Self-confidence and unraveling in matching markets*

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Abstract

We document experimentally how biased self-assessments affect the outcome of matching markets. In the experiments, we exogenously manipulate the self-confidence of participants regarding their relative performance by employing hard and easy real-effort tasks. We give participants the option to accept early offers before information about their performance has been revealed, or to wait for the assortative matching based on their relative performance. Early offers are more often accepted when the task is hard than when it is easy. We show that the treatment effect works through a shift in beliefs, i.e., underconfident agents are more likely to accept early offers than overconfident agents. The experiment identifies a behavioral determinant of unraveling, namely biased self-assessments, which can lead to penalties for underconfident individuals and to efficiency losses and unstable outcomes of markets.

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1. Introduction

Matching markets are markets where the price does not determine who gets what. In labor markets, for instance, the wage alone does not solve the allocation problem. In most labor markets, a firm will not increase the wage offered until one worker is willing to work for it. Similarly, most universities do not choose their tuition fee so that the number of students willing to come is equal to the capacity. Rather, in order to be matched, the worker or student has to choose the firm or university and be chosen by it at the same time. Universities want to select the best students, and firms want to hire workers that best fill their needs.

Well-functioning matching markets allow participants to choose from a number of possible transactions and thereby find their best match. Therefore, the timing of transactions is important. For example, students in many countries are informed about the admission decisions of universities at certain fixed dates of the year. The economic job market has a clear time schedule of when interviews are held and offers are made. This allows students to potentially choose from among many offers.

When some transactions are made early and others later on, the market is thinner at any point in time, and market participants have fewer possible matching partners to choose from. Moreover, information on the quality of the matching partner is sometimes only revealed later. By unraveling, we refer to a state where some matches are formed before this information is revealed (see Li and Rosen 1998 for a definition along these lines, p. 374). Inefficient and unstable matchings can result if insufficient information on the quality of the match is available at the early contracting stage compared to later stages. Note that even if wages are paid, as in the model by Li and Rosen (1998), this does not preclude unraveling.

A classic case of unraveling is the market for medical interns in the US in the 1950s.[2] Future doctors and hospitals agreed on matches long before the medical students had graduated. This led to uncertainty about the quality of the candidates at the time of contract formation. As put succinctly in a report by Reginald Fitz on the US market for medical interns in 1939:

> "*Nearly a year ago the third year classes of the Harvard Medical school and of Tufts Medical College wrote letters to the Boston committee suggesting, in effect, that it would be highly desirable from these students' viewpoint if some arrangement could be established by which intern appointments could be made in various hospitals at about the same time…As one student put it, there are very few men who have the conceit to pass up a very good appointment in one locality offered early simply on the gamble of competing for a somewhat more desirable appointment made later in another locality*." (quoted after Roth 2003)

[2] Other examples of markets that have experienced unraveling include the market for federal court clerks (Avery, Jolls, Posner, and Roth 2001), for gastroenterology fellows (Niederle and Roth 2003, 2004; McKinney, Niederle, and Roth 2005), and for college football games (Fréchette, Roth, and Ünver 2007; Roth 2012).

When students received early offers from the hospitals, they had to form beliefs about their relative ability and their chances of receiving a better offer later on. "Conceit" or sufficient self-confidence was necessary to reject such offers. This holds true for people searching for jobs in general. In a piece on "Accept the Job or Walk Away?" in the Harvard Business Review, the following advice is provided:

> *"Unfortunately, most job searches do not follow an orderly process that lets you compare several offers at once. More likely, you'll receive your first offer when you are still interviewing with or have just sent your resume to other employers. "You can't compare to fantastical, theoretical possibilities. You need to be realistic about what is likely to come down the line," says Lees. Look at the applications you have under way and reasonably assess which are likely to get to offer."*[3]

Thus, job searchers should not be too self-confident, either. In this paper, we ask how such beliefs about one's own relative ability affect labor market outcomes. It can be expected that the less confident a worker is about her own value to prospective employers, the more likely she is to accept an early offer. This is because the candidates with low self-confidence are pessimistic about the probability of getting a better offer later on. We then ask how the level of self-confidence of applicants affects the stability of market outcomes.

Studying the role of people's relative self-assessments on the outcome of markets is notoriously difficult in the field. The main problem is that the level of confidence of market participants cannot be observed. Moreover, differentiating the role of self-assessments from other types of information that affect the decisions of market participants is often impossible. In addition, using theory to investigate the role of self-confidence in markets is only possible by making assumptions about the beliefs of market participants, including their higher-order beliefs. A laboratory experiment allows for the measurement of the beliefs and thus a clean identification of the effects of relative self-assessments that can then guide field studies to evaluate the external validity of the findings.

In our experimental labor market, the productivity of workers is determined by their performance in a real-effort task. We experimentally shift the workers' self-confidence with the help of two different real-effort tasks causing participants to exhibit underconfidence in one and overconfidence in the other. This allows us to investigate whether self-confidence has a causal impact on the amount of unraveling in a market. More precisely, we are interested in whether there will be less unraveling the more confident our experimental subjects are in the role of jobseekers.

The experimental design builds on the insight that unraveling can occur when there is incomplete information regarding the quality of the agents, such as the productivity of the workers (Roth and Xing 1994, Li and Rosen 1998). Uncertainty about who is on the long and the short side of the market, together with the similarity in the preferences of firms can make it optimal for both sides to contract early, which was also pointed out by Halaburda (2010) and Niederle, Roth, and Ünver (2013). The idea is the following: consider a situation

[3] The article by Amy Gallo appeared on March 26, 2012 (accessed online on July, 10, 2017). John Lees is the author of *How to Get a Job You'll Love.*

where firms and workers have similar preferences and there is a shortage of high-quality applicants. Suppose that at an early contracting stage, the quality of the workers is not known either by the firms or by the workers themselves. Then it can be optimal for some firms to make early offers and for some workers to accept these offers. Firms could get lucky and could hire a good worker with an early offer, while workers can avoid a bad matching outcome if they turn out to be of low productivity.

We create a relatively large experimental market with 16 workers and 13 firms. In the first stage firms have the possibility to make an early offer. Those workers who accept an early offer leave the market. However, the productivity of the workers becomes known only after the first stage. Workers can form beliefs about their relative productivity that is determined by a real-effort task while firms do not learn anything about a worker's productivity at the early market stage. Thus, we create a situation of asymmetric information between workers and firms. In the second stage, there is a clearinghouse that implements the assortative matching among all remaining workers and firms. To arrive at the assortative matching, all workers and firms that did not leave the market in stage one are considered, and the worker with the lowest rank number (best performance in the real-effort task) is matched to the firm with the lowest rank number, the worker with the second lowest rank number to the firm with the second lowest rank number, etc., until all firms are matched to a worker.

In order to exogenously manipulate the self-confidence of workers, we use two different tasks. The task employed in one treatment is relatively easy while the task in the other treatment is hard. We expect the simple task to generate overly optimistic beliefs about one's rank, that is, overplacement, and the hard task to lead to underplacement. Thus, we chose the tasks so as to generate different levels of self-confidence regarding one's rank in the group of workers. This self-confidence is predicted to affect unraveling. Suppose workers mis-calibrate their true productivity rank. If they underestimate their relative productivity, firms can profit from early offers because there is a chance that a worker will accept an offer from a firm which is worse than their matching partner in the assortative match. On the other hand, if workers know their type perfectly or are overconfident, firms would not make early offers as they could only lose vis-a-vis the assortative matching outcome in the second stage.

Specifically, the experiment was designed to answer the following question: Are early offers rejected more often in the treatment with the easy task compared to the treatment with the hard task, and is this driven by differences in beliefs? Subjects who are less optimistic about their prospect for the second stage should accept more early offers. Thus, fewer assortative matches should be formed in the treatment with the hard task than with the easy task. In consequence, markets with less-confident subjects should generate less stable outcomes. A matching is considered stable if (a) no two agents prefer each other to their assigned partner, and (b) no agent finds his partner less desirable than being unmatched. Instability can lead workers and firms to sidestep the match because they can achieve something better.

Our main experimental results are as follows. Early offers are accepted less often in the treatment with the easy task compared to the treatment with the hard task (34.4% of early offers received are accepted in the easy-task and 42.7% in the hard-task treatments, p=0.05). The treatment difference is driven by a shift of the beliefs. Subjects are on average overconfident in the treatment with the easy task and underconfident in the treatment with the hard task. Controlling for beliefs, there is no treatment difference in the acceptance decisions. Thus, we find that underconfidence is a source of unraveling, leading to a higher probability of offers being accepted. Moreover, there is a treatment difference in the stability of market outcomes: in the treatment with the hard task market outcomes are less stable than in the treatment with the easy task. All of our experimental markets yield unstable outcomes, but the number of blocking pairs is larger in the treatment when workers are on average underconfident than when they are overconfident.[4]

In addition to our main results, we observe that high-productivity workers earn more in the treatment with the easy task where the average overconfidence is higher than in the treatment with the hard task while low-productivity workers earn more in the hard task treatment. Furthermore, we observe that the lower the quality of the firm, the more likely it is to make early offers. We also find that the profits of the lower quality firms are higher in the treatment with the hard task where workers are underconfident, as expected.

Our study addresses the question to what extent beliefs that may be biased are causal for market outcomes. The main contribution is threefold: (1) To our knowledge, we are the first to employ the so-called "hard-easy gap" (Lichtenstein et al. 1982) to induce different beliefs. This method of shifting the workers' beliefs about their relative performance with the help of the experimental treatments could be useful in other contexts where the effect of self-confidence is studied. (2) The design allows us to investigate the effect of the beliefs on the market outcome. To derive the market equilibria one needs to consider the workers' beliefs about their own ranks (that is, their self-confidence), and the second-order beliefs of firms and workers, and potentially even higher-order beliefs. How market participants form such beliefs in a setting where the ranks of workers are determined by a real task is an empirical question. By demonstrating that market outcomes are influenced by biased beliefs, we speak to the longstanding question of whether biases can affect market outcomes or whether they are wiped out by the mechanics of the market. (3) Our paper identifies a novel potential cause for the unraveling of matching markets. The finding that underconfidence produces unraveling and instability is relevant for the design of university admission procedures or the modalities of hiring processes.

Ad (1), although this paper is to our knowledge the first to use the hard-easy gap to shift beliefs, an exogenous variation in beliefs has been employed in a number of previous papers, such as Jensen (2010) in the realm of education, Möbius, Niederle, Niehaus and Rosenblat (2014) with respect to belief formation about own

[4] The number of blocking pairs is the number of firm-worker pairs that prefer each other to their assigned partner. Thus, this number can be used as a continuous measure of the distance from the stable match.

ability, Costa-Gomes, Huck, and Weizsäcker (2014) in the context of a trust game, as well as in recent work by Schwardmann and Van der Weele (2016) who focus on the optimality of beliefs.

Ad (2), our second main contribution concerns the effect of beliefs on matching market outcomes. Self-confidence has been studied in the context of market entry games (starting with Camerer and Lovallo 1999) which share a number of features with the market game we are studying. In particular, the relative self-assessments of agents as well as the beliefs about the strategies of the other agents are important for the choices in both environments. In addition to the differences between the games induced by matching markets and market entry, the most important distinction is that we exogenously shift the beliefs of workers.[5] The role of self-confidence in matching markets has not been studied so far, with two notable exceptions. Ma, Wu, and Zhong (2016) study Chinese college admissions data where students have to submit rank-order lists over universities before they learn the result from their entrance exam and where the so-called Boston mechanism is used.[6] The study finds that female students are matched to worse universities than male students for a given exam score, due to female students ranking worse colleges first on their list. In order to understand the potential channels of such gender differences, Pan (2016) investigates the role of self-confidence for outcomes of the Boston mechanism with the help of experiments. She identifies a penalty for underconfident agents when the Boston mechanism is used and when students have to submit rank-order lists prior to learning their result from the exam. Both studies provide evidence that there is a correlation between the matching outcome of an individual and the person's gender and self-confidence.

Ad (3), our experiment complements the literature by identifying a novel potential cause of unraveling. Previous work suggests that when markets are congested and market participants fear that they do not have sufficient time to find a good matching partner, the market participants have an incentive to close early contracts (Roth and Xing 1997). Early contracting can also arise in equilibrium if neither the firms nor the workers are informed about the ability of the workers (Li and Rosen 1998), which is the starting point for our study of the role of workers' beliefs. The study of UK regional entry-level labor markets for doctors has led to the hypothesis that a stable centralized clearinghouse, operating once all the relevant information has become available, prevents unraveling. On the other hand, if the matchings generated by the clearinghouse are unstable, then unraveling will be a likely response of market participants (Roth 1991; Kagel and Roth 2000). Other reasons for unraveling that have been analyzed are strategic uncertainty of the proposing side about how many other agents go early

[5] One important difference between the games is that workers in our labor market can only accept or reject an offer if a firm decided to make one. Moreover, the worker's decision may depend on the quality of the offer. In contrast, in market entry games the decision to enter is either zero or one, and it is taken by every participant.

[6] The allocation mechanism used, the so-called Boston mechanism, makes it optimal for students to skip universities on their preference list at which they have no chance of being admitted. Under the Boston mechanism, in the first round, all students apply to the university they listed first and the match between a university and the best-ranked students who applied is made permanent within the limit of its capacity. In subsequent rounds, rejected students apply to the next university on their list. If the university is already full, it rejects all new applications. If it is not full yet, the match will again be permanent between the university and the best-ranked students who applied in this round within the limit of its remaining capacity.

(Echenique and Pereyra 2016), search costs that can render it optimal to accept an early offer (Damiano et al. 2005), and the dynamic arrival of new agents, which provides an incentive for contracting early to avoid being surpassed by new agents of higher quality (Du and Livne 2016).

2. Matching Markets and Experimental Design

This section describes the markets implemented in the experiment, the real-effort tasks employed to determine the workers' rank in the two different treatments as well as the belief-elicitation task and the measures of risk aversion.

2.1 The market game

Consider two disjoint groups of agents, workers and firms. Each firm would like to hire one worker, and each worker can work for one firm. The workers have preferences over the firms, and the firms have preferences over the workers. An allocation of workers to firms is called a *matching*. Thus, we study a two-sided, one-to-one matching problem. A matching of workers to firms is *stable* if it is not blocked by any individual or firm-worker pair. A matching is not blocked by an individual (firm or worker) if each agent is acceptable to his partner. A matching is not blocked by a firm-worker pair if one cannot find a firm and a worker who prefer each other to their current assignment. We call a matching *efficient* if the sum of the payoffs of all agents is highest among all matchings after all uncertainty is resolved. Finally, a matching is *assortative* if the k'th best worker is matched to the k'th best firm, starting at rank 1, until all members of one market side are matched.

We implemented labor markets with 24 subjects, and we invited an equal number of women and men to each session.[7] Of them, 16 participants were in the role of workers, and the remaining eight in the role of firms. Five additional firms (leading to a total of 13 firms) were played by the computer. We designed a relatively large market in order to provide a setting where the workers could form beliefs about their rank and where over- and underconfidence were less often truncated for the best and the worst workers compared to a small market. The five best firms were played by the computer and were programmed to not make early offers. We made this design choice for a number of reasons. Most importantly, creating common knowledge on the strategy of the five best firms simplifies the game, as is detailed when we derive the predictions. Second, in the case where the workers' ranks are determined randomly, the top firms do not make early offers in equilibrium. Thus, if firms believed that

[7] Sometimes the sessions were not fully balanced with respect to gender due to participants not showing up. The most unbalanced session in OVER had 15 men and nine women, while in UNDER it had 13 men and 11 women. In total, 122 men and 118 women participated in the experiment.

workers hold such uniform beliefs about their rank, this would be an equilibrium outcome. Third, we are mainly interested in the workers, not in the firms, and are thereby able to save on subjects.

The value of a worker for a firm depends on her relative productivity that is determined by the real-effort task. All firms have identical preferences over workers, i.e., earn a higher profit, the higher the productivity of the worker they are matched with. The payoff of a firm only depends on the productivity of the worker it is matched to. The exact payoffs implemented in the experiment can be found in Table 1. For example, a firm receives 50 points if it is matched to one of the five most productive workers.

	Most productive workers 1–5	Workers 6–9	Workers 10–13	Least productive workers 14–16
Payoff of firm	50	25	15	10

Table 1: Payoff of firms depending on the productivity of the worker they are matched with.

The payoff of a worker depends on the firm that hires her and, for workers hired by one of the top-five firms, on her own productivity. All workers want to be matched to the best possible firm. There are five high-quality firms that are computerized in the experiment. Furthermore, there are four firms of intermediate or middle quality (firms 6 to 9) and four of low quality (firms 10 to 13). Each of the five most productive workers earns 50 points when they are matched to one of the five best firms while the other workers only earn 32 points at these firms. This provides incentives to workers of intermediate productivity to accept offers from equally ranked firms and not wait for an offer from one of the five best firms in stage two. At all firms except the top five, workers earn the same number of points, regardless of their productivity. If we observe welfare losses for the workers, they are due to the five best workers not being matched to the five best firms.

We chose this payoff structure for the following reasons. First, the absence of complementarities between worker and firm quality (except for the top five firms) simplifies the payoff structure for the participants. Tables 1 and 2 were presented in the instructions for the participants and contain all relevant information. Second, in our framework each firm is only interested in the productivity group of the worker they are hiring and not on his/her specific productivity rank. This makes the firms' decision of whether to make an early offer or not easier. Third, since our primary interest concerns the impact of the biased beliefs of the workers on market outcomes, we attempt to limit the potential effect of efficiency concerns on unraveling. Therefore, the possible welfare losses caused by unraveling are small in the market we designed. Most departures from the assortative matching do not cause a welfare loss but merely transfer payoffs from one agent to another.[8] Finally, the complementarity of payoffs at the top firms captures the idea that for high-level jobs, the productivity depends more on the quality of the worker than for lower-level jobs.

	Five most productive/all other workers
Five best firms	50/ 32
Sixth-best firm	32
Seventh-best firm	31
Eighth-best firm	30
Ninth-best firm	29
Tenth-best firm	17
Eleventh-best firm	16
Twelfth-best firm	15
Thirteenth-best firm	14
No job	0

Table 2: Payoffs of workers depending on the quality of the firm they are matched with and own rank.

Each round of the experiments consists of two stages:

First stage: At the beginning of the first stage, the quality of the firms is revealed to all participants. The productivity of the workers is not known to anybody, neither to the firms nor to the workers themselves.[9] Middle- and low-quality firms can make early offers to the workers while the five computerized firms never make early offers. When a firm decides to make an early offer, it is sent to a random worker. An offer from a firm yields the

[8] There are two ways in which a welfare loss occurs: (1) each time that one of the five best workers is not employed by one of the five best firms, this worker gets 32 instead of 50, corresponding to a loss of 18; (2) whenever the unemployed workers are not workers 14–16, welfare is lost. The worst-case scenario in this respect is when workers 14, 15, and 16 receive and accept an early offer and when workers 6, 7, and 8 end up unmatched, resulting in a welfare loss of 3*15=45 (employing a bad worker instead of a good one provides a payoff of 10 instead of 25, hence the opportunity cost of 15).

[9] The assumption that firms have no information about the productivity of workers is, of course, extreme, since firms often receive signals about the productivity of a worker. However, our setup can reflect a situation with a group of workers that the firm finds most attractive and that it can distinguish from other workers while the members of this group are indistinguishable from each other.

payment to the worker detailed in Table 2.[10] The worker learns which firm is making her an offer and is free to accept or reject the offer. She has 30 seconds to make this decision. If an offer of a firm is accepted, both the firm and the worker leave the market. If an offer of a firm is rejected, it is automatically sent to another worker.[11] The first stage consists of a maximum of nine rounds, thus an offer can be rejected nine times at most. The same offer is never given to a worker who has already rejected it once. This sequential ordering was implemented to capture the feature of many labor markets, where firms make an offer to one worker and, if this offer is rejected, they approach another worker. In addition, this design precludes workers from trying to be faster than others in accepting an offer.

We employ the partial strategy method introduced by Bardsley (2000). Any worker who receives an offer from a firm gets two fictitious offers in addition. These offers were drawn randomly among all firms (of ranks 6 to 13, regardless of whether they made an early offer or not) from which the worker had not yet rejected an offer and excluding the firm that made her a real offer in that round. Each worker has to decide whether to accept each of the three offers or not. This means that she can accept all three offers, only two of them, only one or none of the offers. She does not know which offer is real and which offers are fictitious. If she rejects an offer, she will never receive another offer from this firm regardless of whether the offer was real or fictitious. We use the partial strategy method to collect more information on the acceptance behavior of workers. Compared to the full strategy method where a worker would be asked to respond to potential offers from all firms, our procedure preserves the real-world feature that job offers create a "hot" state, which can potentially affect decisions. Finally, the random fictitious offers have the additional advantage of complicating any potential inferences about the other workers' earlier rejection behavior.

Second stage: All workers and firms who remain unmatched at the end of the first stage move on to the second stage. At the beginning of the second stage, the productivity of all workers is revealed. Moreover, it is announced which firms and workers already left the market at the first stage. Then, the assortative matching of all remaining firms and workers is implemented: the five best unmatched workers are assigned to the five high-quality firms, the sixth-best unmatched worker is assigned to the best among the medium and low-quality firms which are still in the market, and so on. The three workers of the lowest productivity among all workers at the second stage remain unmatched and receive a payoff of 0. Notice that workers and firms only have to make decisions in the first stage. The second stage is executed by the computer, according to the above description.

[10] Our simple setup can be interpreted as a firm paying the same wage to every worker it makes an offer to. (Only the top five firms that do not make early offers pay two different wages.)

[11] This automatic re-direction of rejected offers to another worker may influence the propensity of firms to make early offers. However, since our main interest is in the acceptance and rejection behavior of workers, this feature of the design simplifies the setup and at the same time provides us with a potentially higher number of worker decisions than when allowing firms to restrict the number of times their offer is re-directed.

We conducted only one payoff-relevant market game. If we had subjects play the game with the real-effort task determining the ranks more than once and with feedback, the subjects would have been better calibrated regarding their own rank. This would have limited the differences in self-confidence between the two treatments. However, in order to familiarize the participants with the market rules, the partial strategy method, etc., we started with three practice rounds of the market with randomly drawn productivities before the payoff-relevant market was played.

2.2 Treatments, belief and risk elicitation, and experimental procedures

We implemented two treatments between subjects: OVER and UNDER. The only difference between the treatments is how the relative productivity of workers is determined in the payoff-relevant market. In both treatments, subjects had to solve a real-effort task and were ranked according to how well they did in the task in comparison to the other subjects. In each session, the worker who solved the most tasks correctly received rank 1, etc. In the OVER treatment, subjects had to solve as many additions as they could in the course of five minutes. Every correct answer was worth one point to the participant, and there was no penalty for an incorrect answer. The task is easy in the sense that subjects know what they have to do and have most probably had occasions to solve tasks similar to this one in the past. In the UNDER treatment, subjects had to solve as many logic questions (taken from IQ tests) as they could in five minutes. The participants gained one point per correct answer and one point was subtracted from the participants' score for each incorrect answer. Participants were not allowed to skip questions. This task is hard in the sense that we expect subjects to correctly answer only a small number of questions, and in particular fewer questions than they expect to solve correctly, and because there is no clear technique that can be applied to find the answers. The two tasks were chosen to induce relative overconfidence in the case of the easy additions task (used first in Niederle and Vesterlund 2007 and in many subsequent papers) and relative underconfidence in the hard task with IQ questions, since we expect subjects to place too much weight on their own absolute performance and neglect the difficulty of the task for others (Kruger 1999, Moore and Healy 2008).

The participants in the role of firms knew that the workers had to solve a real-effort task but were not informed about the nature of the task. Thus, the treatments OVER and UNDER were exactly identical for the participants in the role of firms.[12] This design choice seems reasonable, for example, when firms know that the workers take an exam that determines their rank, but they do not know the difficulty of the exam which may change from year to year. Importantly, this feature of the design allows us to interpret all the differences between the treatments as differences in the workers' decisions and beliefs.

[12] During the real-effort task performed by the workers, the firms filled in a general questionnaire on cultural orientations, which is presented in Appendix D.4.

After the first stage and before the start of the second stage, subjects in the role of workers were asked to guess their productivity rank. They were incentivized using a binarized scoring rule (Hossain and Okui 2013). The following payment rule was implemented where p is the probability of winning five points:

$$p = 1 - (\text{guessed rank} - \text{true rank})^2/225.$$

At the same time, subjects in the role of firms were asked to guess these beliefs of the workers at every rank from 1 to 16. They were also incentivized using the binarized scoring rule. They were told that only one of the 16 workers for whom they had made a guess, worker i, would be drawn randomly to determine their payoff. The following payment rule was implemented for each guess where p is the probability of winning five points:

$$p = 1 - (\text{firm's guess of guessed rank of worker i} - \text{guessed rank of worker i})^2/225.$$

Note that the maximum payoff from the belief elicitation task was only five points, compared to earnings of up to 50 points from the market. We chose this relatively small remuneration for the stated beliefs in order to limit the incentive to hedge.

After eliciting the beliefs, we measured the participants' risk preferences. We used three multiple price lists with switching points for the expected value maximizers in the middle, at the top, and at the bottom of the table, respectively, to reduce the noisiness of the measure, in line with the evidence in Vieider (2017). Additionally, as a robustness check and based on the evidence of Dohmen et al. (2005) that non-incentivized measures correlate with the incentivized risk tasks, we run a non-incentivized risk questionnaire (Dohmen et al. 2005).[13]

The experiments were conducted in April 2017 at the WZB-TU lab in Berlin with five sessions each for OVER and UNDER.[14] In total, 240 subjects, who are students from various fields, participated. The experiments were run with the help of computers using z-Tree (Fischbacher, 2007). Subjects were recruited from a database with ORSEE (Greiner, 2015). Each point earned was exchanged for 40 cents at the end of the experiment. The average session lasted 65 minutes, and the average payoff of participants was 14.29 euro plus a 5 euro show-up fee.

3. Experimental Hypotheses

For the decision whether to accept an early offer or not, a worker has to compare the payoff from accepting it with the payoff she expects from the matching in stage two. It is therefore crucial to understand what determines a worker's expected second-stage payoff. This payoff from waiting until stage two depends on the worker's expected rank, her expectations about the stage one decisions of firms whether to make an early offer, and on her expectations concerning the acceptance and rejection decisions of other workers. A worker has to take

[13] For the instructions and exact tables and questions used in the risk elicitation task, see Appendix D.3.

[14] Based on the reviewers' comments on a first version of the paper, new data were collected for both treatments. The old dataset, which yielded qualitatively the same main results, is available upon request from the authors.

into account that some firms and workers will have left the market before stage two, which would affect the expected return from waiting for stage two.[15] The relevance of the self-assessments as well as the beliefs about the firms and the other workers make it difficult to derive clear-cut equilibrium predictions, since for workers 6 to 13, one can rationalize any decision with the help of certain beliefs.[16] We therefore content ourselves with providing an experimental hypothesis based on assumptions regarding the beliefs and the actions of players.

Before presenting the experimental hypothesis, we consider two benchmark cases in which the beliefs of the workers are common knowledge. This allows us to derive the equilibrium predictions for these cases and gain some intuition into how the market works for these simpler environments. Consider first that it is common knowledge that the workers know their own rank but the firms do not know it. There is no unraveling in equilibrium as workers will only accept offers coming from firms that are better than their assortative matching partner, and firms will therefore refrain from making early offers that can only make them worse off than waiting for the second stage.

For the other extreme case, suppose that it is common knowledge that every rank is equally likely for each worker. This case which was first studied by Li and Rosen (1998) can lead to market unraveling. When the workers' ranks are determined randomly, there is a unique equilibrium outcome of the market game in which all middle-quality firms make early offers which are immediately accepted by the workers who receive these offers. All other market participants are matched in stage two.[17] In particular, the five best firms do not make early offers (which would be accepted by the workers) while the low-quality firms' offers are always rejected by the workers, and thus low quality firms are indifferent between making and not making early offers.

For our experimental setup with real-effort tasks and lack of common knowledge of the beliefs, we formulate the following hypothesis:

Experimental hypothesis: ***Early offers will be accepted more often in UNDER than in OVER.***

To see under which conditions this hypothesis holds, note that subjects in the role of firms did not know the nature of the tasks the workers had to solve. Therefore, the beliefs and the behavior of the firms should be the same in treatments UNDER and OVER. Furthermore, to simplify the thought experiment, let us assume that

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[15] One could also imagine a scenario with naïve players where a worker expects that if she rejects an early offer and decides to wait for stage two, she will be matched to the firm of the same rank as her own (and will remain unmatched if her rank is equal to or higher than 14). This would mean that the worker either believes there are no other early offers apart from the one she is dealing with or that all other early offers will be rejected. In this situation, a worker will accept early offers from firms better than (or corresponding to) her believed rank and will reject all other early offers.

[16] Consider the following cases, among many others: It can be optimal for a worker who believes herself to be of rank 6 to accept the offer from firm 13 if she believes that firms 6–13 will make early offers, that the top five workers are well calibrated (and therefore reject any early offer), and that all other workers will accept any offer. Thus, she believes that she will be unassigned in the second stage if she rejects an early offer. Similarly, it can be optimal for a worker who believes she is of rank 13 to reject an offer from firm 6 if she believes that all firms 6–13 will make an early offer, and workers 14, 15, and 16 will reject all offers, while all other workers will accept any offers. Thus, worker 13 believes that she will be matched to the fifth firm in the second round and is therefore indifferent between accepting and rejecting the offer of firm 6 which yields the same payoff.

[17] The proof is relegated to Appendix A.

workers' beliefs regarding their rank are degenerate, i.e., they are certain about their guessed rank. Then, our main experimental hypothesis holds under the following testable assumptions:

Beliefs: Workers of the same true rank believe to be of a better rank in OVER than in UNDER, amounting to a first-order stochastic dominance shift in rank expectations.

Actions: Worker i of guessed rank j takes the following actions:

$j = 1,\ldots,5$	accepts no early offers
$j = 6,\ldots,13$	Pr(accept | rank j) weakly increases in j, for a given type of firm and given i's second-order beliefs, and is constant between treatments
$j= 14,..,16$	accepts all early offers.

The assumptions regarding the choices of workers believing they are of ranks 1 to 5 and 14 to 16 rely on their dominant strategies. Indeed, a worker who believes she belongs to one of the top-five ranks is certain that she will be matched to a top-five firm if she waits for stage two (because top-five firms are computerized and never make early offers) and should therefore never accept an early offer from any other firm. Furthermore, workers 14–16 know that they will remain unmatched if they wait for stage two and should therefore accept any early offer. For workers 6 to 13, the first-order stochastic dominance shift in rank expectations together with the monotonicity of actions in these beliefs yields the predicted treatment difference in acceptance behavior.

If more early matches are formed in UNDER than in OVER, as stated in our experimental hypothesis, the matching will be further away from the assortative matching in UNDER than in OVER, i.e., there will be more blocking pairs. Thus, the matching is predicted to be more stable in OVER than in UNDER.[18]

When deriving these predictions, we abstract from risk aversion. Notice that the more risk averse a worker is, the more likely she is to accept an early offer. This is due to the fact that the payoff from the early match is deterministic while the outcome of the second stage is uncertain. This is the same across the two treatments.

4. Results

[18] One might wonder about the relevance of the distribution of self-assessment biases for the likelihood and severity of unraveling as measured by the number of blocking pairs. In expectation, unraveling will be more severe if good workers are underconfident than if bad workers are underconfident. The intuition is the following: first notice that good workers can mechanically be more underconfident than bad workers in terms of the distance between their believed rank and their actual rank. Second, since the five best firms do not make early offers, bad workers can never be matched to the very good firms. At the same time, the best workers can end up being matched to the worst firms if they are underconfident enough (provided that those firms make early offers and that these offers are sent to the top-five workers).

This section first presents our main result concerning the question of whether the treatment affects the workers' propensity to accept early offers. We then proceed to investigate what explains the observed difference in the acceptances of early offers. After this, we devote a subsection to the analysis and comparison of the stability of the market allocations realized in both treatments. We then turn to the study of workers' payoffs before analyzing firms' behavior and outcomes. For all regressions, we cluster at the level of the markets (that are equivalent to sessions) to account for possible session effects and effects of the practice rounds.

4.1 Treatment difference in acceptances and rejections by workers

We begin by studying our main research question, namely whether the treatment affects the decisions of workers to accept early offers and thereby the market outcome. To determine the workers' true ranks, we count the number of correct answers in OVER and the number of correct answers minus the number of incorrect answers in UNDER. The average performance score in OVER where additions had to be solved was 8.25 while it was 0.35 in UNDER with IQ quiz questions. Thus, it is likely that the IQ questions are perceived as difficult while the additions task is perceived as relatively easy.

Figure 1 presents the average acceptance rates of early offers in OVER and UNDER depending on the rank of the firm that is making the offer. The average acceptance rate is higher in UNDER for all firms but firm 13. The early offers are rejected more often in OVER compared to UNDER (Wilcoxon rank-sum two-sided p=0.05). Moreover, the acceptance and rejection behavior of the workers is significantly different from random choices.[19] The graph presents the raw data, without controlling for the performance of the workers. However, it gives a first impression of the treatment effect on the decisions of workers.

In order to study the acceptance and rejection decisions of workers in the two treatments in more depth, we regress the decision to accept an early offer on a number of explanatory variables. Model (1) of Table 3 shows that early offers are less likely to be accepted in treatment OVER than in UNDER. The regression demonstrates that the higher (i.e., worse) a worker's productivity rank, the more likely she is to accept an early offer. Finally, the regression displays that offers from firms with worse ranks are less likely to be accepted.

Since accepting an early offer allows a worker to resolve the uncertainty regarding which firm she will be matched with, we expect the worker's risk attitude to play a role in the acceptance decision.

[19] We generated the variable random_decision, which takes a value of 0 or 1 (reject and accept respectively) with equal probability. We test the actual decisions of workers against the decisions generated in this manner. Signed rank tests reject the equality of the variables in each of the treatments (p=0.04 in UNDER, p<0.01 in OVER).

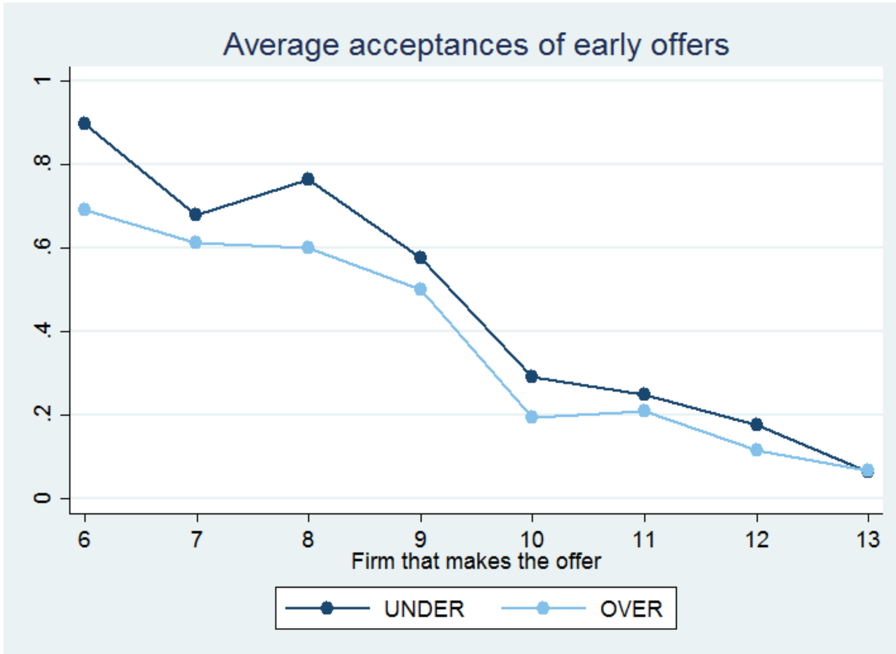

Figure 1: Workers' acceptance of firms' early offers

Notes: The graph displays the average acceptance rates of early offers by treatments. The horizontal axis denotes the rank of the firm that made the offer. The vertical axis denotes the proportion of offers that was accepted.

The variable Risk aversion is constructed as the average switching point in the three different multiple price lists. The higher the number that the variable takes on, the more risk-averse the participant is. Model (2) shows that the more risk averse a worker is, the more likely she is to accept an early offer (although this effect is only marginally significant). [20] Note that there is no significant difference in risk aversion across treatments (Wilcoxon rank-sum, p=0.28). [21]

Our prediction, that more offers are accepted in UNDER than in OVER, finds support in the data. However, it is unclear whether the treatment difference arises due to differences in the confidence level. We hypothesize that the reason for subjects in OVER accepting early offers less often than in UNDER is that more confident subjects have stronger incentives to wait for the assortative matching in the second stage compared to less confident subjects. To test for this channel, we include the beliefs in the regression.

[20] As a robustness check, we use measures from the questionnaire items by Dohmen et al. (2005) to control for risk preferences. The answers to the general risk question and the portfolio allocation task are significant with $p<0.05$ in model (2) (the more risk averse the subject is, the more likely she is to accept the early offer) and not significant in model (3). However, the answers to the domain-specific risk questions from the questionnaire (regarding sports, driving etc.) are not significant in either of the models.

[21] We present the full analysis of risk aversion using all measures in Appendix C.

Dep var : Accept offer	Model (1)	Model (2)	Model (3)
OVER	-0.11*** (0.04)	-0.12*** (0.04)	-0.05 (0.04)
Female	-0.03 (0.07)	-0.04 (0.07)	-0.11* (0.06)
Rank of worker	0.02*** (0.01)	0.02*** (0.01)	-0.00 (0.01)
Rank of firm	-0.13*** (0.01)	-0.13*** (0.01)	-0.14*** (0.01)
Risk aversion		0.03* (0.02)	0.02 (0.02)
Belief			0.06*** (0.01)
N	531	531	531
Pseudolikelihood	-262.8	-260.0	-236.3

Table 3: Workers' acceptance of early offers

Notes: Marginal effects after probit regression with errors clustered at the session level. The dummy variable OVER is 1 for treatment OVER and the dummy variable Female equals 1 for female participants. The variable Belief is the worker's guessed rank number. The variable Risk aversion is measured as the average switching point of three multiple lottery list tasks, such that the more risk averse the subject is, the higher the value of the variable is. N equals the number of offers made, namely 177, plus the 177x2=354 fictitious offers. Values in parentheses represent standard errors. *p<0.1,**p<0.05,*** p<0.01.

In both treatments, the beliefs were elicited by asking subjects in the role of the workers to guess their productivity rank. In Model (3) of Table 3, the variable Belief—which is equal to the worker's guessed rank—is included, resulting in the treatment dummy OVER not being significant anymore. This indicates that the treatment indeed shifts the beliefs: subjects are less likely to accept an early offer in the treatment OVER because they are more optimistic about their productivity rank which determines which firm they will be matched with in the second step. Importantly, we do not observe a significant treatment effect other than through the beliefs. [22]

[22] This result also excludes a potential effect of uncertainty, since the performance scores are less dispersed in UNDER than in OVER. The standard deviations are 2.5 in UNDER and 4.6 in OVER, and there were 18 unique values of scores in OVER versus 12 in UNDER. Effectively, there were more ties (workers with the same score in one session) that had to be broken randomly in UNDER than in OVER. The possible higher uncertainty of workers about their rank in UNDER could explain the higher acceptance rate of early offers in UNDER. However, as shown by Model (3) of Table 3, the treatment effect is fully explained by the difference in the guessed ranks.

Thus, in line with the prediction, the exogenous shift of the subjects' beliefs results in significantly different acceptance decisions.[23]

The treatment effect is mainly driven by workers of high and middle productivity for whom the propensity to accept an early offer in OVER is significantly lower (24 percentage points) than in UNDER, controlling for the rank of the worker and the firm. This can be seen if the sample in model (3) is restricted to workers of rank 1–9.

4.2 What explains the treatment difference in acceptances?

In order to investigate the exact reasons for the observed treatment effect, we study the performance and the beliefs of the workers in the two different tasks. First, this allows us to test the hard-easy gap in an incentivized environment. Second, we can directly test the assumptions that we used to derive our experimental hypothesis, namely the first-order stochastic dominance shift in the workers' beliefs and the actions of workers given their beliefs.

We construct the variable Overconfidence equal to the difference between the productivity and the belief (a positive value means that the subject's actual rank is higher than her guessed rank, indicating overconfidence). We find that the subjects are on average underconfident in UNDER and overconfident in OVER, as shown by Figure 2, left panel, and the difference between OVER and UNDER is significant (Wilcoxon rank-sum two-sided p=0.04).[24] The right panel of Figure 2 presents the workers' overconfidence by their productivity rank. The five most productive workers are underconfident in both treatments, but the degree of underconfidence is higher in UNDER than in OVER. The opposite is true for the least productive workers. Note that the overall treatment difference is driven by workers of productivity 1 to 13, while for the three least productive workers of ranks 14 to 16 the difference is reversed.

[23] We can also control for whether acceptances are influenced by when an offer is received in stage 1. We include a variable that corresponds to the number of times an offer was rejected, which strongly correlates with the time the offer was received. First, adding the variable to Model (1) and Model (2) does not change the significance of the treatment dummy. The variable itself has a negative coefficient and is significant (p=0.02), indicating that the later an early offer is received, the more likely it is rejected. In Model (3), the variable has no significant effect. This excludes the possibility that workers update their self-confidence when receiving late early offers because they believe that other workers must have rejected the early offer before.

[24] Testing whether overconfidence is positive in OVER and negative in UNDER provides the following p-values of the t-test: 0.08 and 0.06, respectively.

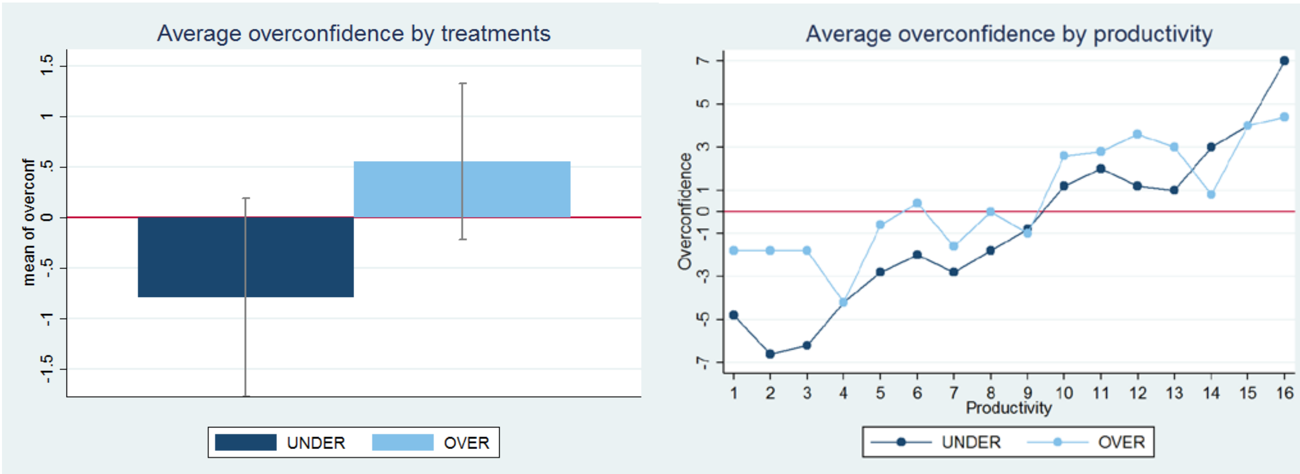

Figure 2: Average overconfidence in treatments UNDER and OVER

Notes: Overconfidence is defined as the difference between the true rank and guessed rank. The left panel displays the average overconfidence with the vertical lines as 95% confidence intervals. The right panel shows the average overconfidence for each productivity rank of the workers.

Figure 3 presents the cumulative distribution functions of the workers' belief for the two treatments. The distributions of the stated beliefs are significantly different between UNDER and OVER (Wilcoxon rank-sum two-sided p=0.01). Moreover, the beliefs in UNDER first-order stochastically dominate the beliefs in OVER, except for workers of rank 13 or higher. Thus, our assumption regarding the relationship between beliefs in OVER and UNDER to support our prediction regarding the amount of unraveling in OVER and UNDER finds support in the data.

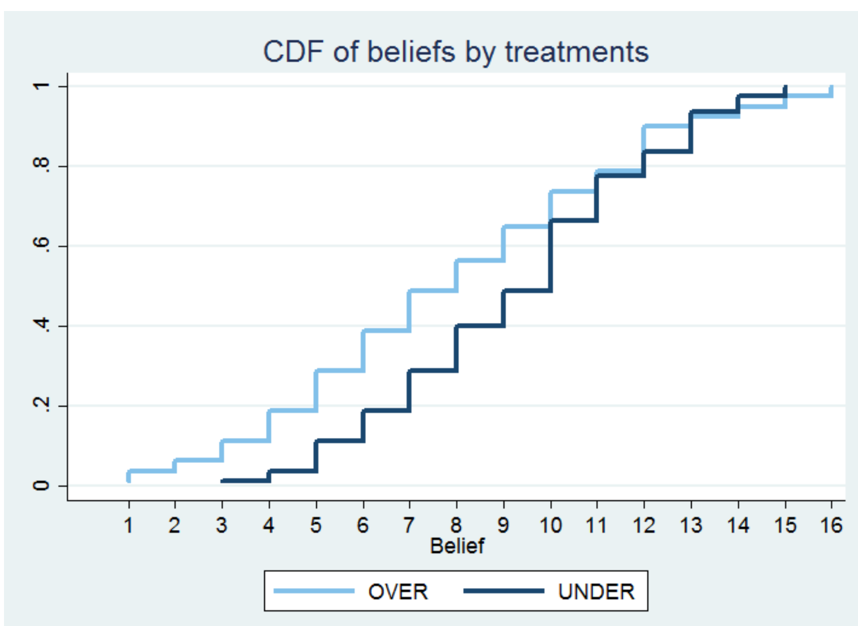

Figure 3: Workers' beliefs about their rank in treatments UNDER and OVER

Notes: The figure displays the cdf of the guessed ranks of the workers in the two treatments.

To test for the treatment difference in beliefs more formally, we run a linear regression of the dependent variable Belief, i.e., the rank guessed by the worker, on the true productivity rank (Rank of worker), on the gender dummy Female, and on a treatment dummy. The results are presented in Table 4. Model (1) shows that the beliefs are correlated with the worker's true rank, that women are less confident than men, and that subjects are less confident in UNDER than in OVER.

In order to understand how the subjects form beliefs and whether the beliefs are closer to the correct beliefs in OVER or in UNDER, we compute the payoff-maximizing or optimal guess for each performance level separately in UNDER and OVER. The optimal guess is the belief which is most likely to be correct given the worker's performance level. In order to do so, we randomly generate 10,000 groups of 15 workers separately for treatments UNDER and OVER. We take a virtual worker and assume that she is facing a group of another 15 workers in the experiment. We then calculate her most likely productivity rank given each of her possible performance levels. For instance, in UNDER if a worker's score is -6 she is most likely to be the least productive of her group of 16 workers.

Dep var : Belief	Model (1)	Model (2)	Model (3)
Intercept	5.75*** (0.60)	6.18*** (0.74)	7.52*** (0.39)
Rank of worker	0.36*** (0.06)	-	-
Female	0.99* (0.49)	1.21** (0.54)	0.97** (0.42)
OVER	-1.31*** (0.46)	-0.63 (0.51)	-4.61*** (0.59)
Optimal guess		0.31*** (0.08)	0.16*** (0.04)
OVER* Optimal guess			0.62*** (0.07)
N	160	160	160
R-squared	0.34	0.27	0.39

Table 4: Workers' beliefs about their rank

Notes: OLS regression of Belief on explanatory variables. The dummy variable OVER is 1 for treatment OVER and the dummy variable Female equals 1 for female participants. Optimal Guess is the rank that a worker's score most likely implies, given the performance of all participants in the respective treatment. Standard errors are clustered at the session level. Values in parentheses represent standard errors. *p<0.1,**p<0.05,***p<0.01.

From Model (2) in Table 4, we can take that the guessed productivity rank (Belief) is higher the higher the optimal guess is. The significance of the coefficient of OVER*Optimal guess shows that it is easier for the subjects to make a good guess in OVER than in UNDER.

We are now in a position to test the assumptions regarding the choices of workers that support the hypothesis of more unraveling in UNDER than in OVER, detailed in section 3, with the help of our data. The assumption on the beliefs (i.e., the first-order stochastic dominance of believed ranks in treatment UNDER over treatment OVER corresponding to more overconfidence in OVER than in UNDER) is supported by Figure 3. We can also test the assumptions regarding the workers' actions:

- Workers of guessed ranks j = 1,…,5. Workers who believe they are among the top five most productive workers have a dominant strategy to reject all offers. We observe that 44.4% of the workers in OVER believe they are among the five most productive workers while only 15.6% hold this belief in UNDER (two-sided Fisher's exact p<0.01). These workers reject 83% of offers in OVER and 92% of offers in UNDER (two-sided Fisher's exact p=0.25). On average, we observe 13.5% of decisions that contradict the theoretical predictions, but the majority of subjects who believe they are among the five best workers reject all early offers.
- Workers of guessed ranks j = 6,…,13. For workers with beliefs between 6 and 13, the probability of accepting an offer should be increasing in the guessed rank, given the quality of the offer. We ran Model (3) of Table 3 for the subset of offers going to workers of purportedly ranks 6 to 13 and find the predicted effect of beliefs on acceptances.
- Workers of guessed rank j = 14,…,16. There are very few workers who believe they are among the three least productive workers and who should therefore accept all offers. Thus, we cannot reliably test the assumption regarding the acceptance behavior of these workers.[25]

To conclude, the assumptions regarding the beliefs and actions of workers that support the hypothesis of more unraveling in UNDER than in OVER are overall consistent with the data.

4.3 Stability

In this subsection, we turn to the analysis of the stability of the market allocations. In the market game, a matching is unstable whenever a worker is matched to a firm that gives her a lower payoff than her assortative matching partner. Consider, for instance, the situation where worker 9 is matched to firm 10. Then worker 9

[25] There are only five such workers in UNDER and six in OVER, and they accept 61% and 44% of offers, respectively (p=0.50).

would rather be matched to any firm of ranks 1 to 9, and one of these firms that must be matched to a worker of rank 10 or worse would prefer to be matched to worker 9.

We observe that early offers were accepted in every market of every treatment, and all the matchings realized in the experiment were unstable. As a continuous measure of the distance between the realized matching and the assortative matching, we calculate the number of blocking pairs in the final allocation. The number of blocking pairs represents the number of firm-worker pairs that prefer to be matched to each other rather than to their actual matching partner. Note that each worker or firm can potentially be part of several blocking pairs.

We have data from five markets per treatment. We find that the average number of blocking pairs for the allocations reached in the five markets in OVER is 8.4 while in UNDER it is 11.6 (two-sided Wilcoxon rank-sum p=0.25). The allocations are based on the workers' decisions concerning the real offers and on the random draws determining which worker receives which offer in the session. Note, however, that we have collected additional data from the workers with the help of the partial strategy method, but these decisions did not influence the realized matching. With the help of simulations, we can use the decisions of the workers regarding the real and the fictitious offers. We simulate the market outcomes by making two assumptions: first, the medium-quality firms make early offers with a probability of 37.5% (the actual average probability of making an early offer by middle firms in both treatments) while the lower-quality firms make early offers with a probability of 82.5% (the actual average probability of an early offer by a lower-quality firm in both treatments). Second, the offers are sent to a random worker among those who have not accepted any offer yet, such that no worker receives more than one offer at the same time. We only use data from one session in each simulated market. If, in the simulation, a worker receives an offer from a firm that she did not make a decision on in her experimental session, the offer is sent to another worker.[26] While the observed market outcomes are influenced by the random set of workers who receive offers and the firms who make early offers, our simulations yield more robust results. The simulations are run separately for each session, which allows us to cluster at the session level. For each session we have simulated 1,000 allocations.

Figure 4 presents the cumulative density functions of the number of blocking pairs by treatment based on the simulations. The average number of blocking pairs is higher in OVER than in UNDER, and the difference

[26] To be more precise, let us provide an example of how the simulation algorithm works. First, in line with the actual average rate of offers made by middle and low-quality firms, firms make offers. Suppose that firms 7, 11, and 13 are drawn to make early offers. Then, the order of the firms' offers is randomly determined, say 7, 11, 13. First firm 7 sends an early offer to a random worker. Then firm 11 sends an offer to a random worker, except for the one who already got the offer from firm 7. Firm 13 sends an offer to a random worker except for the two workers who got offers from firms 7 and 11. Then all three workers simultaneously make their decisions. That is, we consider the decision actually made by those workers regarding offers from these particular firms in a given session. If, for instance, worker 6 was randomly chosen to receive an offer form firm 11 in the simulation but she never made a decision about this firm in her experimental session, the offer is sent to another randomly chosen worker. If an offer is accepted, the firm and the worker leave the market. If not, the process starts from the beginning by drawing a new order of the remaining firms' offers and assigning these offers to workers that are still in the market. This happens up to nine times (as in the experiment).

between the treatments is significant (two-sided Wilcoxon rank-sum, p<0.05 for session averages with five observations per treatment).

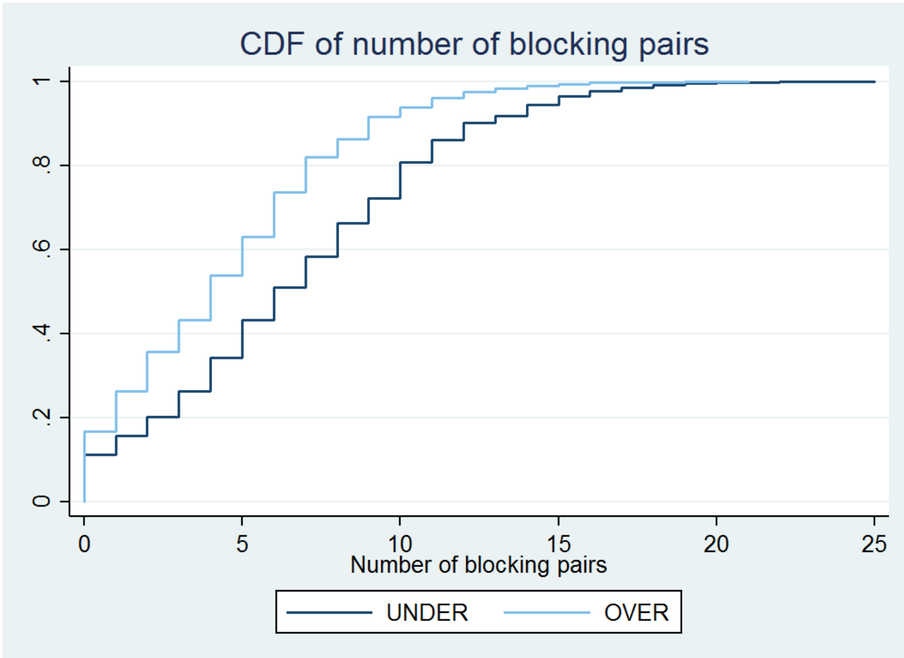

Figure 4: Blocking pairs in the simulated markets by treatments

Notes: The graph displays the cumulative density function of blocking pairs, that is, firms and workers that prefer to be matched with each other compared to their current match.

If we run a linear regression of the number of blocking pairs (with standard errors clustered at the session level), the coefficient of the treatment dummy reveals that there are, on average, 2.24 more blocking pairs in UNDER than in OVER (p=0.007). Moreover, the distribution of blocking pairs in UNDER first-order stochastically dominates the distribution of blocking pairs in OVER, as shown in Figure 4. Thus, the exogenous shift of beliefs in UNDER, making subjects less confident, leads to the expected increase in the number of blocking pairs, and results in a matching further away from the stable and efficient assortative matching than the matching reached in OVER.

4.4 Payoffs of workers

Since our manipulation of the beliefs affected the workers' decisions, we now investigate how the treatment matters for the workers' payoffs. Note that the effect of the treatments on the workers' payoffs is limited by design, as most of the deviations from the assortative match just lead to a redistribution of payoffs, and not to welfare losses. Only a mismatch of the best five workers leads to a welfare loss of 18 points because only these workers get paid 50 points when hired by one of the five best firms while all other workers get 32 points. On the other hand, there could be re-distributive effects between the workers depending on their level of self-confidence. Since the realized payoffs of the workers strongly depend on random factors, such as whether they received an early offer from a particular firm and whether it was a real offer or not, we again study the simulated markets described in the previous subsection.

The average payoffs of workers are significantly higher in OVER than in UNDER (two-sided Wilcoxon rank-sum, $p<0.01$ for session averages, five observations per treatment). This difference in average payoffs can only be driven by the best five workers being matched to the best five firms more often in OVER than in UNDER.

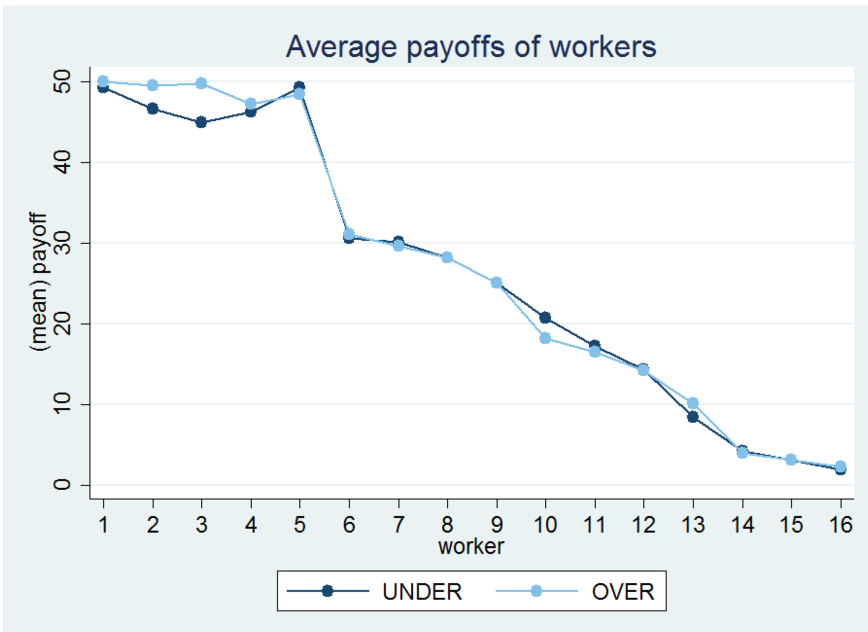

Figure 5: Average payoffs of workers by productivity rank

Notes: The graph displays the average payoffs of workers by treatments. The horizontal axis denotes the productivity ranks of the workers.

To consider possible re-distributive effects, Figure 5 displays the payoffs of workers according to their productivity rank and the treatment. The figure suggests that the observed treatment difference with respect to the average payoffs is mainly driven by the five best workers whose underconfidence always entails a loss in payoffs when they accept an early offer. As for the workers of ranks 6 to 13, underconfidence can have countervailing effects. For example, underconfidence makes these workers more likely to accept early offers, which lowers their payoffs if the offers are from firms that are worse than their assortative match. On the other hand, workers of ranks 6 to 13 can benefit from the underconfidence of workers of higher ranks than themselves who accept offers from bad firms. This allows them to be matched to a better firm in the second stage. Such competing effects explain the absence of a treatment difference between the average payoffs for workers of ranks 6 to 13. Finally, we do not observe a treatment difference for the workers of ranks 14 to 16, which could be expected, since there is no treatment difference in overconfidence for these workers, as is evident from the right panel of Figure 2.

Model (1) of Table 5 presents the results of regressing the payoffs of the workers in the simulated allocations on the treatment dummy OVER and on the rank of the workers. Note that due to the non-linearity of the payoffs of the workers, we control for the workers' productivity with the help of dummy variables for each group of workers, namely workers of ranks 1 to 5, workers of ranks 6 to 9, and workers of ranks 10 to 13. Thus, the effects of the dummies are relative to the payoffs of workers of ranks 14 to 16. Workers on average earn higher payoffs in OVER compared to UNDER, documented by the significance of the treatment dummy. Note that the only situations where the sum of the workers' payoffs are lower than in the case of the assortative matching are those where some of the five best workers are not hired by one of the five best firms. Thus, the payoff difference between the treatments is due to the five best workers making it to stage two more often in OVER than in UNDER, and thereby realizing the high payoff of 50. This is evident from Model (2) of Table 5: the five most productive workers significantly benefit from OVER relative to UNDER in contrast to all other workers.

Dep var : Payoff	Model (1)	Model (2)
OVER	0.46*** (0.11)	0.06 (0.56)
Workers 1–5	44.98*** (0.48)	44.14*** (0.40)
Workers 6–9	25.36*** (0.35)	25.39*** (0.58)
Workers 10–13	11.86*** (0.60)	12.09*** (0.43)
Workers 1–5 * OVER		1.67* (0.77)
Workers 6–9 * OVER		-0.05 (0.69)
Workers 10–13 * OVER		-0.47 (1.19)
Constant	2.89*** (0.29)	3.09*** (0.16)
N	160,000	160,000
R-squared	0.86	0.86

Table 5: Workers' payoffs from simulated data

Notes: OLS regression with errors clustered at the session level. The dummy variable OVER is 1 for treatment OVER. The variable Workers 1–5 is a dummy for the workers of rank 1 to 5. The variable Workers 6 to 9 is a dummy for the workers of rank 6 to 9. The variable Workers 10–13 is a dummy for the workers of rank 10 to 13. The baseline category is Workers 14–16. The variable Workers 1–5 * OVER is an interaction of the dummy for the top five most productive workers and the dummy for treatment OVER. Values in parentheses represent standard errors. *p<0.1,**p<0.05,***p<0.01.

4.6 Behavior and payoffs of firms

In this section, we study the firms' decisions to make early offers, and we ask how the treatments affect the firms' profits. The only decision that the firms had to take in the experiment is whether to make an early offer or not. We predict that the number of early offers made by the firms in the two treatments is the same, since the two treatments are indistinguishable for them (i.e., we only told the subjects in the role of firms that the workers have to perform a real-effort task and are ranked accordingly). Not surprisingly, we observe no significant difference between the number of early offers in both treatments. In particular, the exact same number of 24 out of 40 firms made an early offer in OVER and in UNDER.

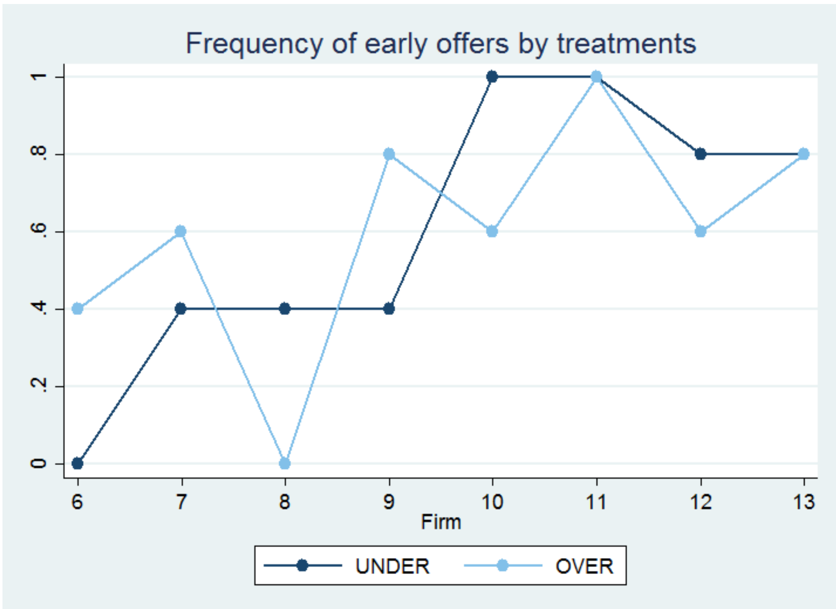

Figure 6. Frequency of early offers by the firms

Notes: The graph displays the relative frequency of early offers by treatment. The horizontal axis shows the firms' ranks.

Figure 6 presents the frequency of early offers for the two treatments. It is evident from the figure that the higher the firm's rank, the more likely it is to make an early offer. In order to provide statistical evidence of this observation, and to control for other possible determinants, we regress the early-offer dummy (which equals 1 if the firm decided to make an early offer) on the firm's average second-order belief, on a dummy that is 1 for female participants, on the firm's risk-aversion and the firm's rank. The variable Second-order belief is the average of all 16 guesses of a firm.[27] A higher average second-order belief indicates that the firm believes that, on average, the workers are less confident.

As expected, we find that there is no treatment difference in the propensity of firms to make early offers. Thus, the experimental design was successful in making the firms' side of the market indistinguishable between OVER and UNDER. The regression also shows no effect of the firms' second-order beliefs on their decision to make an early offer, as can be seen from the insignificant coefficient of Second-order belief in Table 6.[28] Moreover, the probability of making an early offer decreases with the quality of the firm (Rank of firm), as expected, while the gender of the subject in the role of the firm has no effect. The risk preferences of the firms do not have a significant influence on the propensity of making early offers, either.

Dep var : Early offer	
Second-order belief	-0.077 (0.061)
Female	-0.063 (0.130)
Rank of firm	0.103*** (0.030)
Risk aversion	-0.039 (0.056)
OVER	-.020 (0.129)
N	80
Pseudolikelihood	-44.39

Table 6: Early offers by firms

Notes: The table reports the marginal effects of a probit regression of early offers. Second-order beliefs are averages over beliefs for all workers for a given firm. The dummy variable OVER is 1 for treatment OVER and the dummy variable Female equals 1 for female participants. The variable Risk aversion is measured as the average switching point of the three multiple lottery list tasks, such that the more risk averse the subject is, the higher the value of the variable is. Standard errors are clustered on the session level. Values in parentheses represent standard errors. *p<0.1,**p<0.05,***p<0.01.

[27] We use the stated second-order beliefs of the participants in the role of firms, that is, the beliefs that they hold about the perceived rank of each worker. As expected, we see no difference between the second-order beliefs in the two treatments (see Figure B1 in Appendix B). Note that on average firms believe that workers of ranks 1 to 4 are underconfident while workers of ranks 5 to 16 are overconfident, a pattern reflecting the belief that the workers' beliefs are biased toward the average rank.

[28] Another potentially important factor influencing the propensity to make an early offer might be the firms' over-optimism about the likelihood of the offer being accepted by high quality workers. However, our experiment does not allow us to measure this.

Next, we explore the firms' payoffs and how they are affected by the treatments and by the decision to make an early offer. Note that the actual payoff of a firm depends on the random draw of the worker who receives the offer. In order to calculate the expected profits from early offers, we therefore use the simulated market allocations that we have described in subsection 4.3.

Figure 7 shows that the profits of firms 6 to 13 are (almost) always higher in UNDER than in OVER. The difference between the treatments is significant (two-sided Wilcoxon rank-sum, $p<0.05$ for session averages, five observations per treatment). Thus, the middle and low firms profit from the relative underconfidence of the workers, since in UNDER better workers accept early offers compared to OVER. This comes at the expense of the five best firms, which are not displayed in the graph.

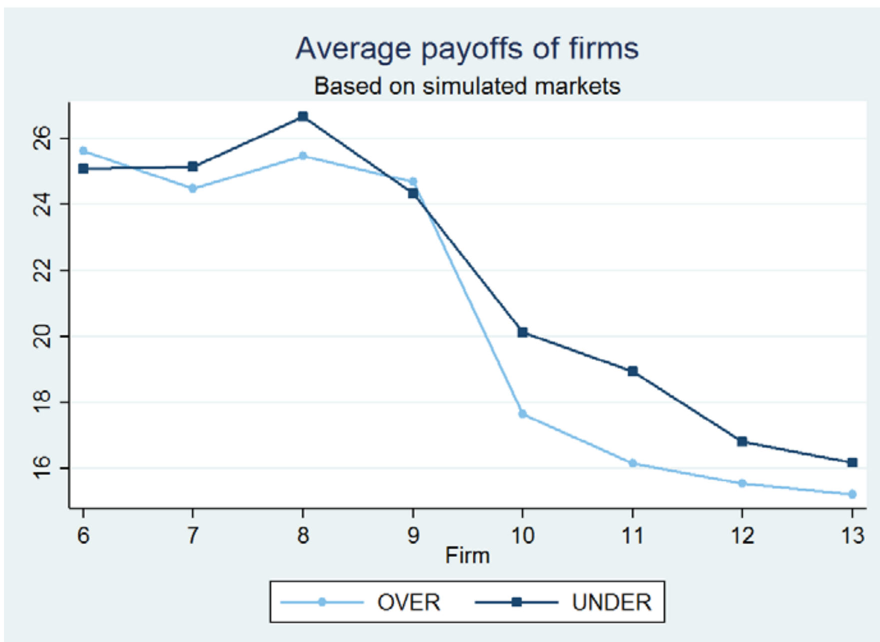

Figure 7: Payoffs of firms depending on the firms' ranks in treatments OVER and UNDER.

Notes: The graph plots the average payoffs of the middle and low-quality firms. The horizontal axis displays the ranks of the firms.

We now consider the determinants of the firms' payoffs with the help of a regression analysis. Table 7 displays the regression results for payoffs of the middle and low-quality firms only. Once again, as in the case of the payoffs of the workers, due to the non-linearity of the payoffs we control for the quality of the firms by introducing a dummy variable for low-quality firms of ranks 10 to 13, taking firms 6 to 9 as the base category. The first model shows that all middle and low-quality firms (6 to 13) earn lower profits in OVER than in UNDER, supporting the graphical evidence of Figure 7. The firms profit from the workers' underconfidence at the expense of the top firms. Model (2) demonstrates that the treatment effect is mainly driven by the worst firms, again as evident in Figure 7. Next, we consider the effect of making an early offer on the firms' profits. It turns out that making an early offer is, on average, beneficial for the firms as shown by Model (3). Model (4) demonstrates that making an early offer in UNDER leads to higher payoffs than in OVER. The treatment dummy is no longer significant, indicating that the treatment effect on payoffs is mainly driven by those firms that make early offers. In particular, the firms that make early offers in UNDER earn higher payoffs than the firms making early offers in OVER or firms not making early offers.[29]

Dep var : Payoff	Model (1)	Model (2)	Model (3)	Model (4)
OVER	-1.05*** (0.19)	-0.23 (0.51)	-1.05*** (0.18)	0.57 (0.35)
Firms 10-13	-8.10*** (0.50)	-7.28*** (0.53)	-8.91*** (0.09)	-9.92*** (0.61)
Firms 10-13*OVER		-1.64* (0.84)		
Early offer			1.80** (0.71)	3.16*** (0.70)
Early offer*OVER				-2.69*** (0.80)
Constant	25.71*** (0.26)	25.30*** (0.26)	25.03*** (0.33)	24.22*** (0.27)
N	80,000	80,000	80,000	80,000
R-squared	0.23	0.23	0.24	0.24

Table 7: Payoffs of the firms of ranks 6 to 13

Notes: The table shows the marginal effects of the probit regression of early offers. The regressions are based on the simulated data with errors clustered at the session level. The dummy variable OVER takes on the value of 1 for treatment OVER and the dummy variable Early offer is 1 if the firm makes an early offer. The variable Firms 10–13 is a dummy variable for firms of ranks 10 to 13. The variable Firms 10–13* OVER is the interaction of the dummy for firms of ranks 10 to 13 and OVER. Values in parentheses represent standard errors. *p<0.1,**p<0.05,***p<0.01.

5. Conclusions

We have designed an experimental labor market to investigate the effects of over- and underconfidence on the market outcome. With the help of two different real-effort tasks, each employed in a separate treatment, we shift the subjects' self-confidence and observe an effect of this shift in beliefs on the market outcome. Namely, we see that in the treatment with the easy task, fewer offers are being accepted early than in the case of the hard task. In other words, the average underconfidence of workers causes the matching to be less stable than when

[29] Adding the interaction of Rank of firm and the dummy for Early offer in Model (4) yields a coefficient for this interaction that is not significantly different from zero, without changing the significance of the other variables.

workers are on average overconfident. We find that apart from shifting the beliefs of the workers, the treatment has no additional effect on the acceptance of early offers.

Regarding the implications of our results, note that unraveling effects similar to the ones described in our experiment occur not only when there is a centralized clearinghouse using a stable mechanism (such as in some US markets for doctors or the Canadian market for young lawyers, see Roth and Xing 1994). Unraveling that is affected by the applicants' self-confidence can also be at play in decentralized markets where some offers are made earlier than others. For example, the market for apprenticeships in Switzerland has unraveled such that many apprenticeships are filled more than a year before applicants have finished school. This large and important market is the main entry-level labor market below tertiary education. The fact that offers are made early makes it likely that applicants who do not know their final grades make suboptimal acceptance decisions that depend on their self-confidence.[30]

How can market design limit the unraveling that is caused by the underconfidence of workers? One possible solution is to reduce underconfidence by providing more feedback for the workers on their performance. Countries with centralized college entrance exams offer mock exams, and our findings suggest that this policy might limit unraveling. Furthermore, whether agents are biased regarding their own attractiveness for the firms becomes irrelevant under the use of strategy-proof mechanisms. Under a strategy-proof mechanism such as the deferred acceptance algorithm, it is safe for all agents to truthfully report their preferences over firms, independent of their relative productivity. Finally, imposing restrictions on early contracting, for example, by setting deadlines until which early offers can be renegotiated, is a useful tool to limit the effects of biased self-assessments.

Market designers need to take into account the possibility of cultural differences between groups of applicants, between women and men, and individual differences that are reflected in the relative self-assessments, since they can affect labor market success. The evidence on the penalty for underconfident women for university admissions in certain regions of China illustrates such effects (Ma et al. 2016, Pan 2016).

Collective shocks to the confidence level can cause or can stop unraveling. We believe that the empirical investigation of such instances, e.g., where beliefs are shifted due to a change in the modalities of a final exam or in the rules of admission, is a worthwhile future endeavor.

[30] See the article in the *Neue Züricher Zeitung* on August 19, 2016 (http://www.nzz.ch/wirtschaft/wirtschaftspolitik/berufsbildung-die-heikle-jagd-nach-den-besten-lehrlingen-ld.111764).

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APPENDIX

Appendix A

Model of the market game when workers' ranks are determined randomly

- There are four sets of workers $W_1 = \{w_1, \dots, w_5\}$, $W_2 = \{w_6, \dots, w_9\}$, $W_3 = \{w_{10}, \dots, w_{13}\}$ and $W_4 = \{w_{14}, \dots, w_{16}\}$. Let $W = W_1 \cup W_2 \cup W_3 \cup W_4$.
- There are three sets of firms $F_1 = \{f_1, \dots, f_5\}$, $F_2 = \{f_6, \dots, f_9\}$, and $F_3 = \{f_{10}, \dots, f_{13}\}$. Let $F = F_1 \cup F_2 \cup F_3$.
- Strategies of firms consist of sending or not sending an offer in the first stage. Let S^f be firm's strategy. Therefore, for all $f \in F, S^f \in \{0,1\}$.
- Strategies of workers consist of the firms from which they would accept an offer in the first stage. Therefore, for all $w \in W, S^w \in \{0,1\}^{|F|}$.[31] We abuse notation and denote by $S^w(f)$ the value of the item with the index of f in S^w. That is, if $S^w(f) = 1$, the strategy S^w states that an offer from f would be accepted.
- The cardinal utilities derived by workers and firms when matched are given by tables 1 and 2.

Firms and workers simultaneously choose their strategies. The outcome of the game is produced by the following process:

1. Step 0: Let $W^0 = W$ and $F^0 = F$. Nature draws, from the uniform distribution, a permutation of the workers in W to their indices.
2. Step 1: If $S^{f_1} = 0$, proceed to the next step. If $S^{f_1} = 1$, firm f_1 makes an offer to a uniformly random drawn worker $w \in W$. If $S^w(f_1) = 1$, worker w and firm f_1 are matched in the first stage, $W^1 = W^0 \backslash \{w\}$ and $F^1 = F^0 \backslash \{f_1\}$. Otherwise, firm f_1 makes an offer to a uniformly random drawn worker $w' \in W \backslash \{w\}$. If $S^{w'}(f_1) = 1$, worker w' and firm f_1 are matched in the first stage, $W^1 = W^0 \backslash \{w'\}$ and $F^1 = F^0 \backslash \{f_1\}$. Proceed this way until either some worker accepts the offer from f_1 and both are therefore matched and leave the market, in which case the values of W^1 and F^1 are updated accordingly, or until all workers reject the offer from f_1, in which case f_1 is left unmatched in the first stage, $F^1 = F^0$ and $W^1 = W^0$.
3. Step k ≤ 13 : If $S^{f_k} = 0$, proceed to the next step. If $S^{f_k} = 1$, firm f_k makes an offer to a uniformly random-drawn worker $w \in W^{k-1}$. If $S^w(f_k) = 1$, worker w and firm f_k are matched in the first stage, $W^k = W^{k-1} \backslash \{w\}$ and $F^k = F^{k-1} \backslash \{f_k\}$. Otherwise, firm f_k makes an offer to a uniformly random drawn worker $w' \in W^{k-1} \backslash \{w\}$. If $S^{w'}(f_k) = 1$, worker w' and firm f_k are matched in the first stage, $W^k = W^{k-1} \backslash \{w'\}$ and $F^k = F^{k-1} \backslash \{f_k\}$. Proceed this way until either some worker accepts the offer from f_k and therefore both are

[31] For simplicity, we consider the natural ordering of firms denoted by their indices, so that, for example, $S^w = (1,1,0,0, \dots, 0)$ represents the strategy of accepting offers only from firms f_1 and f_2.

matched and leave the market, in which case the values of W^k and F^k are updated accordingly, or until all workers reject the offer from f_k, in which case f_k is left unmatched in the first stage, $F^k = F^{k-1}$ and $W^k = W^k$.

4. Step 14: Workers in W^{13} and firms in F^{13} are matched assortatively.

Note that the process above describes the algorithm of finding the allocation, while the actions of the firms and the workers are taken simultaneously and cannot be conditioned at Step k.

The solution concept we use is that of the Bayesian Nash Equilibrium, where all workers and firms share the correct belief that the permutation of workers to their indices is drawn uniformly random. We focus on pure-strategy equilibria.

Theorem 1. *In every pure-strategy Bayesian Nash Equilibrium:*
For every $f \in F_1$, S^f=0, for every $f' \in F_2$, $S^{f'}$=1, for every $f'' \in F_3$, $S^{f''} \in \{0,1\}$.
For every $w \in W$ and $f \in F_1$, $S^w(f) \in \{0,1\}$; for all $f' \in F_2$; $S^w(f') = 1$; for all $f'' \in F_3$; $S^w(f'') = 0$.

Before turning to the computations, let us explain how the proof proceeds. We first show that firms f_1, f_2 and f_3 which will be matched to the three most productive workers in the second stage, will not make offers at stage one in any equilibrium. This, in turn, results in a higher expected payoff of workers in the second period such that workers never accept offers from firms $F_3 = \{f_{10}, \dots, f_{13}\}$ in the first stage. Thus, firms in F_3 are indifferent between making offers or not in the first stage. This in turn makes the offers of firms $F_2 = \{f_6, \dots, f_9\}$ more attractive relative to the expected payoff in the second stage, and their offers are accepted. Although there are multiple equilibrium strategy profiles, they are all outcome equivalent and differ only with respect to offers by firms which are not accepted and with respect to workers accepting or rejecting firms which do not make offers in equilibrium.

First, consider firm f_1. The expected utility from making an early offer is 27.5 (as workers always accept offers from f_1). The strategy profile that would lead to the lowest expected utility for firm f_1 under S^{f_1} =0 results when all other firms make offers which are accepted, that is, for all $f \in F\backslash\{f_1\}$, S^f =1 and for all $w \in W$, $S^w(f) = 1$. This yields an expected utility of 45.27.[32] Thus, the expected utility from making an early offer is lower than the expected utility of not making an early offer under the worst possible scenario, thus S^{f_1} =0.

[32] Firm f_1 can get three possible payoffs when not making an early offer. First, it receives a payoff of 50 if at least one of the five best workers did not receive an early offer. This happens with probability 1-(C(5,5)*C(11,7))/C(16,12)=1490/1820.

Consider now firms f_2 and f_3. The expected utility from making an early offer is 27.5. Since in every equilibrium firm f_1 does not make an early offer, the strategy profile that would lead to the lowest expected utility of f_2 when S^{f_2} =0 results when all other firms (except for f_1) make offers which are accepted, that is, for all $f \in F\backslash\{f_1, f_2\}$, S^f =1 and for all $w \in W, S^w(f) = 1$. This yields an expected utility of 37.14.[33] Thus, the expected utility from making an early offer is lower than the expected utility of not making an early offer under the worst possible scenario, and therefore S^{f_2} =0. As for firm f_3, given that firms f_1 and f_2 do not make early offers, the strategy profile that would lead to the lowest expected utility given S^{f_3} =0 results when all other firms (except for f_1 and f_2) make offers which are accepted, that is, for all $f \in F\backslash\{f_1, f_2, f_3\}$, S^f =1 and for all $w \in W, S^w(f) = 1$. This yields an expected utility of 29.23.[34] Thus, the expected utility from making an early offer is lower than the expected utility of not making an early offer under the worst possible scenario, thus S^{f_3} =0.

Second, it can get a payoff of 25 if all the five best workers $W_1 = \{w_1, \dots, w_5\}$ received an early offer and at least one of the four workers in $W_2 = \{w_6, \dots, w_9\}$ did not. This happens with probability [C(5,5)*C(4,3)*C(7,4)+C(5,5)*C(4,2)*C(7,5)+C(5,5)*C(4,1)*C(7,6)+C(5,5)*C(7,7)]/C(16,12)=295/1820. Finally, it can get a payoff of 15 if all workers in $W_1 = \{w_1, \dots, w_5\}$ and $W_2 = \{w_6, \dots, w_9\}$ received an early offer. This happens with probability C(9,9)*C(7,3)/C(16,12)=35/1820. Overall, this yields an expected payoff from not making an early offer of 45.27.

[33] Firm f_2 can get three possible payoffs. It will get a payoff of 15 if at least eight of the workers in $W_1 = \{w_1, \dots, w_5\}$ and $W_2 = \{w_6, \dots, w_9\}$ receive and accept an early offer. This happens with probability [(C(9,8)*C(7,3))+(C(9,9*C(7,2))]/C(16,11)=336/4368. Then, if at least four of the workers $W_1 = \{w_1, \dots, w_5\}$, but a maximum of seven of the workers $W_1 = \{w_1, \dots, w_5\}$ and $W_2 = \{w_6, \dots, w_9\}$ receive and accept an early offer (with a probability of [C(5,4)*(C(4,0)*C(7,7)+C(4,1)*C(7,6)+C(4,2)*C(7,5)+C(4,3)*C(7,4))+C(5,5) *(C(4,0)*C(7,6)+C(4,1)*C(7,5)+C(4,2)*C(7,4))]/C(16,11)=1776/4368), firm f_2 will get a payoff of 25. Firm f_2 will finally get a payoff of 50 if a maximum of three workers $W_1 = \{w_1, \dots, w_5\}$ receive and accept an early offer (probability=[C(5,0)*C(11,11)+C(5,1)*C(11,10)+C(5,2)*C(11,9)+C(5,3)*C(11,8)]/C(16,11)==2256/4368). The expected payoff of waiting for stage 2 is therefore at least equal to 37.14.

[34] Similarly, Firm f_3 can get payoffs of 15 (case a), 25 (case b) and 50 (case c) which are computed with the help of the following probabilities: P(a)=[(C(9,7)*C(7,3)+C(9,8)*C(7,2)+C(9,9)*C(7,1)]/C(16,10), P(b)=[C(5,3)*(C(4,0)*C(7,7)+C(4,1)*C(7,6)+((4,2)*C(7,5)+C(4,3)*C(7,4))+C(5,4)*(C(4,0)*C(7,6)+C(4,1)*C(7,5)+C(4,2)* C(7,4))+C(5,5)*(C(4,0)*C(7,5)+C(4,1)*C(7,4))]/C(16,10) and P(c)=[C(5,0)*C(11,10)+C(5,1)*C(11,9)+C(5,2)*C(11,8)]/C(16,10).

The fact that in equilibrium the three best firms f_1, f_2, f_3 do not make early offers, ensures that the expected payoff under the worst possible scenario of the second round for workers is higher than being matched to any of the three bad firms, i.e., firms from F_3. As a result, any offers from firms in F_3 will not be accepted in equilibrium: for all $w \in W$and for all $f \in F_3$, $S^w(f) = 0$.

We can now turn to firms f_4 andf_5. Given that firms f_1, f_2, f_3 and firms $F_3 = \{f_{10}, \dots, f_{13}\}$ will hire workers at the second stage, the worst-case scenario for firm f_4 is when firms f_5, f_6, f_7, f_8 and f_9 make early offers which are accepted. In this case, firm f_4's expected utility of matching in the second stage is 37.09.[35] Firm f_4 will therefore choose not to make an early offer: S^{f_4} =0. Likewise, given that firms f_1, f_2, f_3, f_4 do not make early offers in equilibrium and offers of firms $F_3 = \{f_{10}, \dots, f_{13}\}$ are rejected in equilibrium, firm f_5 will get a higher expected utility by not making an early offer in the worst case scenario where firms $F_2 = \{f_6, \dots, f_9\}$ have left the market. Indeed, its expected utility from not making an early offer in this situation is 29.53.[36] Thus, S^{f_5} =0.

The uncertainty that workers have over their own type allows us to narrow down the possible equilibrium strategies further. Consider a worker who receives an offer from firm f_9. The utility of accepting the offer is 29 which is better than the expected utility of rejecting the offer, which is 27.125 in the best possible scenario where firms f_6, f_7, and f_8 are still in the market in the second stage. The same holds for the offers of f_6, f_7, and f_8. As a result, for every worker w, it holds that $S^w(f) = 1$ for $F_2 = \{f_6, \dots, f_9\}$. For firms $F_2 = \{f_6, \dots, f_9\}$, given that firms $F_1 = \{f_1, \dots, f_5\}$ do not make early offers in equilibrium, the maximum utility in the second stage is 25, while the expected utility of making an early offer is 27.5. Thus, firms $F_2 = \{f_6, \dots, f_9\}$ make early offers in equilibrium, and these offers are accepted by the workers.

To conclude, in each equilibrium we have that

- Firms in F_1 do not make an offer in the first stage, i.e. S^f *=0*, for all $f \in F_1$.
- Firms in F_2 make offers in the first stage, i.e., S^f *=1*, for all $f \in F_2$.
- Firms in F_3 are indifferent between making and not making an offer in the first stage, i.e., $S^f \in \{0,1\}$*1*, for all $f \in F_3$.
- Workers' strategies are such that any $S^w(f) \in \{0,1\}$ is an equilibrium for any $w \in W$ and $f \in F_1$ (since these offers will not be made), $S^w(f) = 1$ for every $f' \in F_2$ and for every $f'' \in F_3$, $S^w(f'') = 0$.

[35] The payoff of firm f_4 is 50 if at most one of the five best workers received an early offer (probability=[C(5,0)*C(11,5)+C(5,1)*C(11,4)]/C(16,5)=2112/4368) and 25 otherwise.

[36] This is due to the fact that it will get a payoff of 50 with probability [C(5,0)*C(11,4)/C(16,4)] and a payoff of 25 otherwise.

- The outcome is unique: Firms in F_1 do not make early offers, firms in F_2 make early offers which are accepted and firms in F_3 only make offers which are not accepted. As a result, the workers who are not matched with the firms in F_2 in the first stage are matched to some firm in $F_1 \cup F_3$ in the second stage, or remain unmatched.

Appendix B

Second-order beliefs of firms

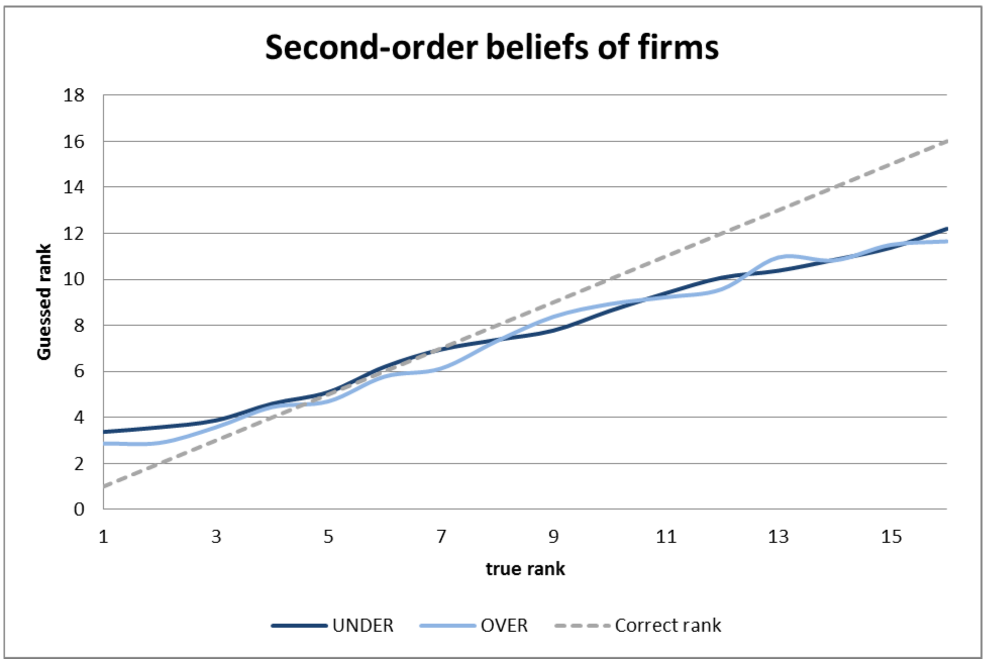

Figure B1: Second-order beliefs of firms regarding the workers' guessed ranks.

Notes: The horizontal axis shows the productivity of the workers for whom the firms state their second-order beliefs. The vertical axis shows the average guessed first-order beliefs of the respective workers of ranks 1 to 16. The 45-degree line corresponds to calibrated beliefs.

Appendix C

Measuring risk aversion: Detailed procedures and results

After all decisions were made but before receiving feedback, all subjects answered several risk-elicitation questions. First, they worked on three incentivized multiple prices lists. The first one replicates Holt and Laury's (2002) list. We implemented a procedure that imposes consistent decisions. The subjects' only decision is to determine the row along which to switch from a safer (small variance in the outcomes of the lottery) to a riskier option (larger variance in the outcomes of the lottery). In this list, a risk-neutral subject should switch at row five out of 10. Switching earlier means that the subject is risk-seeking, while switching later means that the subject is risk averse. Based on this task, we cannot reject risk-neutrality for 13.3% of subjects (they switched exactly at row five), 18.3% of subjects are risk-seeking, while 68.3% of subjects are risk averse.

Given the evidence of Vieider (2017), in order to provide a less noisy measure of risk aversion we use two additional multiple price lists. Thus, each subject took three incentivized decisions. The maximum and minimum values of the lotteries are similar to the classic Holt and Laury list, but we vary the row of the optimal switch for a risk-neutral player (the exact lists are provided in Appendix D.3). In the second list, the risk-neutral player should switch to the riskier option only at the eighth row out of 10. Thus, if a subject tends to switch in the middle of the list, it should lead to more risk-seeking subjects than in the Holt and Laury list. We cannot reject risk-neutrality for 18.3% of the subjects (who switch at row eight), while 47.9% of the subjects are risk-seeking, and 33.7% of the subjects are risk averse. In the third list, we move the row at which risk-neutral subjects should switch to the beginning of the list (row 3). We cannot reject risk neutrality for 10% of the subjects, 5.42% of the subjects are risk-seeking, and 84.5% of the subjects are risk averse. Despite the differences, the three measures are correlated. The Spearman correlations are 0.40, 0.52 and 0.38, respectively, between the switching points in the first and the second, the first and the third, and the second and the third list. For the goal of controlling for the risk in the regression analysis, we construct the variable Risk aversion:

Risk aversion=Average switching point of the three MPLs

Thus, the higher the value of the variable Risk aversion, the less risk-taking the subject is.

Additionally, we run a non-incentivized risk questionnaire (Dohmen et al. 2005). According to Dohmen et al. (2005), the non-incentivized measures correlate with the incentivized risk task. For the general risk question (with answers between 0 and 10, with higher numbers implying more risk tolerance), the average self-assessment was 4.9 with a standard deviation of 2.3. The Spearman correlation with the Risk aversion measure from the multiple price lists is -0.36, and is significant with $p<0.01$. The Spearman correlation of the domain-specific risk measures with the variable Risk aversion from the multiple price lists is significant for risk-taking in financial matters, -0.24 ($p<0.01$), for leisure and sports, -0.17 ($p=0.00$), and for faith in other people, -0.11 ($p=0.08$). Regarding the non-incentivized investment choice question, the average amount invested is 30.3, with a standard deviation of 27. The Spearman correlation of the amount invested and the Risk aversion measure from the multiple price lists is -0.25, and significant with $p<0.01$.

We use these different risk measures to control for risk aversion in the main regression concerning the propensity of workers to accept early offers. In the paper, we use the risk-aversion measure based on the multiple price lists, but the results (significance of the coefficient and the direction of the effect) are the same for each lottery list separately, for the general risk question, and for the question regarding the risky investment. Regarding the domain-specific measures, the coefficients are not significant.

Finally, the measure of risk aversion is not significantly different between treatments. It is 6.44 in UNDER and 6.58 in OVER (Wilcoxon rank-sum $p=0.28$). Each multiple price list separately and the non-incentivized risk measures also do not differ significantly between treatments.

Appendix D

D.1 Instructions of the experiment

Instructions

General description

This experiment is about **workers** who are trying to find the best possible job and **firms** looking for the best possible workers. Each firm wants to employ exactly one worker. At the beginning of the experiment, it will be randomly determined whether you will be in the role of a worker or of a firm. You will keep this role for the entire experiment.

There are 13 firms in the market of which five are of high quality and the remaining eight are each of a different quality. The five firms of high quality are played by the computer while the other eight firms are played by participants in this room. There are also 16 workers who prefer to be matched to the firms of high quality relative to the firms of intermediate or lower quality.

The workers have different productivities for the firm. That is, the workers can be ranked in terms of their productivity, with one worker being the most productive and one worker being the least productive. All firms have identical preferences over workers, that is, they agree on which worker is the most productive, etc.

Each round of the experiments consists of two stages.

First stage

At the beginning of the first stage, the quality of the firms is revealed to all participants. The productivity of the workers is known neither by the firms nor by the workers themselves.

During the first stage, all eight firms that are not of the highest quality are allowed to make early offers to the workers. The firms of high quality which are played by the computer do not make offers. The firms that make offers do not differentiate between the workers, thus they make an offer, if any, to a random worker. Each worker is free to accept or reject the offer. The workers have 30 seconds to submit the decision of acceptance or rejection. If the offer is accepted, both the firm and the worker leave the market. The first stage consists of a maximum of nine rounds. Thus, if an offer of a firm was rejected by a worker it will automatically be sent to another worker. If it is rejected again it will be sent to the third one. Thus, any offer can be rejected a maximum of nine times. (Note that the procedure of distributing offers guarantees that an offer is always sent to a new worker.)

Every worker who receives an offer receives two more fictitious offers. A worker must decide whether or not to accept each of the three offers. This means that she can accept all three offers, only two of them, only one or none. She does not know which offer is real and which offers are fictitious. If she rejects an offer, she will not get any more offers from this firm, independent of whether it was a real or a fictitious offer.

Now consider the following example: Firm 12 makes an offer to a randomly selected worker. The worker sees three offers on her screen: two randomly selected offers and the offer of firm 12. Let us suppose that the offers of firms 9 and 11 were made randomly. Let us also suppose that the worker accepts the offer of firm 9 but rejects the offers of firms 11 and 12. The worker is then told that only the offer of firm 12 was real, so she is still unmatched.

The rejection of the offer of firm 11 is final. This means that the worker will not receive an offer from firm 11 anymore. This means that a worker should consider each of the three offers as if it is the only one that she has received.

Second stage

All workers and firms who remain unmatched at the end of the first stage (that is, firms who decided to wait and did not make early offers, and firms whose offer was rejected) move on to the second stage.

At the beginning of the second stage, the quality of all workers is revealed. Moreover, it will be announced which firms and workers have already left the market in the first stage. Then the following matching is implemented: the five best unmatched workers are assigned to the five best firms, the sixth best unmatched worker is assigned to the sixth best firm, and so on. The three workers of the lowest productivity among all workers at the second stage remain unmatched and receive a payoff of 0.

Workers and firms only have to make decisions in the first stage. The second stage is executed by the computer, according to the above description.

Information and Payoffs

The payoffs of firms and workers in all rounds of the experiment have the same structure and are presented in the tables below.

Payoffs of the firms

	Most productive workers 1–5	Workers 6–9	Workers 10–13	Least productive workers 14–16
Payoff of firm (points)	50	25	15	10

Thus all firms receive 50 points if they are matched with any of the five best workers, 25 if they employ a worker who is ranked 6th to 9th, 15 for a worker ranked 10th to 13th, and 10 if they employ any of the least productive three workers. The firms that are played by the computer receive no payoffs.

Payoffs of the workers

The payoff of a worker depends on which firm it concludes a contract with. For a contract with one of the top five firms, the five most productive workers receive a payoff of 50, while all other workers receive a payoff of 32 for these firms. For all other firms, all workers receive an equal payoff. For example, every worker who signs a contract with the 10th-best firm receives a payoff of 17, with the 11th best firm receiving only 16, etc.

All workers	Five most productive workers	All other workers
Top Firm	50	32
2nd best firm	50	32
3rd best firm	50	32
4th best firm	50	32
5th best firm	50	32
6th best firm	32	32
7th best firm	31	31
8th best firm	30	30
9th best firm	29	29
10th best firm	17	17
11th best firm	16	16
12th best firm	15	15
13th best firm	14	14
Unassigned	0	0
Unassigned	0	0
Unassigned	0	0

Rounds

There are a total of four rounds. The first three are practice rounds and do not affect your payoff. Only in the fourth round will your payoffs be determined. In each practice round, the rank of the participants in the role of the workers is drawn anew.

Productivity of workers

In each practice round the productivity of the workers is determined by a random draw. That is, the computer randomly assigns a productivity rank to each worker. A new ranking is randomly drawn in every round. The ranks thus determined are communicated to all workers and to all firms at the beginning of the second stage.

In the third round of the experiment, which is relevant for the payoffs, the ranks of all workers are determined as follows:

- All workers are asked to work on a task for which they earn points.
- Whoever has reached the most points within a certain time is the most productive worker. The one who has reached the second most points is the second most productive worker, and so on.
- If two or more workers are equal, the relative ranking of these workers is determined by chance.

Exchange rate

The points that you earn in the experiments will be paid out to you according to the following exchange rate: 1 point = 40 cents.

Hints

Note that in the first stage, only intermediate and low-quality firms can make offers to workers. Thus, the only way for workers to be employed by one of the five best firms is to stay in the market until the second stage.

Moreover every time a worker receives an offer in the first stage, she knows which firm made the offer, and thus the corresponding payoff.

Note that every participant in the role of the firm knows its own quality.

Also, keep in mind that a firm that makes an offer in the first part does not know what productivity the workers have.

If you have any questions about the experiment, please raise your hand.

D.2 Instructions for belief elicitation stage

[distributed in the final payoff-relevant round after subjects have worked on the real-effort task and have taken their decisions regarding offers, rejections, and acceptances]

Indicating your expectations

Workers

a) How to indicate your expectations

All 16 workers, including you, have completed a task. According to the performance of all workers, each of them is attributed a rank. Rank 1 corresponds to the worker whose performance was best, rank 2 to the worker whose performance was the second best, and so on. We would like to ask you to state your expectation of your rank. More precisely, we want you to tell us your expected rank as an integer between 1 and 16.

b) How is the payoff calculated for your stated beliefs?

After you have estimated your expected rank, your payoff is calculated. The more precise your estimation, the higher the probability is that you will win 5 points. The likelihood of your receiving the payoff of 5 is higher, the closer your stated rank is to your true rank (which corresponds to the rank of your performance among all other workers' performances). Your payoff is calculated as follows:

• First the computer randomly selects a number between 0 and 225. Every number between 0 und 225 is equally likely.
• The difference between the estimate of your rank and your true rank is the so-called prediction error. If your prediction error, multiplied by itself, is not larger than the random number then you will receive 5 points. Otherwise you will receive 0 points.

Important: You may wonder why have chosen this payment rule. The reason is that this payment rule makes it optimal for you to indicate your expected rank.

Example: Your estimated rank is 13. Your true rank is 10. Thus, your prediction error is (13-10) = 3. Your prediction error, multiplied by itself, is 9. If the random number that is drawn by the computer is greater than or equal to 9, for example 26, then you will receive 5 points. If the random number that is drawn by the computer is smaller than 9, for example 8, then you will receive 0 points.

Indicating your expectations

Firms

a) How to indicate your expectations

We have just asked the workers to tell us what they think their rank is. The question was: "All 16 workers, including you, have completed a task. According to the performance of all workers, each of them is attributed a rank. Rank 1 corresponds to the worker whose performance was best, rank 2 to the worker whose performance was the second best, and so on. We would like to ask you to state your expectation about your rank. More precisely, we want you to tell us your expected rank as an integer between 1 and 16."

Please tell us what you think each worker thought about his true rank. In particular, please tell us which rank the worker thought would be his expected rank. Of course, the best-performing workers are likely to have guessed differently than the worst-performing ones. For this reason, you will be asked to give us your expectation for the estimated rank of each of the 16 workers.

b) How is the payoff calculated for your stated beliefs?

Your payoff is calculated after you have given us your estimate of the expected rank stated by all 16 workers. For each worker, it will be determined which payoff you will receive for your estimate. The more accurate your estimate, the more likely you are to earn 5 points. This is guaranteed by the following procedure:

The probability of the payoff depends on the difference between your expectation regarding the worker's self-assessment and the true self-assessment of the worker. The probability of your payoff is higher if you have indicated a rank that is close to the self-assessed rank of the worker. The probability of your payoff is lower if you have indicated a rank that is further away from the self-assessed rank of the worker. Your payoff is calculated as follows:

• First the computer randomly selects a number between 0 and 225. Every number between 0 und 225 is equally likely.

• The difference between your expectation of the estimate of the worker and the true self-assessment of the worker is the so-called prediction error. If your prediction error, multiplied by itself, is not larger than the random number then you will receive 5 points. Otherwise you will receive 0 points.

Important: You may wonder why we have chosen this payment rule. The reason is that under this payment rule it is best for you to indicate your expectation regarding the self-assessment of the workers.

At the end, one of the 16 workers is drawn randomly. You will only be paid for your estimate regarding this worker.

Example:

Let us assume that the worker of rank 5 was chosen for your payoff. This worker has indicated an expected rank of 4. Your expectation of the estimate of this worker is 9. Therefore, your prediction error is (9-4)=5. Your prediction error, multiplied by itself, is 25. If the random number that is drawn by the computer is greater than or equal to 25, for example 26, then you will receive 5 points. If the random number that is drawn by the computer is smaller than 25, for example 8, then you will receive 0 points.

D.3 Instructions for the risk-measurement questions

Instructions

In this task you will be shown on your screen three tables with 10 rows in sequential order. In each of the rows, you are given the choice between option A and B. You need to decide in every row which of the two options you prefer. At the end, only one of the rows from the three tables will determine your earnings, but you do not know in advance which row it will be. Every row is drawn with the same probability. Thus, after you have taken your decision in each of the three tables, the computer will randomly determine which row determines your payoffs. Afterwards, the computer will draw your earnings given your decision for one of the rows, which is either A or B. These earnings will be added to the return from the experiment. Thus, this exact sum will be paid out to you at the end of the experiment.

Please consider row 1 at the top of the screen. Option A yields a 10% chance of winning 2.00 euro and a 90% chance of winning 1.60 euro. Option B yields a 10% chance of winning 3.85 euro and a 90% chance of winning 0.10 euro. The other rows are analogous. By scrolling down the screen, the chance increases in each option to win the higher amount. In row 10, no random draw is needed since both options yield the higher amount with certainty. Thus, you effectively decide in row 10 between 2.00 euro and 3.85 euro.

	Option A	Option B
	Wähle Option B für ALLE Zeilen	
1	10% Chance auf 2.00 EUR & 90% Chance auf 1.60 EUR	10% Chance auf 3.85 EUR & 90% Chance auf 0.10 EUR
	Wähle Option A für Zeile 1 und Option B für Zeilen 2 bis 10	
2	20% Chance auf 2.00 EUR & 80% Chance auf 1.60 EUR	20% Chance auf 3.85 EUR & 80% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 2 und Option B für Zeilen 3 bis 10	
3	30% Chance auf 2.00 EUR & 70% Chance auf 1.60 EUR	30% Chance auf 3.85 EUR & 70% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 3 und Option B für Zeilen 4 bis 10	
4	40% Chance auf 2.00 EUR & 60% Chance auf 1.60 EUR	40% Chance auf 3.85 EUR & 60% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 4 und Option B für Zeilen 5 bis 10	
5	50% Chance auf 2.00 EUR & 50% Chance auf 1.60 EUR	50% Chance auf 3.85 EUR & 50% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 5 und Option B für Zeilen 6 bis 10	
6	60% Chance auf 2.00 EUR & 40% Chance auf 1.60 EUR	60% Chance auf 3.85 EUR & 40% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 6 und Option B für Zeilen 7 bis 10	
7	70% Chance auf 2.00 EUR & 30% Chance auf 1.60 EUR	70% Chance auf 3.85 EUR & 30% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 7 und Option B für Zeilen 8 bis 10	
8	80% Chance auf 2.00 EUR & 20% Chance auf 1.60 EUR	80% Chance auf 3.85 EUR & 20% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 8 und Option B für Zeilen 9 bis 10	
9	90% Chance auf 2.00 EUR & 10% Chance auf 1.60 EUR	90% Chance auf 3.85 EUR & 10% Chance auf 0.10 EUR
	Wähle Option A für Zeilen 1 bis 9 und Option B für Zeile 10	
10	100% Chance auf 2.00 EUR	100% Chance auf 3.85 EUR
	Wähle Option A für ALLE Zeilen	
		Bestätigen

For each row you are asked to decide which of the two options you prefer.

You have to make one of the following choices:

- Choose Option B for ALL rows.
- Choose Option A for row 1 und Option B for rows 2 to 10.

• Choose Option A for rows 1 and 2 and Option B for rows 3 to 10.

• Choose Option A for rows 1 to 3 and Option B for rows 4 to 10.

• Choose Option A for rows 1 to 4 and Option B for rows 5 to 10.

• Choose Option A for rows 1 to 5 and Option B for rows 6 to 10.

• Choose Option A for rows 1 to 6 and Option B for rows 7 to 10.

• Choose Option A for rows 1 to 7 and Option B for rows 8 to 10.

• Choose Option A for rows 1 to 8 and Option B for rows 9 and 10.

• Choose Option A for rows 1 to 9 and Option B for row 10.

• Choose Option A for ALL rows.

You can choose which of these possible decisions to take. You can make your choice by **pressing the appropriate button.**

Please raise your hand if you have a question. The experimenter will come to you in order to help.

As the first multiple price list, the original Holt and Laury (2002) was used, just like on the print screen above.

The second and the third price lists looked as follows:

List 2:

10% Chance auf 2.60 EUR & 90% Chance auf 2.05 EUR	10% Chance auf 3.00 EUR & 90% Chance auf 0.50 EUR
20% Chance auf 2.60 EUR & 80% Chance auf 2.05 EUR	20% Chance auf 3.00 EUR & 80% Chance auf 0.50 EUR
30% Chance auf 2.60 EUR & 70% Chance auf 2.05 EUR	30% Chance auf 3.00 EUR & 70% Chance auf 0.50 EUR
40% Chance auf 2.60 EUR & 60% Chance auf 2.05 EUR	40% Chance auf 3.00 EUR & 60% Chance auf 0.50 EUR
50% Chance auf 2.60 EUR & 50% Chance auf 2.05 EUR	50% Chance auf 3.00 EUR & 50% Chance auf 0.50 EUR
60% Chance auf 2.60 EUR & 40% Chance auf 2.05 EUR	60% Chance auf 3.00 EUR & 40% Chance auf 0.50 EUR
70% Chance auf 2.60 EUR & 30% Chance auf 2.05 EUR	70% Chance auf 3.00 EUR & 30% Chance auf 0.50 EUR
80% Chance auf 2.60 EUR & 20% Chance auf 2.05 EUR	80% Chance auf 3.00 EUR & 20% Chance auf 0.50 EUR
90% Chance auf 2.60 EUR & 10% Chance auf 2.05 EUR	90% Chance auf 3.00 EUR & 10% Chance auf 0.50 EUR
100% 2.60 EUR	100% 3.00 EUR

List 3:

10% Chance auf 2.20 EUR & 90% Chance auf 1.00 EUR	10% Chance auf 4.10 EUR & 90% Chance auf 0.30 EUR
20% Chance auf 2.20 EUR & 80% Chance auf 1.00 EUR	20% Chance auf 4.10 EUR & 80% Chance auf 0.30 EUR
30% Chance auf 2.20 EUR & 70% Chance auf 1.00 EUR	30% Chance auf 4.10 EUR & 70% Chance auf 0.30 EUR
40% Chance auf 2.20 EUR & 60% Chance auf 1.00 EUR	40% Chance auf 4.10 EUR & 60% Chance auf 0.30 EUR
50% Chance auf 2.20 EUR & 50% Chance auf 1.00 EUR	50% Chance auf 4.10 EUR & 50% Chance auf 0.30 EUR
60% Chance auf 2.20 EUR & 40% Chance auf 1.00 EUR	60% Chance auf 4.10 EUR & 40% Chance auf 0.30 EUR
70% Chance auf 2.20 EUR & 30% Chance auf 1.00 EUR	70% Chance auf 4.10 EUR & 30% Chance auf 0.30 EUR

80% Chance auf 2.20 EUR & 20% Chance auf 1.00 EUR	80% Chance auf 4.10 EUR & 20% Chance auf 0.30 EUR
90% Chance auf 2.20 EUR & 10% Chance auf 1.00 EUR	90% Chance auf 4.10 EUR & 10% Chance auf 0.30 EUR
100% 2.20 EUR	100% 4.10 EUR

Only one random list was payoff-relevant for subjects.

In addition to making decisions in the incentivized multiple price lists, subjects were asked to answer the following questions:

How do you see yourself? Are you generally a person who is fully willing to take risks or do you try to avoid taking risks? Please tick a box on the scale below, where 0 means “risk averse” and 10 means “fully prepared to take risks”:

People can behave differently in different situations. How would you rate your willingness to take risks in the following areas?

- while driving?
- in financial matters?
- during leisure and sport?
- in your job?
- regarding your health?
- your faith in other people?

Please consider what you would do in the following situation:

Imagine that you have won 100,000 euro in the lottery. Almost immediately after you collect the winnings, you receive the following financial offer from a reputable bank, the conditions of which are as follows:

There is the chance to double the money within two years. It is equally possible that you could lose half of the amount invested. You have the opportunity to invest the full amount, part of the amount or reject the offer. What share of your lottery winnings would you be prepared to invest in this financially risky, yet lucrative investment?

100,000 euro / 80,000 euro / 60,000 euro / 40,000 euro / 20,000 euro / Nothing, I would decline the offer.

D.4 Questionnaire on cultural orientations

(completed by subjects in the role of firms while workers perform the real-effort task)

The following section seeks to evaluate your cultural orientation. Please indicate your agreement with each of the following statements: Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree

1. Individuals should sacrifice self-interest for the group that they belong to.
2. Individuals should stick with the group even through difficulties.

3. Group welfare is more important than individual rewards.
4. Group success is more important than individual success.
5. Individuals should pursue their goals after considering the welfare of the group.
6. Group loyalty should be encouraged even if individual goals suffer.
7. People in higher positions should make most decisions without consulting people in lower positions.
8. People in higher positions should not delegate important tasks to people in lower positions.
9. People in higher positions should not ask the opinions of people in lower positions too frequently.
10. People in higher positions should avoid social interaction with people in lower positions.
11. People in lower positions should not disagree with decisions made by people in higher positions.
12. It is important to have instructions spelled out in detail so that I always know what I am expected to do.
13. It is important to closely follow instructions and procedures.
14. Rules/regulations are important because they inform me of what is expected of me.
15. Standardized work procedures are helpful.
16. Instructions for operations are important.
17. It is more important for men to have a professional career than it is for women.
18. Men usually solve problems with logical analysis; women usually solve problems with intuition.
19. Solving difficult problems usually requires an active forceful approach, which is typical for men.
20. There are some jobs that a man can always do better than a woman.
21. Even though certain food products are available in a number of different flavors, I tend to buy the same flavor.
22. I would rather stick with a brand I usually buy than try something I am not very sure of.
23. I think of myself as a brand-loyal consumer.
24. When I go to a restaurant, I feel it is safer to order dishes I am familiar with.
25. If I like a brand, I rarely switch away from it just to try something different.
26. I am very cautious with respect to trying new or different products.
27. I rarely buy brands about which I am uncertain how they will perform.
28. I usually eat the same kinds of food on a regular basis.