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Increasing Employment Through the Partial Release of Information

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Abstract

Skills and ability affect the likelihood of a worker getting hired. We ask if keeping these attributes fixed, can we increase employment by changing the information employers receive about potential workers. We use laboratory experiments with subjects as employers and agencies to test how different market designs can result in different information being released about workers which in turn affects the number hired. We find that full information about workers leads to high employer profits. Revealing coarser and not necessarily verifiable information about workers increases employment albeit at the expense of the employers' profits and average skill of workers employed.

Keywords: Job placements, lab experiments, institutions, information design, unemployment

JEL codes: C9, D82, J6

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1 Introduction

Increasing employment and labor force participation is an objective of most democratically elected governments. Labor markets, as is, may not achieve the best feasible outcome due to imperfections. For instance, minimum wages and reasonable work conditions might make it too expensive to hire a worker that would be hired without regulations. Removing such regulations might not be politically feasible. Also, employing workers has positive externalities - the government might save on welfare benefits and have increased tax revenues. Beyond the monetary savings, workers earning wages rather than receiving benefits could lead to better mental health, reduced crime (Heller, 2014; Gelber et al., 2015), and might be preferred by society (Maimonides, 1168). Also, getting an initial job may break a vicious cycle of not being offered a job because one has been long-term unemployed. The government could increase employment by subsidizing the hiring of workers but this may be both expensive and distortionary.

In this paper, we examine another potential way to increase employment – the use of an agency to strategically release information about workers. We ask if this agency is able to increase employment by providing coarse information rather than fine information about workers. If an agency releases fine information, then employers will be able to identify less desirable workers, thereby, lowering their chances of employment. If an agency releases coarse information by pooling more and less desirable workers together, then an employer may be willing to hire both of them. We have two related research questions. First, can an agency increase employment by releasing coarser information? Second, if so, does the information need to be verifiable?

Revealing coarse information to increase employment is similar to the use of bundling of goods to increase sales. Stigler (1963) claims that Hollywood studios bundled films to movie theaters in order to increase the number of their films playing. Many supermarkets put fruit in bags rather than sell them individually. This prevents less appealing oranges being left unsold. De Beers has long used a practice of bundling diamonds together. They list only weight and a coarse classification while only allowing buyers to examine the diamonds after the sale (Kenney and Klein, 1983). Similar to the mechanisms in our paper, law schools generally give only partial information about their graduates.¹

¹At the time of writing this paper (2020), rules vary from Yale that gives no information to Colorado that gives the ranking of the top 1/3 but does not distinguish among those in the bottom two-thirds. Others like Harvard Law School divides students that graduate with some degree of honors (roughly 25% of the class) to those without honors. providing no additional information.

Ratings are commonly used by experts to provide information about restaurants (Michelin), company bonds (Moody, S&P), film and theater (various newspapers) and hotels.² Often ratings are coarse, for example, star ratings for movies and UK degree classifications. In principle, the coarseness of these ratings can be used to increase sales and, in the case of students, employment. In many cases, the relationship between ratings and quality is not predetermined. While these cannot be instantly verifiable, over time they can become credible. For instance, with university graduates, employers may learn the capabilities of a student with a 2.1 from the University of Gallifrey.³

We use theory and experiments to analyze the following environments. *Full information* - agencies provide the skill level of individual workers. *Bundles* - agencies divide workers into groups and provide the average skill of each group. *Stars* - agencies also divide workers into groups but instead provide a star rating (one to five) for each group. There is no obligation that a worker's star rating corresponds to the skill of the worker. We consider settings where one agency and one employer interact as well as a setting with competition between agencies and employers.

We start by theoretically exploring the equilibria under the three environments. In one-shot, as a baseline, under full information only those with high enough skill are hired. We find that both the bundles and stars environments can have strictly higher employment since low-skill workers can be grouped with higher-skilled workers while still making the expected skill profitable for the employer to hire. With repeated play and sufficiently high discount factors, all three environments have a range of equilibria varying from the one-shot full-information equilibrium to a high-employment low-employer-profit equilibrium.

Our laboratory experiment investigated behavior in the three environments. Subjects played the roles of agencies and employers. Since theory yields multiple predictions, laboratory experiments allow us to determine which equilibrium is likely to be selected. A laboratory setting also allows us to precisely control the

While many law employers would be happy to hire someone who is in the bottom 75% at Harvard, they would not be willing to hire the person at the bottom of the class.

²There are also various crowd-sourced ratings such as Trip-advisor, Uber drivers, and sellers on Amazon/eBay.

³Another interesting example of bundling to increase acceptances is that MA admission decisions in Israel universities are not allowed to be based upon undergraduate institution. Technically, if a student took the same courses in Technion (a highly ranked university) and received an 85 they would have the same chance as getting in as a student that received an 85 from the local community college. The logic is to allow students from a more diverse socioeconomic background to have a chance of enrolling. This is essentially bundling the two together.

agencies' and employers' payoffs which is important in understanding the effects of policies.

We experimentally find that coarsening information about workers increases employment, but hurts the employers' profits, and lowers the average skill of the workers employed as suggested possible by our theory. Interestingly, in stars, we found agencies divided employable workers into two categories which gave lower agency profits than the simpler equilibrium where such workers are placed in a single category. In bundles, lower-skilled workers are more likely to be employed when other workers are higher skilled, but in stars, lower-skilled workers are less likely to be employed. Finally, we found that adding competition increases employers' profits under all three environments but had mixed effects on employment.

Our findings can contribute to improving government policy. Governments have long attempted to create programs aimed at increasing employment, for instance, the US Department of Labor, Employment and Training Administration funds job training programs, also the UK's Work and Health Programme (Department of Work and Pension, 2017) has agencies help job seekers join the labor force. Even when unemployment is low overall, it can still be high for certain groups such as those with disabilities and health problems, refugees, ex-offenders.⁴ As mentioned earlier, reducing long-term unemployment has economic benefits ranging from increased tax revenue to improved mental health.⁵ Our paper suggests an alternative, information-based mechanism, that can be a complement to the strategies tried thus far and would particularly help those that have difficulties finding employment.

Card et al. (2010, 2018) look at a large group of studies on programs to increase employment, they find that programs that are more effective have a greater human capital accumulation aspect, impacts are greater for women and for individuals with long-term unemployment and for programs during times of recession.⁶ We could combine a training program with our mechanism. This would give agencies better information about workers (similar to universities having better information about students). Hence, our mechanism could be used to increase

⁴ See Holzer (2007) for ex-offenders and Dumont et al. (2016) for refugees, In the UK, the employment rate for disabled workers was 53.2 compared to 81.8 for non-disabled workers (Putz, 2019).

⁵ Sen (1997) describes mental and physical health problems, social exclusion and potential loss of freedom from long-term unemployment. Krueger et al. (2014) find that longer the workers are unemployed, the more difficult it is for them to get back to the labor force.

⁶For a survey on the related literature see Crépon and Van Den Berg (2016).

the effectiveness of existing training programs. It also could be used without a training program where the agency just evaluates workers. Evaluating workers is likely to be less costly than training them.

There have been a number of studies investigating how information affects hiring in online labor markets. While these markets are still a small part of the economy, lessons can be taken from them. Stanton and Thomas (2016) show that agencies can improve the job prospects of workers. In an online field experiment, Pallais (2014) hired workers for a data entry task and then varied the information provided to future employers. Making information less coarse helped the more productive workers but harmed the less productive ones. We study how agencies can use coarse information to increase employment in a setting where it is common knowledge that the agency has an incentive to increase employment.

Laboratory experiments are useful in increasing our understanding of labor markets and improving the design of institutions (see Charness and Kuhn, 2011). Our work is related to the strand of the experimental literature that focuses on how workers are matched with jobs via institutions (Haruvy et al., 2006; Kagel and Roth, 2000) in that we want to design an institution to help workers find jobs. The difference is that as with the literature of search models (Brown et al., 2011; Nalbantian and Schotter, 1995) we have incomplete information, namely employers do not have complete information about the abilities of workers.

In a similar vein to our paper, Siegenthaler (2017) experimentally confirms the theory of Kim (2012) that cheap talk can increase transactions in a goods market in the presence of asymmetric information and matching frictions. This increase is compared to no information and is still less than it would be under full information. Our paper, on the other hand, shows in our cheap talk treatment (stars) there can be an increased number of transactions over full information as well.

In the next section, we build a theoretical model to examine the environment that we test later in the paper.

2 Theory

2.1 Model

There are n_f employers and n_a agencies. Each agency has a continuum of workers. The workers prefer to be employed over being unemployed and have random preferences over employers. Each worker i has an *iid* random skill s_i drawn from

the continuous distribution F on $[0, 1]$. The agency knows the skills of the workers which are hidden from the employers.⁷ Agencies are paid a linear function of how many of their workers are hired.

Employers hire workers at an exogenous wage $w \in (0, 1)$ and earn $s_i - w$.⁸ We focus on the case when the wage is higher than the expected skill, i.e., $w > \int_0^1 s dF(s)$. If this condition did not hold, even without an agency, there would be full employment.

The timing of the model is as follows. First, the workers' skills are drawn by nature. These are seen by the agencies but not the employers. Second, the agencies decide which workers to offer to employers. For each worker offered, a message is sent to all employers. The messages that can be sent depend upon the environment (to be described later). Third, the employers observe the messages and decide which of the workers to try to hire. If more than one employer wants to hire a worker, that worker's preference determines which employer hires him. Fourth, workers are paid wages, employers make profits, and agencies receive payoffs.

We will examine three different environments. In all three environments, agencies can choose whether or not to offer each individual worker to the employers. The environments differ in the form and precision of information that the agencies are able to send.

Full information Agencies must communicate the s_i of each worker, that is, they must tell the exact skill level of the workers offered to the employers.

Bundles Agencies partition workers into sets and for each worker in a set, the employers receive the same message: the average skill and the range of skills for the workers in the set (bundle).

Stars Agencies partition workers into up to five sets and for each worker in a set, the employers receive the same message: a star rating (from one of the 5 stars) that is not necessarily related to the skills of the worker.

There are two key differences between the environments. First, under full information, the agency is restricted to sending fine information in the sense that if two

⁷We assume that the agency has a specialization in evaluating workers (perhaps through economies of scale) or help provide training for the workers and learn the information in the process.

⁸This can be thought of as a regulated wage, a binding minimum wage, or set by a body outside those making hiring decisions.

workers have different skills, the employer will receive two different messages. In bundles and stars, the agency can provide coarse information, meaning that they can send the same message for two workers with different skills. Second, in full information and bundles, the content of the messages is determined by the skills of the workers whereas for stars, the agency can choose the messages regardless of the skills of the workers.

2.2 Stage game equilibria

While straightforward, we begin by describing equilibrium behavior under full information in a one-shot setting.

Proposition 1 *Under full information, there is an equilibrium where a worker is hired if and only if $s_i \geq w$.*

From Proposition 1, ex-ante each worker has probability $1 - F(w)$ of being hired. Each employer has expected profits per worker of

$$\int_w^1 (s - w) dF(s). \quad (1)$$

We now look at behavior in equilibrium under bundles where all workers are offered.⁹ There is a partition of the possible values of s . Namely, a set of p_i 's where $\{p_0 = 0, p_1, p_2, \dots, p_m = 1\}$. When s is in $(p_i, p_{i+1}]$, an agency sends $(p_i, p_{i+1}]$ (and sends $(p_0, p_1]$ if $s = 0$). We can now characterize an equilibrium in bundles using partitions.

Proposition 2 *Under bundles, there exist equilibria where skill levels are divided into partitions $(p_i, p_{i+1}]$ and a worker is hired if and only if $\int_{p_i}^{p_{i+1}} s dF(s) \geq w$.*

For the highest level of employment, all the workers with skills above a certain point p_i^* need to be included in the same partition. Workers can only be hired on one partition. Otherwise, there will be a partition with skill levels strictly above w . This would then raise the p_i of the lowest partition where workers would be hired which needs to satisfy

$$\int_{p_i}^{p_{i+1}} s dF(s) \geq w. \quad (2)$$

⁹There are a number of equivalent equilibria where low-skill workers are not offered.

We then see for the highest employment there needs to be only two intervals of the partition. The partition that achieves this is $\{0, p_1^*, 1\}$. This **high employment level** is $1 - p_1^*$ and p_1^* is set such that

$$\int_{p_1^*}^1 s dF(s) = w. \quad (3)$$

This is summarized in the following proposition.

Proposition 3 *Under bundles, an equilibrium with the highest level of employment (agency profit) is partition $\{0, p_1^*, 1\}$, where $\int_{p_1^*}^1 s dF(s) = w$, while an equilibrium with the highest level of employer profit is partition $\{0, w, 1\}$.*

In the high-employment equilibrium described by Proposition 3, all workers with skills above p_1^* will be employed and all those below will be unemployed. This partition yields zero profit for the employers since the expected skill level of the workers employed equals precisely the wage they receive. A worker hired with skill close to p_1^* has a skill level strictly below w and hence an employer is losing profit on them. However, overall the employer is compensated by also hiring workers with skill levels strictly above w . Expanding this region to include employing workers below p_1^* will cause the employers to lose money overall.

In the high-employer-profit equilibrium described by Proposition 3, all workers with skills above w will be employed and all those below will be unemployed. This means a worker is only employed if the worker is profitable to the employer and is not employed if the worker is not profitable. This is the same profits as in the equilibrium of the full information case of Proposition 1.

We also note that any partition $\{0, p_1, 1\}$ where $p_1^* < p_1 < w$ can also form an equilibrium where workers with skill above p_1 are employed and those below are not employed. The employment is strictly less than that in the high-employment equilibrium of Proposition 3 and the employer profit is strictly less than the high-profit equilibrium of Proposition 3.

Note that while we discuss two-interval partitions in Proposition 3, there can be equilibria with more than two intervals and where workers are hired in two or more of them. When there are two or more intervals where workers are hired, employment will be strictly lower than in the high-employment equilibrium of Proposition 3. The only equilibrium that survives subgame-perfection is the high-employment equilibrium since any other equilibrium would have a partition with higher employment that would still be profitable for the employer to hire all the workers.

We now move on to discuss one-shot equilibria under star ratings. We restrict our attention to equilibria of the partition structure defined above but where the rating of r corresponds to the worker being in the partition of $(p_r, p_{r+1}]$. The rating can be interpreted as the message “this worker has skill level between p_r and p_{r+1} .” Equilibria with non-continuous partitions are possible. For instance, where skills in $(0.7, 0.8]$ and $(0.9, 1]$ are rated 5-star while $(0.8, 0.9]$ are rated 4-star.¹⁰

With this partition, any worker with a rating of r^* or higher is hired if inequality (2) is satisfied for partition $(p_{r^*}, p_{r^*+1}]$. In this equilibrium each agency rates $1 - F(p_{r^*})$ of its workers at a star level of r^* or above. The strategy of the employers is that if any see a larger proportion of workers rated at r^* than $1 - F(p_{r^*})$, then they do not hire anyone.

This equilibrium strategy of employers gives the agencies no incentive to deviate. If they try to increase the number of workers employed by giving a larger number of high star ratings, it would result in no one being hired.¹¹ There is also no incentive to keep the proportion the same but switch higher skill workers for lower skill ones since the total number employed will be the same. Note that while we are restricting skill level of partitions to be in order of star ratings, this is without loss to generality. We could also have the mirror image of the above equilibrium where fewer stars is considered better.

To further refine the set of Nash equilibria, we restrict the beliefs of the employers to be *sorted*. Namely, the employers believe that the workers are monotonic in the star rating: if worker A has a higher star rating than worker B, then A’s skill level is weakly higher than B’s. This restriction seems reasonable in that this is a natural order (5-star is better than 4-star, etc.) and the agency has no incentive to do deviate from this order. Under the sorted beliefs, any sequential equilibrium will be equivalent to one with a two-interval partition where p_{r^*} is set to p_1^* from equation (3). This definition leads to our next proposition.

Proposition 4 *Under stars, any sequential equilibrium with sorted beliefs results in employment equaling the high employment level.*

In the equilibrium of Proposition 4, workers with skill level above p_1^* are hired, where p_1^* is the high employment cutoff, that is, solves $\int_{p_1^*}^1 s dF(s) = w$. We also

¹⁰There are also equilibria with overlaps, for instance, $w = 0.5$ and a worker with a skill of 0.85 can be given a 4-star rating or a 5-star rating and would be hired in either case.

¹¹If alternatively beliefs only depend on an *individual* worker’s star rating, then the only equilibrium would have a no information/no hire outcome. This is because an agency would rate each worker the star rating that gives that worker the highest possibility of being hired.

note that in this equilibrium, those hired have a strictly higher star rating than those that are not hired.

We also note that for all the above propositions, it does not matter whether or not there is competition. Having more than one agency allows for asymmetric equilibria when say one agency is offering the workers such that it is in the highest level of employment while another agency is offer workers such that the equilibrium is with the highest level of employer profit.

2.3 Punishment strategy equilibria

Any stage game equilibrium can also be an equilibrium in a repeated setting. We now also wish to look at repeated game equilibria, where perhaps a higher level of employment/profits can be supported by repeated interaction and punishment. In order to do so, we introduce a discount rate into the preferences of δ , $0 < \delta < 1$, where a profit of one in period $t + 1$ is worth δ in period t .

Let us first consider the case of no-competition where one agency interacts with one employer. In the following proposition, we characterize the range of possible employment levels.

Proposition 5 *In repeated play, with full information, for any ρ satisfying $p_1^* < \rho \leq w$, there exists a large enough discount rate δ , such that there exists an equilibrium where workers with skill level above ρ are employed. With bundles and stars, a similar result holds but with the condition $p_1^* \leq \rho \leq w$.*

The reasoning of the above proposition is as follows. Employers can punish agencies by not hiring workers. Agencies can punish employers by not offering workers (withholding workers). The worst case punishment strategy yields zero profits to both parties. Under full information we have $p_1^* < \rho \leq w$ since an employer cannot be left with zero profits. The employer could always cherry-pick workers and earn profits in period one and forgo future profits since there are none. The difference between full information and bundles or stars, is that an agency can leave the employers with zero expected profit since there is no profitable deviation. The employer cannot identify talented workers to cherry-pick.

Now let us consider the case of competition with multiple agencies and multiple employers.

Proposition 6 *In repeated play with bundles and full information, competition does not affect the set of feasible equilibria. However, in repeated play and stars,*

competition reduces the set of equilibria in favor of the agencies since punishment by employers is now more limited.

If employers can coordinate to punish an agency for deviations from the equilibrium and agencies can coordinate to punish an employer for deviations, then the set of equilibria under competition will coincide with the set of equilibria without competition. Under bundles this is indeed possible. Employers can see what bundles each of agency offers. Agencies can see which workers employers hire. Under stars, however, this is not possible. Employers can only see the star ratings placed on workers and cannot see if an agency gave a low skilled worker a high star-rating whom they did not hire. Only the employer, after hiring the worker, can see the worker's true skill, the other agency and non-hiring employer cannot see this.

In the full information environment, the set of repeated equilibria is larger than the set of one-shot equilibria. In particular, in one-shot, no worker with a skill level strictly under w can be hired in equilibrium, but this can be supported in repeated play by withholding workers to punish the employers. While for bundles and stars, the range of equilibria is the same for both repeated and one-shot games, the mechanism supporting them can be very different. For instance, the high employer profit equilibrium can only be supported as a Nash equilibrium under one-shot with bundles since the employer would not refuse a bundle offering positive profit. However, this can be supported under repeated play since the employer would refuse a lower bundle if it would maintain a higher profit equilibrium in the future.

While in this theory section, we assumed a continuum of workers, our experiment had a finite number of workers. We discuss in Section 4 how this affects our results in particular with bundles for the high employment equilibrium, employers would sometimes have bundles where profits are negative. There is a limit to how much of a loss the employers would be willing to accept.

3 Design

A total of 240 subjects participated in the experiment, 40 in each of 6 treatments. The experiment was conducted in the FEELE lab at the University of Exeter and subjects were undergraduate students. Subjects played the agencies and the employers in equal numbers over a series of periods. In each period, each agency received five workers each with skill s drawn *iid* from $(0, 1, \dots, 10)$ with each value equally likely. Employers could hire up to five workers. For each worker

hired, the agency earned one point and the employer earned $s - w$ where s was the worker's skill and w represented the wage and was fixed at 6.

The timing of the experiment was as follows. At the start of the experiment, subjects read through a set of paper instructions.¹² Then each participant practiced both the role of the agency and the employer before being assigned a fixed role and group. The worker skill levels were redrawn for each agency each period. However, the same sequences of draws were used for each treatment. For example, agency 3 in period 4 would have the same worker skill draws in each of the treatments. An HTML5 user interface was used which enabled agencies and employers to make their decisions by dragging and dropping workers into bundles or rankings. Within each period, agencies chose which workers to offer and what information to reveal about their workers to employers. After seeing information about the workers from the agencies, employers decided which workers to send offers to.

From the 10th period onwards, there was a 10 percent chance of the game ending after each period. The experiment lasted from 11 periods to 30 periods (average of 18.1 periods). Participants were paid for the last 10 periods completed. For example, if the game ends after the 17th period, they would be paid based on their points from periods 8 to 17. Subjects received a show-up fee of £5 and £0.20 for each point earned in the ten paid periods. The experiment lasted between 45 and 75 minutes and the average payment was approximately £10.

We use a 3×2 design consisting of three information structures and two market structures. The information structures vary in how much an agency reveals to the employers about the skills of their workers:

Full information Agencies must tell the precise skill level of the workers offered.

In the full-information treatments, the employer observes the skill of each worker before deciding which workers to hire.

Bundles The agency placed the workers into bundles of one or more workers.

The mean skill and range of skills of workers in a bundle were revealed. The employers learned the true skill of individual workers only after they were hired.

Stars The agency assigned each worker a star rating (1 to 5). There was no obligation that the star rating corresponded to the skill of the worker. The workers' true skill levels were only revealed to the employer if the employer actually hired them.

¹²A sample set of instructions is included as a supplementary file.

See the respective screenshots of each information structure in Appendices B, C, and D.

There are two market structures (in each, agencies had five workers and employers could hire up to five workers):

No-competition One agency interacts with one employer. Employers selected which workers to hire.

Competition Two agencies interact with two employers. Employers were told which agency each worker was from. The employers ranked the workers they were interested in hiring. The ranking could include more than five workers since both employers might be interested in the same workers. To resolve possible competition for workers, a deferred acceptance matching algorithm was used.¹³ Workers had a random preference over working for the two employers and employers made the proposals, so it was incentive compatible for the employers to truthfully report their preferences.

The full-information, no-competition treatment can be regarded as the baseline.

4 Predictions

In this section, we apply our theoretical results to the parameters detailed in the design section accounting for a finite number of workers. There is generally a range of equilibria which we highlight below.

4.1 Stage game equilibria

With full information if subjects play as if they are in a one-shot game, in a subgame-perfect equilibrium all workers with skill 7 or higher would be hired and those with skill 5 or less would not be hired, those with skill 6 could either be

¹³ The deferred acceptance algorithm (Gale and Shapley, 1962) works as follows. Workers always want to be employed and rank both employers. Employers may not want to hire all the workers and thus rank only those they are interested in. The algorithm goes through a number of iterations. In the first iteration, employers make offers to their top five workers. If a worker gets an offer from both employers, then the least preferred offer is rejected. In the next iteration, if an employer had an offer rejected in the previous iteration, then the employer makes additional offers up to a total of five outstanding offers. Workers with two offers, again must reject one. The algorithm is repeated until no offers are rejected.

hired or not be hired. This results in 36-45% being hired with the corresponding average skill of workers from 8.5 to 8, respectively. The expected employer profits per worker in these cases will be 0.909. These numbers are regardless of whether or not there is competition.

With bundling, in a subgame perfect equilibrium, the agency creates a bundle by adding the worker with the highest skill not in the bundle until adding the worker would cause the bundle average skill to fall below 6. In expectation, this yields 67.2% being hired. We note that 11.5% of the workers with skill level 0 and 1 will be hired.

With stars, the highest employment can be achieved in equilibrium when the agency rates the three best workers 5-stars and the rest lower than 5-star (this is sustained since employer beliefs depend upon the number of workers in a particular category). We note that 5.5% of workers with level 0 and 1 will be hired in such an equilibrium. The equilibrium with the highest employer profit has only two workers being offered (or given the highest rating) yielding an employer profit of 3.46.

4.2 Punishment strategy equilibria

In addition to the stage game equilibria, in repeated games we can have equilibria sustained with the threat of punishment. The agency can punish employers by withholding workers in subsequent periods. Employers can punish agencies by not hiring in subsequent periods. Punishment is limited by the 10% chance of the experiment ending after the tenth round. Some punishments may be less plausible than others, for instance, under full information an agency withholding workers that would be attractive to an employer or an employer not hiring a worker that would yield profit might not be credible, but under stars this could be more palatable since true skill is not known to the employer.

There is a straightforward equilibrium where employers make their maximal profits. Agencies offer all workers at level 6 or above, 45% of workers (also, 7 or above, 35% of workers, is a similar equilibrium). Employers punish if a worker is offered that does not satisfy this criterion. Agencies do not have an incentive to deviate by offering fewer workers (which would not be detected) and would be punished by offering more workers. This is the case under full information, bundles, and stars.

Under full information, an agency can use the threat of withholding workers to have all workers with 3 or above hired. The employer would still hire all 5 workers even if they all have a skill level of 3. The average skill level of a worker

given that they have a skill level of 3 or higher is 6.5. There is an $8/11$ chance of a worker having a 3+ skill level. Hence, each period the employer expects to make $(8/11) \cdot 5 \cdot (6.5 - 6)$. Discounting the expected stream of profits yields 16.4 which is higher than the cost of hiring 5 workers with skill level of 3. We note that there are more complicated equilibria where some of the workers with skill level 2 are hired.

With bundles, the agency can increase bundle size up to a certain limit and still have an employer hire everyone in the bundle. By doing so, an employer may lose a certain amount. If the agency limits this amount to L , the employer may be willing to bear this loss if the future expectation of such an arrangement is high enough. For instance, say the agency sets $L = 3$ and if bundling all 5 workers yields a loss larger than 3, the agency will see if offering the best 4 workers yields a loss larger than 3. Again, if so, this can be repeated by offering the best 3 workers and so on. By computation, using $L = 3$ yields an employer profit of 0.020 versus using $L = 2$ yields a profit of 0.656. We see that a loss of 3 would not be tolerable to an employer with a discount rate of 0.9. However, losing 2 today is well worth an expected stream of profits equalling 0.656. In this case, employment will be 75.8%.

Under stars, there can be higher employment in equilibrium than with bundles. This is because with stars the employer knows the expected skill when deciding whom to hire and only sees the actual skill after hiring workers. The agency can give a 5-star rating to all those workers with skill level of 2+ (and workers with skill level of 1 or 0 a rating of 1-star). This on average would leave the employer with zero profits but would still be an equilibrium. In each round, after seeing the workers offered, the expected profit would be 0 for an employer.¹⁴ Any deviation by the agency can be detected by the employer and can be punished by no hiring in the future. At most, the agency can have five more workers hired by giving five skill 0 workers a 5-star rating. Doing so, would not be worthwhile since it would lose an average of 4.1 workers being hired in each future round.

Finally, in all cases, there are other equilibria between the two extremes. Note that the use of repeated game strategies can increase employment in equilibrium. Under full information and stars, there will be no skill level 0 and 1 hired in the equilibrium that we examine. Under bundles this would happen some of the time

¹⁴We can give an employer an arbitrarily small amount of profit with the following strategy. The agency gives a 5-star rating to all workers with skill level 2 or above when there are two or more workers. When there is a single worker with a skill level of 2+, the agency only gives a 5-star rating to this worker when the skill level is 3+. This can be done every n rounds to make the profit arbitrarily small.

Table 1: Average profits and employed skill for each treatment

treatment	agency-profits	employer-profits	employed avg. skill
full info	0.399	0.808	8.031
bundles	0.511	0.522	7.053
stars	0.421	0.245	6.578
full info competition	0.453	0.879	7.903
bundles competition	0.480	0.564	7.205
stars competition	0.525	0.424	6.775

Notes: Different groups completed different numbers of periods. Hence, treatment averages are calculated from group averages. The highest figure in each column is in bold.

such as when one worker has skill level 0 and the other workers have a skill level of 7+. In our repeated game equilibrium, 20.3% of level 0 and 1 workers will be hired in equilibrium.

With competition, all the above repeated equilibria can be supported. For full information and bundles, both employers can see what is offered and punish deviations accordingly. With stars, only the employer getting a worker with a low skill will see this. However, just one employer punishing in return is enough since at most an agency can place an additional five workers, but punishment from one employer will cost more than one worker per round on average.

5 Results

We start by looking at the employment, employer profits and average skill level of employed workers in each treatment. There is a constraint restricting the average skill of employed workers and the level of employment achievable. The outcome of each treatment and the employment-average skill trade-off is illustrated in Figure 1. The frontier (solid line) shows the trade-off and the iso-profit lines show combinations of employment and average skill that give the employer the same profit. Note that points A and B in Figure 1, correspond to the range given in Section 4.1 that are achievable in a stage game equilibrium under full information. Numerical values are reported in Table 1. For employment, the stars with competition did the best while full information without competition did the worst. For employer profits, full information with competition did the best and stars did

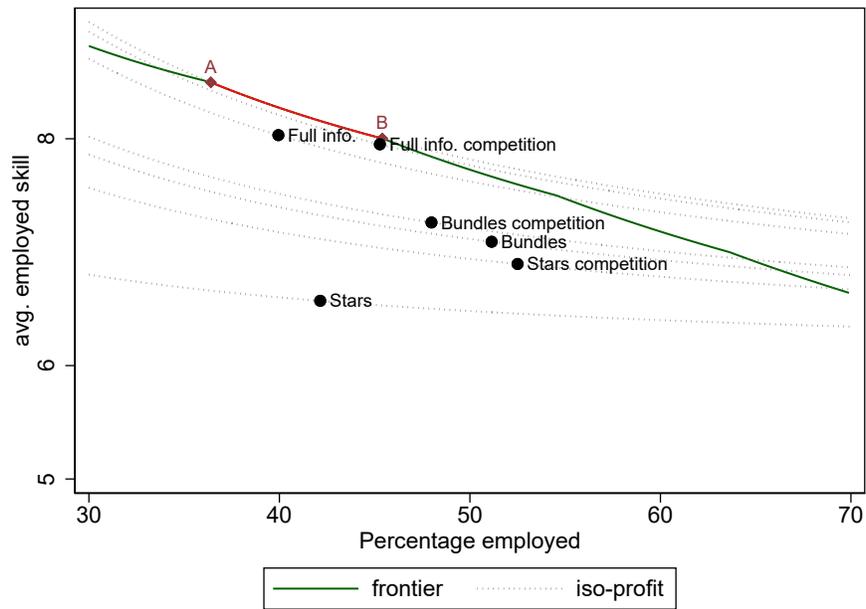


Figure 1: Plot of the average skill level of employed workers versus the number employed for each treatment. Treatment averages are the average of group averages, so that all groups have equal weight. The isoprofit curves of employers are dashed. The solid curve is the limit of the feasible possibilities. The points on the section of the curve labeled A-B are the feasible combinations that give the highest profit curve.

the worst. For average skill, full information did the best and stars did the worst.¹⁵

Notice that under full information and competition, the level of employment is close to that of point B (45.4%) in Figure 1. This leads to our first result.

Result 1 *Full information leads to high employer profits with and without competition.*

With full information and competition, employment is on the frontier of the theoretical maximal employer profits with the largest employment (that is, point B in Figure 1). Full information without competition has lower employment and slightly lower employer profits compared with full information with competition. This is mainly due to the reduction in hiring particularly skill level 6 workers (see Table 3 for details). There was some drop in hiring level 7+ skill workers mainly due to the agencies not offering such workers (627 hired out of 642 offered without competition versus 669 hired out of 673 with competition).

Withholding of workers with skill greater than 6 was relatively rare - only three agencies, all in the full information without competition treatment, failed to offer all workers with skill greater than 6. While withholding is a punishment strategy and in equilibrium would not be used, the equilibrium supported by such strategies are far from the observed behavior, that is, skill levels is much higher than 6.5 and employment is much lower than 73% from what we found in Section 4.2.

Our next result shows that under different treatments when we move away from full information, we increase employment at the expense of hiring workers only with high skill levels.

Result 2 *Coarsening of information about workers increased employment at the expense of employer profits.*

We can see from Figure 1 and Table 1 that the employment is higher in the bundles and stars treatments where the agencies could release coarse information. This is supported by regression 1 of Table 2 where the probability of employment increases by 5 percentage points if information is coarse (in the bundles or stars treatments) compared to full information. Regression 2 disaggregates the effects

¹⁵ In our sample, if all skill 6 and above are employed, the level of employment is 821 (out of 1810) with average skill of 8.02. If only skill 7 and above are employed, the level of employment is 673 with average skill of 8.47. In both cases, there are employer profits of 0.917 per worker (including those unemployed). This compares with section 4.1 prediction of an average skill level of 8 and 8.5, respectively and profits of .909.

Table 2: Probability of a worker being employed based upon treatment.

	(1)	(2)	(3)
coarse-information	0.051** (0.02)		
bundles		0.060* (0.02)	0.102** (0.03)
stars		0.041 (0.02)	0.007 (0.03)
competition		0.050* (0.02)	
competition × full-information			0.055* (0.02)
competition × bundles			-0.029 (0.04)
competition × stars			0.123*** (0.04)
constant	0.434*** (0.01)	0.409*** (0.02)	0.407*** (0.02)
clusters	120	120	120
N	10860	10860	10860

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Linear probability models are estimated with one observation per worker. The dependent variable is whether the worker is employed. *Coarse information* equals one for the stars and bundles treatments and zero otherwise. *Stars, bundles and full-information* equal one for the respective treatments and zero otherwise. *Competition* equals one for treatments with competition and zero otherwise. Standard errors are shown in parentheses with clustering at the level of agencies.

Table 3: Number of workers employed based upon skill

Treatment	skill<6	skill=6	skill>6	total
full	18	91	627	736
full competition	34	132	669	835
stars	221	71	457	749
stars competition	268	108	596	972
bundles	220	109	591	920
bundles competition	164	107	597	868



Figure 2: Number of workers offered and employed by skill level for each treatment.

of stars and bundles while controlling for competition. The effect sizes for stars and bundles are similar to the effect size of coarse information in regression 1, although for stars, it is not statistically significant at the 5% level (but is at the 10% level).

Looking at employer profits, when we move from the full information and competition, Result 1 indicates that employer profits must be lower when employment increases. This can only happen if workers of level 5 skill or lower are hired. Indeed, Table 3 and Figure 2 show that employment increases are due to more low-skill workers being hired albeit at some cost of less high-skill workers being hired.

We can see the change in both employment and employer profits in Figure 1. The coarsening of information decreased employer profits in all cases. When there was no competition, the coarsening caused the employer profits to drop from 0.808 with full information to 0.522 with bundles and 0.245 with stars. When there was competition, the coarsening of information caused the employer profits to drop from 0.879 with full information to 0.564 with bundles and 0.424 with stars (see Table 1).

The coarsening of information also reduced the average skill of the employed. When there was no competition, the coarsening caused the average skill of workers employed to drop from 8.031 with full information to 7.053 with bundles and

6.578 with stars. When there was competition, the coarsening of information caused the average skill of workers to drop from 7.903 with full information to 7.205 with bundles and 6.775 with stars (see Table 1).

We now examine the effect of competition (two agencies and two employers) within each information condition.

Result 3 *Competition increases employment under full information and stars.*

Looking at regression 2 of Table 2, the probability of being employed is higher in the competition treatments. Breaking this down into the three information conditions in regression 3 of Table 2, we see that this is driven by full information and stars only. While not significant, the sign for bundles and competition is negative.

From Table 3, we see Result 3 in that agencies are helped by the number of workers employed increasing going to competition in both full information and stars. We note that with bundles the number of workers employed actually decreased in going to competition in bundles but this is not significant. Competition led to better bundles which hurt the lower skill workers relative to no competition. In Table 3, we have the number of workers employed based upon their skill level for each of the six treatments.

Table 1 shows the agency and employer profits in each of the treatments. We see in all cases employer profits increased with competition, but none of the increases were significant. With competition employment was highest with stars.

Our next result deals with how the employment of lower-skilled workers is affected by other workers from the same agency.

Result 4 *With bundles, lower-skilled workers benefit when other workers are higher skilled, the opposite occurs in stars.*

The evidence of this result is in Table 4 which displays regressions examining the effect of others' skill on employment of low skill workers. The dependent variable is being employed. There is one observation per worker with skill less than 6. Separate regressions are run for each of the bundles and stars treatments. There is a positive relationship to the average skill of others with bundles and a negative one with stars. The effect is statistically significant except for bundles with competition.

We see that low-skill workers are a complement to high-skill workers in bundles. This result comes from agencies including low skill workers in bundles with high skill workers while ensuring the average bundle skill is greater than 6. When

Table 4: Regressions on low skill workers where the dependent variable is being employed.

	(1)	(2)	(3)	(4)
	bundles	bundles competition	stars	stars competition
mean others' skill	0.056*** (0.01)	0.017 (0.01)	-0.037** (0.01)	-0.082*** (0.01)
round	-0.000 (0.00)	-0.006** (0.00)	-0.009** (0.00)	-0.004 (0.00)
constant	-0.056 (0.07)	0.141* (0.05)	0.505*** (0.06)	0.734*** (0.07)
clusters	20	20	20	20
N	989	989	989	989

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Linear probability models are estimated with one observation per worker.

the skill of the other workers goes up, the possibility of forming such a bundle that includes a low skill worker goes up. This is consistent with the stage-game equilibria analysis for bundles of Section 4.1.

In contrast, high-skill workers are substitutes for low skill workers with stars. This indicates that the agency is using a target for the number of 4 and 5 stars given out. When they fail to have the number of workers achieving the target with high skill levels, they use low skill levels to increase the number of workers.¹⁶ This is consistent with the stage-game analysis for stars where the highest employment equilibria had the top 3 workers offered each time and the highest employer profit equilibria had the top 2 being offered each period. Hence, low-skill workers act as substitutes for high-skill workers.

Our next result was unanticipated and in order to precisely explain it, we need to introduce two definitions. For the star ratings, the agency and employer can think of certain star ratings as a category for outstanding workers, like what we think of 5-stars in regards to hotels. Here we define such an **outstanding category** as one where the skill level guarantee's a profit, namely, of skill 7 or higher. We also define a **borderline skill category** as one with skill levels of 5 or 6, for which

¹⁶We find empirical support for such behavior in that a regression of a worker being rated a 4-star or 5-star is negative in the average skill of the other workers (with and without competition). For brevity, we leave a table of these results out of the paper.



Figure 3: The breakdown of skills offered and hired for each rating star.

the employer would be either indifferent or suffer a minor loss for hiring such a worker. We can now use the above nomenclature to describe our next result about how there were different star rating categories.

Result 5 *With stars, there were two categories where workers of employable skills were both classified and employed. The 5-star category was for outstanding workers. The 4-star category was for borderline workers. Competition drove both categories to be more delineated and increased acceptance rates of both.*

This result was surprising since in our theory section, only one star category of employable workers is sufficient to achieve the highest level of employment.

We find support for Result 5 visually in Figure 3. From this figure, we see that competition drove more 7, 8, 9, 10 skilled workers into the 5-star category and away from 3-star and lower. We also see that competition drove more 0, 1, 2 skilled workers away from the 3-star category. For the 5-star rating, 72% of workers offered are outstanding workers compared with 3%, 7%, 15%, and 30%, for 1-star, 2-star, 3-star, and 4-star categories, respectively. For the 4-star rating, 31% of workers offered are borderline skill workers compared with 6%, 8%, 22% and 13%, for 1-star, 2-star, 3-star, and 5-star categories, respectively.

We also see that from Table 5, the average skill level of a 5-star bundle is 6.99 without competition and 7.51 with competition and the average skill level of a 4-

Table 5: Average skill for each star level

Star	Offered			Employed		
	Competition	No Competition	Combined	Competition	No Competition	Combined
5	7.51	6.99	7.26	7.32	7.66	7.52
4	4.89	5.22	5.05	5.69	5.45	5.55
3	3.46	4.57	4.02	4.92	4.13	4.61
2	2.41	3.13	2.72	3.67	2.24	2.97
1	1.11	2.15	1.71	3.40	1.13	2.27

star bundle is 5.22 without competition and 4.89 with competition. This indicates an increased separation moving from no competition to competition.

We would expect agencies to only make use of the 5-star category, but they put employable workers in the 4-star and 5-star categories. The 5-star is highly profitable for the employer, the 4-star is borderline. Employers respond by almost always hiring the 5-star workers and hiring some of the 4-star workers. We also see from Figure 3 that the shift of higher skilled workers into the 5-star rating led to a higher acceptance of 5-star (and maybe higher 4-star acceptance).

Finally, we note that there is a degree of heterogeneity in individual agency behavior. In Appendix A, Figures 4 and 5 display the range of worker skills for each individual agency for without and with competition, respectively. While most and a strictly positive relationship between skills and star ratings. We see, for instance, Agency 7 in Figure 4 consistently only offered workers of skill 6 and above and only labeled them 5-star. Also, Agency 20 in Figure 5 used star ratings of 1-star, 2-star, and 3-star for skills 0 and 1 and reserved category 4-star and 5-star for the higher skills (although not exclusively).

We wish to know if employers learned about the strategies of the agencies. In other words, whether the agencies create a reputation. We, hence, analyze decisions of the employers based upon the observed skills of the workers previously hired both from current agency and from workers from the other agency. Our findings are summarized in the following result.

Result 6 *With star ratings, the reputation of an agency affects the employers' willingness to employ a worker, namely, higher previous observed skill in the star category from the same agency increased the likelihood of a worker receiving an acceptance.*

Models are estimated using workers from a particular treatment with a particular star rating. See the regression reported in Table 6. For instance, model

(1) considers workers with a 4-star rating from the treatment without competition. The dependent variable is 1 if the employer was willing to hire the worker and 0 otherwise. The explanatory variables are as follows. *Unobserved* is 1 if the employer has never hired a worker with the current star rating from the agency offering the worker and 0 otherwise. *Observed* is the mean skill of workers with the current star rating that the employer has previously hired from the agency offering the worker or 0 if no such workers have been hired. *Round* is the round number. For the treatments with competition, *unobserved other* and *observed other* are the equivalents of *unobserved* and *observed* for the other agency.

The coefficient on *observed* is positive for all models. For four of the six models it is statistically significant. This suggests that employers were more willing to hire workers with a given star rating the higher the skill of previously hired workers from the same agency with the same star rating. This in turn suggests there was some learning rather than immediate coordination between the agency and the employer on the meaning of star ratings.

6 Discussion

Our theoretical analysis suggests that there is a range of possible equilibria that may occur in an agency-employer game. We then use experiments to examine what is likely to play out in practice. Doing so, we find that an agency can increase worker employment by only revealing coarse information about workers (our bundle treatment) and this information does not have to be verifiable (our stars treatment). While in theory we found a possible alternative means for increasing employment by an agency punishing employers through withholding high skill workers, we did not see any evidence of this in our experiment.

In our experiment, bundles and stars both yielded higher employment than full information, but bundles outside the lab might be harder to implement since it requires verification. These results were robust to competition. Our experimental results suggest that this extra cost of using verifiable information might not be necessary. One difference that we find between stars and bundles is that with stars, workers with high and low skills are substitutes whereas with bundles they are complements. This is like being a sprinter in the Olympics. Strong teammates hurt your chances of making the Olympics in an individual event but increase your chances of making the Olympics in the relay races.

One may worry that the our proposed mechanism might only temporarily increase employment. The employer may wish to dismiss workers after discovering

Table 6: Willingness to hire workers given the observed skill of previous workers with the same star rating

	No competition		Competition			
	(1) 4 stars	(2) 5 stars	(3) 4 stars	(4) 5 stars	(5) 4 stars	(6) 5 stars
unobserved	0.716*	0.939**	0.125	0.633	0.220	0.717
	(0.29)	(0.26)	(0.20)	(0.33)	(0.17)	(0.32)
observed	0.119*	0.112**	0.078	0.083*	0.074	0.081*
	(0.04)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
round	-0.013**	0.006*	-0.015*	0.003	-0.016*	0.002
	(0.00)	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)
unobserved other					0.040	-0.268
					(0.18)	(0.21)
observed other					0.039	-0.015
					(0.03)	(0.02)
constant	-0.075	-0.147	0.243	0.129	0.078	0.282
	(0.25)	(0.25)	(0.19)	(0.32)	(0.31)	(0.36)
clusters	19	20	10	10	10	10
N	339	680	780	1446	780	1446

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: Linear probability models are estimated with one observation per worker per employer. Models are estimated using workers from a particular treatment with a particular star rating.

that they are low skilled. While indeed an employer may eventually discover this, the employer may still want to retain a significant portion of these workers. There are three reasons for this beyond basic switching costs. First, some workers may learn valuable skills (some firm specific) on the job. Second, some of the workers might be underrated: the initial signal might not fully represent the worker's ability. Once given the chance to prove himself/herself, the worker may shine. This could be particularly true for workers caught in a trap of not given a chance after an initial lower signal or in the case of a first job (see Stanton and Thomas, 2016). Finally, for worker retention there could be a multiplier effect in that a firm's willingness to hire workers increases with other firms hiring workers (due to increased demand).

There is growing governmental interest in involving the private sector to help with job placements. The success is mixed. In 2010, the UK government adopted a series of steps to help unemployed people back to work. The program which is currently called the Work and Health Programme is designed to help long-term unemployed, people with disabilities, and people who are considered vulnerable find employment.¹⁷ The program includes offering training, help in writing CVs, etc. Providers were paid according to the number of unemployed who were placed. Between November 2017 and November 2019, a total of 121,710 individuals in England and Wales were referred (a fifth of whom were long-term unemployed) and resulted in 10,260 jobs. Given the low success thus far, our results suggest that there is room for a government to delegate job placement to an agency that has the authority to restrict information about workers. This can be a low-cost complement to existing government programs.

Our approach could also be used to improve the employment prospects of refugees. Dumont et al. (2016) report that the employment rate of refugees in the EU is nine percentage points lower than native-born persons and that it can take 20 years before refugees have similar employment prospects. While refugees are on average less educated than natives, employed well-educated refugees are more likely to be overqualified for their jobs than natives. This suggests that at least part of the problem relates to information. Employers will often have difficulties evaluating refugees' qualifications, particularly if documentation is missing or not verifiable. It seems there is a natural role for an agency to provide information in this setting.

While there is potential to improve employment with our suggestion, care

¹⁷Eriksson and Rooth (2014) confirm with a field experiment the difficulty for the longterm unemployed to get back to work.

must be taken when trying to implement this as a policy tool. It is possible that those grouped together might be further divided by another characteristic that is observable to the employer. This may make the perceived desirability of workers in one of those subgroups to be too low to be offered a job. Indeed, Doleac and Hansen (2020) find that an attempt to increase the employment of those with criminal records by banning a question about it early in the hiring process had the unintended consequence of decreasing employment of young black men (presumably since they were all grouped together).

While our intent was to look at worker placement programs, our results have wider implications. In particular, we shed light on whether or not rating agencies should be regulated. In the US, farm produce quality is classified by the USDA. There is scope for a classification of mixed quality, making it easier to sell low quality produce and avoid waste. For financial products, regulation may be in order since it may be undesirable that high risk bonds, mortgages, etc. are sold (as part of a bundle) without the purchaser being aware of the details. Once purchased, the new owner may not learn the true risk, only the realization of the risk. The ratings of hotels both through a star rating and brand categories such as Marriott, Hilton and IHG (Holiday Inn) tend to be unregulated. Our stars treatment shows that such a mechanism can work even if what makes a 5-star hotel is not always codified.

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A Star Ratings of Individual Agencies

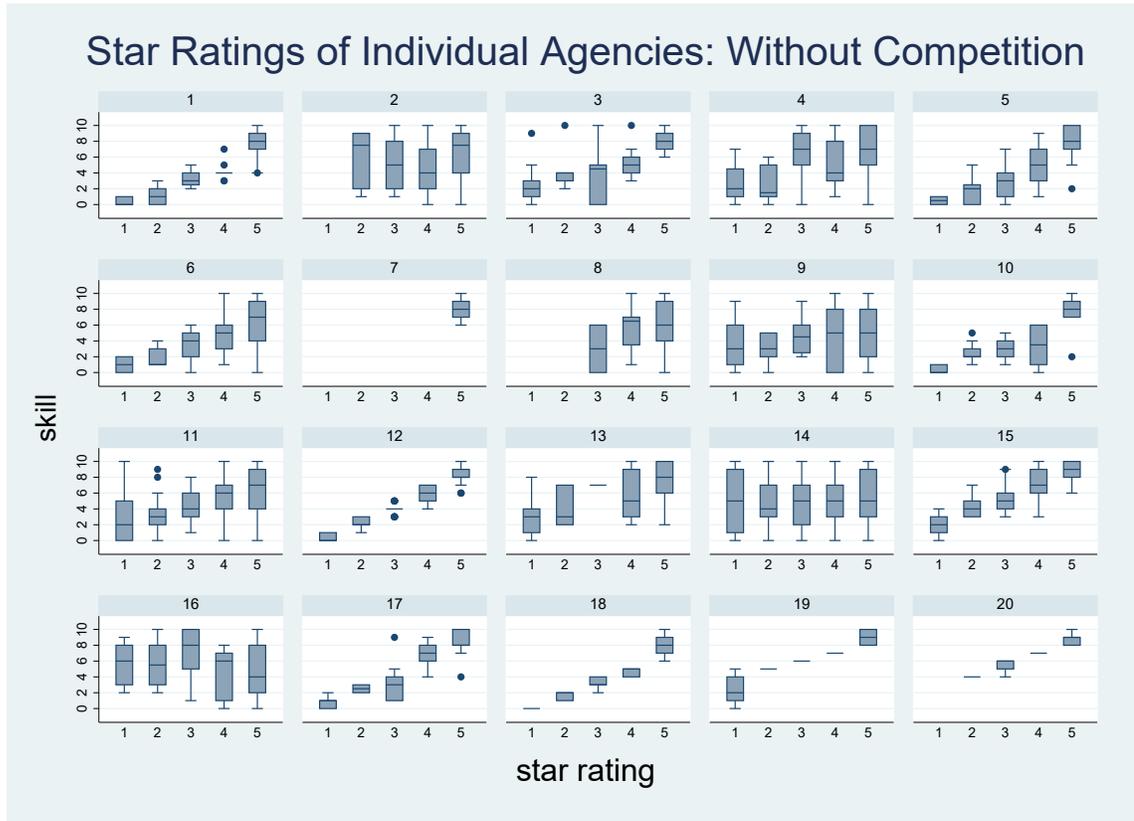


Figure 4: The range of worker skills for star ratings of workers by individual agency without competition.

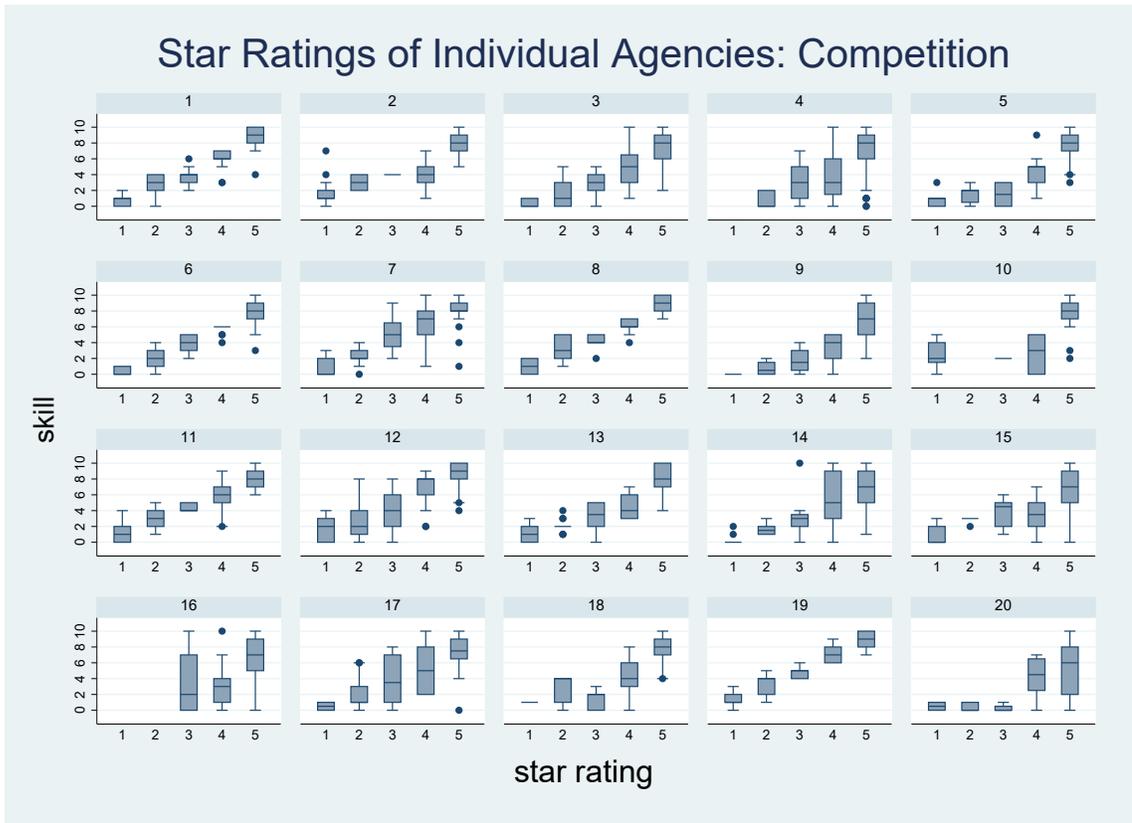


Figure 5: The range of worker skills for star ratings of workers by individual agency with competition.

B Screenshots: full information

Practice round 1: Agency #1

There is one agency and one employer. The agency has 5 workers and the employer can hire upto 5 workers.

Workers can be dragged and dropped into sets. The mean of the workers' skill and its range is shown above each non-empty set.

Unassigned	Set 1	Set 2	Set 3	Set 4	Set 5
Worker 1 skill = 4 Worker 2 skill = 6 Submit		Skill 8 [8, 8] Worker 3 skill = 8	Skill 9 [9, 9] Worker 5 skill = 9	Skill 8 [8, 8] Worker 4 skill = 8	

Practice round 1: Employer #1

There is one agency and one employer. The agency has 5 workers and the employer can hire upto 5 workers.

Drag and drop the workers you are interested in hiring on to your ranking and order them from best to worst. Each worker is from a set. The mean skill of the workers in the set and its range is shown.

You earn (skill - wage) for each worker hired where skill is the worker's skill and wage is 6.

Unranked	Ranking (best at top)
Worker 4 (agency 1) set 2: skill = 8 [8, 8] Worker 3 (agency 1) set 4: skill = 8 [8, 8] Worker 1 (agency 1) set 5: skill = 4 [4, 4] Submit	Worker 2 (agency 1) set 1: skill = 6 [6, 6] Worker 5 (agency 1) set 3: skill = 9 [9, 9]

C Screenshots: bundles

Practice round 1: Agency #1

There is one agency and one employer. The agency has 5 workers and the employer can hire upto 5 workers.

Workers can be dragged and dropped into sets. The mean of the workers' skill and its range is shown above each non-empty set.

Unassigned	Set 1	Set 2	Set 3	Set 4	Set 5
	Skill 6 [4, 8]	Skill 8 [8, 8]	Skill 7.5 [6, 9]		
<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 1 skill = 4</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 3 skill = 8</div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 4 skill = 8</div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 5 skill = 9</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 2 skill = 6</div>			
Submit					

Practice round 1: Employer #1

There is one agency and one employer. The agency has 5 workers and the employer can hire upto 5 workers.

Drag and drop the workers you are interested in hiring on to your ranking and order them from best to worst. Each worker is from a set. The mean skill of the workers in the set and its range is shown.

You earn (skill - wage) for each worker hired where skill is the worker's skill and wage is 6.

Unranked

Ranking (best at top)

<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 3 (agency 1) set 1: skill = 8 [8, 8]</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 1 (agency 1) set 4: skill = 4 [4, 4]</div>	<div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 4 (agency 1) set 1: skill = 8 [8, 8]</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 5 (agency 1) set 2: skill = 7.5 [6, 9]</div> <div style="border: 1px solid gray; padding: 5px; margin-bottom: 5px;">Worker 2 (agency 1) set 2: skill = 7.5 [6, 9]</div>
Submit	

D Screenshots: star ratings

Practice round 1: Agency #1

There is one agency and one employer. The agency has 5 workers and the employer can hire upto 5 workers.

Workers can be dragged and dropped into sets. The mean of the workers' skill and its range is shown above each non-empty set.

Unassigned Set ★★★★★ Set ★★★★ Set ★★★ Set ★★ Set ★

Worker 1 skill = 4	Skill 9 [9, 9]	Skill 7 [6, 8]			
Worker 4 skill = 8	Worker 5 skill = 9	Worker 2 skill = 6			
		Worker 3 skill = 8			

Submit

Practice round 1: Employer #1

There is one agency and one employer. The agency has 5 workers and the employer can hire upto 5 workers.

Drag and drop the workers you are interested in hiring on to your ranking and order them from best to worst. Each worker is from a set. The number of stars for the set the agency placed the worker in is shown.

You earn (skill - wage) for each worker hired where skill is the worker's skill and wage is 6.

Unranked	Ranking (best at top)
Worker 2 (agency 1) set ★★★★★	Worker 5 (agency 1) set ★★★★★
Worker 1 (agency 1) set ★★★	Worker 3 (agency 1) set ★★★★★
	Worker 4 (agency 1) set ★★★★★

Submit