

The Dynamics of Law Clerk Matching: An Experimental and Computational Investigation of Proposals for Reform of the Market

Online Appendices

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Appendix: Genetic Algorithm and Representation of Strategy Strings

The outline of one simulation session can be stated as follows:

Algorithm: Generate the initial population of strategies for each pool (that has a population of s strategies at a time) that will cause an outcome in matching behavior similar to the experimental subjects in market 1.

For $g=1 \dots G$, the total number of generations, run the following algorithm for the existing set of strategies for each pool.

- Make a **tournament** of T matching games by randomly choosing strategies $i=1, \dots, s$ from each pool $k=1, \dots, 5$. The existing 5 types are Judge 1, Judge 2, Judge 3, Judge 4 and workers. Determine the reinforcement (or fitness) of each strategy as the average payoff that it brought to the players who adopted it in the tournament.
- For $i=1, \dots, h$, **select** the i 'th **highest fitness** strategy of each type k to the next generation offspring. Return these strategies to the population pool for crossover.
- For $i=1, \dots, (s-h)/2$, **crossover** 2 parents for the $(2i-1)$ 'th and $(2i)$ 'th spots in the offspring generation for each type $k=1, \dots, 5$ using the following technique:
 - Use **tournament selection** to determine two parents P_{2i-1}^k and P_{2i}^k : Choose four parent candidates C_1, C_2, C_3, C_4 for type k randomly using the discrete uniform density. The higher fitness strategy of C_1, C_2 and C_3, C_4 become the two parents P_{2i-1}^k, P_{2i}^k for type k .

- With probability p , crossover the parents, with probability $1-p$ directly copy the parents as the offspring using single point **linear crossover**.
 - If crossover is adopted, randomly draw a crossover digit, c in $\{1,2,\dots,l^k-1\}$, in the strategy string of the size l^k .
 - Otherwise set $c=0$. Copy the digits $1,\dots,c$ of P_{2i-1}^k and $c+1,\dots,l^k$ digits of P_{2i}^k to form the child O_{2i-1}^k , copy the digits $1,\dots,c$ of P_{2i}^k and $c+1,\dots,l^k$ digits of P_{2i-1}^k to form the child O_{2i}^k .
- For $i=1,\dots,s$, **mutate** each decision variable $d=1,\dots,l^k$ in the offspring strategy O_i^k of each type t with probability $q = (1 - g / G) p_{\max}^m + (g / G) p_{\min}^m$ where g is the current generation number. Let $O_i^k(d)$ be the current decision variable.
 - If mutation is adopted, randomly draw an integer x in $\{r_1,\dots,r_2\}$, the range of the current decision variable $O_i^k(d)$, and replace it with x .
 - If mutation is not adopted, directly copy the existing digit.
- The strategies for generation $g+1$ are the offspring of generation g . \diamond

The artificial adaptive agents are constructed to choose among strategies represented by strings of decision variables. The strategies are conditioned on the rank of players as well as the current information available in each year. The applicants are ex-ante identical, so they use the same pool of strategies. The judges have different ex-ante qualities; therefore judges of different types consider different pools of strategies. Therefore there are 5 pools of strategies. The strategies are coded using **integer coding**.¹ We use a bounded rational representation for the strategies.

In the law clerk market simulations, a judge strategy is represented as a string of 6 decision variables:

$$T- A^1-R^1-A^2-R^2-R^3$$

Variable T is an integer in $\{1,2,3\}$. This decision variable is the year when the judge is going to start accepting applications from applicants. This is automatically set to 1 in the treatments without announcements in all generations. In the treatments with

¹ Each decision variable is represented by an integer.

announcements, T is chosen from its full domain and evolves over time. A^t is in $\{0,1\}$. When $A^t=1$, the judge may hire an applicant in year t . When $A^t=0$, the judge will not hire an applicant in year t . A judge may announce admitting applications in a period, but this judge does not have to hire an applicant in the same period. This is the reason why we use two variables T and A^t ($A^3=1$ is automatically set at the beginning of the simulations, so it is not a decision variable.) R^t is in $\{1,2,3,4\}$. This decision variable is the threshold rank of the applicant that the judge is going to hire,² in the case $A^t=1$. When the applicants have lower ranks than R^t , simply the judge does not hire anybody in that period. Otherwise, it hires the best applicant. In treatments with announcements, depending on the values of T some values of A^t and R^t may not be used.

An applicant strategy is a string of 20 decision variables:

$$S^1_1-N^1_1-S^1_2-N^1_2-S^1_3-N^1_3-S^1_4-N^1_4 - S^2_1-N^2_1-S^2_2-N^2_2-S^2_3-N^2_3-S^2_4-N^2_4- N^3_1-N^3_2-N^3_3-N^3_4$$

Variable S^t_r is in $\{0,1\}$. When applicant is ranked r^{th} among the others, if $S^t_r=1$, she sends at least 1 application in year t ; otherwise if $S^t_r=0$ she does not send any applications in year t . ($S^3_r=1$ is automatically set, so it is not a decision variable.) N^t_r is in $\{1,2,3,4\}$ and denotes the number of judges that she will send an application in year t when she is ranked r at year t^3 and $S^t_r=1$. If none of these judges are available, she sends an application to the best available judge.⁴

The bounded rationality feature of the strategy representations comes from one source. We do not model all information sets using these representations. For example, subjects observe who already got matched and left the market before each period and they also observe actual grades of applicants not only their current rankings. As we find in our results, the current representations model subject learning pretty well in the experiment even though they are bounded rational.

² R^t is the rank of least acceptable applicant among the available ones.

³ If none of these best N^t_r judges are available, she only sends an application to the best available judge.

⁴ To keep the information sets simple, in the computational simulations ties are broken arbitrarily in every period, so there are never two students with the same rank.

Appendix: Sensitivity Analysis

Simulation Parameters

In this section we report results of three sets of sensitivity tests for the artificial adaptive agent simulations. These tests aim to see how much the results achieved through simulations depend on the choice of genetic algorithm parameters.

In the first set of tests, we conduct comparative static exercises by changing one parameter at a time. In three tests of this first set, we change number of simulation markets from 500 to 5000, we change number of simulations from 20 to 100 and we change number of tournament games from 1000 to 10000 one by one. In each of the tests we measure mean welfare of applicants in all treatments, welfare difference between centralized-idealized and decentralized treatments, welfare difference between centralized-idealized and centralized-coerced treatments, welfare difference between decentralized and centralized-coerced treatments, and welfare difference between announcement and no-announcement treatments in each of the three market designs. We take the average of these in last 50 markets and report in Table 7 as well as the results for the original simulations reported earlier. We observe that average welfare across all treatments is almost the same in every exercise.

We observe that welfare in decentralized markets is catching up with the welfare in centralized-idealized markets in the 5000 generation treatment, although the latter is always higher. Moreover decentralized markets continue to raise more welfare than the centralized-coerced markets. The differences between announcement and no-announcement sessions are usually robust. In all cases announcements increase welfare slightly except the centralized-coerced treatment. In the original experiments for this treatment, announcement causes less welfare but this is not significant.

In the second set of tests, we conduct active nonlinear tests (ANTs) to obtain a multivariate sensitivity analysis. This is a technique found by Miller (1998). An ANT is a hill climbing optimization procedure, which tries to maximize some objective in the simulation by randomly searching in the parameter space. We use 100 iterations for the optimization procedure. Using this technique, the worst case scenarios for simulation models can be easily determined. The results show how much the results obtained in the original simulations depend on the choice of parameters and how much at worst results

will be distorted if different parameters are chosen. We form the search space of deviations from the original parameters as $\{-50\%, -40\%, -30\%, -20\%, -10\%, 0\%, +10\%, +20\%, +30\%, +40\%, +50\%\}$ for the parameters, which have real number values. These parameters are the ratio of selected best strategies for the next market under selection pressure, crossover probability, initial mutation probability, final mutation probability, strategy population. We define the search space of other parameters as selection pressure and no-selection pressure operator; random generation of initial strategies and forcing initial worker generation to submit applications in each period (i.e. using strategies similar to initial human subject strategies). We try to maximize and minimize the welfare measures used in the comparative static exercises. The results are displayed in Table 8.

We observe that the welfare differences between market types are very robust and the choice of parameters does not affect the fact that highest welfare is raised under centralized-idealized markets, followed by decentralized markets, followed by centralized-coerced markets. Mean welfare across all treatments is close to maximum under the original sessions. However the lack of selection under pressure accompanied by a combination of other parameters can decrease mean welfare substantially. This is due to substantial decrease in welfare for the centralized-coerced treatment with announcements.

In the third set of sets, we change the strategy representation used. Instead of using two digits to represent the action of an agent in each set (the first for deciding to do anything in the current period or not and the second one for deciding what action to take in case the agent decides to apply/hire in the current period) we use a single digit to represent agent actions: for a judge the range of actions is given by 0 to 4 where 0 denote not hiring anybody and $k > 0$ denotes the threshold rank of an applicant to hire in the current period, for the applicant the range is analogously defined. As we see in Table 9, the ordering of welfare results are identical in the new simulations with that of the original simulations. However the magnitude of changes is different and as a big difference we observe that decentralized announcement treatment's relative well-being is slightly higher with respect to the no announcement treatment in the new set of simulations. Our strategy representation used in the original simulations has slightly better fit than the one considered here for the experimental data.

Sensitivity Analysis on Experimental Design Parameters

In this section, we conduct robustness analysis by changing experimental design parameters. With different experimental designs, we run additional simulations.

First, we impose two types of changes on payoff structure and on grade generation process for applicants. We choose new payoffs so that the maximum possible welfare of applicants is the same as the original experiments and they decrease the marginal utility of match quality for type j : in the original design this marginal utility is j , in subsequent comparative static exercises we have $3j/5$ and $3j/7$.⁵ For different grade generation processes, we uniformly draw the grades of students from $\{0,1,\dots,5\}$ and $\{0,1,\dots,10\}$ instead of $\{0,1,2\}$. These decrease the probability of ties. The welfare measures discussed in the previous section are also calculated for these new exercises. The results are displayed in Table 10 for the last 50 markets of the simulations. We observe that with decreasing marginal utility of match quality, mean welfare of treatments increases, and particularly the welfare differences between treatments decrease. With decreasing probability of ties among student grades, the results are not substantially affected across different market designs. However announcements become slightly more effective and quicker in raising welfare.

Next, we impose a dramatic change in the design. In the original coerced-central treatment, the applicants can only apply in two periods to the available judges to get a right to be matched in the centralized period. In this new design, we create an application period preceding the centralized match period and succeeding the second period. In particular, before this new stage, all information about the applicant qualities becomes public information. The welfare implications of this design change in the coerced-central treatment are given in Table 11 and Figure 4. In Table 11, summary statistics about the average welfare in last 50 generations are given. We observe that the welfare in the new central-coerced treatment increases although still stays lower than the decentralized treatment. Moreover, the effect of announcements in the central-coerced treatment is reversed now: announcements no longer decrease welfare. Figure 4 shows average group welfare over time in all three treatments. One can trace the increase in the welfare of the

⁵ In the original design, utility of quality j agent from a quality i match is ij , in the subsequent exercises it is $3(ij+5)/5$ and $3(ij+10)/7$ respectively.

central-coerced treatment in this new design by contrasting it with Figure 2b. We conclude that our findings about the signs of welfare differences within treatments are robust for this design change as well, although the magnitudes of the differences are not robust.

Table 7. Robustness Analysis for Simulations: Comparative Statics on Simulation Length, Simulation Number, and Tournament Length

Comparative Statics	Original Simulations	With 5000 generations	With 100 simulations	With 10000 games per tournament
Mean welfare of applicants in all treatments	28.35 (0.0628)⁶	28.77	28.38	28.56
Welfare diff. between central-idealized and decentral.	0.87 (0.0495)	0.26	0.78	0.69
Welfare diff. between central-idealized and central-coerced	2.48 (0.0646)	2.25	2.45	2.48
Welfare diff. between decentral. and central-coerced	1.61 (0.0912)	1.99	1.67	1.79
Welfare diff. between central-idealized A and NA	0.16 (0.0541)	0.07	0.17	0.11
Welfare diff. between decentral. A and NA	0.25 (0.0969)	0.14	0.27	0.28
Welfare diff. between central-coerced A and NA	-0.12 (0.0603)	0.17	0.01	0.07

Table 8. Robustness Analysis for Simulations: Multivariate Active Nonlinear Tests (ANTs) on other GA parameters

ANTs	Max.	Min.
Mean welfare of applicants in all treatments	28.81	23.23
Welfare diff. between central-idealized and decentral.	2.77	0.25
Welfare diff. between central-idealized and central-coerced	10.70	1.99
Welfare diff. between decentral. and central-coerced	7.93	0.98
Welfare diff. between central-idealized A and NA	0.37	-0.17
Welfare diff. between decentral. A and NA	0.25	-0.03
Welfare diff. between central-coerced A and NA	0.42	-6.39

⁶ The numbers in parentheses are standard errors of the benchmark simulations.

Table 9. Robustness Analysis for Simulations: Comparative Statics on Strategy Representation

Comparative Statics	Original Simulations	Alternative strategy representation
Mean welfare of applicants in all treatments	28.35 (0.0628)	28.43
Welfare diff. between central-idealized and decentral.	0.87 (0.0495)	1.46
Welfare diff. between central-idealized and central-coerced	2.48 (0.0646)	2.20
Welfare diff. between decentral. and central-coerced	1.61 (0.0912)	0.73
Welfare diff. between central-idealized A and NA	0.16 (0.0541)	0.25
Welfare diff. between decentral. A and NA	0.25 (0.0969)	0.91
Welfare diff. between central-coerced A and NA	-0.12 (0.0603)	0.12

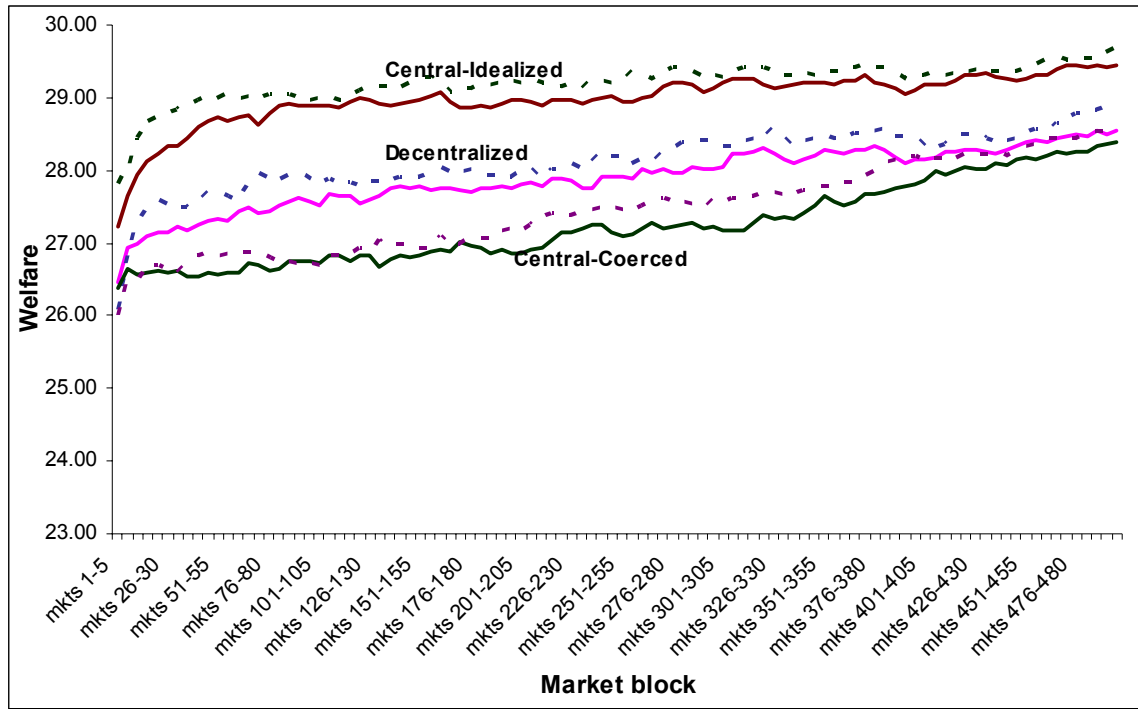
Table 10. Robustness Analysis for Experimental Design Through Simulations: Comparative Statics on Marginal Utility of Match Quality and Grade Generation of Students

Comparative Statics	Marginal Utility of Productivity for type $j=3/5j$	Marginal Utility of Productivity for type $j=3/7j$	Grades of applicants are uniformly drawn from $\{0,1,\dots,5\}$	Grades of applicants are uniformly drawn from $\{0,1,\dots,10\}$
Mean welfare of applicants in all treatments	29.01	29.29	28.41	28.40
Welfare diff. between central-idealized and decentral.	0.52	0.37	0.86	0.75
Welfare diff. between central-idealized and central-coerced	1.49	1.06	2.52	2.31
Welfare diff. between decentral. and central-coerced	0.97	0.69	1.66	1.55
Welfare diff. between central-idealized A and NA	0.09	0.07	0.12	0.17
Welfare diff. between decentral. A and NA	0.15	0.11	0.17	0.45
Welfare diff. between central-coerced A and NA	-0.07	-0.05	-0.07	0.09

Table 11. Robustness Analysis for Experimental Design Through Simulations: Effect of increasing application periods in the centralized-coerced treatment

Comparative Statics	Original Simulations	With 4 periods in coerced-central treatment
Mean welfare of applicants in all treatments	28.35 (0.0628)	28.80
Welfare diff. between central-idealized and decentral.	0.87 (0.0495)	0.87
Welfare diff. between central-idealized and central-coerced	2.48 (0.0646)	1.11
Welfare diff. between decentral. and central-coerced	1.61 (0.0912)	0.24
Welfare diff. between central-idealized A and NA	0.16 (0.0541)	0.16
Welfare diff. between decentral. A and NA	0.25 (0.0969)	0.25
Welfare diff. between central-coerced A and NA	-0.12 (0.0603)	0.19

Figure 4: Robustness Analysis for Experimental Design Through Simulations: Effect of increasing application periods in the centralized-coerced treatment on Average Group Welfare. Dashed lines represent announcement conditions.



Instructions for decentralized without announcements

WELCOME

This is an experiment about economic decision making. It is important that during the experiment you remain SILENT. If you have any questions, or need assistance of any kind, RAISE YOUR HAND but DO NOT SPEAK. We expect and appreciate your cooperation.

The decisions made in this experiment are hiring decisions. Accordingly, your role will be either “firm” or “applicant.” If you look at the screen in front of you right now, you will see your role. Your role, firm or applicant, will stay the same throughout the experiment.

The experiment will have 20 “markets,” which will last three “years” each.

To get a positive payoff in any given market, a firm will need to hire one, and only one, applicant in that market. An applicant will need to be hired by one, and only one, firm in that market.

In each group, there are four firms and four applicants. The firms are numbered 1 through 4, and the applicants are numbered 5-8.

The firms and applicants are assigned “qualities.” Your payoff as a firm is your quality multiplied by the quality of the applicant you have hired. Similarly, your payoff as an applicant is the product of your quality and your employing firm’s quality. For example, if a firm of quality 3 hires an applicant of quality 4, both firm and applicant will receive a payoff of 12 tokens each.

Firms’ qualities are simply their assigned participant number. In other words, if you are firm 3, your quality is 3. If you are firm 4, your quality is 4.

Applicants' "qualities," in contrast, have nothing to do with their assigned number and depend solely on the applicant's "grades."

EXACTLY HOW ARE APPLICANTS' QUALITIES DETERMINED?

Think of the applicants as attending school for three years. Following each year of school, each of the applicants gets a grade of 0, 1, or 2, with 2 being the best possible grade and 0 being the worst possible grade. The computer generates these grades randomly, with each of 0, 1, and 2 having an equal chance of occurrence.

Each year, the grades are summed up, and the applicant is given his or her cumulative grade. In the third year, applicants are assigned qualities as follows: The applicant with the highest cumulative grade in the third year gets a quality of 4, the applicant with the second highest cumulative grade gets a quality of 3, the applicant with the third highest cumulative grade gets a quality of 2, and the applicant with the lowest cumulative grade gets a quality of 1.

For example, let's say that applicant 5 got grades of 1, 0, and 2 in the three years. His cumulative grade would be the sum of the three: $1 + 0 + 2 = 3$. That cumulative grade is NOT his quality, however. In fact, applicant 6 had a cumulative grade of 5, applicant 7 had a cumulative grade of 4 and applicant 8 had a cumulative grade of 2. Since applicant 5 had the third highest cumulative grade, he would be third ranked, resulting in a quality of 2. Applicant 6, who is best ranked, gets a quality of 4.

If there are no ties, the applicant qualities will be 1 through 4, with the highest quality of 4 going to the best ranked applicant; that is, to the applicant with the highest total grade. The quality of 3 will go to the second ranked applicant in total grades, and so on. The worst ranked applicant will get a quality of 1.

In case of ties, applicants having the same cumulative grade get ranked arbitrarily relative to each other. Then we assign qualities 1, 2, 3, and 4 to the four applicants according to

their ranks, as before, with best ranked getting a quality of 4 and worst ranked getting a quality of 1.

IF YOU HAVE ANY QUESTIONS, PLEASE RAISE YOUR HAND.

THE FINAL YEAR

In the final year of each market, one additional piece of information will be revealed – the final quality of each applicant. Whereas in each of the first two years, participants see only the applicants' cumulative grades, in the final year, the applicants' final qualities will be shown as well.

PAYMENT

Since the highest possible quality for a firm or applicant is 4, the maximum payoff anyone can make per market is \$16. At the end of the experiment, we will determine your dollar payoffs by dividing your total token amount by the number of markets and multiplying by 2. Hence you will get **DOUBLE** your average token earnings in dollars. This is in addition to your show up fee.

THE STAGES OF A MARKET

Each year of each market consists of two stages:

1. APPLICANTS SEND APPLICATIONS TO FIRMS EACH YEAR
2. FIRMS MAY HIRE ANY APPLICANTS WHO APPLIED IN A GIVEN YEAR

Stage 1: APPLICANTS enter in the box in the top right hand corner the number of a firm to which they wish to send a resume (apply for a job). Clicking on the “send resume” button underneath the text box completes the application process. Applicants can apply to more than one position, with the limitation that the firm receiving the application must be on the market.

Market # 1		
YEAR # 2		
<p>Make sure to press Finish when you are done selecting firms.</p> <div style="text-align: right; margin-top: 10px;"> <input type="button" value="Finish"/> </div>	<p style="text-align: right;">Send resume to firm: <input style="width: 50px;" type="text"/></p> <div style="text-align: center; margin-top: 10px;"> <input type="button" value="Send resume"/> </div>	
Private Information		
<p>YOUR ROLE Applicant</p> <p>You are Applicant 5</p> <p>You have been hired by nobody yet!</p>		
Firms who will receive your resume		
Firm	Value of firm	
1	1	
4	4	
Firms this year		
Firm	Hired	Hired in year
1	Nobody	0
2	applicant 7	1
3	Nobody	0
4	Nobody	0
{Applicants' cumulative grades for year 2}		
Applicant	Cumulative Grade	Hired By
5	2	Nobody
7	2	Firm 2
8	2	Nobody
6	3	Nobody

Stage 2: In the second stage, the firm makes a hiring decision, by entering the number of an applicant in the box in the top right hand corner and pressing the “Make an offer” button. The applicants available to the firm are displayed in the top table under the title “Applicants who had sent you a resume.” Notice that the firm’s screen closely resembles the applicants’ screen.

Market # 1 YEAR # 2		
Action	Hire applicant: <input style="width: 50px; height: 20px;" type="text"/> <div style="text-align: center; margin-top: 5px;"> Do not make any offers in this year Make an offer </div>	
Private Information		
YOUR ROLE Firm You are Firm 3 Your Quality is 3 You have not hired anyone yet.		
Applicants who had sent you a resume		
Applicant		
5 6		
Firms this year		
Firm	Hired	Hired in year
1	Nobody	0
2	applicant 7	1
3	Nobody	0
4	Nobody	0
{ Applicants' cumulative grades for year 2}		
Applicant	Cumulative Grade	Hired By
5	2	Nobody
6	3	Nobody
7	2	Firm 2
8	2	Nobody

Note that as a firm, each year you are allowed to make ONLY one hiring decision. If no higher quality firm made an offer to the same applicant, an offer will result in a hiring of that applicant. If a higher quality firm made an offer to the same applicant you made an offer to, the applicant will be hired by the other (higher quality) firm, and the computer will prompt you to make another hiring decision for that year. Once you made an offer which was accepted, you are “married” to that hired applicant for the duration of the market, and in future years in that market you will not get a decision but rather a message informing you that you had already hired a particular applicant.

If you have any questions please raise your hand.

Caution: The above example was selected arbitrarily and in way intends to suggest the actual qualities of players.

We now ask that you answer the quiz in front of you. Once you are done with all the questions, raise your hand and one of the experimenters will come to you.

Quiz

Applicant	YEAR 1	YEAR 2	YEAR 3
5	0	0	1
6	1	0	1
7	2	2	0
8	2	1	2

Imagine that the above table reflects the final grades after year 3 for the four applicants. You are firm 4. You hired applicant 7. Your payoff for this market is

Instructions for decentralized with announcements

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In each group, there are four firms and four applicants. The firms are numbered 1 through 4, and the applicants are numbered 5-8.

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Each year, the grades are summed up, and the applicant is given his or her cumulative grade. In the third year, applicants are assigned qualities as follows: The applicant with the highest cumulative grade in the third year gets a quality of 4, the applicant with the second highest cumulative grade gets a quality of 3, the applicant with the third highest cumulative grade gets a quality of 2, and the applicant with the lowest cumulative grade gets a quality of 1.

For example, let's say that applicant 5 got grades of 1, 0, and 2 in the three years. His cumulative grade would be the sum of the three: $1 + 0 + 2 = 3$. That cumulative grade is NOT his quality, however. In fact, applicant 6 had a cumulative grade of 5, applicant 7 had a cumulative grade of 4 and applicant 8 had a cumulative grade of 2. Since applicant 5 had the third highest cumulative grade, he would be third ranked, resulting in a quality of 2. Applicant 6, who is best ranked, gets a quality of 4.

If there are no ties, the applicant qualities will be 1 through 4, with the highest quality of 4 going to the best ranked applicant; that is, to the applicant with the highest total grade. The quality of 3 will go to the second ranked applicant in total grades, and so on. The worst ranked applicant will get a quality of 1.

In case of ties, applicants having the same cumulative grade get ranked arbitrarily relative to each other. Then we assign qualities 1, 2, 3, and 4 to the four applicants according to their ranks, as before, with best ranked getting a quality of 4 and worst ranked getting a quality of 1.

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PAYMENT

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THE STAGES OF A MARKET

Each market consists of three stages:

3. FIRMS ANNOUNCE THEIR YEAR OF ENTRY INTO THE MARKET
4. APPLICANTS SEND APPLICATIONS TO FIRMS EACH YEAR
5. FIRMS MAY HIRE ANY APPLICANTS WHO APPLIED IN A GIVEN YEAR

Stage 1 precedes the start of the market. In that stage, participants in the FIRM role declare the year in which they wish to be available to APPLICANTS to send them resumes. That choice is 1, 2, or 3, corresponding to first, second, and third year, respectively. Prior to the year indicated, applicants cannot send resumes to the firm and hence the firm cannot hire applicants.

Market # 1	
YEAR # 1	
Action	I want to start hiring in year: <input type="text"/>
	<input type="submit" value="Submit"/>
	Private Information
	YOUR ROLE Firm
	You are Firm 4
	Your Quality is 4
	You have not hired anyone yet.

Stage 2: In stage 2, participants in the APPLICANT role enter in the box in the top right hand corner (applicant screen shown below) the number of a firm to which they wish to send a resume (apply for a job). Clicking on the “send resume” button underneath the text box completes the application process. Applicants can apply to more than one position, with the limitation that the firm receiving the application must be on the market. The list of the firms on the market is shown in the middle table on the applicants screen shown below.

Market # 1
YEAR # 1

<p>Make sure to press Finish when you are done selecting firms.</p> <div style="text-align: right; margin-top: 10px;"> <input type="button" value="Finish"/> </div>	<p style="text-align: right;">Send resume to firm: <input style="width: 50px;" type="text"/></p> <div style="text-align: center; margin-top: 10px;"> <input type="button" value="Send resume"/> </div>
Private Information	
<p>YOUR ROLE Applicant</p> <p>You are Applicant 6</p> <p>You have been hired by nobody yet!</p>	

Firms who will receive your resume	
Firm	Value of firm
1	1
2	2

Firms on the market this year				
Firm	Announced entry in year	Available this year	Hired	Hired in year
1	1	YES	Nobody	0
2	1	YES	Nobody	0
3	1	YES	Nobody	0
4	1	YES	Nobody	0

{Applicants' cumulative grades for year 1}	
Applicant	Cumulative Grade
8	0
6	2
7	0
5	2

Stage 3: In the third stage, the firm makes a hiring decision, by entering the number of an applicant in the box in the top right hand corner and pressing the “Make an offer” button. The applicants available to the firm are displayed in the top table under the title “Applicants who had sent you a resume.” Notice that the firm’s screen closely resembles the applicants’ screen.

Market # 1				
YEAR # 1				
Action	Hire applicant: <input style="width: 50px;" type="text"/>			
	<div style="border: 1px solid black; background-color: red; color: white; padding: 2px; display: inline-block;">Do not make any offers in this round</div>			
	<div style="border: 1px solid black; background-color: red; color: white; padding: 2px; display: inline-block;">Make an offer</div>			
	Private Information			
	YOUR ROLE Firm			
	You are Firm 4			
	Your Quality is 4			
	You have not hired anyone yet.			
Applicants who had sent you a resume				
Applicant				
6				
7				
8				
Firms on the market this year				
Firm	Announced entry in year	Available this year	Hired	Hired in year
1	1	YES	Nobody	0
2	3	NO	Nobody	0
3	2	NO	Nobody	0
4	1	YES	Nobody	0
{Applicants' cumulative grades for year 1 }				
Applicant			Cumulative Grade	
8			2	
6			0	
7			1	
5			2	

Note that as a firm, each year you are allowed to make ONLY one hiring decision. If no higher quality firm made an offer to the same applicant, an offer will result in a hiring of that applicant. If a higher quality firm made an offer to the same applicant you made an offer to, the applicant will be hired by the other (higher quality) firm, and the computer will prompt you to make another hiring decision for that year. Once you made an offer which was accepted, you are “married” to that hired applicant for the duration of the market, and in future years in that market you will not get a decision but rather a message informing you that you had already hired a particular applicant.

If you have any questions please raise your hand.

Caution: The above example was selected arbitrarily and in way intends to suggest the actual qualities of players.

We will now review the screen together.

We now ask that you answer the quiz in front of you. Once you are done with all the questions, raise your hand and one of the experimenters will come to you.

Quiz

Applicant	YEAR 1	YEAR 2	YEAR 3
5	0	0	1
6	1	0	1
7	2	2	0
8	2	1	2

Imagine that the above table reflects the final grades after year 3 for the four applicants. You are firm 4. You hired applicant 7. Your payoff for this market is

Instructions for centralized idealized without announcements

WELCOME

This is an experiment about economic decision making. It is important that during the experiment you remain SILENT. If you have any questions, or need assistance of any kind, RAISE YOUR HAND but DO NOT SPEAK. We expect and appreciate your cooperation.

The decisions made in this experiment are hiring decisions. Accordingly, your role will be either “firm” or “applicant.” If you look at the screen in front of you right now, you will see your role. Your role, firm or applicant, will stay the same throughout the experiment.

The experiment will have 20 “markets,” which will last three “years” each.

To get a positive payoff in any given market, a firm will need to hire one, and only one, applicant in that market. An applicant will need to be hired by one, and only one, firm in that market.

In each group, there are four firms and four applicants. The firms are numbered 1 through 4, and the applicants are numbered 5-8.

The firms and applicants are assigned “qualities.” Your payoff as a firm is your quality multiplied by the quality of the applicant you have hired. Similarly, your payoff as an applicant is the product of your quality and your employing firm’s quality. For example, if a firm of quality 3 hires an applicant of quality 4, both firm and applicant will receive a payoff of 12 tokens each.

Firms’ qualities are simply their assigned participant number. In other words, if you are firm 3, your quality is 3. If you are firm 4, your quality is 4.

Applicants' "qualities," in contrast, have nothing to do with their assigned number and depend solely on the applicant's "grades."

EXACTLY HOW ARE APPLICANTS' QUALITIES DETERMINED?

Think of the applicants as attending school for three years. Following each year of school, each of the applicants gets a grade of 0, 1, or 2, with 2 being the best possible grade and 0 being the worst possible grade. The computer generates these grades randomly, with each of 0, 1, and 2 having an equal chance of occurrence.

Each year, the grades are summed up, and the applicant is given his or her cumulative grade. In the third year, applicants are assigned qualities as follows: The applicant with the highest cumulative grade in the third year gets a quality of 4, the applicant with the second highest cumulative grade gets a quality of 3, the applicant with the third highest cumulative grade gets a quality of 2, and the applicant with the lowest cumulative grade gets a quality of 1.

For example, let's say that applicant 5 got grades of 1, 0, and 2 in the three years. His cumulative grade would be the sum of the three: $1 + 0 + 2 = 3$. That cumulative grade is NOT his quality, however. In fact, applicant 6 had a cumulative grade of 5, applicant 7 had a cumulative grade of 4 and applicant 8 had a cumulative grade of 2. Since applicant 5 had the third highest cumulative grade, he would be third ranked, resulting in a quality of 2. Applicant 6, who is best ranked, gets a quality of 4.

If there are no ties, the applicant qualities will be 1 through 4, with the highest quality of 4 going to the best ranked applicant; that is, to the applicant with the highest total grade. The quality of 3 will go to the second ranked applicant in total grades, and so on. The worst ranked applicant will get a quality of 1.

In case of ties, applicants having the same cumulative grade get ranked arbitrarily relative to each other. Then we assign qualities 1, 2, 3, and 4 to the four applicants according to

their ranks, as before, with best ranked getting a quality of 4 and worst ranked getting a quality of 1.

IF YOU HAVE ANY QUESTIONS, PLEASE RAISE YOUR HAND.

THE FINAL YEAR

In the final year of each market, one additional piece of information will be revealed – the final quality of each applicant. Whereas in each of the first two years, participants see only the applicants' cumulative grades, in the final year, the applicants' final qualities will be shown as well.

PAYMENT

Since the highest possible quality for a firm or applicant is 4, the maximum payoff anyone can make per market is \$16. At the end of the experiment, we will determine your dollar payoffs by dividing your total token amount by the number of markets and multiplying by 2. Hence you will get **DOUBLE** your average token earnings in dollars. This is in addition to your show up fee.

THE STAGES OF A MARKET

In each of years 1 and 2:

6. APPLICANTS SEND APPLICATIONS TO FIRMS EACH YEAR
7. FIRMS MAY HIRE ANY APPLICANTS WHO APPLIED IN A GIVEN YEAR

At the end of year 2:

FIRMS AND APPLICANTS NOT MATCHED BY THE END OF YEAR 2 ARE AUTOMATICALLY MATCHED BY THE COMPUTER.

Stage 1: APPLICANTS enter in the box in the top right hand corner the number of a firm to which they wish to send a resume (apply for a job). Clicking on the “send resume” button underneath the text box completes the application process. Applicants can apply to more than one position, with the limitation that the firm receiving the application must be on the market.

Market # 1 YEAR # 2																	
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Firm																	
1																	
2																	
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Hired in year																	
0																	
1																	
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0																	
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Stage 2: In the second stage, the firm makes a hiring decision, by entering the number of an applicant in the box in the top right hand corner and pressing the “Make an offer” button. The applicants available to the firm are displayed in the top table under the title “Applicants who had sent you a resume.” Notice that the firm’s screen closely resembles the applicants’ screen.

Market # 1 YEAR # 2		
Action	Hire applicant: <input style="width: 50px; height: 20px;" type="text"/> <div style="text-align: center; margin-top: 5px;"> Do not make any offers in this year Make an offer </div>	
Private Information		
YOUR ROLE Firm You are Firm 3 Your Quality is 3 You have not hired anyone yet.		
Applicants who had sent you a resume		
Applicant		
5 6		
Firms this year		
Firm	Hired	Hired in year
1	Nobody	0
2	applicant 7	1
3	Nobody	0
4	Nobody	0
{ Applicants' cumulative grades for year 2}		
Applicant	Cumulative Grade	Hired By
5	2	Nobody
6	3	Nobody
7	2	Firm 2
8	2	Nobody

At the end of year 2: If you are not matched by the end of year 2 of any market, the computer will match you in year 3 as follows: Unmatched firms and applicants will be sorted by qualities. The firm with the highest quality will be matched with the highest quality unemployed applicant, the second highest quality firm will be matched with the second highest quality applicant, and so on.

Note that as a firm, each year you are allowed to make ONLY one hiring decision. If no higher quality firm made an offer to the same applicant, an offer will result in a hiring of that applicant. If a higher quality firm made an offer to the same applicant you made an offer to, the applicant will be hired by the other (higher quality) firm, and the computer will prompt you to make another hiring decision for that year. Once you made an offer which was accepted, you are “married” to that hired applicant for the duration of the market, and in future years in that market you will not get a decision but rather a message informing you that you had already hired a particular applicant.

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We now ask that you answer the quiz in front of you. Once you are done with all the questions, raise your hand and one of the experimenters will come to you.

Quiz

Applicant	YEAR 1	YEAR 2	YEAR 3
5	0	0	1
6	1	0	1
7	2	2	0
8	2	1	2

Imagine that the above table reflects the final grades after year 3 for the four applicants. You are firm 4. You hired applicant 7. Your payoff for this market is

Instructions for centralized idealized with announcements

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THE STAGES OF A MARKET

I. Prior to year 1:

FIRMS ANNOUNCE WHICH YEAR THEY WILL BE RECEIVING APPLICATIONS.

II. In each of years 1 and 2:

8. APPLICANTS SEND APPLICATIONS TO FIRMS EACH YEAR

9. FIRMS MAY HIRE ANY APPLICANTS WHO APPLIED IN A GIVEN YEAR

III. At the end of year 2:

FIRMS AND APPLICANTS NOT MATCHED BY THE END OF YEAR 2 ARE AUTOMATICALLY MATCHED BY THE COMPUTER.

Announcement Stage: Precedes the start of the market. In that stage, participants in the FIRM role declare the year in which they wish to be available to APPLICANTS to send them resumes. That choice is 1, 2, or 3, corresponding to first, second, and third year, respectively. Prior to the year indicated, applicants cannot send resumes to the firm and hence the firm cannot hire applicants.

Market # 1 YEAR # 1	
Action	I want to start hiring in year: <input type="text"/>
	<input type="submit" value="Submit"/>
	Private Information
	<p>YOUR ROLE Firm</p> <p>You are Firm 4</p> <p>Your Quality is 4</p> <p>You have not hired anyone yet.</p>

Each year: APPLICANTS enter in the box in the top right hand corner the number of a firm to which they wish to send a resume (apply for a job). Clicking on the “send resume” button underneath the text box completes the application process. Applicants can apply to more than one position, with the limitation that the firm receiving the application must be on the market.

Market # 1
YEAR # 1

<p>Make sure to press Finish when you are done selecting firms.</p> <div style="text-align: right; margin-top: 10px;"> <input type="button" value="Finish"/> </div>	<p style="text-align: right;">Send resume to firm: <input style="width: 50px;" type="text"/></p> <div style="text-align: center; margin-top: 10px;"> <input type="button" value="Send resume"/> </div>																									
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Firm	Announced entry in year	Available this year	Hired	Hired in year																						
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Each year: Following the applicants' decisions, each firm makes a hiring decision, by entering the number of an applicant in the box in the top right hand corner and pressing the "Make an offer" button. The applicants available to the firm are displayed in the top table under the title "Applicants who had sent you a resume." Notice that the firm's screen closely resembles the applicants' screen.

Market # 1				
YEAR # 1				
Action	Hire applicant: <input style="width: 50px;" type="text"/>			
	Do not make any offers in this round			
	Make an offer			
Private Information				
YOUR ROLE Firm				
You are Firm 4				
Your Quality is 4				
You have not hired anyone yet.				
Applicants who had sent you a resume				
Applicant				
6				
7				
8				
Firms on the market this year				
Firm	Announced entry in year	Available this year	Hired	Hired in year
1	1	YES	Nobody	0
2	3	NO	Nobody	0
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4	1	YES	Nobody	0
(Applicants' cumulative grades for year 1)				
Applicant			Cumulative Grade	
8			2	
6			0	
7			1	
5			2	

At the end of year 2: If you are not matched by the end of year 2 of any market, the computer will match you in year 3 as follows: Unmatched firms and applicants will be sorted by qualities. The firm with the highest quality will be matched with the highest quality unemployed applicant, the second highest quality firm will be matched with the second highest quality applicant, and so on.

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Quiz

Applicant	YEAR 1	YEAR 2	YEAR 3
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7	2	2	0
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Instructions for centralized coerced without announcements

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In each group, there are four firms and four applicants. The firms are numbered 1 through 4, and the applicants are numbered 5-8.

The firms and applicants are assigned “qualities.” Your payoff as a firm is your quality multiplied by the quality of the applicant you have hired. Similarly, your payoff as an applicant is the product of your quality and your employing firm’s quality. For example, if a firm of quality 3 hires an applicant of quality 4, both firm and applicant will receive a payoff of 12 tokens each.

Firms’ qualities are simply their assigned participant number. In other words, if you are firm 3, your quality is 3. If you are firm 4, your quality is 4.

Applicants' "qualities," in contrast, have nothing to do with their assigned number and depend solely on the applicant's "grades."

EXACTLY HOW ARE APPLICANTS' QUALITIES DETERMINED?

Think of the applicants as attending school for three years. Following each year of school, each of the applicants gets a grade of 0, 1, or 2, with 2 being the best possible grade and 0 being the worst possible grade. The computer generates these grades randomly, with each of 0, 1, and 2 having an equal chance of occurrence.

Each year, the grades are summed up, and the applicant is given his or her cumulative grade. In the third year, applicants are assigned qualities as follows: The applicant with the highest cumulative grade in the third year gets a quality of 4, the applicant with the second highest cumulative grade gets a quality of 3, the applicant with the third highest cumulative grade gets a quality of 2, and the applicant with the lowest cumulative grade gets a quality of 1.

For example, let's say that applicant 5 got grades of 1, 0, and 2 in the three years. His cumulative grade would be the sum of the three: $1 + 0 + 2 = 3$. That cumulative grade is NOT his quality, however. In fact, applicant 6 had a cumulative grade of 5, applicant 7 had a cumulative grade of 4 and applicant 8 had a cumulative grade of 2. Since applicant 5 had the third highest cumulative grade, he would be third ranked, resulting in a quality of 2. Applicant 6, who is best ranked, gets a quality of 4.

If there are no ties, the applicant qualities will be 1 through 4, with the highest quality of 4 going to the best ranked applicant; that is, to the applicant with the highest total grade. The quality of 3 will go to the second ranked applicant in total grades, and so on. The worst ranked applicant will get a quality of 1.

In case of ties, applicants having the same cumulative grade get ranked arbitrarily relative to each other. Then we assign qualities 1, 2, 3, and 4 to the four applicants according to

their ranks, as before, with best ranked getting a quality of 4 and worst ranked getting a quality of 1.

IF YOU HAVE ANY QUESTIONS, PLEASE RAISE YOUR HAND.

THE FINAL YEAR

In the final year of each market, one additional piece of information will be revealed – the final quality of each applicant. Whereas in each of the first two years, participants see only the applicants' cumulative grades, in the final year, the applicants' final qualities will be shown as well.

PAYMENT

Since the highest possible quality for a firm or applicant is 4, the maximum payoff anyone can make per market is \$16. At the end of the experiment, we will determine your dollar payoffs by dividing your total token amount by the number of markets and multiplying by 2. Hence you will get **DOUBLE** your average token earnings in dollars. This is in addition to your show up fee.

THE STAGES OF A MARKET

In each year:

10. Applicants send applications to firms.

11. Firms may hire any one applicant from the pool of applicants who had applied in a given year.

At the end of year 2:

Firms and applicants not matched by the end of year 2 are matched by the computer. Applicants can only be matched to firms which had received their applications in either year 1 or year 2 of that market.

Stage 1: APPLICANTS enter in the box in the top right hand corner the number of a firm to which they wish to send a resume (apply for a job). Clicking on the “send resume” button underneath the text box completes the application process. Applicants can apply to more than one position, with the limitation that the firm receiving the application must be on the market.

Market # 1 YEAR # 2		
<p>Make sure to press Finish when you are done selecting firms.</p> <div style="text-align: right; margin-top: 10px;"> <input type="button" value="Finish"/> </div>	<p style="text-align: right;">Send resume to firm: <input style="width: 50px;" type="text"/></p> <div style="text-align: center; margin-top: 10px;"> <input type="button" value="Send resume"/> </div>	
Private Information		
<p>YOUR ROLE Applicant</p> <p>You are Applicant 5</p> <p>You have been hired by nobody yet!</p>		
Firms who will receive your resume		
Firm	Value of firm	
1	1	
4	4	
Firms this year		
Firm	Hired	Hired in year
1	Nobody	0
2	applicant 7	1
3	Nobody	0
4	Nobody	0
{Applicants' cumulative grades for year 2}		
Applicant	Cumulative Grade	Hired By
5	2	Nobody
7	2	Firm 2
8	2	Nobody
6	3	Nobody

Stage 2: In the second stage, the firm makes a hiring decision, by entering the number of an applicant in the box in the top right hand corner and pressing the “Make an offer” button. The applicants available to the firm are displayed in the top table under the title “Applicants who had sent you a resume.” Notice that the firm’s screen closely resembles the applicants’ screen.

Market # 1		
YEAR # 2		
Action	Hire applicant: <input style="width: 50px;" type="text"/>	
	Do not make any offers in this year	
	Make an offer	
Private Information		
YOUR ROLE Firm		
You are Firm 3		
Your Quality is 3		
You have not hired anyone yet.		
Applicants who had sent you a resume		
Applicant		
5		
6		
Firms this year		
Firm	Hired	Hired in year
1	Nobody	0
2	applicant 7	1
3	Nobody	0
4	Nobody	0
{ Applicants' cumulative grades for year 2 }		
Applicant	Cumulative Grade	Hired By
5	2	Nobody
6	3	Nobody
7	2	Firm 2
8	2	Nobody

At the end of year 2: If you are not matched by the end of year 2 of any market, the computer will match you in year 3 as follows: Unmatched firms and applicants will be sorted by qualities. The firm with the highest quality will be matched with the highest quality unemployed applicant that had sent this firm an application in either year 1 or year 2 or both. From the remaining unemployed applicant pool, the second highest quality firm will be matched with the highest quality applicant that had sent this firm an application in either year 1 or year 2 or both, and so on.

Hence, to be eligible for hiring by a firm following year 2, an applicant needs to have sent an application to that firm in either year 1 or year 2.

Note that as a firm, each year you are allowed to make ONLY one hiring decision. If no higher quality firm made an offer to the same applicant, an offer will result in a hiring of that applicant. If a higher quality firm made an offer to the same applicant you made an offer to, the applicant will be hired by the other (higher quality) firm, and the computer will prompt you to make another hiring decision for that year. Once you made an offer which was accepted, you are “married” to that hired applicant for the duration of the market, and in future years in that market you will not get a decision but rather a message informing you that you had already hired a particular applicant.

If you have any questions please raise your hand.

Caution: The above example was selected arbitrarily and in way intends to suggest the actual qualities of players.

We now ask that you answer the quiz in front of you. Once you are done with all the questions, raise your hand and one of the experimenters will come to you.

Quiz

Applicant	YEAR 1	YEAR 2	YEAR 3
5	0	0	1
6	1	0	1
7	2	2	0
8	2	1	2

Imagine that the above table reflects the final grades after year 3 for the four applicants. You are firm 4. You hired applicant 7. Your payoff for this market is

Instructions for centralized coerced with announcements

WELCOME

This is an experiment about economic decision making. It is important that during the experiment you remain SILENT. If you have any questions, or need assistance of any kind, RAISE YOUR HAND but DO NOT SPEAK. We expect and appreciate your cooperation.

The decisions made in this experiment are hiring decisions. Accordingly, your role will be either “firm” or “applicant.” If you look at the screen in front of you right now, you will see your role. Your role, firm or applicant, will stay the same throughout the experiment.

The experiment will have 20 “markets,” which will last three “years” each.

To get a positive payoff in any given market, a firm will need to hire one, and only one, applicant in that market. An applicant will need to be hired by one, and only one, firm in that market.

In each group, there are four firms and four applicants. The firms are numbered 1 through 4, and the applicants are numbered 5-8.

The firms and applicants are assigned “qualities.” Your payoff as a firm is your quality multiplied by the quality of the applicant you have hired. Similarly, your payoff as an applicant is the product of your quality and your employing firm’s quality. For example, if a firm of quality 3 hires an applicant of quality 4, both firm and applicant will receive a payoff of 12 tokens each.

Firms’ qualities are simply their assigned participant number. In other words, if you are firm 3, your quality is 3. If you are firm 4, your quality is 4.

Applicants' "qualities," in contrast, have nothing to do with their assigned number and depend solely on the applicant's "grades."

EXACTLY HOW ARE APPLICANTS' QUALITIES DETERMINED?

Think of the applicants as attending school for three years. Following each year of school, each of the applicants gets a grade of 0, 1, or 2, with 2 being the best possible grade and 0 being the worst possible grade. The computer generates these grades randomly, with each of 0, 1, and 2 having an equal chance of occurrence.

Each year, the grades are summed up, and the applicant is given his or her cumulative grade. In the third year, applicants are assigned qualities as follows: The applicant with the highest cumulative grade in the third year gets a quality of 4, the applicant with the second highest cumulative grade gets a quality of 3, the applicant with the third highest cumulative grade gets a quality of 2, and the applicant with the lowest cumulative grade gets a quality of 1.

For example, let's say that applicant 5 got grades of 1, 0, and 2 in the three years. His cumulative grade would be the sum of the three: $1 + 0 + 2 = 3$. That cumulative grade is NOT his quality, however. In fact, applicant 6 had a cumulative grade of 5, applicant 7 had a cumulative grade of 4 and applicant 8 had a cumulative grade of 2. Since applicant 5 had the third highest cumulative grade, he would be third ranked, resulting in a quality of 2. Applicant 6, who is best ranked, gets a quality of 4.

If there are no ties, the applicant qualities will be 1 through 4, with the highest quality of 4 going to the best ranked applicant; that is, to the applicant with the highest total grade. The quality of 3 will go to the second ranked applicant in total grades, and so on. The worst ranked applicant will get a quality of 1.

In case of ties, applicants having the same cumulative grade get ranked arbitrarily relative to each other. Then we assign qualities 1, 2, 3, and 4 to the four applicants according to

their ranks, as before, with best ranked getting a quality of 4 and worst ranked getting a quality of 1.

IF YOU HAVE ANY QUESTIONS, PLEASE RAISE YOUR HAND.

THE FINAL YEAR

In the final year of each market, one additional piece of information will be revealed – the final quality of each applicant. Whereas in each of the first two years, participants see only the applicants' cumulative grades, in the final year, the applicants' final qualities will be shown as well.

PAYMENT

Since the highest possible quality for a firm or applicant is 4, the maximum payoff anyone can make per market is \$16. At the end of the experiment, we will determine your dollar payoffs by dividing your total token amount by the number of markets and multiplying by 2. Hence you will get **DOUBLE** your average token earnings in dollars. This is in addition to your show up fee.

THE STAGES OF A MARKET

Prior to year 1:

Firms announce which year they will begin receiving applications.

In each year:

12. Applicants send applications to firms.

13. Firms may hire any one applicant from the pool of applicants who had applied in a given year.

At the end of year 2:

Firms and applicants that were not matched by the end of the second year are matched by the computer. Applicants can only be matched to firms which had received their applications in either year 1 or year 2 of that market.

Announcement Stage: Precedes the start of the market. In that stage, participants in the FIRM role declare the year in which they wish to be available to APPLICANTS to send them resumes. That choice is 1, 2, or 3, corresponding to first, second, and third year, respectively. Prior to the year indicated, applicants cannot send resumes to the firm and hence the firm cannot hire applicants.

Market # 1	
YEAR # 1	
Action	I want to start hiring in year: <input type="text"/>
	<input type="submit" value="Submit"/>
	Private Information
	YOUR ROLE Firm
	You are Firm 4
	Your Quality is 4
	You have not hired anyone yet.

Each year: APPLICANTS enter in the box in the top right hand corner the id number of a firm to which they wish to send a resume (apply for a job). Clicking on the “send resume” button underneath the text box completes the application process. Applicants can apply to more than one position, with the limitation that the firm receiving the application must be on the market. Remember to click on *Finish* when done sending applications. The top table shows which firms will receive your applications. The next table shows which firms are available and which have hired or not yet entered the market. The last table shows applicants’ cumulative grades.

Market # 1				
YEAR # 1				
<p>Make sure to press Finish when you are done selecting firms.</p> <div style="text-align: right;"> <input type="button" value="Finish"/> </div>		<p>Send resume to firm: <input style="width: 50px;" type="text"/></p> <div style="text-align: center;"> <input type="button" value="Send resume"/> </div>		
Private Information				
YOUR ROLE Applicant				
You are Applicant 6				
You have been hired by nobody yet!				
Firms who will receive your resume				
Firm		Value of firm		
1		1		
2		2		
Firms on the market this year				
Firm	Announced entry in year	Available this year	Hired	Hired in year
1	1	YES	Nobody	0
2	1	YES	Nobody	0
3	1	YES	Nobody	0
4	1	YES	Nobody	0
{Applicants' cumulative grades for year 1 }				
Applicant		Cumulative Grade		
8		0		
6		2		
7		0		
5		2		

Each year: Following the applicants' decisions, each firm makes a hiring decision, by entering the number of an applicant in the box in the top right hand corner and pressing the "Make an offer" button. The applicants available to the firm are displayed in the top table under the title "Applicants who had sent you a resume." Notice that the information tables on the firm's screen closely resemble those on the applicants' screen.

Market # 1				
YEAR # 1				
Action	Hire applicant: <input style="width: 50px;" type="text"/>			
	<div style="border: 1px solid red; padding: 2px; display: inline-block; color: white; background-color: red;">Do not make any offers in this round</div>			
	<div style="border: 1px solid red; padding: 2px; display: inline-block; color: white; background-color: red;">Make an offer</div>			
	Private Information			
	YOUR ROLE Firm			
	You are Firm 4			
	Your Quality is 4			
	You have not hired anyone yet.			
Applicants who had sent you a resume				
Applicant				
6				
7				
8				
Firms on the market this year				
Firm	Announced entry in year	Available this year	Hired	Hired in year
1	1	YES	Nobody	0
2	3	NO	Nobody	0
3	2	NO	Nobody	0
4	1	YES	Nobody	0
(Applicants' cumulative grades for year 1)				
Applicant			Cumulative Grade	
8			2	
6			0	
7			1	
5			2	

At the end of year 2: If you are not matched by the end of year 2 of any market, the computer will match you in year 3 as follows: Unmatched firms and applicants will be sorted by qualities. The firm with the highest quality will be matched with the highest quality unemployed applicant that had sent this firm an application in either year 1 or year 2 or both. From the remaining unemployed applicant pool, the second highest quality firm will be matched with the highest quality applicant that had sent this firm an application in either year 1 or year 2 or both, and so on.

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Quiz

Applicant	YEAR 1	YEAR 2	YEAR 3
5	0	0	1
6	1	0	1
7	2	2	0
8	2	1	2

Imagine that the above table reflects the final grades after year 3 for the four applicants. You are firm 4. You hired applicant 7. Your payoff for this market is
