this time zone would affect the decision to participate, but not spending behavior. We use probit regression to predict the likelihood of participation (coefficient: B = -0.310, p = 0.000; model: Log likelihood = -24845.144, p =0.000) and calculate the inverse mills ratio based on these results. When we included this ratio in our main regressions, it did not change the direction or the significance of our results. Thus, we are confident that selfselection of evaluators did not bias our results.

<sup>&</sup>lt;sup>2</sup> The evaluators had time to familiarize themselves with the ideas in prior weeks (cf. §4.1).



#### 5.3 Additional Analyses that Support Homophily

In §3, we presented three different theoretical perspectives that may explain how hierarchical distance affects idea evaluation in corporations. In the following two sections, we will interpret our findings in light of these theoretic perspectives, starting by showing further evidence in favor of the homophily perspective (this section) and then presenting additional analyses that refute the two alternative perspectives (competition and status).

The homophily perspective suggests that idea evaluators are likely to favor ideas from idea creators who are hierarchically close to them. So far, our findings provide strong support for the homophily perspective: the greater the hierarchical distance between the idea creator and the idea evaluator, the lower the evaluation, regardless of idea quality; this holds irrespective of whether the idea creator's hierarchical position is above or below that of the evaluator.

To seek further evidence for the homophily perspective, we undertook three sets of additional analyses. First, we tested whether we could replicate the inverse U-shape suggested by homophily (see Table 1) in our data by altering some specifications. To do so, we introduced a relative specification of hierarchical distance as our independent variable. To measure HIERARCHICAL DISTANCE (RELATIVE), we subtracted the idea creator's number of steps to CEO from the evaluator's number of steps to CEO. Thus, a positive value indicated that the idea creator is hierarchically above the evaluator, a negative value indicates the opposite, and 0 indicates that they are at the same level. For IDEA EVALUATION, we used the same random-effects tobit model as before, now employing a non-linear quadratic specification of hierarchical distance (relative). We found that relative hierarchical distance significantly predicts IDEA EVALUATION (p = 0.000) and takes an inverted U-shape (see Figure 2). Thus, IDEA EVALUATION is highest for individuals at the same hierarchical level (inflection point at - 0.13) and declines with increasing distance between the idea creator and the idea evaluator.

Insert Figure 2 about here

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Second, we exploited a part of our dataset in which idea creators remained anonymous owing to their country's privacy laws. Thus, idea evaluators were blind to the identities of the idea creators and their positions in the organization. This reduced dataset encompassed 9 ideas and 2,376 evaluator-idea pairs. To check whether our contention that evaluators are likely to engage in social evaluation of ideas based hierarchy information, we checked whether we find hierarchy effects in the anonymous sample. We compared these findings in a reduced sample of non-anonymous ideas to make sure that our findings were not distorted due to different sample sizes; the reduced sample was obtained by using bootstrapping (drawing 1000 samples of n= 2376). Since multilevel



analyses should not be used when there are fewer than 10 clusters (in our case 9 ideas) {Snijders, 1999 #2867}, we rely on regular tobit and enter control variables for each idea. Comparing the anonymous and the nonanonymous model we find that hierarchical distance becomes insignificant in the anonymous model, but remains negative and significant in the model run on the bootstrapped original sample with reduced sample size (p=0.025).

When we reran our main analyses shown in Table 4 and Table 5 with the reduced dataset, the significant effect of hierarchical distance disappeared in the anonymous sample. We This supports our contention that evaluators are likely to engage in social evaluation of ideas based on the information at hand.

Third, we ruled out the possibility that the hierarchy bias we found is an artifact of the distribution of the hierarchical positions of idea creators and idea evaluators. If there were a concentration of high-quality ideas on one hierarchical level of idea creators and there were also many idea evaluators on that level, the relationship between hierarchical distance and evaluation may be overestimated. To assess this, we replicated our regressions using several random allocations of evaluators' investments, leaving the data on the personal characteristics of idea evaluators and idea creators, especially their hierarchical positions, unchanged. If our results were only an artifact of the distribution, we should not measure the bias despite the random reallocations. We calculated the mean investment, excluding zero investments ( $\xi$ 1,338.25) and randomly allocated this amount 486 times (i.e., the number of investments) across all idea creator-evaluator dyads. The resulting data shows an insignificant relationship between hierarchical distance and investments. We also randomly allocated the exact investment amounts across the ideas. Again, the regression analysis did not show any significant impact of hierarchical distance on these investments. Finally, we randomly allocated 486 investment amounts drawn from a uniform distribution bounded between  $\xi$ 1 and  $\xi$ 3,160 over all idea-creator-evaluator dyads. Again, hierarchical distance was statistically insignificant. In summary, all these analyses provided unequivocal support for the homophily perspective and none for the other two perspectives.

#### 5.4 Ruling out Alternative Mechanisms

The competition perspective suggests that the smaller the hierarchical distance between an idea evaluator and an idea creator, the less favorable the evaluation. This should be especially true for individuals hierarchically below the idea evaluator: if competition is the mechanism driving the relationship between hierarchical distance and idea evaluation, idea evaluators would be especially critical about ideas from creators at their own level or slightly below, who are most likely to be rivals with respect to career-related resources. To test this assumption, we analyzed a subsample with only downward evaluations. Using the same tobit specifications as in the main analysis, we found that hierarchical distance is significantly and negatively related to IDEA EVALUATION (n = 6,462, hierarchical distance p = 0.000), which speaks against the competition perspective.



Next, we considered the possibility that idea creators' status, as captured by their hierarchical position, affects the evaluations of their ideas. Specifically, the status perspective suggests that an evaluator will assess an idea more favorably, the higher the idea creator is above the evaluator in the organizational hierarchy, owing to the attribution of status-based competence to those up in the hierarchy. To test this prediction, we limited our sample to upward evaluations. If the status perspective were to hold, we would see a positive and significant effect of hierarchical distance on idea evaluation. However, using the same tobit specification as in the main analysis, we found that hierarchical distance continues to be significantly and negatively related to IDEA EVALUATION (n = 5,253, hierarchical distance p = 0.000). This speaks against the positive upward evaluation suggested by the status perspective.

#### 5.5 The Influence of Idea Novelty

Finally, we investigated whether our findings are affected by the extent of idea novelty, a core characteristic of ideas. While the implementation of highly novel ideas leads to competitive advantage, the ultimate value of any given novel idea is hard to assess because novel ideas differ from established ways of thinking (Berg 2016). The uncertainty inherent in the evaluation of novel ideas may lead to more biased evaluations.

To investigate idea novelty's influence, we used a tobit random-effects model at the idea level. We included IDEA NOVELTY as a moderating effect on the relationship between HIERARCHICAL DISTANCE and IDEA EVALUATION. We used the same set of control variables as in the main analysis. As shown in Table 5, we found a significant interaction between hierarchical distance and idea novelty. In Figure 3, we see that, in this interaction, the negative relationship between hierarchical distance and idea evaluation is stronger for more novel ideas. (The illustration shows marginal effects at sample means and for being conditional above 0; novelty is depicted at +/- 1 SD.) This means that, independent of idea quality, the negative evaluation bias exerted by hierarchical distance is stronger for more novel ideas.

Insert Table 5 about here

Insert Figure 3 about here

\_\_\_\_\_



#### 6 Discussion and Conclusion

#### 6.1 Summary

This study investigated idea selection biases in organizations. Such biases produce systematic misjudgments and can lead to the implementation of mediocre ideas, ultimately stunting innovation and performance. We examined how idea evaluation is biased by differences in hierarchical position between an idea creator and an idea evaluator. We theorized and tested three competing mechanisms that produce three different forms of bias: homophily, competition, and status. We also considered how hierarchy bias interacts with an idea's characteristics, particularly idea novelty.

Our empirical strategy exploited a unique enterprise crowdfunding dataset consisting of 20,405 idea evaluations (idea creator-evaluator pairs) nested in 77 ideas. We used an idea-level random-effects and fixed-effects design, controlling for many other confounding factors such as horizontal distance, idea quality, complexity etc. and applying numerous robustness checks. Our findings unequivocally supported the homophily perspective. We found evaluators to favor ideas from idea creators who are hierarchically similar to them; the greater the hierarchical distance (either upward or downward), the lower the evaluation, independently of objective idea quality. This bias was magnified by idea novelty.

#### 6.2 Interpretation and Generalizability

We will now reason why we found support for homophily, but not the theoretical mechanisms of competition and status, and in what conditions these explain idea evaluation patterns. To do so, we drew on the wellestablished notion that individuals' behaviors in organizations can be classified into task behaviors (i.e., behaviors that employees regard as core to their job) and contextual behaviors (i.e., behaviors that employees regard as beyond their core task) (Motowidlo and van Scotter 1994).

In our context of enterprise crowdfunding, idea creation and idea evaluation were part of employees' contextual performance. Employees were unlikely to use enterprise crowdfunding as their main avenue for suggesting new ideas in the organization. They may well expect some personal and career benefits from suggesting ideas, obtaining funding, and conducting innovation projects financed via enterprise crowdfunding. Still, their career success would depend on many other (and likely more important) activities performed outside our context. Concerning idea evaluation, employees are also unlikely to view their idea evaluation and selection decisions on the Quickstarter platform as part of their task. After all, they experience no personal loss if they support an idea that turns out to be a failure. For all these reasons, social evaluations based on homophily rather than competition or status seem well aligned with the characteristics of our context.



In other contexts, idea creation and evaluation are core tasks and employees will be assessed on. In contexts where *idea creation* is key, we expect homophilic evaluation tendencies to become weaker and the competition mechanism to become more salient. If successful idea proposal and idea implementation are key to career advancement, evaluators would likely be more hesitant to support the ideas of their competitors, i.e. those of similar hierarchical position.

Further, status considerations can be expected to bias idea evaluations wherever *idea evaluation* is part of employees' core task. Individuals who are strongly motivated or incentivized to pick the best projects are more likely to pay attention to how competent they perceive an idea creator to be. As individuals tend to ascribe more status-based competence to those higher up in the hierarchy, we expect to find status-based evaluation bias in such settings. Further, to the extent that, first, it is known who did or did not support someone's idea and, second, such support is valued by superiors who, third, have a say in promotion decisions, idea evaluators can be expected to bias their evaluations in favor of ideas from higher up in the organizational hierarchy.

#### 6.3 Theoretical Contributions

Our research contributes to the literature on idea evaluation and selection in organizations by showing that hierarchical similarity between idea creators and idea evaluators influences evaluations. As hierarchies are ubiquitous in organizations (Anderson and Brown 2010, Magee and Galinsky 2008), it is crucial to understand how hierarchical differences or similarities affect idea evaluations. While extant research has uncovered various sources of bias (Berg 2016, Boudreau et al. 2016, Reitzig and Sorenson 2013, Moreau et al. 2001, Criscuolo et al. 2017), it has neglected the hierarchical dimension of idea evaluation. By carving out the importance of vertical distance for idea evaluation, we complement research that shows that the horizontal distance between idea evaluators and creators negatively affects evaluations. Idea evaluators not only seem to suffer from intra-organizational "provincialism" (Reitzig and Sorenson 2013), but also from intra-organizational "class struggle".

Second, considering idea novelty, we found that hierarchy bias is stronger for more novel ideas. The idea evaluation literature establishes that greater idea novelty leads to less accurate evaluations of idea quality (Berg 2016). We contribute by showing that, concerning highly novel ideas, individuals rely on social evaluations to a greater extent. When evaluating a very novel idea, individuals are exposed to high uncertainty. To overcome this uncertainty about an idea, they evaluate what they know about the idea's origin. We showed that evaluators' decisions are influenced by how similar and organizationally close they are to an idea creator in terms of hierarchical position. More generally, we would expect that similarity biases based on business unit, same country, gender, etc. are also more intense for more novel ideas. By contrast, for less novel ideas, uncertainty is lower and true quality is easier to determine; thus, idea evaluators are less likely to resort to social evaluations.



Our findings also have implications for research into the organizational design of idea selection processes. Recent research has called for opening up strategic decision-making to other stakeholders, particularly employees (Stieger et al. 2012, Birkinshaw 2017) and has investigated how internal idea selection operates without hierarchy (Keum and See [in press] 2017). This research has found that idea selection without hierarchical structure suffers from self-promotion (i.e. individuals championing their own ideas). Thus, this literature warns that "when attempting to reduce organizational hierarchy as a means of 'democratizing' the innovation process" [...] some firms that rely heavily on selection might not benefit from a less hierarchical design." (Keum and See [in press] 2017) We contribute to this literature by showing that, in decentralized internal idea selection, biases may stem not only from a lack of formal hierarchical selection power, but – somewhat ironically – may be due to the organization's hierarchical structure. The pervasiveness of organizational design is so strong that it cannot be easily stripped off if hierarchical cues are still visible. This insight calls for careful design of open and decentralized idea selection environments.

#### 6.4 Limitations and Avenues for Future Research

Our study has some limitations, which also open avenues for future research. First, even if our findings are in line with homophily-based explanations, we did not observe the mechanism. Future work should address this by explicitly measuring the mediating processes between hierarchical distance and idea evaluation.

Second, we have discussed but not tested under what circumstances we expect competition or status, rather than homophily, to shape hierarchy biases in idea evaluation. For instance, we expect the competition mechanism to prevail in contexts where idea creation is a core task on which employees are incentivized and assessed. Conversely, in contexts in which idea evaluation is a core employee task, we expect status to be the prevailing mechanism. Future research could establish, for instance via experiments, whether the prevalence of the three mechanisms we distinguished as drivers of hierarchical idea evaluation bias can be explained by the (non-)coreness of idea creation and evaluation tasks.

Third, we cannot know how carefully the evaluators screened the ideas on the platform and sought to identify the best ones. To develop a better qualitative understanding of the considerations that motivate evaluators' investment decisions, we conducted interviews with 22 evaluators after the Quickstarter initiative. These interviews suggest that evaluators were in fact diligent in seeking to identify the best ideas: they reported to have "tried to really understand what the different projects are about", to have "had a look at the project plan, how they wanted to achieve it, whether it would make sense, whether it is reasonable, whether they could deliver according to the plan". Even if these statements cannot prove that all the ideas were diligently assessed by the evaluators, they support our contention that evaluators took considerable care when making their investment decisions.



#### 6.5 **Managerial Implications**

Our findings are relevant for organizations that are setting up idea evaluations systems that open up the idea selection function to employees at large (Stieger et al. 2012, Birkinshaw 2017). We show that, overall, idea quality relates positively to idea evaluation, indicating that such systems are effective for identifying the best ideas, at least to some extent. At the same time, our findings also show that, independent of true idea quality, hierarchical distance between idea evaluators and idea creators bias idea evaluations. When designing idea evaluation systems, firms can overcome this bias by anonymizing idea proposals. However, this comes at the cost of reduced transparency and employee empowerment. Perhaps even more importantly, the absence of social credit for idea creators may also diminish their motivations to suggest ideas. The net benefits of not keeping idea creators anonymous may well prevail, as indicated by the continued successful use of the Quickstarter platform in its presented form at Siemens.

Our findings also speak to situations of idea evaluation in organizations more generally, where individuals voice their ideas in meetings or other encounters, and others decide on whether or not to back these ideas. In such settings, we suggest, idea evaluations are likely to be distorted by hierarchical (dis)similarity. Our findings indicate that managers who evaluate ideas and decide whether to act on them are more likely to approve of ideas from other, similarly positioned managers (but not their competitors), and to reject ideas from below. Conversely, employees lower in the hierarchy may regard ideas from managers to be of lower quality because they are not one of their kind. While the exact shape of this hierarchy bias is likely to depend on the context in the ways we have explained, in our view, it is clear that hierarchy-based biases may lead to misjudgments and ultimately to the selection and implementation of ideas of lower objective quality. Managers are advised to guard against such distortions by carefully designing idea evaluation systems and processes. This is particularly true for very novel ideas, for which biases are likely to be larger and the mistakes more grievous.



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## **Tables and figures**

Table 1

### Mechanisms that Potentially Explain the Relationship between Hierarchical Distance and Evaluation

Theoretical perspective	Predicted relationship between hierarchical distance and evaluation	Mechanism
Homophily (e.g., McPherson et al. 2001)	e 0 d	<ul> <li>Similarity between individuals leads to increased social interaction, improved communication, and understanding</li> <li>Similarity between an idea evaluator and an idea creator leads to higher shared cognition and higher trust</li> </ul>
Expectation states and status characteristics (e.g., Kim and King 2014)	e 0 d	<ul> <li>Individuals with high status are expected to have more experience and more knowledge</li> <li>Individuals with low status are expected to have less experience and less knowledge</li> </ul>
Competition (e.g., Marino and Zábojník 2004)	e 0 d	<ul> <li>Evaluators consider their career concerns when evaluating ideas</li> <li>Investment means to allocate resources to a potential competitor</li> <li>Individuals who are hierarchically close, especially slightly below or at the same level, are evaluated more critically</li> </ul>
Notes: e = evaluation amoui	nt; a = nierarchical distance.	



#### Table 2

#### **Description of Variables**

Variable name	Explanation		Data source				
IDEA EVALUATION	The total amount of money spent by an idea evaluator	Dyad	Evaluation				
	on a given idea creator's idea		system				
IDEA SELECTION	Dummy = 1 if an idea evaluator has invested in a given	Dyad	Evaluation				
	idea		system				
HIERARCHICAL DISTANCE	Absolute difference between an idea creator's number	Dyad	Evaluation				
	of steps to CEO and an idea evaluator's number of steps	-	system +				
	to CEO		Company				
			directory				
HIFRARCHICAL DISTANCE	An idea evaluator's number of steps to CEO minus an	Dvad	Evaluation				
	idea evaluator's number of steps to CEO	Dyaa	system +				
			Company				
			directory				
	<b>4</b> if an ideal and the big much in the balance of ideal	Durad	Grectory				
DOWNWARD EVALUATION	1 If an idea creator is hierarchically below an idea	Dyad	Evaluation				
	evaluator, U otherwise		system +				
			Company				
			directory				
UPWARD EVALUATION	1 if an idea creator is hierarchically below an idea	Dyad	Evaluation				
	evaluator, 0 otherwise		system +				
			Company				
			directory				
SHARE FUNDED	Share of target funding reached at the time of	Dyad	Evaluation				
	evaluation		system				
SAME COUNTRY	Dummy = 1 if an idea evaluator and an idea creator are	Dvad	Company				
	from the same country	,	directory				
GENDER SIMILARITY	Dummy = 1 if idea evaluator and creator have the same	Dyad	Company				
	gender		directory				
	5		,				
RELEVANCE	Equals 1 if the idea creator indicated that an idea is						
	relevant for the evaluator's unit 0 otherwise						
HORIZONTAL DISTANCE	Idea evaluator and idea creator are in:	Dvad	Company				
	0 - the same denartment	Dyad	directory				
	1 - the same business unit		uncetory				
	1 - the same division						
	2 = the same division						
	3 = more distant						
<b>COMPLEXITY</b>	Number of words in the text description of an idea	Idea	Evaluation				
	Number of words in the text description of an idea	lucu	system				
	Negativity of topo in an idea description	Idoa	Evaluation				
NEGATIVE TONE	Negativity of tone in an idea description	luea	Evaluation				
			System				
ΟΠΑΓΙΤΧ	The idea quality, as rated by independent experts	Idea	Expert rating				
	me aca quanty, as rated by macpendent experts	iaca	Expertituting				
NOVELTY	The idea novelty, as rated by independent experts	Idea	Expert rating				



#### Table 3

#### **Descriptive Statistics**

	Variable	Obs.	Mean	S.D.	Min.	Max.	1	2	3	4	5	6	7	8	9	10	11	12	13
1	IDEA EVALUATION	17,952.00	38.99	288.47	0.00	3160.00	1.00												
2	IDEA SELECTION	17,952.00	0.03	0.16	0.00	1.00	0.81	1.00											
3	HIERARCHICAL DISTANCE	17,952.00	1.57	1.51	0.00	7.00	-0.08	-0.07	1.00										
4	HIERARCHICAL DISTANCE (RELATIVE)	17,952.00	-0.15	2.18	-7.00	5.00	-0.01	-0.01	-0.07	1.00									
5	DOWNWARD EVALUATION	17,952.00	0.36	0.48	0.00	1.00	-0.02	-0.01	0.41	-0.77	1.00								
6	UPWARD EVALUATION	17,952.00	0.29	0.45	0.00	1.00	-0.04	-0.03	0.36	0.76	-0.48	1.00							
7	SHARE FUNDED	17,952.00	0.15	0.26	0.00	1.00	0.08	0.09	0.06	0.00	0.03	0.04	1.00						
8	SAME COUNTRY	17,952.00	0.43	0.49	0.00	1.00	0.10	0.10	-0.09	0.20	-0.17	0.10	0.08	1.00					
9	GENDER SIMILARITY	17,952.00	0.80	0.40	0.00	1.00	0.01	0.01	0.02	-0.01	0.00	0.01	0.00	-0.04	1.00				
10	HORIZONTAL DISTANCE	17,952.00	1.95	0.68	0.00	3.00	-0.14	-0.13	0.29	-0.10	0.25	0.12	0.02	-0.06	-0.04	1.00			
11	COMPLEXITY	17,952.00	575.41	309.76	125.00	1812.00	0.02	0.01	-0.05	0.08	-0.10	0.03	0.14	-0.08	-0.05	0.01	1.00		
12	NEGATIVE TONE	17,952.00	0.64	0.69	0.00	2.49	0.02	0.01	-0.04	0.03	-0.01	0.01	0.21	-0.16	0.03	0.02	0.24	1.00	
13	QUALITY	17,952.00	3.62	0.68	1.80	5.20	0.05	0.05	0.06	-0.08	0.08	-0.02	0.20	-0.08	0.02	0.04	0.29	0.32	1.00
14	NOVELTY	17,952.00	3.51	0.79	1.80	5.20	0.05	0.04	-0.05	0.06	-0.08	0.01	0.16	0.05	-0.06	0.01	0.32	0.37	0.61



#### Table 4

#### Tobit Idea-level Random-effects Analysis for IDEA EVALUATION

Variables	Model 1	Model 2
SHARE FUNDED	246.8	355.3*
	(172.3)	(153.9)
SHARE FUNDED X SHARE FUNDED	-411.3*	-377.0*
	(208.1)	(152.0)
RELEVANCE	-26.89	-28.91
	(29.02)	(33.29)
SAME COUNTRY	259.3***	201.7***
	(27.00)	(22.84)
SAME GENDER	-13.00	9.241
	(33.13)	(27.02)
HORIZONTAL DISTANCE	-314.3***	-222.9***
	(18.93)	(14.97)
COMPLEXITY	-1.798***	-0.266***
	(0.0981)	(0.0775)
TONE	47.16*	71.51*
	(22.11)	(29.43)
QUALITY	90.33***	-29.01
	(25.14)	(41.28)
NOVELTY	-110.7***	-105.4**
	(24.06)	(34.24)
HIERARCHICAL DISTANCE X UPWARD EVALUATION		-58.88***
		(9.629)
HIERARCHICAL DISTANCE X DOWNWARD EVALUATION		-56.76***
		(11.34)
HIERARCHICAL DISTANCE	-82.77***	
	(11.12)	
CONSTANT	239.5*	14.27
	(95.45)	(199.5)
Observations	17.952	17.952
Number of ideas	68	68
N	17.952	17.952
Log-likelihood	-8,910	-8,360
Notes: standard errors in parentheses;	- /	, ·

\*\*\* p < 0.001; \*\* p < 0.01; \* p < 0.05.



#### Table 5

#### The Random-effects Model for Interaction between Novelty and Hierarchical Distance on IDEA EVALUATION

Variables	IDEA EVALUATION
HERDING	95.15
	(163.2)
HERDING X HERDING	-547.4**
	(203.4)
RELEVANCE	-24.77
	(27.93)
SAME COUNTRY	282.0***
	(25.67)
SAME GENDER	10.99
	(31.44)
HORIZONTAL DISTANCE	-326.0***
	(18.06)
COMPLEXITY	-1.289***
TONE	(0.0779)
IONE	64.24***
QUALITY	(21.35)
QUALITY	(24.36)
ΝΟΥΕΙΤΥ	-58 00*
	(26.02)
HIERARCHICAL DISTANCE	32 69
	(47.01)
HIFRARCHICAL DISTANCE X NOVELTY	-32.00*
	(13.51)
CONSTANT	-13.49
	(98.47)
Observations	17,952
Number of ideas	68
Ν	17,952
Log-likelihood	-8,934

Notes: standard errors in parentheses;

\*\*\* p < 0.001, \*\* p < 0.01, \* p < 0.05.

















