All That Glitters Is Not Gold: The Impact of Certification Costs in Online Labor Markets

Online Appendices

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Appendix A: Analytical Model

A-1: Model Notations

Table A1. Notation Table

Notation	Definition
q	Quality of the service, which follows a distribution from 0 to 1, with a probability density function $g(q) = 2(1-q)$.
q_i	Expected quality from a worker of type i.
θ	Level of certification test discernment.
c	Cost of certification test $c = c_t + c_e$. c_t is the monetary certification test cost. $c_e = \theta(1-q)$ is the effort and time cost of preparing the test.
α	Commission rate: percentage of the price paid to the platform.
f	Employer's cost of participating in the labor platform, which follows a uniform distribution from 0 to 1.
o	Employer's hassle cost of opening the worker profile and checking detailed certification information.
h_i	Hiring likelihood for a worker of type i.
n_i	Fraction of worker type i.
p_i	Price per job for a worker of type i.
w_i	Wage paid to hire a worker of type i, $w_i = (1-\alpha)p_i$.
π	Platform's profit.
i	$i = c$ (or $i = nc$) represents the case with (or without) certification.

A-2: Model Development

We solve the analytical model in Section 3.1. To characterize the equilibrium structure for any certification test cost, we derive the equilibrium price and hiring probability through backward induction, followed by proofs of the propositions.

Step 1: Derivation of the Employer Hiring, Equilibrium Price, and Platform Profit

The worker determines the optimal price by maximizing her expected earnings. The certified worker maximizes $h_c(p_c)(1-\alpha)p_c = (q_c - p_c)(1-\alpha)p_c$ by choosing p_c, and the uncertified worker maximizes $h_{nc}(p_{nc})(1-\alpha)p_{nc} = (q_{nc} - p_{nc})(1-\alpha)p_{nc}$ by choosing p_{nc}. To find the optimal prices, we solve for p_c and p_{nc} from the first-order conditions $\frac{\partial((q_c - p_c)(1-\alpha)p_c)}{\partial p_c} = 0$ and $\frac{\partial((q_{nc} - p_{nc})(1-\alpha)p_{nc})}{\partial p_{nc}} = 0$, respectively. Solving these, we obtain $p_c = \frac{q_c}{2}$, and $p_{nc} = \frac{q_{nc}}{2}$.

The employer makes hiring decisions based on her expected utility:

1) The employer will hire the worker regardless of worker type if $U_c^e(f) = q_c - p_c - f \geq 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f \geq 0$. This is equivalent to $f \leq \frac{q_{nc}}{2}$.
2) The employer will only hire the certified worker if $U_c^e(f) = q_c - p_c - f \geq 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f < 0$, or equivalently $\frac{q_{nc}}{2} < f \leq \frac{q_c}{2}$.
3) The employer will not hire any worker if $U_c^e(f) = q_c - p_c - f < 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f < 0$, or equivalently $f > \frac{q_c}{2}$.

A worker will choose to take the certification test if and only if their expected utility from certification is greater than or equal to their expected utility without certification: $U_c^w(q, p_c) = h_c(p_c)(1-\alpha)p_c - c \geq U_{nc}^w(q, p_{nc}) = h_{nc}(p_{nc})(1-\alpha)p_{nc}$, where $c = c_t + \theta(1-q')$. Otherwise, they will not take the test. To ensure that some workers choose to take the certification test while others do not, we define the marginal worker with quality $q' \in (0,1)$ as the one who is indifferent between taking or not taking the test. This worker satisfies:

$$U_c^w(q', p_c) = h_c(p_c)(1-\alpha)p_c - c_t - \theta(1-q') = U_{nc}^w(q', p_{nc}) = h_{nc}(p_{nc})(1-\alpha)p_{nc}.$$

As the effort cost $\theta(1-q)$, decreases with worker quality q, workers with quality $q \geq q'$ will take the

test, and $q < q'$ would not take the test. Substitute $h_i(p_i) = q_i - p_i$, with $p_i = \frac{q_i}{2}$ and rearranging, we obtain the equilibrium condition, $\frac{(1-\alpha)(q_c^2 - q_{nc}^2)}{4} - c_t - \theta(1-q') = 0$.

In equilibrium, the probability that a worker takes and passes the test is given by:

$$n_c = \int_{q'}^{1} 2(1-q)\,dq = 1 - 2q' + (q')^2,$$

and the probability that a worker does not take the test is

$$n_{nc} = \int_{0}^{q'} 2(1-q)\,dq = 2q' - (q')^2.$$

The equilibrium qualities are $q_c = \int_{q'}^{1} q \cdot 2(1-q)\,dq = \frac{1}{3}(1+2q')$ and $q_{nc} = \int_{0}^{q'} q \cdot 2(1-q)\,dq = \frac{q'(3-2q')}{3(2-q')}$. It is straightforward to show that $q_c > q_{nc}$.

Substituting the following expressions $q_c = \frac{1}{3}(1+2q')$, $q_{nc} = \frac{q'(3-2q')}{3(2-q')}$, $h_c = q_c - p_c$, $p_c = \frac{q_c}{2}$, $h_{nc} = q_{nc} - p_{nc}$, $p_{nc} = \frac{q_{nc}}{2}$, $n_c = 1 - 2q' + (q')^2$, and $n_{nc} = 2q' - (q')^2$ into the profit function $\pi = \alpha(p_c h_c n_c + p_{nc} h_{nc} n_{nc})$, we get

$$\pi = \frac{\alpha(2+3q'-8(q')^2+4(q')^3)}{36(2-q')}.$$

Step 2: Proofs of the Propositions

Proposition 1. After removing certification test costs (i.e., $c_t = 0$), in equilibrium, the number of certified workers increases.

Proof of Proposition 1:

In Step 1, we established that, at equilibrium, $\frac{(1-\alpha)(q_c^2 - q_{nc}^2)}{4} - c_t - \theta(1-q') = 0$. Substituting $q_c = \frac{1}{3}(1+2q')$ and $q_{nc} = \frac{q'(3-2q')}{3(2-q')}$, and then rearrange, we obtain:

$$c_t = f(q') = \frac{1-\alpha-36\theta+(3-3\alpha+72\theta)q'-(2-2\alpha+45\theta)(q')^2+9\theta(q')^3}{9(2-q')^2}.$$

Taking the derivative of $f(q')$ in respect to q', we have

$$\frac{\partial f(q')}{\partial q'} = \frac{(1-\alpha)(8-5q')+9\theta(2-q')^3}{9(2-q')^3} > 0.$$

This indicates that $f(q')$ increases with q', it follows that q' must also increase with c_t. Additionally, the fraction of certified workers is given by $n_c = 1 - 2q' + (q')^2$, which decreases in q'. This implies that n_c decreases in c_t.

Therefore, we can conclude that as the certification cost is eliminated, the number of certified workers will increase. ■

When the certification test cost is removed, workers who were previously uncertified may now find it profitable to invest the effort needed to obtain certification. This leads to an influx of certified workers following the removal of the test fee.

Proposition 2. After removing certification test costs (i.e., $c_t = 0$), in equilibrium, the likelihood of hiring certified workers and hiring uncertified workers both decreases. The difference between these two likelihoods also decreases.

Proof of Proposition 2:

(1) As proven earlier, the probability of hiring a certified worker is $h_c = q_c - p_c = \frac{q_c}{2} = \frac{1}{6}(1 + 2q')$, which increases in q'. Additionally, as established in the proof of Proposition 1, q' increases in the test cost c_t. Therefore, h_c also increases in test cost c_t.

Consequently, we can conclude that when the certification test cost c_t is removed, the likelihood of hiring certified workers decreases.

(2) Similarly, the probability of hiring an uncertified worker is given by: $h_{nc} = q_c - p_c = \frac{q_{nc}}{2} = \frac{q'(3-2q')}{6(2-q')}$, which increases in q'. Since q' increases in test cost c_t, it follows that h_{nc} also increases in test cost c_t.

Therefore, when the certification test cost c_t is removed, the likelihood of hiring uncertified workers decreases.

(3) Finally, the difference between the likelihood of hiring certified workers and the likelihood of hiring uncertified workers can be expressed as: $h_c - h_{nc} = \frac{q_c}{2} - \frac{q_{nc}}{2} = \frac{1}{6-3q'}$, which increases in q'. Since q' increases in test cost c_t, we can conclude that $h_c - h_{nc}$ also increases in test cost c_t.

Thus, we can conclude that when the certification test cost is removed, the difference between the likelihood of hiring certified and uncertified workers decreases. ■

Following policy implementation (i.e., removing the certification test cost), the hiring probability of workers with and without certification decreases. Furthermore, the hiring probability difference between certified and uncertified workers shrinks.

The impact of policy on the hiring probability is mainly driven by the change in the quality distribution among certified and uncertified workers. A direct effect of removing certification test costs is that the worker's net payoff from taking the test increases. However, the lower cost induces low-quality workers to take the test, who previously had chosen not to due to the high effort required for test preparation and the high test cost. As more low-quality workers become certified, the average quality of certified workers decreases, we refer to this decrease as the quality dilution effect. At the same time, among the workers who previously chose not to take the certification test, after the certification test cost is removed, more higher-quality workers take the test and receive certification, leading to an even lower average quality of workers in the uncertified group. Since employers can perceive the shift in the quality distribution between certified and uncertified workers, the overall reduction in quality for both worker types results in lower utility for employers when hiring these workers. Consequently, the hiring probabilities for both certified and uncertified workers decrease.

Finally, as the certification test cost is eliminated, the signal effect of the certification—defined as the disparity in average quality between certified and uncertified workers—is reduced due to a more negligible difference in average qualities between certified and uncertified workers. The diminished quality gap between certified and uncertified workers is also perceived by employers, leading to a reduction in the difference in hiring probabilities between certified and uncertified workers.

We further show that a similar effect occurs with the equilibrium price:

Proposition 3. After removing the certification test cost (i.e., $c_t = 0$), in equilibrium, the average price of hiring certified and uncertified workers both decreases. The difference between them also decreases.

Proof of Proposition 3:

(1) The price for certified worker is given by $p_c = \frac{q_c}{2} = \frac{1}{6}(1 + 2q')$, which increases in q'. As proved in the proof of Proposition 1, q' increases in the test cost c_t. Therefore, p_c also increases in test cost c_t. We can conclude that when the certification test cost c_t is removed, the price of hiring certified workers decreases.

(2) Similarly, the price for uncertified worker is given by $p_{nc} = \frac{q_{nc}}{2} = \frac{q'(3-2q')}{6(2-q')}$, which increases in q'. Since q' increases in the test cost c_t, we can conclude that p_{nc} also increases in the test cost c_t.

Therefore, when the certification test cost c_t is removed, the price of hiring uncertified workers decreases.

(3) Finally, the price of hiring certified workers minus the price of hiring uncertified workers can be expressed as $p_c - p_{nc} = \frac{q_c}{2} - \frac{q_{nc}}{2} = \frac{1}{6-3q'}$, which increases in q'. Since q' increases in the test cost c_t, we can conclude that $p_c - p_{nc}$ also increases in the test cost c_t.

Thus, when the certification test cost c_t is removed, the difference in prices for hiring certified and uncertified workers decreases. ■

A lower hiring probability, resulting from the reduced expected quality of both certified and uncertified workers, ultimately leads to lower utility for workers. To mitigate this negative impact, workers would lower their prices to encourage employers to hire them, thereby limiting the harm to their earnings. As a result, we observe lower prices for both certified and uncertified workers. Consequently, the gap between the equilibrium prices also diminishes.

In summary, our model shows opposing effects of cost removal on the platform. On the one hand, aligning with the platform's intuitive goal, since employers pay higher prices to certified workers than to uncertified workers, a lower certification test cost increases the number of certified workers (Proposition 1) and the fraction of contracts signed by certified workers in equilibrium. As a result, the platform can earn higher commissions, ultimately boosting its profit. On the other hand, the quality dilution effect decreases the hiring probabilities (Proposition 2) and prices (Proposition 3) for both certified and uncertified workers, which reduces the platform's profit. The following proposition formally summarizes our conjectures:

Proposition 4. After removing the certification test cost (i.e., $c_t = 0$), the platform profit is more likely to decrease.

Proof of Proposition 4:

In Step 1, we have derived the platform profit, which is given by

$$\pi = \alpha(p_c h_c n_c + p_{nc} h_{nc} n_{nc}) = \alpha \frac{(2+3q'-8(q')^2+4(q')^3)}{36(2-q')}.$$

It is straightforward to show that the platform profit π first increases with q' and then decreases with q', meaning the profit function follows an inverted U-shape in q'. Since Proposition 1 demonstrates that q' increases with the test cost c_t, the profit function also follows an inverted U-shape in q'. Profit will be

low if q' and the test cost are either too low or too high, and will be optimized when the test cost is at a moderate level.

Given that, in our dataset, the effort cost is low because the certification tests primarily consist of multiple-choice questions, and the platform removes the monetary certification test cost after the policy change, it is more likely that the test cost is in the "too low" range post-policy, leading to lower platform profits. ■

Proposition 4 indicates that the negative effect (e.g., a decrease in hiring probability and price) is more likely to outweigh the positive effect (e.g., an increase in the number of jobs completed by certified workers), leading to a reduction in profit.

A-3: Impact of the Level of Discernment on Platform Profit

Although setting the test cost to zero may diminish the signaling effect and potentially jeopardize the overall efficacy of the platform, this policy can benefit the financially disadvantaged high-quality workers in practice. To mitigate the adverse impact on the platform, a viable strategy is to improve the level of discernment θ. The next proposition examines the impact of increasing the certification test's level of discernment θ on the platform's profit.

Proposition 5. When the certification test's level of discernment θ increases, the platform profit is more likely to increase.

Proof of Proposition 5:

In Step 1, we established that, at equilibrium, $\frac{(1-\alpha)(q_c^2-q_{nc}^2)}{4} - c_t - \theta(1-q') = 0$. Setting $c_t = 0$ and substituting $q_c = \frac{1}{3}(1+2q')$ and $q_{nc} = \frac{q'(3-2q')}{3(2-q')}$, and then rearrange, we obtain:

$$\theta = f(q') = \frac{(1-\alpha)(1+3q'-2(q')^2)}{9(2-q')^2(1-q')}.$$

Taking the derivative of $f(q')$ in respect to q', we have

$$\frac{\partial f(q')}{\partial q'} = \frac{2(1-\alpha)(5-4q'-(q')^2+(q')^3)}{9(2-q')^3(1-q')^2} > 0.$$

This indicates that $f(q')$ increases with q', it follows that q' must also increase with θ.

In the proof of Proposition 4, we derived that the profit is a U-shaped curve in q', and that post-policy, the profit is more likely to fall within the range where q' is low and the profit function increases in q'.

Since we have just shown that the q' increases with θ, we can conclude that the profit is more likely to increase in θ. ■

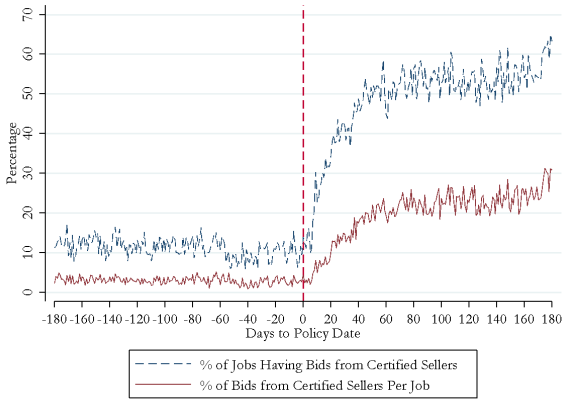
As θ increases, the disparity in the effort cost of passing the test among workers with distinct qualities becomes more pronounced, and so does the corresponding profit. This is because the increased signaling quality enables employers to distinguish high-quality workers from low-quality ones and, thus, makes them more willing to hire certified workers and pay higher wages.

Appendix B: Data

B-1: Effects of Zero-Cost Certification Tests Over Time

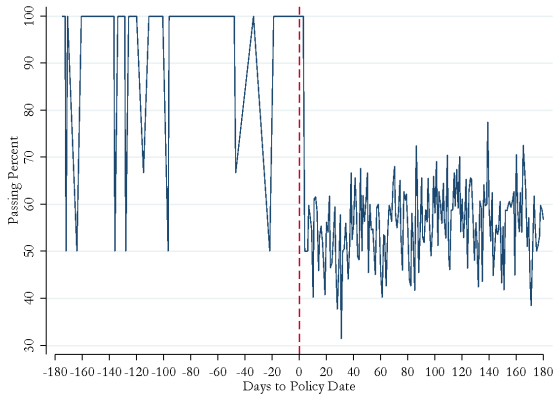
Figure B1. Effects of Zero-Cost Test Policy

(a) Percent of Jobs Receiving Bids and Bids per job from Certified Workers



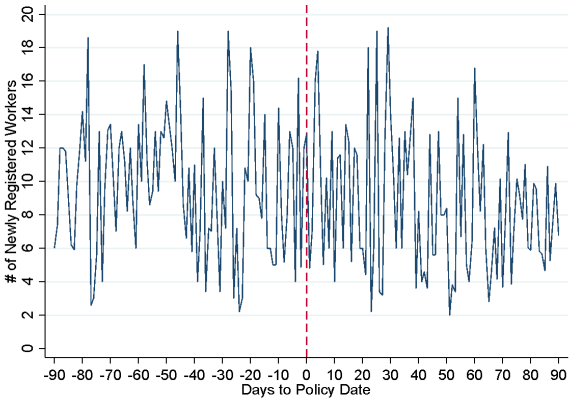
This graph shows that after the policy, the percentage of jobs receiving bids from certified workers and the percentage of bids per job from certified workers increased.

(b) Test Passing Rates



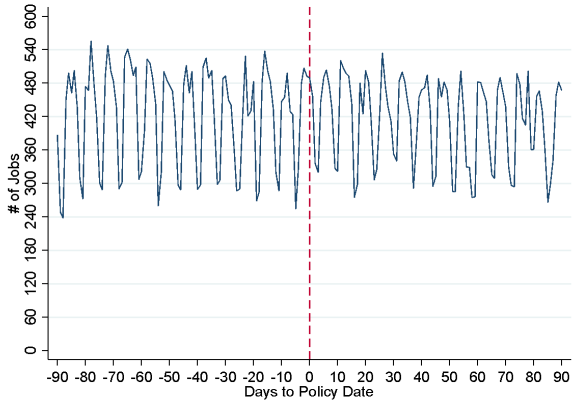
This graph shows that the certification test passing rates dropped dramatically after the policy.

(c) Number of Newly Registered Workers Over Time



This figure shows that the number of registered workers remained constant over time.

(d) Number of Posted Jobs Over Time



This figure shows that the number of posted jobs remained constant over time.

B-2: Descriptive Statistics for Additional Variables

Table B2. Variable Definitions, Measurement, and Descriptive Statistics

Variables	Explanations and Measurements	*Means*	*Std.*	*Min*	*Max*
	Panel A: Bidding Outcome, Auction Outcome, and Worker Quality				
HiredCertWorker	1 if the employer who creates a job hired a certified worker to complete the job	0.334	0.471	0	1
EnteringContract	1 if the employer who creates a job hired a worker to complete this job	0.708	0.455	0	1
	*Panel F: Employer and Job Characteristics**				
JobValueType	Variable that shows the job's possible value, with the following values: 1 ($0.01 - $99.99). 2 ($100 - $499.99).3 ($500 - $4999.99). 4($5000 - $24999.99). 5 (not sure)				
JobCategories	Category of the job. There are six main categories: Data Entry and Management, Graphical Design, Network and Software Application, Website and Software Development, Writing and Content Management, and Other				

Note. ǂ denotes variables measured at the bid level; n=1,085,795. ***** denotes variables measured at the project level, n=151,037.

B-3: Correlation Matrix of Key Variables

#	Variable Names	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	*Certified*	1														
2	*AfterPolicy*	0.30***	1													
3	*#OfRatings*	0.22***	0.04***	1												
4	*AvgRating*	0.19***	0.01***	0.66***	1											
5	*WorkerReg(months)*	0.15***	0.06***	0.69***	0.57***	1										
6	*HavingPic*	-0.02***	-0.16***	0.12***	0.11***	0.09***	1									
7	*HadSimiJobs*	0.18***	0.02***	0.68***	0.85***	0.57***	0.11***	1								
8	*BidAmount*	-0.01***	0	0	-0.06***	0.09***	-0.00***	-0.03***	1							
9	*BidOrder*	-0.05***	-0.02***	-0.10***	-0.12***	-0.04***	0.01***	-0.10***	0.05***	1						
10	*BidAmount Position*	0.03***	0.02***	0.13***	0.09***	0.10***	0.01***	0.08***	0.05***	-0.21***	1					
11	*SameCountry*	0.01***	-0.01***	-0.04***	-0.03***	-0.02***	-0.01***	-0.03***	0.01***	-0.03***	0.03***	1				
12	*EmployerReg(months)*	0.03***	0.04***	0.03***	0.04***	0.01***	-0.02***	0.02***	-0.19***	-0.05***	0.04***	-0.02***	1			
13	*EmployerExp*	0.02***	0.02***	0.05***	0.05***	0.01***	-0.01***	0.03***	-0.26***	-0.08***	0.05***	-0.02***	0.78***	1		
14	*Description Length*	-0.02***	-0.01***	-0.08***	-0.08***	-0.05***	-0.02***	-0.06***	0.17***	0.08***	-0.11***	0.01***	-0.01***	-0.04***	1	
15	*RatioOfCertBids*	0.53***	0.57***	0.12***	0.08***	0.10***	-0.08***	0.08***	-0.04***	-0.07***	0.03***	0	0.05***	0.04***	-0.04***	1
16	*#OfCertBids*	0.34***	0.64***	0.05***	0.02***	0.06***	-0.07***	0.03***	0.01***	0.36***	-0.11***	-0.02***	0.02***	-0.02***	0.03***	0.63***

Note. *** p<0.01, ** p<0.05, * p<0.1

B-4: Multicollinearity Analysis

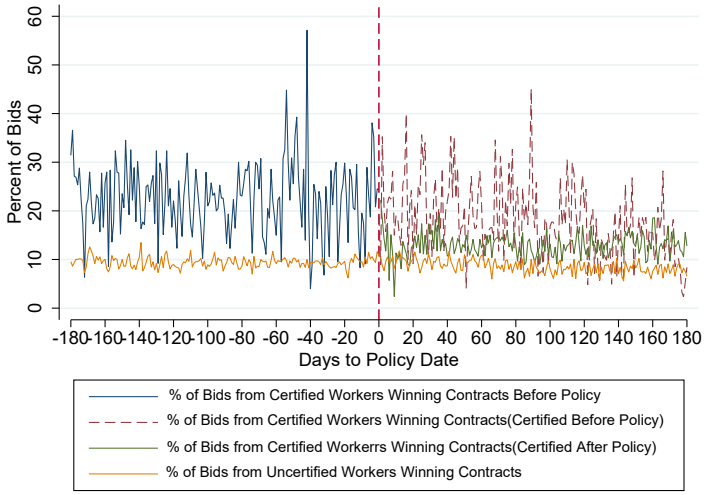
Variable	VIF	SQRT VIF	Tolerance	R-Squared	Eigenval	Cond Index
Certified	1.47	1.21	0.6795	0.3205	3.3089	1
AfterPolicy	2.05	1.43	0.4877	0.5123	0.1974	4.0945
Certified (Before Policy)	1.05	1.03	0.9499	0.0501	0.1487	4.7166
#OfRatings	2.62	1.62	0.381	0.619	2.4843	1.1541
AvgRating	3.86	1.96	0.2591	0.7409	2.1853	1.2305
WorkerReg(months)	2.08	1.44	0.4813	0.5187	1.5965	1.4397
HavingPic	1.05	1.02	0.953	0.047	1.2648	1.6174
MsgSentiment	2.04	1.43	0.49	0.51	1.042	1.782
MsgLen(log)	2.13	1.46	0.469	0.531	0.9988	1.8201
Readability(fkg)	1.03	1.01	0.9739	0.0261	0.9762	1.8411
BidAmount	1.19	1.09	0.8434	0.1566	0.9526	1.8637
BidOrder	1.53	1.24	0.6539	0.3461	0.9034	1.9138
BidAmtPosition	1.09	1.04	0.9168	0.0832	0.896	1.9217
SameCountry	1.01	1	0.9925	0.0075	0.7165	2.149
HadSimiJobs	3.94	1.99	0.2537	0.7463	0.6774	2.2101
EmployerReg(months)	2.54	1.59	0.3932	0.6068	0.5114	2.5437
EmployerExp	2.64	1.63	0.3786	0.6214	0.359	3.036
DescriptionLength	1.07	1.04	0.9318	0.0682	0.293	3.3608
#OfCertBids	2.44	1.56	0.4091	0.5909	0.2701	3.5001
RatioOfCertBids	3.11	1.76	0.3218	0.6782	0.2177	3.8988
Mean VIF	2			Condition Number		4.7166

Appendix C: Effects of Zero-Cost Certification Test Policy on Employers' Hiring Decisions

C-1: Model Free Evidence

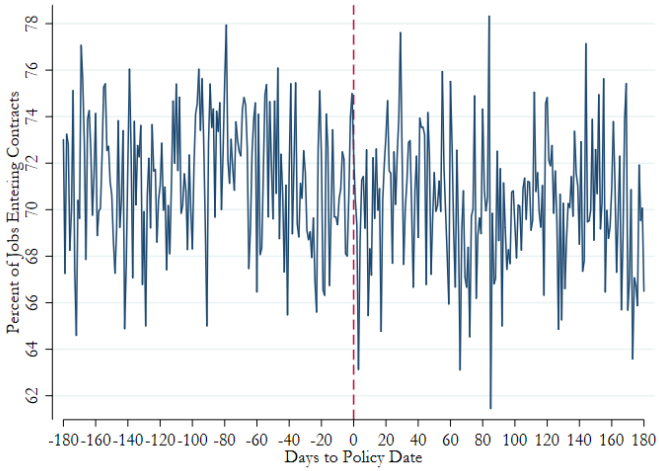
Figure C1. Contract Winning Rates Over Time for Different Workers and at Overall Platform

(a) Percent of Bids Winning Contracts (Uncertified Workers vs. Workers Certified Before Policy vs. Workers Certified After Policy)



This graph shows that 1) percent of bids from certified workers (including being certified both before and after policy) that won contracts dropped and the percentage of bids from workers being certified after policy dropped more than that for workers certified before the policy; (2) although bids from certified workers have higher contract-winning rates than those from uncertified workers, the gap narrowed (the differences shrank) after the policy; and (3) percent of bids winning contracts from uncertified workers dropped slightly after the policy.

(b) Percent of Jobs Entering Contracts



This graph shows that the percentage of jobs entering contracts dropped after the policy date.

C-2: Propensity Score Matching

Using propensity score matching, we examine the impact of removing certification costs on the relationship between certification and employers' hiring. We matched samples on worker, employer and job characteristics using a one-to-one nearest-neighbor matching approach without replacement. The following table reports the balance sheet after matching.

Table C1. Matching on Bids (1 Month Before and After Policy Date)

Variable	Mean		%bias	t-test		V(T)/V(C)
	Treated	*Control*		*t*	*p>t*	
#OfRatings	2.0233	2.0412	-1	-1.24	0.216	0.96*
AvgRating	6.909	6.9396	-0.7	-0.9	0.367	1
WorkerReg(months)	2.1587	2.1842	-2	-2.43	0.015	0.97*
HavingPic	0.45799	0.45858	-0.1	-0.15	0.884	.
HadSimiJobs	0.68978	0.69342	-0.8	-0.97	0.331	.
EmployerExp	2.741	2.7542	-0.9	-1.11	0.266	1
EmployerReg(months)	2.6256	2.6244	0.1	0.08	0.935	1.03*
DescriptionLength	4.1185	4.1471	-3	-3.69	0	1.10*
ProjectType($0.01 - $99.99)	0.57924	0.59499	-3.2	-1.14	0.252	.
ProjectType($100 - $499.99	0.1853	0.17789	1.9	0.69	0.492	.
ProjectType($500 - $4999.99)	0.02647	0.01857	3.7	1.89	0.059	.
ProjectType($5000 and above)	0	0	0	.	.	.
ProjectType(Uncertain Value)	0.20899	0.20855	0.1	0.04	0.969	.
Data Entry and Management	0.26719	0.27073	-0.8	-0.98	0.325	.
Graphical Design	0.25263	0.2525	0	0.04	0.971	.
Network and Software Application	0.45754	0.45568	0.4	0.46	0.644	.
Website and Software Development	0.60143	0.59678	1	1.17	0.242	.
Writing and Content Management	0.36694	0.36884	-0.4	-0.49	0.627	.
others	0.2985	0.29469	0.8	1.03	0.304	.
RatioOfCertBids	0.00768	0.00849	-0.8	-0.51	0.612	0.30*
#OfCertified	0.07965	0.07879	0.2	0.09	0.93	1.03
Matching on Bids (1 Month Before and 3rd Month After Policy Date)						
#OfRatings	2.0915	2.1216	-1.7	-1.09	0.277	0.96*
AvgRating	7.0243	6.9766	1.2	0.76	0.447	0.98
WorkerReg(months)	2.2954	2.3514	-4.4	-2.85	0.004	0.97*
HavingPic	0.43639	0.43165	1	0.63	0.53	.
HadSimiJobs	0.69645	0.7007	-0.9	-0.61	0.543	.

EmployerExp	2.8421	2.8011	2.8	1.9	0.058	0.94*
EmployerReg(months)	2.7692	2.6827	4.7	3.18	0.001	0.96*
DescriptionLength	4.1408	4.1121	3	1.13	0.259	1.11*
ProjectType($0.01 - $99.99)	0.55749	0.5613	-0.8	-0.26	0.792	.
ProjectType($100 - $499.99	0.18098	0.16987	2.8	1	0.317	.
ProjectType($500 - $4999.99)	0.05287	0.04924	1.7	0.57	0.571	.
ProjectType($5000 and above)	0	0	0	.	.	.
ProjectType(Uncertain Value)	0.20866	0.2196	-2.6	-0.92	0.359	.
Data Entry and Management	0.25968	0.2731	-3	-2.04	0.042	.
Graphical Design	0.22787	0.19088	8.4	6.03	0	.
Network and Software Application	0.44041	0.46368	-4.7	-3.13	0.002	.
Website and Software Development	0.57963	0.60289	-4.8	-3.16	0.002	.
Writing and Content Management	0.34674	0.35562	-1.8	-1.25	0.213	.
others	0.32336	0.332	-1.9	-1.23	0.218	.
RatioOfCertBids	0.00988	0.01088	-1	-0.49	0.624	0.30*
#OfCertified	0.16798	0.19306	-4	-2.39	0.017	0.96

Note. *** p<0.01, ** p<0.05, * p<0.1

C-3: Ruling Out Alternative Explanations

One concern might be whether some unobserved covariation rather than the zero-cost certification test policy caused changes in employers' views on certified workers witnessed in the data. To address this concern, we implement four approaches.

C-3 (a): Employers Who Were Workers Before Policy

In the first approach, we exploited the fact that the platform has sent the certification-cost-reduction announcement directly to workers (but not employers), such that some employers who also had worked as workers before the policy change would have received such notification because their "role" in the platform database would include "worker." This awareness differential allowed us to verify that our previous findings resulted from the policy that freed certification tests. We narrowed down the data to jobs posted by employers within three months after the policy change. A total of 3,140 jobs were posted by 983 employers who were active workers before the policy change; and 4,233 jobs were posted by 1,732 employers who were not. The unit analysis is at the job level. We estimate logit regression. The outcome variable is whether the employer who created the job hired a certified worker (*HireCertWorker*). The main independent variable, a binary variable, indicates whether employers who posted the jobs were active workers before the policy (*BothEmployerWorker*). We control employer and job characteristics, the average of workers, bid (including BidAmount and SameCountry), and worker's message characteristics at the job level. The result in Table C2 column 1 showed that the coefficient of *BothEmployerWorker* is negative and statistically significant at .01 level. We find that employers who were active workers before the policy and likely received notification about the zero-cost certification test policy are less likely to hire certified workers than employers who were not previously workers on the platform.

C-3 (b): Employers Who Posted Jobs Both Before and After Policy

In the second approach, we notice that some employers posted jobs before and after the policy change, and their jobs received bids from certified workers. These employees were likely aware of the jump in the bids from certified workers for jobs posted after the policy change. If there is a quality dilution effect on employers' perceived quality, employers will likely be less satisfied with the pool of bidding workers. Thus, we would have expected that when all else was equal, the same employers would have been less likely to choose any workers after the policy change than before the policy change.[1] We identified 1,456 employers who were not active workers before the policy change and received bids from certified workers for their 22,534 jobs posted within three months both before and after the policy change. We first match their jobs before policy and after policy on job characteristics and average bidder characteristics

[1] Thank AE for this great suggestion.

(e.g., average bidders' rating and number of ratings). Then, we used the matched sample for analysis. The unit analysis is at the job level. The dependent variable is a binary variable measuring whether an employer who posts a job has chosen any worker to work on their job. The main independent variable was *AfterPolicy*. We estimate an OLS regression with employer-fixed effects and control for the same information as the previous analysis. The result in Table C2 column 2 showed that the coefficient of *AfterPolicy* is negative and statistically significant at the 5% level. We find that employers who posted jobs before and after the policy change and received bids from certified workers were less likely to hire any workers.

Table C2. Effects of Zero-Cost Certification Test Policy on Whether Hiring Certified Workers (Employers were Active Workers before Policy or Employers Having Jobs Both Before and After Policy)

Variables	DV: Whether Choosing a Certified Worker	DV: Whether Choosing a Worker
BothEmployerWorker	-0.2867***	
	(0.0693)	
AfterPolicy		-0.0271**
		(0.0127)
Worker Information	YES	YES
Worker Message Information	YES	YES
Bid Information	YES	YES
Job Information	YES	YES
Employer Information	YES	YES
Observations	7,371	19,858
Job Value Type Fixed Effects	YES	YES
Job Category Fixed Effects	YES	YES
Year-month Fixed Effects	YES	YES
Employer Fixed Effects	NO	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

C-3 (c): Online Controlled Experiment

Our findings thus far support hypothesis 1: Employers are less likely to choose certified workers after the free-test policy. To ensure the validity of these findings, we conduct an online experiment using the following procedure.

Sampling and Experimental Procedure

We recruited 154 working adults in the United States via a U.K.-based survey response panel (Prolific) with pay. We decided a priori on this sample size by conducting a power analysis. Specifically, we used the G*Power software (Erdfelder et al. 1996) to conduct a power analysis for a one-way ANOVA test for two groups and 80% power to detect a small-to-medium effect (f = 0.25). This analysis determined that the sample size should be 128. We restricted participation to PC users. Participants who failed any of the three attention check questions (e.g., "*What can a freelancer specify when bidding on a job?*") were dropped from the analysis (n = 8). The final dataset included 146 respondents who were 63% female, 69.6% Caucasian, 14.2% Asian, 10.1% Black or African American, 6.1% of other races, and an average age of 35.5 years.

Procedurally, this study used a between-group design to manipulate job applicants' attributes. Specifically, the design manipulated two levels of certification test cost ($0 versus $50). Using random assignment to certification cost condition of either $0 or $50, each participant received information about six job applicants. Each job applicant had a similar number of ratings and average rating, and their bids for the jobs were similar in dollar amount. We kept the set of job applicants the same for each participant because we needed to ensure that our manipulation of certification test cost would be salient and *not* diluted by variance in job applicants.

All participants were first instructed to imagine that (1) they are the owners of a food truck and are trying to hire a freelancer to design a website that can show a menu, open hours, locations and allow online orders; (2) that a good friend of them who is an IT person suggests that they hire a freelancer on websites such as Freelancer.com or Upwork.com where they would typically receive multiple bids from freelancers for the job; (3) that freelancers will specify how much they need to complete the job (i.e., bid amount); (4) that they can see these freelancers' backgrounds (i.e., number of ratings and average of these ratings received from previous employers and the certificate they have (if the freelancer had)). Then, these participants will read explanations about the background information. Most importantly, they will receive the following information about the certification test ($X will be replaced with a randomly assigned value of either $0 or $50):

*"Freelancers who take the test would pay a fee of **$X** each time he or she makes an attempt. Not all of those who try would pass. The icon will appear only when they have passed a test. The cost of the tests is set by the platform."*

To proceed to the next screen, these participants must answer questions that test their understanding of average rating, bid amount, the name of a certificate example, and certification. They also needed to answer a manipulation question about the certification test cost. (Answer options: $0, $10, or $50)

In the next screen, these participants would read the job description and the following instructions:

"Suppose that you have now received 6 bids from 6 different freelancers for this job, and the website shows their info in the table below."

Participants would see six different bids randomly ordered vertically; each bid shows the bidder's number of ratings, an average of ratings, certificates if any, and bid amount. After viewing these bids, these participants need to click and drag freelancers to rank them based on their hiring preference from the highest (most likely that they would hire) to the lowest (less likely). Additionally, participants needed to rate how workers' certificates, average rating, number of ratings, and bid amount to complete the job affect their hiring decisions using a 5-point Likert scale (1- not at all, 5- Extremely Much). Finally, participants were asked to provide their demographics.

Figure C2 provides screenshots of these stages.

Measures and Variables

SelectionRank. Participants ranked the hiring likelihood of each job applicant from highest (1) to lowest (6).

CostType. This indicator equals one if the participant was randomly assigned to a scenario in which the certification test cost was $0. Otherwise, it is 0.

Certified. It is an indicator that equals one if a job applicant is certified. Otherwise, 0.

Control Variables. We controlled for each job applicant's number of ratings (#OfRating), average rating, and bid amount.

Manipulation Check

We ran a one-factor ANOVA analysis to test whether participants realized the manipulation of certification test cost. We found that all randomly assigned participants to scenarios designed to have $0 or $50 certification tests perfectly selected $0 or $50, respectively. Thus, our manipulation of certification cost was effective.

Hypothesis Testing and Results

We analyze how participants combine attributes of job applicants into overall evaluations of the attractiveness of these alternatives and rank them for hiring. The outcome variable is the hiring probability rank by participants from highest (1) to lowest (6). Thus, we implemented rank-ordered logit regression with the participant's ID as a grouping variable to test our hypotheses (Beggs et al. 1981). The main independent variable is *Certified* and its interaction term with *CostType*. We estimate two model

specifications. One specification only includes Certified without its interaction term with CostType. Another specification adds the interaction term to specification 1. All models include control variables (i.e., number of ratings, average rating, and bid amount) and have reverse settings since the ranking value for the most preferred job applicant is 1 rather than 6.

Table C3 reports the results. Consistent with Hypothesis 1, we found that the coefficient of the interaction term between *Certified* and *CostType* is negative and statistically significant (-0.4283, $p<0.1$). This result suggests that participants in $0 certification test cases are less likely to rank certified job applications as highly as participants in randomly assigned $50 certification test cases.

Table C3. Effects of Certification and Cost Type on Hiring Ranking

Variables	DV: *SelectionRank*	DV: *SelectionRank*
Certified	1.9875***	2.2219***
	(0.1716)	(0.2316)
Certified×CostType		-0.4283*
		(0.2371)
#OfRating	0.7229***	0.7398***
	(0.1593)	(0.1609)
BidAmount	-2.1659***	-2.1938***
	(0.3088)	(0.3117)
AvgRating	0.8524***	0.8518***
	(0.1273)	(0.1276)
Observations	876	876
Number of groups	146	146

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Underlying Mechanism

We explore underlying mechanisms for participants' hiring preferences by asking participants (serving employers' roles) to rate the several important mechanisms that might affect their hiring decisions using a 5-point Likert scale (1- not at all, 5- extremely). These mechanisms include worker's certificates, average rating, number of ratings, and worker's asked amount to complete the job. Then, we compare ratings for certificates between $0 test cost group and $50 test cost group. Since the rating is not normally distributed, the result in Table C4 from a Wilcoxon-Mann-Whitney test (Harris and Hardin 2013) shows that certificates in $50 test group are rated as more important than certificates in the $0 groups and the difference is statistically significant (sum of rank: 202989 vs. 181137, p<0.01). Our two-sample t-test shows that the average importance rating in $50 group is higher than that in $0 group (4.33 vs. 4.19,

p<0.05). This result verifies our proposed mechanisms–when the certification test cost is zero, the signaling value of certification decreases.

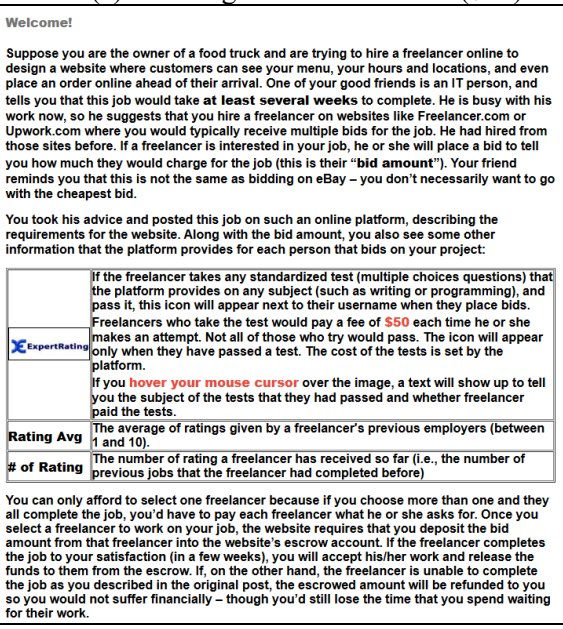
Table C4. Two-sample Wilcoxon rank-sum (Mann–Whitney) test of the Importance of Certification

Certification Test Cost	Obs	Rank Sum	Z Score
$0	438	181137	-3.171 (p<0.01)
$50	438	202989	

Our experiment supports our hypotheses. These patterns suggest that, as we predicted, job recruiters' hiring decisions are influenced by certification test costs. Furthermore, these results lend further support to our findings based on the analyses of the archival data.

Figure C2. Screenshots of Experiment Design

(a) i. Background Information ($50)



Welcome!

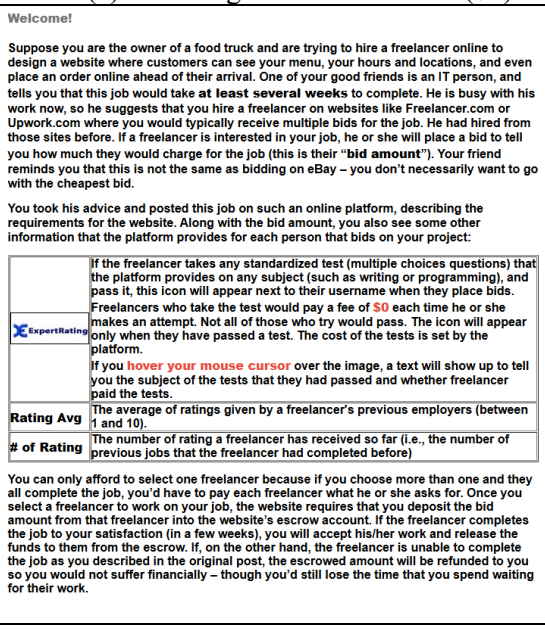
Suppose you are the owner of a food truck and are trying to hire a freelancer online to design a website where customers can see your menu, your hours and locations, and even place an order online ahead of their arrival. One of your good friends is an IT person, and tells you that this job would take **at least several weeks** to complete. He is busy with his work now, so he suggests that you hire a freelancer on websites like Freelancer.com or Upwork.com where you would typically receive multiple bids for the job. He had hired from those sites before. If a freelancer is interested in your job, he or she will place a bid to tell you how much they would charge for the job (this is their "**bid amount**"). Your friend reminds you that this is not the same as bidding on eBay – you don't necessarily want to go with the cheapest bid.

You took his advice and posted this job on such an online platform, describing the requirements for the website. Along with the bid amount, you also see some other information that the platform provides for each person that bids on your project:

ExpertRating	If the freelancer takes any standardized test (multiple choices questions) that the platform provides on any subject (such as writing or programming), and pass it, this icon will appear next to their username when they place bids. Freelancers who take the test would pay a fee of $50 each time he or she makes an attempt. Not all of those who try would pass. The icon will appear only when they have passed a test. The cost of the tests is set by the platform. If you hover your mouse cursor over the image, a text will show up to tell you the subject of the tests that they had passed and whether freelancer paid the tests.
Rating Avg	The average of ratings given by a freelancer's previous employers (between 1 and 10).
# of Rating	The number of rating a freelancer has received so far (i.e., the number of previous jobs that the freelancer had completed before)

You can only afford to select one freelancer because if you choose more than one and they all complete the job, you'd have to pay each freelancer what he or she asks for. Once you select a freelancer to work on your job, the website requires that you deposit the bid amount from that freelancer into the website's escrow account. If the freelancer completes the job to your satisfaction (in a few weeks), you will accept his/her work and release the funds to them from the escrow. If, on the other hand, the freelancer is unable to complete the job as you described in the original post, the escrowed amount will be refunded to you so you would not suffer financially – though you'd still lose the time that you spend waiting for their work.

(a) ii. Background Information ($0)



Welcome!

Suppose you are the owner of a food truck and are trying to hire a freelancer online to design a website where customers can see your menu, your hours and locations, and even place an order online ahead of their arrival. One of your good friends is an IT person, and tells you that this job would take **at least several weeks** to complete. He is busy with his work now, so he suggests that you hire a freelancer on websites like Freelancer.com or Upwork.com where you would typically receive multiple bids for the job. He had hired from those sites before. If a freelancer is interested in your job, he or she will place a bid to tell you how much they would charge for the job (this is their "**bid amount**"). Your friend reminds you that this is not the same as bidding on eBay – you don't necessarily want to go with the cheapest bid.

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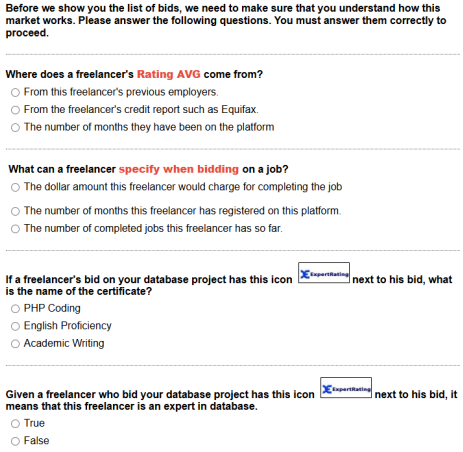
Rating Avg	The average of ratings given by a freelancer's previous employers (between 1 and 10).
# of Rating	The number of rating a freelancer has received so far (i.e., the number of previous jobs that the freelancer had completed before)

You can only afford to select one freelancer because if you choose more than one and they all complete the job, you'd have to pay each freelancer what he or she asks for. Once you select a freelancer to work on your job, the website requires that you deposit the bid amount from that freelancer into the website's escrow account. If the freelancer completes the job to your satisfaction (in a few weeks), you will accept his/her work and release the funds to them from the escrow. If, on the other hand, the freelancer is unable to complete the job as you described in the original post, the escrowed amount will be refunded to you so you would not suffer financially – though you'd still lose the time that you spend waiting for their work.

(b) Background Understanding Questions



Before we show you the list of bids, we need to make sure that you understand how this market works. Please answer the following questions. You must answer them correctly to proceed.

Where does a freelancer's Rating AVG come from?
- From this freelancer's previous employers.
- From the freelancer's credit report such as Equifax.
- The number of months they have been on the platform

What can a freelancer specify when bidding on a job?
- The dollar amount this freelancer would charge for completing the job
- The number of months this freelancer has registered on this platform.
- The number of completed jobs this freelancer has so far.

If a freelancer's bid on your database project has this icon ExpertRating next to his bid, what is the name of the certificate?
- PHP Coding
- English Proficiency
- Academic Writing

Given a freelancer who bid your database project has this icon ExpertRating next to his bid, it means that this freelancer is an expert in database.
- True
- False

(c) Manipulation Question

How much does a certification test cost?

- ○ $0
- ○ $10
- ○ $50

Please click >> to continue once you verify your answers.

(d) Hiring Questions

I need someone to build a website for my food truck. The website doesn't need to be fancy but should be generally easy to use (it's fine to use a template). However, it should allow me to show my menu, hours and locations, and allow customers to place an order online before they come and pick up. To place an order they'd need to enter their food choice, their name and phone number, and their estimated pickup time.

Suppose that you have now received 6 bids from 6 different freelancers for this job, and the website shows their info in the table below.

Note: Bidder usernames were automatically generated and given by platform.

Username	Rating Avg / # of Ratings	Bid Amount
URC	9.44 / 24 RATINGS	$197
W7B ExpertRating	9.39/ 22 RATINGS	$199
KDY ExpertRating	9.40 /23 RATINGS	$198
REQ	9.43 /23 RATINGS	$198
5MA ExpertRating	9.44 / 24 RATINGS	$200
PTW	9.39 / 24 RATINGS	$199

Overall, how confident that you'll be able to find a good freelancer based on the information shown above?

	Scale				
	Not at all 1	Somehow 2	Moderately 3	Much 4	Extremely much 5
	○	○	○	○	○

Please click on and drag freelancer IDs below to rank them based on your hiring preference from highest (most likely that you'd hire) to the lowest (least likely):

- Freelancer PTW
- Freelander 5MA
- Freelander REQ
- Freelander KDY
- Freelander W7B
- Freelander URC

Please rate the importance of each of the following for your decision-making:

	Scale				
	Not at all 1	Somehow 2	Moderately 3	Much 4	Extremely much 5
Bid Amount	○	○	○	○	○
ExpertRating	○	○	○	○	○
# of Ratings	○	○	○	○	○
Rating AVG	○	○	○	○	○

(e) Demographics

In order for us to be able to describe this study's sample, please answer these questions. Remember NO findings can be linked to you because all data will be reported in the aggregate (e.g., % of men, % of women, etc.).

What is your race? (Choose only one category)

- ○ White, Anglo, or Caucasian
- ○ Black or African American
- ○ American Indian or Alaskan Native
- ○ Asian
- ○ Native Hawaiian or Other Pacific Islander
- ○ Other NonWhite Race

What is your age?

What is your gender?

- ○ Male
- ○ Female
- ○ non-binary

C-3 (d): Falsification Tests

We conducted a series of falsification tests to address concerns that unobserved factors may drive our findings. If a factor other than the zero-cost certification policy caused employers to hire fewer certified workers, it should have led to similar hiring patterns even without the policy. In that case, we would observe the same effects under hypothetical policy shocks. If no such effects emerge, it further supports our conclusions.

For these tests, we use all bids for jobs posted six months before the actual policy change, assuming the policy was enacted at the start of the 5th, 4th, 3rd, and 2nd months prior. We then analyze employers' hiring decisions around these hypothetical policy dates, comparing certified bidders' hiring rates one month before and after each assumed implementation. For all tests, we estimate conditional fixed-effects logit models regressing *Awarded* on *Certified, AfterPolicy (Hypothetical),* their interaction, and bid, worker, and message characteristics. The results (Table C5) consistently show no effect from these hypothetical policies, reinforcing that our findings are driven by the actual policy change.

Table C5. Effects of Certification and Zero-Cost Certification Test Policy on Employers' Hiring Decisions Before and After Policy Change
(Falsification Tests Using Different Hypothetical Policy Dates)

Variables	All Bids (6th and 5th Mons Before)	All Bids (5th and 4th Mons Before)	All Bids (4th and 3rd Mons Before)	All Bids (3rd and 2nd Mons Before)
	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*
Certified	0.446***	0.404***	0.361***	0.274**
	(0.101)	(0.102)	(0.109)	(0.117)
AfterPolicy(Hypothetical) × *Certified*	-0.018	-0.027	-0.180	-0.065
	(0.142)	(0.146)	(0.158)	(0.184)
CONTROLS	YES	YES	YES	YES
Observations	105,111	105,125	107,559	106,749
Job fixed effects	YES	YES	YES	YES

***Note*:** All columns report coefficients and standard errors from conditional fixed effects logit regressions of *Awarded* on *Certified, AfterPolicy(Hypothetical),* and their interaction term*,* bid, worker, and worker message characteristics. Columns 1 to 4 use all bids for jobs posted 6th or 5th month before the policy date, 5^{h} or 4th month before the policy date, 4^{h} or 3rd month before the policy date, and 3rd or 2nd month before the policy date. *** and ** indicate statistical significance at the 1% and 5% levels, respectively. All estimations include project fixed effects.

C-4: Robustness Tests

C-4 (a): Heterogeneity of Workers and Employers

Because experience plays a vital role in online labor market hiring (Chan and Wang 2017), employers likely respond to the policy differently depending on their own experience and that of bidding workers. This may have created boundary conditions for our findings. When an inexperienced worker applied for a posted job, the employer who created the job may have relied more on worker certification because little verified information (e.g., past working records) was available for evaluating the worker. When an employer with no hiring experience browsed job applicants to make a hiring decision, this inexperienced employer may have relied more on worker certification. If true, either of these two scenarios would have affected our findings. Therefore, we examined how employer and worker heterogeneity in terms of experience affected our results.

According to Pallais (2014), inexperienced workers who have not completed any jobs or received ratings are more likely to be unemployed. Because the significance of certification for these workers is a key factor that platforms often use to promote certifications, it is crucial to understand the impact of a zero-cost certification test policy on the workers. In this part of our study, we defined inexperienced workers as those with no prior ratings (comprising over 70% of all workers) before bidding. We analyzed the effect of certification on the employment of these inexperienced workers both before and after the policy change. We collected all bid data for jobs posted within one month before and one month after the policy implementation date. We found that 4,814 new workers made 26,709 bids before the policy change, whereas 4,657 new workers submitted 26,801 bids after the policy took effect.

We estimate three different model specifications. The first two specifications study the impact of certification on inexperienced workers' contract winning before policy and after policy, respectively. We replace the rating information (i.e., *#OfRating* and *AvgRating*) in equation (1) with a dummy variable (*NoRating*), which allows us to capture whether workers had any ratings at the time of bid (1 if yes, 0 otherwise), and its interaction term with *Certified*. The last model specification compares hiring rates between bids placed before and after policy by new workers. We follow the exact estimation procedure in the main analysis to obtain the effects of policy change on hiring. Specifically, we implement PSM (one-to-one nearest neighbor matching without replacement) to match bids placed before and after policy by new workers on worker, employer, and job characteristics (including the number and proportion of bids from certified workers for a job) in Table 1. Then, we conducted sensitivity analyses to confirm that the matching was insensitive to other confounding factors. Finally, we used the matched samples to estimate the logit model specified in equation (6) in the main paper.

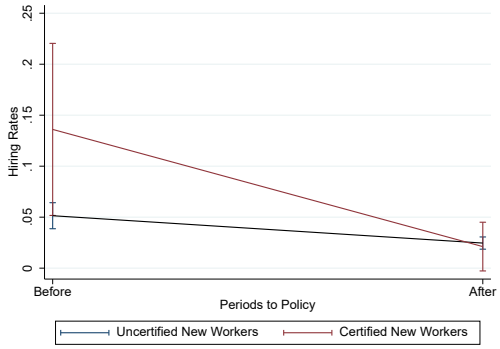
Table C6 reports the results. The coefficients of *NoRating* are negative in all columns. We find that new workers are (as expected) less likely to win contracts than experienced workers, consistent with Lin et al. (2018). However, the coefficients of *Certified*×*NoRating*, the interaction term between certification and no rating (new workers), are all positive but only statistically significant at the .05 level in column 1. This suggests that new workers only benefit from certification before the free-test policy. When certification tests are zero-cost, new workers no longer benefit from receiving certifications; the negative, statistically significant coefficient of *Certified*×*AfterPolicy* in column 3 and Figure C3 shows this finding.

Table C6. Effect of Certification and Zero-Cost Certification Test Policy on Employer's Hiring Decisions (Inexperienced Workers)

Variables	All Bids (1 Mon Before)	All Bids (1 Mon After)	All Bids (1 Mon Before and After)
	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*
Certified	0.5197***	0.3061***	1.0664***
	(0.1284)	(0.0685)	(0.3470)
NoRating	-0.2536***	-0.2120**	
	(0.0873)	(0.0895)	
Certified× *NoRating*	0.8285**	0.0108	
	(0.3507)	(0.2628)	
AfterPolicy			-0.7651***
			(0.2400)
Certified×*AfterPolicy*			-1.2211*
			(0.6747)
Worker Information	YES	YES	YES
Worker Message Information	YES	YES	YES
Bid Information	YES	YES	YES
Job Information	NO	NO	YES
Employer Information	NO	NO	YES
Observations	50,336	50,009	18,201
Job Fixed Effects	YES	YES	NO

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05

Figure C3. Hiring Rates for New Workers (certified vs. uncertified)



Employers are the decision makers who decide whether they will hire a bidding worker. Their experience in this marketplace likely affects their decisions. While experienced employers likely choose bidding workers based on criteria formed from their own experience and thus be less influenced by advertised quality signals such as third-party certification, inexperienced employers who lack experience in this market need to seek all available tools to make the judgment; certification is likely one of such tools. If our conjecture is true, inexperienced employers are more likely to enter contracts with certified workers than experienced employers. The effects are likely magnified after policy when certification becomes more visible on the platform. We extract all jobs that received bids from certified workers to test our conjectures. We define employers with no completed jobs and just registered as employers on the studied platform as inexperienced employers and employers with at least four completed jobs (more than 75 percent of employers in our dataset) as experienced workers. A total of 1,413 (2,273) inexperienced (experienced) employers posted 1,763 (5,193) jobs that received bids from certified workers before policy. A total of 5,950 (4,177) inexperienced (experienced) employers posted 10,982 (18,601) jobs that received bids from certified workers after policy.

We employed logistic regressions with standard robust errors to test whether inexperienced employers receiving bids from certified workers are more likely to hire certified workers for their jobs than experienced employers. The unit analysis is at the job level. The dependent variable is a binary variable showing whether an employer hired a certified worker for his job. We estimate three model specifications. Specifications 1 and 2 use jobs posted before and after policy, respectively. We test how inexperienced employers consider certification before and after policy. The independent variable is *InexpEmployer*, a binary variable that indicates whether the employer is inexperienced. The last specification tests whether and how inexperienced workers change their views on certified workers after policy. The independent variable becomes the interaction of *InexpEmployer* and *AfterPolicy*. To address the concern the jobs may differ before and after policy, we use PSM (one-to-one nearest neighbor matching without replacement) to match jobs posted before and after policy on employer and job

characteristics and *#OfCertified* and *RatioOfCertBids*. We used matched pairs for analysis. In all model specifications, we control job characteristics and worker, bid, and worker's message characteristics aggregated to job level.

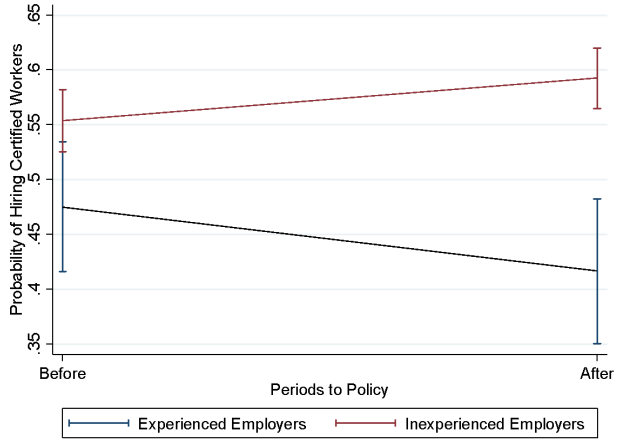
Table C7 reports the results. The coefficients of *InexpEmployer* in columns 1 to 3 are positive and significant at .01 levels. These show that inexperienced employers, as expected, are more likely to hire certified workers than experienced employers. The coefficient of interaction term between *InexpEmployer* and *AfterPolicy* in column 3 is positive and significant, supporting our conjectures that inexperienced employers are more likely to hire certified workers after policy. Figure C4 provides further support to our findings.

Table C7. Effects of Zero-Cost Certification Test Policy on Employer's Hiring Decisions (Inexperienced Employers vs. Experienced Employers)

Variables	All Jobs (6 Mons Before)	All Jobs (6 Mons After)	All Jobs (6 Mons Before and After)
	DV: Hiring Certified Workers	DV: Hiring Certified Workers	DV: Hiring Certified Workers
InexpEmployer	0.568***	0.283***	0.3570***
	(0.108)	(0.034)	(0.1313)
AfterPolicy			-0.2281
			(0.1806)
InexpEmployer × *AfterPolicy*			0.3546*
			(0.1965)
Worker Information	YES	YES	YES
Worker Message Information	YES	YES	YES
Bid Information	YES	YES	YES
Job Information	YES	YES	YES
Employer Information	YES	YES	YES
Observations	6,956	29,583	5,373
Job Category Fixed Effects	YES	YES	YES
Job-value Fixed Effects	YES	YES	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, * p<0.1. We excluded *EmployerReg(months)* and *EmployerExperience* because of their high correlation (at least 0.87) with *InexpBuyer.*

Figure C4. Rates of hiring certified workers (Inexperienced vs. Experienced Buyers)



C-4 (b): Worker Panel Analysis

The conditional logit models we analyzed so far are based on the natural grouping of bids (i.e., bids placed on the same job form a "pool" from which the employer chooses a winner). To ensure the robustness of our results, we adopt an orthogonal approach and focus on the worker side instead since our dataset provides a unique identifier for each worker. We aim to rely on within-worker variations in terms of contract-winning probabilities and try to associate that with a zero-cost certification policy. To construct a worker panel dataset, we trace the worker's bidding history within three months after the policy implementation. Workers who only placed one bid or whose bids all won or failed during our study period are excluded because they will not offer the within-worker variation that this analysis requires. This new dataset includes 424,548 bids from 7,692 workers. We estimate a worker panel model on this dataset. The unit of analysis remains at the bid level. The dependent is still *Awarded* and the main independent variables are *Certified*, *AfterPolicy*, and their interaction terms. We run an OLS regression with worker fixed-effects estimators. The model includes all controls in Table 1. We report the results in Appendix Table C8. The coefficients of *AfterPolicy* and its interaction term with *Certified* are all negative and statistically significant at the .01 level. This again supports the finding that certified workers are less likely to win contracts after the policy (compared to before).

Table C8. Effects of Zero-Cost Certification Test Policy on Employers' Hiring Decisions (Worker Panel Analysis)

Variables	DV: *Awarded*
AfterPolicy	-0.0298***
	(0.0042)
Certified	0.0678***

	(0.0110)
AfterPolicy× Certified	-0.0305***
	(0.0105)
Worker Information	YES
Worker Message Information	YES
Bid Information	YES
Job Information	YES
Employer Information	YES
Observations	424,548
R-squared	0.3122
Project Category	YES
Project-value Type Fixed Effects	YES
Year-month Fixed Effects	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05

C-4 (c): Full and Matched Samples (Excluding Bid Statistics from Certified Workers at the Job Level)

In the main analysis, we use matching because a high proportion of bids from certified workers may mislead results, making it seem employers prefer certified workers simply due to their higher proportion among bidders. For example, suppose 9 bidders on Project A are certified and 1 is uncertified; whereas for Project B, 9 are uncertified and 1 is certified. Suppose the employer of Project A had no preference toward certified workers and simply randomly chose one of the 10. Without considering the proportion of certified workers bidding on each project, Project A's employer may appear to favor certified workers, when compared to an employer for a different project that had attracted fewer certified workers. However, a potential concern of this approach is that matching will reduce the sample size and may lead to sample selection bias.

Thanks to one of the reviewers, we conducted robustness tests using both the full samples and matched job-level samples (excluding bid statistics from certified workers at the job level) to avoid selection issues from matching. Specifically, we used the two sets of subsamples constructed in the main analysis to examine the changes in employers' views on certification due to the zero-cost certification test policy. The first set covered the period of one month before policy implementation to one month after implementation. The second set covered one month before policy implementation and the third month after implementation, providing a check on the robustness of the findings from the first set. In all tests, the dependent variables are *Awarded*. The main independent variables are *Certified* and its interaction with *AfterPolicy*. We implemented conditional fixed effects logistic models for all tests.

We conducted two sets of analyses. One set used full samples and another set used matched samples matched on all employer and job characteristics (excluding bid-level data on certified workers). Table C9 reports the results. The coefficients of *Certified* × *AfterPolicy* in columns 1 and 2 using full sample are negative and statistically significant at the 0.05 level, supporting our finding that employers are less likely to hire certified workers after the policy change. For these matched samples, the coefficients of *Certified* × *AfterPolicy* in columns 3 and 4 are consistently negative and statistically significant at the 0.05 level, reinforcing our results.

Therefore, we do have consistent findings with both full and matched samples.

Table C9. Results from Full Samples and Samples Matched on Employer and Job Characteristics

Variables	Full Samples		Samples Matched on Employer and Job Characteristics	
	All Bids (One Mon Before and 1st Mon After)	All Bids (One Mon Before and 3rd Mon After)	All Bids (One Mon Before and 1st Mon After)	All Bids (One Mon Before and 3rd Mon After)
	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*
Certified	0.449***	0.450***	0.430***	0.513***
	(0.125)	(0.125)	(0.126)	(0.138)
Certified × *AfterPolicy*	-0.313**	-0.344**	-0.294**	-0.407***
	(0.140)	(0.134)	(0.143)	(0.146)
CONTROLS	YES	YES	YES	YES
Observations	101,686	91,889	95,004	80,898
Job fixed effects	YES	YES	YES	YES

***Note*:** The first two columns report coefficients and standard errors from conditional fixed effects logit regressions of *Awarded* on *Certified, AfterPolicy,* and their interaction term*,* bid, worker, and worker message characteristics. Column 1 uses all bids for jobs posted immediately one month before and after the policy but column 2 uses all bids for jobs posted immediately one month before and the third month after the policy change. The last two columns repeat the same analyses as columns 1 and 2 but use samples matched on employer and job characteristics (excluding *#OfCertified* and *RatioOfCertBids)*. All estimations include project fixed effects. *** and ** indicate statistical significance at the 1% and 5% levels, respectively.

C-4 (d): Impact of Jump in Certified Workers on Hiring

We finally confirm our findings by examining the impact of increased competition among certified workers in a job on employers' hiring decisions. The sharp increase in the average percentage of bids from certified workers per job (as shown in Figure C5) likely causes employers to ignore certification information after the policy. Furthermore, the percentage of jobs receiving bids from certified workers rose from 11.18% before the policy to 48.23% after the policy, exacerbating this effect. If our interpretation is that an increase in the number of certified bidders causes employers to be less likely to hire certified workers, we should observe a negative relationship between the percentage of bids from

certified workers and employers' hiring decisions. Thus, we incorporated the percentage of bids from certified workers into our analysis by adding an interaction term between the percentage of certified bids (*CertPct*) and certified workers (*Certified* × *CertPct*). The dependent variable is still *Awarded*. The unit analysis is at the job level. We implement a logit regression to regress the dependent variable on the main independent variable and other job-level characteristics. As shown in Table C10, the coefficient of this interaction term is negative and statistically significant at the 0.01 level, indicating that the higher the ratio of bids from certified workers, the less likely employers are to hire certified workers for a given job.

Fig C54. Distributions of Percentage of Bids from Certified Workers Per Job
(Before Policy v.s. After Policy)

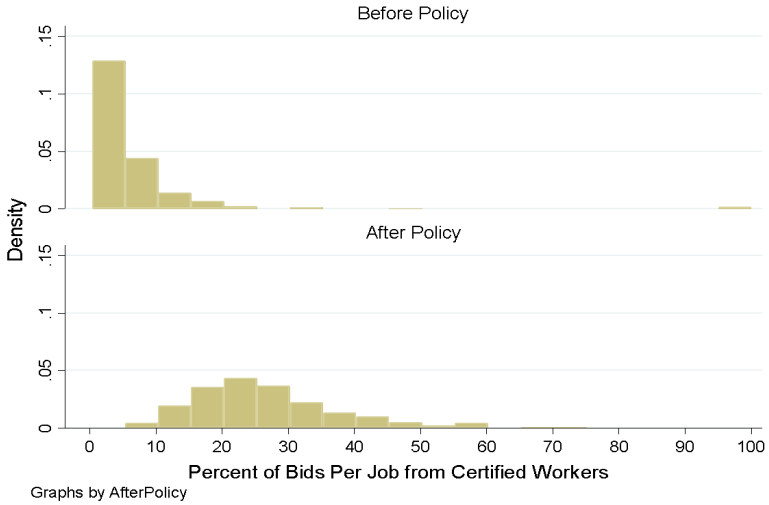


Table C10. Effects of Percent of Bids from Certified Workers on Employers' Hiring Decisions

Variables	DV: *Award*
Certified	0.266***
	(0.037)
Certified×*CertPct*	-0.004***
	(0.001)
CONTROLS	YES
Observations	594,499
Job fixed effects	YES

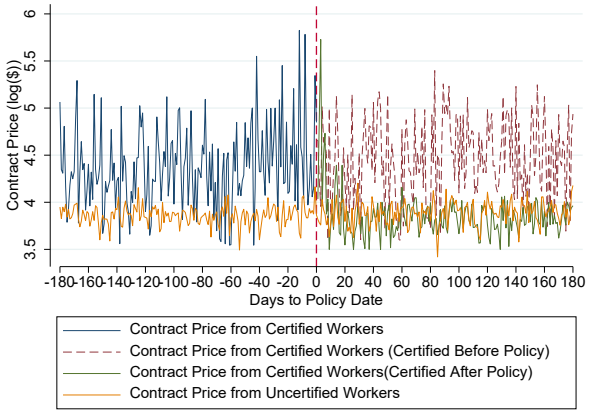
Note. This table reports coefficients and standard errors from a fixed-effects conditional logit regression of *Awarded* on *CertPct, Certified* and their interaction term, worker, worker message, and bid characteristics with job fixed effects. This analysis uses bids for all jobs posted within six months before and after the policy. *** indicates statistical significance at the 1% level from two-tailed tests, respectively.

Appendix D: Effects of Zero-Cost Certification Test Policy on Job Outcomes (Transaction Amount and Perceived Quality of Work)

D-1: Model Free Evidence (Contract Price)

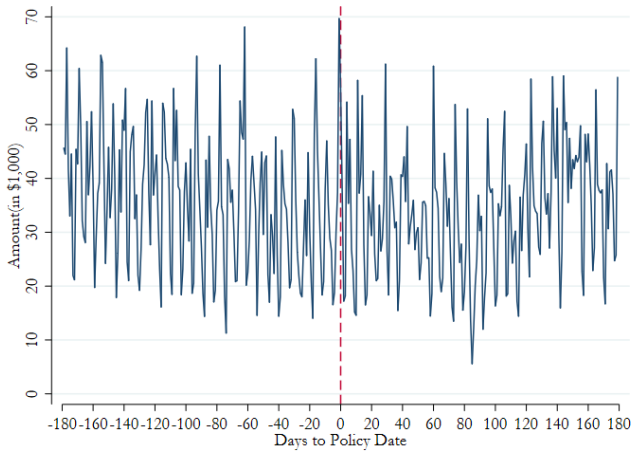
Figure D1. Contract Price Over Time for Different Workers and at Overall Platform

(a) Contract Price (Uncertified Workers vs. Workers Certified Before Policy vs. Workers Certified After Policy)



This graph shows that (1) the contract price of certified workers (including being certified both before and after the policy) dropped and the contract price from workers being certified after the policy dropped more than that for workers certified before the policy, (2) although certified workers overall command higher contract prices than uncertified workers, the difference shrank after the policy; and (3) contract price of uncertified workers slightly dropped after the policy.

(b) Graphs of Platform Total Transaction Amount ($) Over Time



This graph shows that total transactions gradually dropped after the policy.

D-2: Ruling Out Alternative Explanations (Contract Price)

We have conducted a series of tests to address the concern of unobserved variables and test the robustness of our findings. Specifically, we first took advantage of the unique features of the studied platform. One feature is that some employers whose jobs received bids from certified workers after the policy were also active workers before the policy. These employers clearly knew that a flood of certified workers stemmed from a zero-cost certification test policy that enabled unqualified workers to obtain certification through repeated attempts. If policy is the main drive of our findings, we expect that these employers will offer lower prices when hiring certified workers. Another feature is that some employers who posted jobs both before and after the policy experienced a jump in bids from certified workers. These employers are likely cautious of the contract price with workers, including certified workers (Section 5.2 provides a more detailed discussion about these two types of employers).

We have conducted a comprehensive analysis using GLS models for both approaches and have included employer-fixed effects for the second approach. The unit of analysis is at the job level, with the outcome variable being the contract price. In the first approach, the main independent variable is the interaction term between B*othEmployerWorker* and certified, which captures the differences in certified workers' contract prices offered by employers who were active workers before the policy and by employers who were not. We extracted jobs posted within three months after the policy and received bids from certified workers. In the second approach, the main independent variable is the interaction term between *AfterPolicy* and *Certified,* which measures the differences in certified workers' contract prices offered by the same employers for jobs posted before and after the policy date. We identified employers who posted jobs within three months before and after the policy date and hired certified workers for these jobs. We extracted these jobs. We include employer fixed effects. In all analyses, we control employer and job characteristics, the averaged worker, bid (including *BidAmount* and *SameCountry*), and worker's message characteristics at the job level. We also included Inversed Mills Ratios in all models to address selection concerns since only the selected worker will have the contract price (Heckman 1976). The results in Tables D1 and D2 not only validate but also further confirm our hypothesis 2, providing strong support for our research.

Table D1. Effects of Zero-Cost Certification Test Policy on Contract Price (Employers were Active Workers before Policy or Employers Having Jobs Both Before and After Policy)

Variables	Winning Bids (Employers were Workers Before the Policy)	Winning Bids (Employer Had Jobs Both Before and After Policy)
	DV:*ContractPrice*	DV:*ContractPrice*
Certified	21.7702***	22.8289***

	(2.0002)	(3.4663)
BothEmployerWorker	-3.0739*	
	(1.7486)	
BothEmployerWorker×Certified	-7.5535***	
	(2.8359)	
AfterPolicy		-13.1936**
		(5.1930)
Certified×AfterPolicy		-5.9090*
		(3.4255)
IMR	YES	YES
Worker Information	YES	YES
Worker Message Information	YES	YES
Bid Information	YES	YES
Job Information	YES	YES
Employer Information	YES	YES
Observations	5,164	14,692
Job Value Fixed Effects	YES	YES
Job Category Fixed Effects	YES	YES
Employer Fixed Effects	NO	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1; *RatioOfCertBids* is excluded due to high correlation with *Certified.*

Table D2. Effects of Interaction Terms on Contract Price

	Employers were Workers Before the Policy			Employer Had Jobs Both Before and After Policy		
	Certified	*Uncertified*	*Difference*	*Certified*	*Uncertified*	*Difference*
Employers were Workers						
Yes	53.484*** (2.098)	40.017*** (1.139)	13.467** (2.442)			
No	66.436*** (1.984)	42.607*** (0.986)	23.828*** (2.310)			
Zero-cost Policy						
After				59.354*** (3.460)	42.508*** (2.300)	16.846*** (1.770)
Before				86.523*** (7.209)	55.147*** (2.883)	31.376*** (5.981)
Difference	-12.952*** (2.723)	-2.590* (1.465)	-10.361*** (chi2= 120.82)	-27.169*** (8.376)	-12.639** (4.992)	-14.530*** (chi2=111.21)
Findings	H2(a)-(c) are supported			H2(a)-(c) are supported		

Note. Reported results are marginal effects. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

D-3: Robustness Tests (Contract Price)

D-3 (a): Heterogeneity of Workers and Employers

We also examine how our findings may differ due to the heterogeneity of workers (i.e., new workers) and employers (i.e., worker experience).

We first examine how employers evaluate bids from new workers with certification before and after policy. Columns 1 and 2 in Table D3 show that new workers benefit only from certification before policy when all else is equal. Using new workers' winning bids matched on worker, job, and employer characteristics between before and after policy, column 3 in Table D3 confirms that inexperienced certified workers received lower contract prices after policy than before policy.

Table D3. Effects of Zero-Cost Certification Test Policy on Contract Price (Inexperienced Workers)

Variables	DV: Contract Price		
	Winning Bids (1 Mon Before)	Winning Bids (1 Mon After)	Winning Bids (1 Mon Before and After)
	DV:*ContractPrice*	DV:*ContractPrice*	DV:*ContractPrice*
Certified	1.2612	1.9957	3.8390
	(7.3285)	(3.1140)	(31.6768)
NoRating	-55.9423***	-49.3028***	
	(2.8693)	(2.3005)	
Certified× NoRating	31.6342*	-12.2884	
	(18.9255)	(9.2603)	
AfterPolicy			0.0364
			(5.0213)
Certified×AfterPolicy			-65.0744*
			(37.5166)
IMR	YES	YES	YES
Worker Information	YES	YES	YES
Worker Message Information	YES	YES	YES
Bid Information	YES	YES	YES
Job Information	YES	YES	YES
Employer Information	YES	YES	YES
Observations	8,816	9,104	1,228
Job Value Fixed Effects	YES	YES	YES
Job Category Fixed Effects	YES	YES	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

We next examine how inexperienced employers evaluate bids from certified workers before and after policy, respectively. Columns 1 and 2 in Table D4 show that inexperienced employers offer higher contract prices to certified workers for jobs posted both before and after policy periods than experienced employers. Using winning bids from certified workers matched on worker, job, and employer characteristics before and after the policy, column 3 in Table D4 confirms that differences in contract prices offered by these two types of employers increase after the policy.

Table D4. Effects of Zero-Cost Certification Test Policy on Contract Price (Inexperienced Employers vs. Experienced Employers)

Variables	Winning Bids (6 Mons Before)	Winning Bids (6 Mons After)	Winning Bids (6 Mons Before and After)
	DV:*ContractPrice*	DV:*ContractPrice*	DV:*ContractPrice*
InexpEmployer	24.3467***	5.5996***	39.0132***
	(5.6649)	(1.5328)	(11.8492)
Certified	8.9331***	1.0789	
	(3.0227)	(0.8566)	
Certified× *InexpEmployer*	16.3938***	10.1761***	
	(5.1856)	(1.2374)	
AfterPolicy			-11.5855**
			(5.0304)
InexpBuyer× *AfterPolicy*			30.9577***
			(11.1572)
IMR	YES	YES	YES
Worker Information	YES	YES	YES
Worker Message Information	YES	YES	YES
Bid Information	YES	YES	YES
Job Information	YES	YES	YES
Employer Information	YES	YES	YES
Observations	4,745	19,890	2,881
Job Category Fixed Effects	YES	YES	NO
Job-value Fixed Effects	YES	YES	NO

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

D-3 (b): Worker Panel Analysis

To ensure the robustness of our results, we adopted an orthogonal approach and focused on the worker side instead and conducted a worker panel analysis. We trace the worker's winning history within three months after the policy implementation to construct a worker panel dataset. The unit of analysis is at the job level. The dependent is still *ContractPrice* and the main independent variables are *Certified*, *AfterPolicy*, and their interaction terms. We run a GLS model with worker fixed-effects estimators. The model includes jobs, workers, bids, workers' messages, and employer characteristics at the job level. We report the results in Table D5. The coefficients of *AfterPolicy* and its interaction term with *Certified* are all negative and statistically significant at .01 and .05 levels, respectively. This again supports the finding that employers give lower valuations to certification after the policy (compared to before the policy).

Table D5. Effects of Zero-cost Certification Test on Contract Price
(Worker Panel Analysis)

Variables	DV:*ContractPrice*
AfterPolicy	-22.8421***
	(3.9064)
Certified	26.4540***
	(3.9573)
AfterPolicy×Certified	-7.7853**
	(3.9656)
IMR	YES
Worker Information	YES
Worker Message Information	YES
Bid Information	YES
Job Information	YES
Employer Information	YES
Observations	52,726
Project Category	YES
Project-value Type Fixed Effects	YES
Year-month Fixed Effects	YES
Worker Fixed Effects	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05.

D-4: Effects of Zero-Cost Certification Test Policy on Perceived Quality of Work

We find that employers prefer certified workers, but the platform's zero-cost certification test policy weakens their preference in terms of hiring. These findings are consistent with our theoretical model, which is built on the premise that the flood of certified workers into the market causes a drop in certified workers' perceived quality and, consequently, less trust from employers. Then, a logical question follows: Is the premise justified? In other words, are certified workers performing worse after policy than before?

We start answering the question above by first examining whether certified workers are better at completing their expected tasks when employers hire them. If the result is affirmative, this verifies the signaling value of third-party skill certifications. Good workers attempt and pass certification tests; therefore, employers can and should use certification status to screen potential workers. On the other hand, if certified workers are not better than uncertified workers, employers should ignore certifications--in turn, workers should not bother attempting the certification tests. Recall that at the beginning of this paper, we mentioned the presence of diverging industry practices regarding third-party certifications: Some platforms embrace them, whereas others abandon them. Hence, studying the relationship between certification status and perceived quality of work has important implications for theory and practice. We turn to this question in the following section. Parallel to the structure in this section, we first examine this relationship under normal market conditions (i.e., where workers are required to pay a non-refundable fee to complete certification tests; Section D-4(a)); next, we investigate whether that relationship changed when the platform implemented the zero-cost policy for certification tests (Section D-4(b)).

D-4 (a): Certification and Perceived Quality of Work

For certifications to positively impact employer choice, it must necessarily be the case that employers expect certified workers to perform better than uncertified workers. This assumption of superior quality also supports the signaling argument within the literature that favors third-party certifications in general (Dranove and Jin 2010, Elfenbein et al. 2015). However, the empirical evidence is mixed. While some studies show that individuals who are certified perform better than those who are not (e.g., Gao et al. (2010), Gopal and Gao (2009), and Rao (1994)), other studies find that the effect of certification is far from certain and depends on many factors, such as the certifier's biases (Bolton et al. 2012) and certification standards (Harbaugh et al. 2011). It is also unclear whether third-party certifications are indeed indicative of perceived worker quality in online labor markets. Therefore, we investigate this question here.

We extracted all jobs (auctions) posted within three months before t_0, when the zero-cost certification test policy was implemented. We then retrieved information about the workers who submitted bids for those jobs, the employers, and the auctions. As a result, this analysis is conducted at the job level because

we can only observe a worker's perceived quality of work when they are hired to do a job. We measure the worker's perceived quality of work using the rating that the employer gives the worker at the end of the job, very much like a performance evaluation after a job has been completed, and it is perhaps the most uncontroversial measure of perceived quality. The rating is an integer that ranges from 0 to 10; therefore, we estimate an ordered probit model with robust standard errors. The underlying latent regression model is specified by Greene (2008) as

$$y_i^* = X_i\,\beta + \alpha * Certified_j + \varepsilon_i \quad \text{(D-1)}$$

in which the latent utility, y_i^*, is the unobserved dependent variable for the worker rating for the job *i*. X_i is a vector of controls, including worker, employer, bid, and job characteristics (excluding *RatioOfCertBids* and *#OfCertBids* since these two variables have correlations over 0.85 with *Certified* at job level). Parameter α is our focus, showing the relationship between certification status and worker ratings. Since y_i^* cannot be observed, we instead describe this relationship with the following equation:

$$y_i = j \; if \; \mu_{j-1} < y_i^* \leq \mu_j \quad \text{(D-2)}$$

here, y_i is the observed worker rating for a job. $\mu = \{\mu_1, \mu_2, \ldots, \mu_9\}6$ represents the threshold values that define y_i. j is the worker rating, an integer ranging from 1 to 10. We also include year-month dummies to control unobserved shock related to time.

Column 1 in Table D6 reports the results. The coefficient of *Certified* is positive and statistically significant ($\alpha = 0.268$, p<0.01). This suggests that workers with certifications indeed perform well.

For robustness, we examine an alternative perceived quality measure, *Rehire*, which indicates whether the employer hires this worker again after the current job. This has been used as a proxy for reputation in prior studies (Banerjee and Duflo 2000). In a sense, ratings are just "cheap talk," whereas actually hiring a worker again indicates strong satisfaction with prior performance. Because this is a binary indicator, we estimate a standard probit model with robust standard errors. The main independent variable is still *Certified*. We also control worker characteristics, employer characteristics, auction characteristics, and weekday dummies using robust standard error estimators. Results are reported in Table D6, column 2. The coefficient of *Certified* is positive and statistically significant, confirming that certified workers deliver a higher perceived quality of work.

All results above consistently show that certification in the online labor market signals workers' perceived quality, a finding consistent with our argument in the theoretical section. Because removing the cost of certification tests influences workers' behavior (as shown in Figure 1), removing the cost may also impact the signaling role of certification. We next examine how the policy of eliminating the cost of attempting certification tests affects their signaling power.

Table D6. Effects of Certification and Zero-Cost Certification Test on Rating Given by Employers and Rehiring by Same Employers

Variables	All Winning Bids (3 Mons Before)		Matched Winning Bids (3 Mons Before and After)		Winning Bids from Workers Certified from Zero-Cost Tests and Uncertified Workers (3 Mons After)	
	DV: *WorkerRating*	DV: *Rehire*	DV: *WorkerRating*	DV: *Rehire*	DV: *WorkerRating*	DV: *Rehire*
Certified	0.268***	0.195***	0.269***	0.194***	0.038	0.009
	(0.044)	(0.044)	(0.046)	(0.045)	(0.023)	(0.023)
AfterPolicy			-0.006	-0.388***		
			(0.013)	(0.013)		
Certified× *AfterPolicy*			-0.187***	-0.170***		
			(0.051)	(0.050)		
#OfRatings	0.075***	0.068***	0.089***	0.060***	0.093***	0.055***
	(0.007)	(0.008)	(0.005)	(0.006)	(0.007)	(0.007)
AvgRating	0.037***	0.020***	0.035***	0.010***	0.033***	0.003
	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)	(0.005)
HavingPic	0.009	-0.032*	0.007	-0.032**	0.021	-0.035**
	(0.016)	(0.018)	(0.012)	(0.013)	(0.017)	(0.017)
ComplSimiJobs	-0.087**	0.094**	-0.067**	0.143***	-0.014	0.171***
	(0.037)	(0.041)	(0.028)	(0.029)	(0.040)	(0.039)
WorkerReg(months)	-0.010	-0.014	-0.021***	-0.000	-0.036***	0.011
	(0.009)	(0.010)	(0.007)	(0.007)	(0.010)	(0.010)
BidAmount	-0.095***	0.091***	-0.078***	0.070***	-0.062***	0.055***
	(0.009)	(0.010)	(0.007)	(0.007)	(0.010)	(0.009)
BidOrder	0.073***	-0.179***	0.075***	-0.150***	0.085***	-0.122***
	(0.012)	(0.015)	(0.009)	(0.010)	(0.013)	(0.014)
BidAmountPosition	0.018	0.234***	0.005	0.192***	0.011	0.154***
	(0.024)	(0.029)	(0.018)	(0.020)	(0.025)	(0.027)
SameCountry	0.110***	-0.130***	0.068***	-0.137***	0.030	-0.143***
	(0.027)	(0.031)	(0.021)	(0.023)	(0.030)	(0.031)
EmployerReg(months)	-0.052***	-0.173***	-0.054***	-0.152***	-0.051***	-0.126***
	(0.009)	(0.010)	(0.007)	(0.007)	(0.009)	(0.009)
EmployerExperience	0.105***	0.227***	0.102***	0.200***	0.092***	0.171***
	(0.007)	(0.008)	(0.005)	(0.006)	(0.007)	(0.007)
DescriptionLength	0.273***	-0.095***	0.278***	-0.083***	0.279***	-0.075***
	(0.008)	(0.008)	(0.006)	(0.006)	(0.008)	(0.008)
Constant		-1.100***		-1.023***		-0.599***
		(0.072)		(0.050)		(0.066)
Observations	27,112	27,112	48,572	48,572	24,636	24,636
Project Category	YES	YES	YES	YES	YES	YES
Project-value Type Fixed Effects	YES	YES	YES	YES	YES	YES
Year-month Fixed Effects	YES	YES	YES	YES	YES	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.

D-4 (b): How Certification Cost Affects the Relationship between Certification and Perceived Quality of Work

This section tests whether the signaling power of certification is affected after the cost of attempting certification tests is removed. The previous section shows that certification is a legitimate signal of service quality. This justifies employers' decisions to prefer certified workers over uncertified workers when awarding contracts. However, the findings in Section 5.1 also show that employers' preferences for certified workers are weakened after the certification tests are offered free of charge. When the policy of providing certification tests free of charge further increases the existing cost of maintaining the certification mechanism in online labor platforms, it is essential to understand the impact that such policy exerts on the ability of certifications to signal worker perceived quality. If the results indicate that free certification tests are correlated with poor service performance, this will provide strong evidence for platforms to reverse the policy change in existing markets. In this section, we will examine how the policy of removing the cost of certification testing affects the established positive relationship between certification and perceived service quality.

Figure D2. Graphs of Rating Given by Employers to Hired Workers Over Time

Our initial exploration of ratings given by employers to hired workers in Figure D4 shows that certified workers receive higher ratings than uncertified workers, but the differences between their ratings decreased after the policy to remove the cost of the certification test. Also, the absolute values of ratings received by certified workers significantly dropped after the policy.

We estimate the policy of removing certification cost on the signaling role of certification while retaining the winning bid for each job. We conduct two analyses at the job level because perceived quality can only be measured on the job level (hence, the use of winning bids). The dependent variable in all

analyses is *WorkerRating*, the employer satisfaction variable used in the previous analyses. We also check the distributions of *WorkerRating* variables in both periods to ensure they are comparable in Table D9.

Table D7. Distributions of *WorkerReceivedRating* variables before and after the policy (6 months before and after the policy)

Periods	Certified Workers	Samples (# of Workers)	Mean	Std	Min	Max
Before policy	YES	2,241	6.09	4.85	0	10
	NO	52,406	5.77	4.87	0	10
After policy	YES	12,589	5.95	4.81	0	10
	NO	39,728	5.79	4.89	0	10

The main differences among these analyses are in the main independent variables and the samples used. In the first analysis, we used all jobs entering into contracts from both periods. This analysis tries to find whether the performance of certified workers is different before and after the policy. The main independent variable is the interaction term between *Certified* and *AfterPolicy*. In the second analysis, we use data from the three months after the policy, and we compare the perceived quality of workers who were certified after the policy against workers who were not certified. This analysis aims to determine whether certification continues to serve as a quality signal for certified workers when certification tests are offered free of charge. To ensure that jobs posted and contracted workers before and after policy are comparable in the first and third analyses, we implement PSM to match jobs posted between these two periods on employer, job, and worker characteristics. Then, we used matched samples for analysis. All analyses control for worker, employer, bid, and job characteristics (excluding *RatioOfCertBids* and *#OfCertBids* since these two variables have correlations over 0.85 with *Certified* at job level).

Table D6 reports the results. The coefficient of *Certified*×*AfterPolicy* in column 3 is negative and statistically significant at .01 level, showing certified workers delivered less satisfactorily after the policy than before. The coefficient of *Certified* in column 5 is positive but statistically insignificant, suggesting that after certification tests became free, those newly certified workers did not perform better than those who were not certified. This explains the finding from column 3, which is why certified workers perform worse after the policy. This further suggests the negative impact of removing the cost of certification testing on the signaling values of certification. In other words, the value of certification in predicting the perceived quality of workers is much lower after the zero-cost certification test policy was implemented. To analyze the robustness of our finding, we replace the dependent variable with *Rehire* and run the same three different model specifications. The findings are consistent with those using *WorkerReceivedRating* as outcome variables.

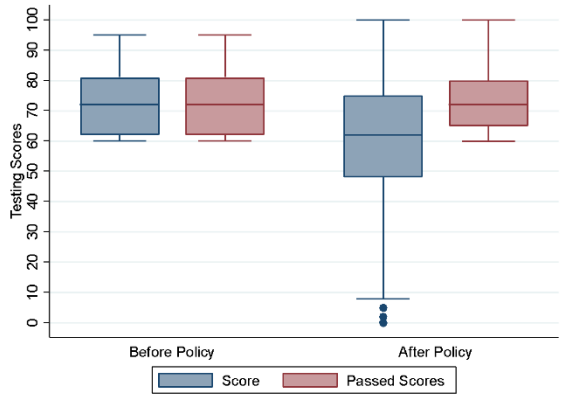
Appendix E: Mitigating Negative Effects of Zero-Cost Certification Test Policy

E-1: Test Score Distributions

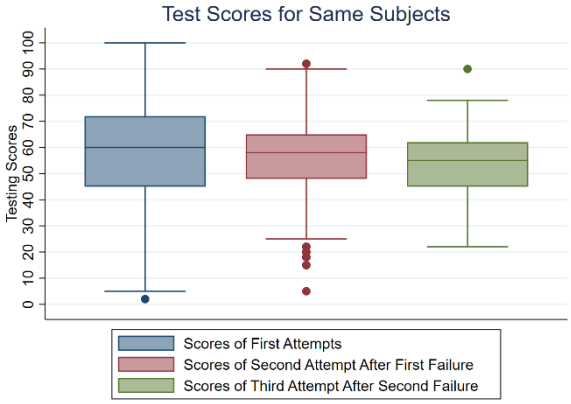
The following graphs show the certification test score distributions. Figure E1 (a) compares distributions for both certification test scores (including scores for both failed and passed certification attempts) and each worker's last passing scores on a subject. Since workers can attempt as many times as possible after the policy change, they can attempt tests for the same subject until they receive satisfactory scores. Hence, we expect the final passing scores to be much higher. Although the overall average test scores dropped after the policy change, we do not see a jump in passing scores. Figure E1 (b) further verifies our findings, showing that the same workers' repeated attempts on the same subject did not lead to increased test scores.

Figure E1. Certification Test Score Distributions

a. Test Scores and Passing Scores Distributions



b. Test Score Distributions for Repeated Attempts



E-2: Model Extension: Cost of Accessing

Building on our base model, we account for the cost of accessing detailed certification information. After a worker submits a bid, if they are certified, the employer must decide whether to incur a hassle cost o to open the profile and review the certification details. We assume that workers are myopic and do not consider the employer's decision to open the profile when making their certification test or pricing decisions.

We analyze the equilibrium structure below. If the employer accesses detailed certification information, they receive additional signals about a certified worker's unobserved quality. Suppose that the employer can further distinguish between

- High-quality certified workers with $q \geq q_1$ (labeled as worker type s),
- Low-quality certified workers with $q' \leq q < q_1$ (labeled as worker type ns).

In equilibrium, the probability that a worker is of type s is:

$$n_s = \int_{q_1}^{1} 2(1-q)\, dq = 1 - 2q_1 + (q_1)^2.$$

The probability that a worker is of type ns is:

$$n_{ns} = \int_{q'}^{q_1} 2(1-q)\, dq = 2\mathrm{q}_1 - \mathrm{q}_1^2 - 2q' + (q')^2.$$

The employer's utility from hiring a worker of type s is:

$$U_s^e(f) = \frac{\int_{q_1}^{1} (\mathrm{q} - p_c - f) \cdot 2(1-q) dq}{n_s} = \frac{\int_{q_1}^{1} (\mathrm{q}) \cdot 2(1-q) dq}{n_s} - p_c - f = q_s - p_c - f.$$

Similarly, the employer's utility from hiring a worker of type ns is:

$$U_{ns}^e(f) = \frac{\int_{q'}^{q_1} (\mathrm{q} - p_c - f) \cdot 2(1-q) dq}{n_{ns}} = \frac{\int_{q'}^{q_1} (\mathrm{q}) \cdot 2(1-q) dq}{n_{ns}} - p_c - f = q_{ns} - p_c - f,$$

where the expected equilibrium qualities for workers of type s and ns are given by:

$$q_s = \frac{\int_{q_1}^{1} q \cdot 2(1-q) dq}{n_s} = \frac{1}{3}(1 + 2\mathrm{q}_1) \text{ and } q_{ns} = \frac{\int_{q'}^{q_1} q \cdot 2(1-q) dq}{n_{ns}} = \frac{\mathrm{q}_1(3-2\mathrm{q}_1) + (3-2\mathrm{q}_1)q' - 2(q')^2}{3(2-\mathrm{q}_1-q')}.$$

If the worker is certified (with a probability of n_s), the employer then decides whether to access a worker's profile to access the detailed certification information by comparing the utility of opening the profile versus not opening it (see Appendix A-2). If the employer chooses to access the detailed

certification information, they will incur an access cost of o, resulting in a total cost of $o\ n_s$. Four possible hiring scenarios arise:

1) Hiring any worker regardless of type: This occurs if the employer's utility is non-negative for all worker types,
   $U_s^e(f) = q_s - p_c - f \geq 0$, $U_{ns}^e(f) = q_{ns} - p_c - f \geq 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f \geq 0$.
   This is equivalent to $f \leq \frac{q_{nc}}{2}$.
2) Hiring only certified workers: The employer hires certified workers but not uncertified ones if
   $U_s^e(f) = q_s - p_c - f \geq 0$, $U_{ns}^e(f) = q_{ns} - p_c - f \geq 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f < 0$.
   This simplifies to: $\frac{q_{nc}}{2} < f \leq q_{ns} - \frac{q_c}{2}$.
3) Hiring only high-quality certified workers: The employer hires high-quality certified workers but not low-quality certified or uncertified ones.
   $U_s^e(f) = q_s - p_c - f \geq 0$, $U_{ns}^e(f) = q_{ns} - p_c - f < 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f < 0$.
   This is equivalent to: $q_{ns} - \frac{q_c}{2} < f \leq q_s - \frac{q_c}{2}$.
4) Not hiring any workers at all: The employer refrains from hiring any worker if
   $U_s^e(f) = q_s - p_c - f < 0$, $U_{ns}^e(f) = q_{ns} - p_c - f < 0$, and $U_{nc}^e(f) = q_{nc} - p_{nc} - f < 0$.
   The conditions hold when $f > q_s - \frac{q_c}{2}$.

Proposition 6. With the absence of cost of access o, viewing detailed certification information can improve the employer's utility.

Proof of Proposition 6:

By comparing the employer's hiring scenarios with and without access to certification scores, as derived in Appendix A-2 and E-1, we find the following:

- If $f \leq q_{ns} - \frac{q_c}{2}$ or $f > q_s - \frac{q_c}{2}$, then accessing detailed certification information does not affect the employer's utility.
- If $q_{ns} - \frac{q_c}{2} < f \leq \frac{q_c}{2}$, then:

1) If the employer does not access detailed certification information, she will only hire certified workers, and her expected utility is given by:
$$U_0 = \int_{q'}^{1}(q - p_c - f)2(1-q)dq = \frac{1}{6}(1 - 6f + 2q')(1-q')^2.$$
2) If the employer accesses the detailed certification information, she will only hire high-quality certified workers, and her utility is:
$$U_1 = \int_{q_1}^{1}(q - p_c - f)2(1-q)dq = \frac{1}{6}(1-\mathrm{q}_1)^2(1 - 6f + 4\mathrm{q}_1 - 2q').$$

The value of the detailed information for the employer is:
$$U_1 - U_0 = \frac{1}{6}(1-\mathrm{q}_1)^2(1 - 6f + 4\mathrm{q}_1 - 2q') - \frac{1}{6}(1-q')^2(1 - 6f + 2q').$$
It is straightforward to show that the right-hand side increases in f and reaches 0 at the minimum value of $f = q_{ns} - \frac{q_c}{2}$. Therefore, $U_1 - U_0 > 0$, meaning that employers earn higher utility when they access detailed certification information.

- If $\frac{q_c}{2} < f \leq q_s - \frac{q_c}{2}$, then:

1) If the employer does not access detailed certification information, she will not hire any workers, and her utility is: $U_0 = 0$.
2) If the employer accesses the detailed certification information, she will only hire high-quality certified workers, and her utility is:

$$U_1 = \int_{q_1}^{1}(q - p_c - f)2(1-q)dq = \frac{1}{6}(1-\mathrm{q}_1)^2(1 - 6f + 4\mathrm{q}_1 - 2q') > 0.$$

Since $U_1 - U_0 = \frac{1}{6}(1-\mathrm{q}_1)^2(1 - 6f + 4\mathrm{q}_1 - 2q') > 0$, employers earn a higher utility by accessing the detailed certification information.

In summary, we can conclude that employers benefit from having access to detailed certification information. ■

Proposition 6 suggests that when employers have access to more detailed certification information, such as test scores and testing dates, they can leverage this valuable signal to make better-informed hiring decisions. However, an increase in the number of certified workers may lead to information overload. This can cause employers to overlook comprehensive evaluations of individual candidates. For example, employers may not have the time to thoroughly review profiles, including scrutinizing test scores and certification dates, which could lead them to make irrational decisions, such as ignoring critical details. As a result, the signal value of certification tests could be further diminished. This phenomenon is empirically validated in Section 7. The following proposition offers a potential solution to encourage employers to access detailed certification information by reducing the cost of access, thereby alleviating this issue.

Proposition 7. Employers are more likely to access worker profiles to review detailed certification information and gain higher utilities when the cost of access o is reduced.

Proof of Proposition 7:

If the employer chooses not to access detailed certification information, utility is given by:

$$U_{no} = (q_c - p_c - f)^+ n_c + (q_{nc} - p_{nc} - f)^+ n_{nc}.$$

If the employer chooses to access the detailed certification information, her utility is

$$U_o = (q_s - p_c - f)^+ n_s + (q_{ns} - p_c - f)^+ n_{ns} - o\, n_c + (q_{nc} - p_{nc} - f)^+ n_{nc}.$$

The employer decides whether to access it by comparing the two utilities. The difference between access and not to access $U_o - U_{no}$ can be expressed as

$$(q_s - p_c - f)^+ n_s + (q_{ns} - p_c - f)^+ n_{ns} - (q_c - p_c - f)^+ n_c - o\, n_c.$$

Since this expression decreases as the access cost o increases, a reduction in the cost of accessing information would encourage employers to review certification details.

Next, we show that it will also improve employer utility. Since the employer would choose the option that yields a higher utility. His utility would be max (U_o, U_{no}). Therefore, a reduction in the

accessing cost o would lead to a higher U_o, which would eventually increase the employer's utility. ■

Proposition 7 indicates that if the platform can reduce the employer's cost of accessing detailed certification information (such as displaying this information on the worker's bidding page), employers would be more likely to check this information, ultimately mitigating the negative impact of the policy (i.e., improving the employer's utility). This is because the policy reduces the certification signal, and the detailed information acts as a stronger quality signal. By lowering the cost of obtaining this stronger signal, employers are more inclined to seek out and use this information, leading to better estimation of workers' quality and enabling more informed decision-making, which in turn enhances their utility.

E-3: Online Controlled Experiment: Platform Design for Accessing Certification Test Passing Scores

We find that test passing scores can serve as a strong indicator of a worker's perceived quality. However, after the policy of removing certification test costs, employers appear to disregard this information. We interpret this shift as being primarily driven by the increased number of certified workers, influencing employers' decisions.

An alternative explanation for this phenomenon could be the platform's design, which requires employers to click on workers' certification icons to view details, including test passing scores. This design may make employers less likely to utilize this information. Since this design was in place both before and after the implementation of the zero-certification test cost policy, its impact on our findings should be minimal. Nonetheless, to address any potential concerns, we conducted an online experiment using the following procedure.

Sampling and Experimental Procedure

We recruited 206 working adults in the United States through a U.K.-based survey platform, Prolific, with paid participation. The sample size was determined a priori based on a power analysis using G*Power software (Erdfelder et al. 1996). Specifically, the analysis was conducted for a two-way ANOVA with four groups, targeting 90% power to detect a small-to-medium effect size (f = 0.25). The analysis indicated that a minimum sample size of 171 participants was required. Participation was restricted to PC users, and respondents who failed any of the three attention check questions (e.g., "*What can a freelancer specify when bidding on a job?*") were excluded from the analysis (n = 14). The final dataset consisted of 192 participants, of whom 45.3% were female, 69.3% identified as Caucasian, 16.7% as Black or African American, 11.5% as Asian, and 3.5% as other races. The average participant age was 38 years.

Procedurally, this study used a 2 by 2 factorial design to manipulate job applicants' attributes. Specifically, the design manipulated two levels of platform design for certification test passing score access (*Easy Access* vs. *Difficult Access*) and two levels of supply of certified workers (*Low Supply* vs. *High Supply*). While *Easy Access* means that a worker's certification test passing score is immediately visible on bids placed by this worker, *Difficult Access* means employers must click a "certified" icon accompanying this worker's bids to view this worker's certification test passing score on a separate page. *Low Supply* indicates that only one out of six bidders for the posted job is certified but *High Supply* means that three out of six bidders for the posted job are certified. This results in four experimental conditions: *Easy Access & Low Supply*, *Easy Access & High Supply, Difficult Access & Low Supply*, and *Difficult Access & High Supply.* Using random assignments to one of these four conditions, each participant

received information about six job applicants. Each job applicant had a similar number of ratings and average rating, and their bids for the jobs were similar in dollar amount. We kept the set of job applicants the same for each participant because we needed to ensure that our manipulation would be salient and *not* diluted by variance in job applicants.

All participants were first instructed to imagine that (1) they are the owners of a food truck and are trying to hire a freelancer to design a website that can show a menu, open hours, locations and allow online orders; (2) that a good friend of them who is an IT person suggests that they hire a freelancer on websites such as Freelancer.com or Upwork.com where they would typically receive multiple bids from freelancers for the job; (3) that freelancers will specify how much they need to complete the job (i.e., bid amount); (4) that they can see these freelancers' backgrounds (i.e., number of ratings and average of these ratings received from previous employers and the certificate they have (if the freelancer had)). Then, these participants will read explanations about the background information. Most importantly, subjects will receive explanations about a worker's certification details, including the test subject and passing score.

To proceed to the next screen, these participants must answer questions that test their understanding of average rating, bid amount, an *Easy Access* certificate example (test subject and score are visible), and a Difficult Access certificate example (clicking to view test subject and score on a different web page).

In the next screen, these participants would read the job description and the following instructions:

"Suppose that you have now received 6 bids from 6 different freelancers for this job, and the website shows their info in the table below."

Participants would see six different bids randomly ordered vertically; each bid shows the bidder's number of ratings, an average of ratings, certificates if any, and bid amount. After viewing these bids, these participants need to click and drag freelancers to rank them based on their hiring preference from the highest (most likely that they would hire) to the lowest (less likely). Additionally, participants needed to rate how workers' certificates, average rating, number of ratings, and bid amount to complete the job affect their hiring decisions using a 5-point Likert scale (1- not at all, 5- Extremely Much).

On the next page, participants need to answer two manipulation questions about whether there were multiple bidders with certificates and whether, for bids with certification icon, test subject and passing score are displayed beneath the icon. Finally, participants were asked to provide their demographics.

Figure E2 provides screenshots of experiment.

Measures and Variables

SelectionRank. Participants ranked the hiring likelihood of each job applicant from highest (1) to lowest (6).

SelectedCert. It is an indicator that equals one if a participant ranked a bid from a certified worker as the highest hiring likelihood. Otherwise, 0.

SelectedHigh. It is an indicator that equals one if a participant ranked a bid from a certified worker with the highest passing score among all bidders. Otherwise, 0.

HighestScore. It is an indicator that equals one if a job applicant is certified and has the highest passing score among all certified bidders for the same job. Otherwise, 0.

HighSupply. It is an indicator that equals one if the supply of certified workers is *High Supply*. Otherwise, 0.

Control Variables. We controlled for each job applicant's number of ratings and average rating.

Manipulation Check

We conducted two t-tests to assess whether participants recognized the manipulations related to certification test passing score access and the supply of certified workers. The results revealed significant differences between the treatment and control groups for both manipulations, as shown in Table E1. These findings confirm that our manipulations were effective.

Table E1. Manipulation Check Results

Manipulations	Treatment (Means/Std.)	Control(Means/Std.)	Differences
Easy Access to Certification Test Passing Scores	0.884/0.03	0.11/0.03	0.77 (t-stats=16.68, p<0.01)
High Supply of Certified Workers	0.85/0.03	0.18/0.04	0.68 (t=12.70, p<0.01)

Analyses and Results

In our paper, we proposed that the increased number of certified bidders for a job (i.e., the increased supply of certified workers) caused employers to pay less attention to certification passing scores after the platform removed the certification test cost. Here, we analyze the role of platform design in accessing certification test passing scores (*Easy* vs. *Difficult*) within this relationship.

We begin by verifying two key points: (1) that a worker's certification test passing score significantly influences participants' hiring decisions, and (2) that the supply of certified workers affects the selection of certified workers with the highest passing scores. To test these points, we conducted two analyses. In

one test, using data from conditions with multiple certified bidders, we examined the effect of certification test passing scores on hiring. The unit of analysis was at the bid level, with the dependent variable being *SelectionRank*. The main independent variable was *HighestScore*. We also controlled for the number of workers and their average ratings. In another test, using all data, we analyzed whether participants selected the certified worker with the highest passing score when faced with varying numbers of certified bidders. The unit of analysis was at the participant level, with *SelectedHigh* as the dependent variable and *HighSupply* as the independent variable.

Table E2 presents the results. In column 1, the coefficient of *HighestScore* is positive and statistically significant, indicating that certified workers with higher passing scores are more likely to be hired. Additionally, the coefficient of *HighSupply* is negative and statistically significant, suggesting that when there are more certified bidders, certified workers with the highest passing scores are less likely to be selected.

Table E2. Impact of Certification Passing Score and Supply on Hiring

Variables	DV: *SelectionRank*	DV: *SelectedHigh*
HighestScore	1.467***	
	(0.144)	
HighSupply		-1.060***
		(0.303)
Number of Rating	-7.961***	
	(1.619)	
Average Rating	24.938***	
	(2.720)	
Constant		0.803***
		(0.220)
Observations	570	191
Participant fixed effect	YES	NO

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01

Next, we explore how the platform design for accessing certification test passing scores (*Easy* vs. *Difficult*) influences this relationship. Specifically, we investigate how the ease of access to passing scores impacts participants' hiring decisions under two different levels of certified worker supply (*High* vs. *Low*).

For each supply condition, we conduct a t-test to compare the differences in hiring probabilities between easy and difficult access to passing scores. The results are presented in Table E3. Across both supply conditions, hiring rates are significantly higher when access to passing scores is easier compared to when it is more difficult. These findings indicate that platform design plays a crucial role in participants' consideration of passing scores in their hiring decisions.

Table E3. Effects of Access to Certification Test Passing Score (Easy vs. Difficult) on Hiring Rates

Type of supply	Access to Passing Scores	Obs	Hiring Rates	
			Means	Std.
Low	Easy	48	0.813	0.071
	Difficult	49	0.571	0.057
	Difference		0.241*** (T stats= 2.633, p<0.01)	
High	Easy	47	0.745	0.064
	Difficult	48	0.542	0.073
	Difference		0.203** (T stats= 2.089, p=0.04)	

Note. *** p<0.01, ** p<0.05

Finally, we examine how access to certification test passing scores influences the relationship between the supply of certified workers and participants' hiring decisions. If platform design for accessing test scores were the sole determinant of employers' consideration of passing scores, we would expect the inclusion of access information to render the effects of certified worker supply insignificant.

The analysis is conducted at the participant level, with the dependent variable being *SelectedHigh* and the independent variable a categorical variable representing the four experimental conditions: *Easy Access & Low Supply*, *Easy Access & High Supply, Difficult Access & Low Supply*, and *Difficult Access & High Supply*.

Table E4 presents the results. The marginal effects for all conditions are positive and statistically significant, with the *Difficult Access & High Supply* condition serving as the baseline. These findings indicate that both low supply and easy access to test scores increase the hiring rates for workers with the highest passing scores. Furthermore, the difference in hiring probability between easy and difficult access (0.596, $p<0.01$) is larger than the difference between low and high supply of certified workers (0.483, $p<0.01$). These findings underscore the importance of information transparency in mitigating the negative effects of an oversupply of certified workers.

In summary, we find that both an increased number of certified workers bidding for the same job and difficulty accessing certification test passing scores discourage employers from considering passing scores in their hiring decisions. Additionally, we find that making the test results more easily accessible (without requiring clicks) should be able to significantly balance out the negative effect of having too many certified workers.

Table E4. Marginal Effects of Access to Certification Test Passing Score (Easy vs. Difficult) and Supply of Certified Workers (High vs. Low) on Hiring Rates

Variables	DV: *SelectedHigh*

Easy access with Low supply	0.539***
	(0.071)
Easy access with High supply	0.358***
	(0.0.078)
Difficult access with low supply	0.302***
	(0.080)
Observations	192

Note. Reported results are marginal effects. Standard errors in parentheses. *** p<0.01

Underlying Mechanism

We investigate the underlying mechanisms influencing participants' hiring preferences by asking participants, acting as employers, to rate the importance of several factors in their hiring decisions. These factors include workers' certificates, average rating, number of ratings, and the amount requested to complete the job. Ratings were collected on a 5-point Likert scale (1 = Not at all, 5 = Extremely Much) for each assignment.

To analyze the role of certificates, we compared their ratings across the four experimental conditions. The dependent variable, certificate rating, is ordinal and non-normally distributed, while the independent variable, experimental condition, has four levels. Therefore, we conducted a Kruskal-Wallis test (McKight and Najab 2010) to show the rank of certificates as the most important factor in four different experimental conditions.

The results, presented in Table E5, show that certificates were rated as the most important in the *Easy Access & Low Supply* condition and the least important in the *Difficult Access & High Supply* condition. The *Easy Access & High Supply* condition ranked just after the *Easy Access & Low Supply* condition. The differences among the four experimental conditions were statistically significant ($\chi^2(3) = 15.350$, $p < 0.01$).

These findings support our conclusion that both easy access to test passing scores and a lower supply of certified workers enhance the importance of certification (and its scores) in hiring decisions.

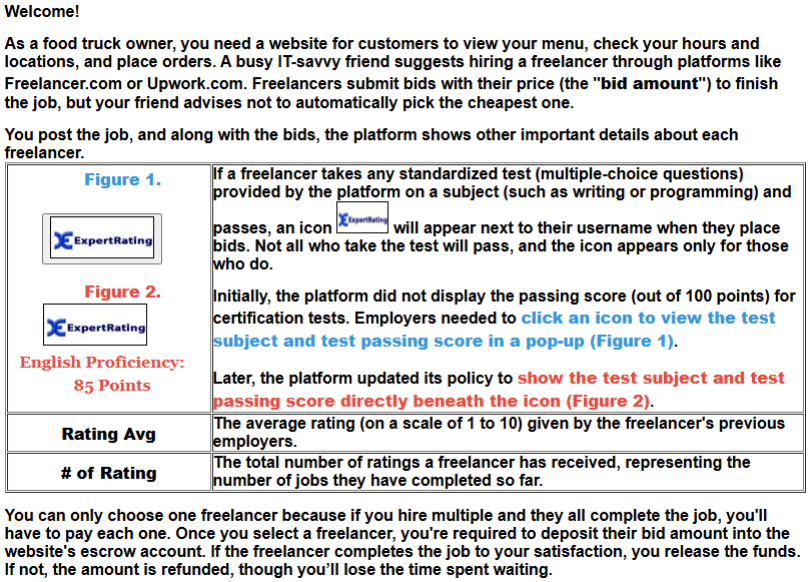
Table E5. Kruskal Wallis test of the Importance of Certification

Experimental Conditions	Obs	Rank Sum
Difficult access with high supply	288	152244
Difficult access with low supply	294	163875
Easy access with High supply	282	165957
Easy access with Low supply	288	182052
Chi2(3) = 15.350, p<0.01		

Our experiment supports the conclusion that the influence of certification passing scores on job recruiters' hiring decisions is impacted by the number of certified bidders. Furthermore, improving access to certification test passing scores can amplify their effect on hiring decisions.

Figure E2. Screenshots of Experiment Design

(a) Background Information



Welcome!

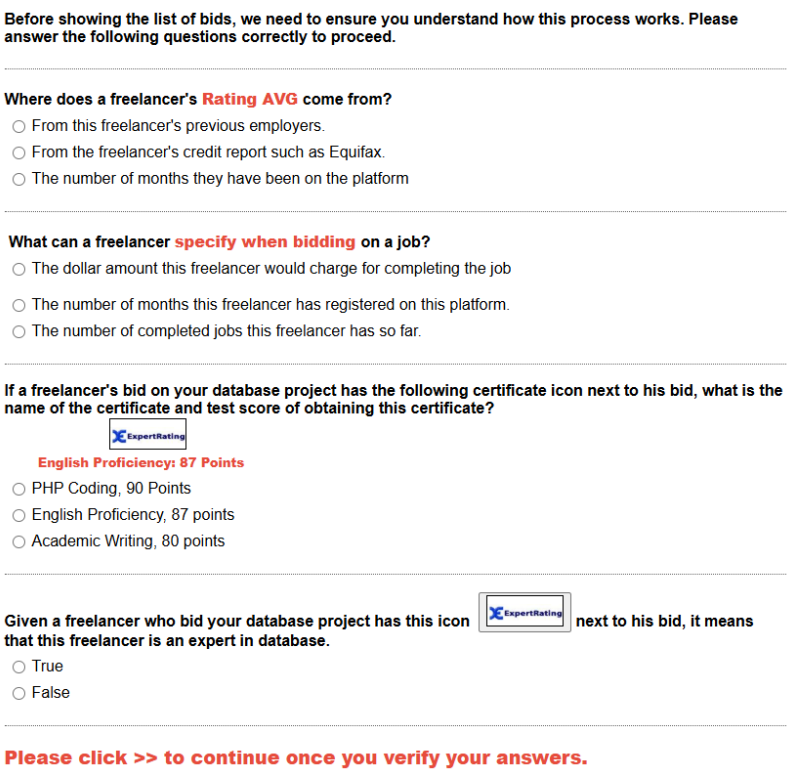
As a food truck owner, you need a website for customers to view your menu, check your hours and locations, and place orders. A busy IT-savvy friend suggests hiring a freelancer through platforms like Freelancer.com or Upwork.com. Freelancers submit bids with their price (the "bid amount") to finish the job, but your friend advises not to automatically pick the cheapest one.

You post the job, and along with the bids, the platform shows other important details about each freelancer.

Figure 1. ExpertRating **Figure 2.** ExpertRating English Proficiency: 85 Points	**If a freelancer takes any standardized test (multiple-choice questions) provided by the platform on a subject (such as writing or programming) and passes, an icon will appear next to their username when they place bids. Not all who take the test will pass, and the icon appears only for those who do.** **Initially, the platform did not display the passing score (out of 100 points) for certification tests. Employers needed to click an icon to view the test subject and test passing score in a pop-up (Figure 1).** **Later, the platform updated its policy to show the test subject and test passing score directly beneath the icon (Figure 2).**
Rating Avg	**The average rating (on a scale of 1 to 10) given by the freelancer's previous employers.**
# of Rating	**The total number of ratings a freelancer has received, representing the number of jobs they have completed so far.**

You can only choose one freelancer because if you hire multiple and they all complete the job, you'll have to pay each one. Once you select a freelancer, you're required to deposit their bid amount into the website's escrow account. If the freelancer completes the job to your satisfaction, you release the funds. If not, the amount is refunded, though you'll lose the time spent waiting.

(b) Background Understanding Questions



Before showing the list of bids, we need to ensure you understand how this process works. Please answer the following questions correctly to proceed.

Where does a freelancer's Rating AVG come from?

- ○ From this freelancer's previous employers.
- ○ From the freelancer's credit report such as Equifax.
- ○ The number of months they have been on the platform

What can a freelancer specify when bidding on a job?

- ○ The dollar amount this freelancer would charge for completing the job
- ○ The number of months this freelancer has registered on this platform.
- ○ The number of completed jobs this freelancer has so far.

If a freelancer's bid on your database project has the following certificate icon next to his bid, what is the name of the certificate and test score of obtaining this certificate?

ExpertRating

English Proficiency: 87 Points

- ○ PHP Coding, 90 Points
- ○ English Proficiency, 87 points
- ○ Academic Writing, 80 points

Given a freelancer who bid your database project has this icon ExpertRating **next to his bid, it means that this freelancer is an expert in database.**

- ○ True
- ○ False

Please click >> to continue once you verify your answers.

(c) i. Certification Information Disclosed Example

Job Description:

I need a simple, user-friendly website for my food truck. A template is fine. It should display my menu, hours, and locations, and let customers place orders online. For orders, they'll need to enter their food choice, name, phone number, and estimated pickup time

You've received 6 bids from different freelancers for this job, shown in the table below.
Note: Bidder usernames were automatically generated by the platform.

Username	Rating Avg / # of Ratings	Bid Amount
URC	9.44 / 24 RATINGS	$197
W7B ExpertRating Website Design: 81 Points	9.39/ 22 RATINGS	$199
KDY ExpertRating Website Design: 87 Points	9.40 /23 RATINGS	$198
REQ	9.43 /23 RATINGS	$198
5MA ExpertRating Website Design:75 Points	9.44 / 24 RATINGS	$200
PTW	9.39 / 24 RATINGS	$199

Please click on and drag freelancer IDs below to rank them based on your hiring preference from highest (most likely that you'd hire) to the lowest (least likely):

- Freelancer PTW
- Freelancer 5MA
- Freelancer REQ
- Freelancer KDY
- Freelancer W7B
- Freelancer URC

Please rate the importance of each of the following for your decision-making:

	Scale				
	Not at all 1	Somehow 2	Moderately 3	Much 4	Extremely much 5
Bid Amount	○	○	○	○	○
ExpertRating	○	○	○	○	○
# of Ratings	○	○	○	○	○
Rating AVG	○	○	○	○	○

(c) ii. Certification Information Undisclosed Example

Job Description:

I need a simple, user-friendly website for my food truck. A template is fine. It should display my menu, hours, and locations, and let customers place orders online. For orders, they'll need to enter their food choice, name, phone number, and estimated pickup time

You've received 6 bids from different freelancers for this job, shown in the table below.
Note: Bidder usernames were automatically generated by the platform.

Username	Rating Avg / # of Ratings	Bid Amount
URC	9.44 / 24 RATINGS	$197
W7B ExpertRating	9.39/ 22 RATINGS	$199
KDY ExpertRating	9.40 /23 RATINGS	$198
REQ	9.43 /23 RATINGS	$198
5MA ExpertRating	9.44 / 24 RATINGS	$200
PTW	9.39 / 24 RATINGS	$199

Please click on and drag freelancer IDs below to rank them based on your hiring preference from highest (most likely that you'd hire) to the lowest (least likely):

- Freelancer PTW
- Freelancer 5MA
- Freelancer REQ
- Freelancer KDY
- Freelancer W7B
- Freelancer URC

Please rate the importance of each of the following for your hiring decision-making:

	Scale				
	Not at all 1	Somehow 2	Moderately 3	Much 4	Extremely much 5
Bid Amount	○	○	○	○	○
ExpertRating	○	○	○	○	○
# of Ratings	○	○	○	○	○
Rating AVG	○	○	○	○	○

(d) Manipulation Questions

Do we have multiple workers with certifications among all the bidders for this job?

○ Yes
○ No

For bids with a certificate icon, were test subject and test passing score displayed beneath the icon?

○ Yes
○ No

(e) Demographics

What is your race? (Choose only one category)

○ White, Anglo, or Caucasian
○ Black or African American
○ American Indian or Alaskan Native
○ Asian
○ Native Hawaiian or Other Pacific Islander
○ Other NonWhite Race

What is your age?

What is your gender?

○ Male
○ Female
○ non-binary

Do you have any comments (optional)?

Appendix F: Full Results for Tables in Main Paper

Table F1. Effects of Certificates and Zero-Cost Certification Test Policy on Employers' Hiring Decisions Before and After Policy (Corresponding to Table 2)

Variables	All Bids (1 Mon Before)	All Bids (1st Mon After)	All Bids (3rd Mon After)	Matched Bids (1 Mon Before vs 1st Mon After)	Matched Bids (1 Mon Before vs 3rd Mon After)
	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*	DV: *Awarded*
Certified	0.275**	0.087	0.080	0.666***	0.589***
	(0.135)	(0.071)	(0.053)	(0.132)	(0.125)
AfterPolicy				-0.871***	-1.635***
				(0.109)	(0.278)
AfterPolicy×Certified				-0.590***	-0.458***
				(0.171)	(0.155)
#OfRatings	0.308***	0.309***	0.337***	0.119***	0.179***
	(0.019)	(0.020)	(0.020)	(0.010)	(0.016)
AvgRating	0.107***	0.089***	0.132***	0.080***	0.099***
	(0.011)	(0.010)	(0.012)	(0.006)	(0.009)
WorkerReg(months)	-0.064***	-0.079***	-0.091***	0.120***	0.066***
	(0.025)	(0.025)	(0.027)	(0.014)	(0.021)
HavingPic	-0.048	0.002	-0.050	-0.029	-0.007
	(0.043)	(0.041)	(0.047)	(0.024)	(0.039)
HavingSimiJobs	-0.104	0.052	-0.190**	0.129***	0.141*
	(0.087)	(0.084)	(0.093)	(0.048)	(0.073)
MsgSentiment	-0.731***	-0.761***	-0.667***	-0.836***	-0.509***
	(0.066)	(0.067)	(0.076)	(0.041)	(0.066)
MsgLen(log)	1.007***	1.172***	1.144***	0.554***	0.485***
	(0.029)	(0.028)	(0.032)	(0.015)	(0.024)
Readability(fkg)	-0.256***	-0.394***	-0.424***	-0.272***	-0.248***
	(0.025)	(0.033)	(0.035)	(0.018)	(0.029)
BidAmount	-1.230***	-1.191***	-1.262***	-0.421***	-0.371***
	(0.060)	(0.056)	(0.065)	(0.013)	(0.021)
BidOrder	0.638***	0.552***	0.634***	-1.225***	-0.853***
	(0.047)	(0.046)	(0.050)	(0.019)	(0.032)
BidAmountPosition	-0.293***	-0.243***	-0.213**	0.532***	0.356***
	(0.094)	(0.087)	(0.100)	(0.033)	(0.053)
SameCountry	0.577***	0.743***	0.486***	0.505***	0.488***
	(0.084)	(0.082)	(0.102)	(0.046)	(0.077)
EmployerReg(months)				-0.018	0.003
				(0.013)	(0.021)
EmployerExperience				0.080***	0.070***
				(0.010)	(0.016)
DescriptionLength				-0.392***	-0.448***
				(0.013)	(0.019)
RatioOfCertBids				0.032***	0.033***
				(0.003)	(0.002)
#OfCertBids				-1.841***	-2.409***
				(0.059)	(0.066)
Constant				12.001***	11.718***
				(1.205)	(1.192)
Observations	50,336	50,009	41,765	73,317	32,416
Job Fixed Effects	YES	YES	YES	NO	NO

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table F2. Effect of Certification and Zero-Cost Certification Test Policy on Contract Price (Corresponding to Table 5)

Variables	Winning Bids (1 Mon Before)	Winning Bids (1st Mon After)	Winning Bids (3rd Mon After)	Matched Winning Bids (1 Mon Before vs 1st Mon After)	Matched Winning Bids (1 Mon Before vs 3rd Mon After)
	DV: *ContractPrice*	DV: *ContractPrice*	DV: *ContractPrice*	DV: *ContractPrice*	DV: *ContractPrice*
Certified	0.190*	0.099***	0.074**	0.356***	0.487***
	(0.103)	(0.038)	(0.031)	(0.060)	(0.075)
AfterPolicy				-0.020*	-0.070***
				(0.012)	(0.023)
Certified×AfterPolicy				-0.102*	-0.360***
				(0.057)	(0.105)
Avg#OfRating	0.191***	0.182***	0.159***	0.193***	0.176***
	(0.009)	(0.008)	(0.009)	(0.007)	(0.012)
AvgWorkerRating	0.269***	0.293***	0.345***	0.286***	0.304***
	(0.006)	(0.007)	(0.008)	(0.005)	(0.009)
AvgWorkerReg(months)	0.109***	0.104***	0.121***	0.101***	0.167***
	(0.010)	(0.010)	(0.013)	(0.008)	(0.014)
AvgPic	0.144***	0.067***	0.139***	0.117***	0.133***
	(0.018)	(0.018)	(0.020)	(0.013)	(0.024)
AvgHavingSimiJob	0.736***	0.586***	0.305***	0.654***	0.570***
	(0.038)	(0.038)	(0.045)	(0.029)	(0.057)
AvgSameCountry	-0.064**	-0.379***	-0.258***	-0.236***	-0.099**
	(0.028)	(0.027)	(0.034)	(0.021)	(0.041)
AvgSent	-0.692***	-0.572***	-0.247***	-0.632***	-0.526***
	(0.026)	(0.025)	(0.028)	(0.019)	(0.035)
AvgMsgLen	-1.190***	-1.178***	-1.067***	-1.257***	-1.243***
	(0.039)	(0.039)	(0.042)	(0.030)	(0.050)
AvgReadability	-0.501***	-0.463***	-0.354***	-0.503***	-0.456***
	(0.017)	(0.017)	(0.017)	(0.013)	(0.021)
EmployerExperience	0.231***	0.176***	0.209***	0.207***	0.199***
	(0.007)	(0.007)	(0.008)	(0.005)	(0.009)
EmployerReg(months)	0.039***	0.107***	0.065***	0.070***	0.060***
	(0.008)	(0.007)	(0.008)	(0.006)	(0.010)
DescriptionLength	-0.191***	-0.236***	-0.234***	-0.220***	-0.267***
	(0.008)	(0.008)	(0.009)	(0.006)	(0.011)
RatioOfCertBids	0.350***	0.212***	0.420***		
	(0.113)	(0.050)	(0.042)		
#OfCertBids	-0.472***	-0.174***	-0.325***	-0.217***	-0.317***
	(0.068)	(0.018)	(0.016)	(0.051)	(0.055)
IMR	6.541***				
	(0.106)				
IMR1		6.685***			
		(0.096)			
IMR2			6.112***		
			(0.105)		
IMR3				6.715***	
				(0.080)	
IMR4					6.445***
					(0.113)
Constant	0.350***	0.583***	-0.069	0.508***	1.054***
	(0.084)	(0.074)	(0.089)	(0.062)	(0.119)
Observations	8,816	9,104	7,695	14,423	6,896

Job Value Fixed Effects	YES	YES	YES	YES	YES
Job Category Fixed Effects	YES	YES	YES	YES	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. *RatioOfCertBids* is excluded from columns 4 and 5 because of its correlation with *Certified.*

Table F3. Effects of Policy Change on Platform Transaction Amount (in $1,000) (Table 7 in Main Paper)

Variables	Subsamples						All Data
	Winning Bids (6 Mons Before vs. 1st Mon After)	Winning Bids (6 Mons Before vs.2nd Mon After)	Winning Bids (6 Mons Before vs. 3rd Mon After)	Winning Bids (6 Mons Before vs. 4th Mon After)	Winning Bids (6 Mons Before vs. 5th Mon After)	Winning Bids (6 Mons Before vs. 6th Mon After)	All Winning Bids (6 Mons Before and After)
	DV: *TotalAmt*	DV: *TotalAmt*	DV: *TotalAmt*	DV: *TotalAmt*	DV: *TotalAmt*	DV: *TotalAmt*	DV: *TotalAmt*
DistToPolicy(1st mon after)	-4.713						-22.64***
	(3.226)						(7.739)
DistToPolicy(2nd mon after)		-5.112					-26.48***
		(3.701)					(8.268)
DistToPolicy(3rd mon after)			-8.975*				-33.72***
			(4.802)				(9.169)
DistToPolicy(4th mon after)				-10.18**			-36.67***
				(5.139)			(9.544)
DistToPolicy(5th mon after)					-8.403**		-29.48***
					(4.015)		(8.527)
DistToPolicy(6th mon after)						-11.87**	-37.34***
						(5.096)	(10.15)
DailyAvg#OfRating	73.72***	79.07***	64.43***	68.94***	60.39***	70.93***	74.65***
	(21.11)	(20.56)	(17.49)	(19.02)	(19.12)	(19.08)	(13.16)
DailyAvgWorkerRatin	-13.41	-9.537	-10.53	-10.17	-5.636	-8.075	-14.67**
	(9.305)	(8.723)	(8.343)	(8.749)	(9.171)	(9.179)	(7.146)
DailyAvgWorkerReg(months)	-12.75	-24.05	-4.591	-2.963	4.397	-3.175	26.33
	(25.96)	(24.72)	(22.93)	(24.02)	(24.47)	(25.41)	(20.83)
DailyBidSimilarJobs	3.893	-13.18	-32.22	-43.73	-24.30	-33.31	-42.73
	(104.7)	(96.72)	(92.41)	(98.21)	(102.0)	(89.77)	(66.01)
DailyAvgBidAmount	22.34***	23.85***	21.08***	24.48***	18.22***	22.80***	14.15***
	(7.142)	(7.154)	(7.189)	(6.941)	(6.825)	(7.070)	(5.189)
DailyAvgSameCountry	-149.4*	-116.3	-148.7**	-76.97	-100.2	-131.1*	-74.70
	(75.87)	(75.17)	(60.17)	(77.54)	(75.72)	(78.48)	(52.81)
DailyMsg	10.31	-1.948	9.718	-7.563	12.86	1.947	29.22*
	(21.84)	(20.85)	(22.26)	(21.63)	(21.26)	(22.17)	(15.38)
SPY(500)	-12.08	-10.68	-12.41	-12.91	-9.343	-11.36	58.33**
	(14.04)	(14.15)	(13.85)	(13.98)	(14.11)	(13.48)	(29.15)
Constant	6.875	-9.240	19.45	0.799	-40.11	-24.15	-484.3**
	(116.0)	(118.6)	(114.2)	(114.0)	(118.0)	(109.3)	(197.4)
Observations	210	210	210	210	210	210	360
R-squared	0.166	0.157	0.184	0.171	0.151	0.173	0.233

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table F4. Effects of Certified Before Policy on Rating Given by Employers and Rehiring By Same Employers, and on Employers' Hiring Decisions (All Bids for Jobs within 3 Months After Policy) (Corresponding to Table 9)

Variables	All Winning Bids from Workers Certified from Fee-based Tests and Uncertified Workers		Winning Bids from All Certified Workers		Matched Bids from Certified Workers
	DV: *WorkerRating*	DV: *Rehire*	DV: *WorkerRating*	DV: *Rehire*	DV: *Rehire*
Certified (before_ Policy)	0.234***	0.120**	0.193***	0.145**	0.084
	(0.053)	(0.051)	(0.060)	(0.057)	(0.116)
#OfRatings	0.095***	0.066***	0.182***	0.042**	0.180***
	(0.008)	(0.008)	(0.017)	(0.017)	(0.041)
AvgRating	0.037***	0.006	0.013	-0.006	0.142***
	(0.005)	(0.005)	(0.013)	(0.013)	(0.034)
WorkerReg(months)	-0.035***	-0.007	-0.108***	0.046**	-0.107*
	(0.011)	(0.011)	(0.023)	(0.022)	(0.064)
HavingPic	-0.009	-0.050***	-0.029	-0.053	0.018
	(0.019)	(0.019)	(0.040)	(0.039)	(0.096)
ComplSimiJobs	-0.044	0.154***	-0.121	0.177*	-0.046
	(0.043)	(0.042)	(0.096)	(0.097)	(0.229)
BidAmount	-0.060***	0.054***	-0.094***	0.050**	-0.477***
	(0.010)	(0.010)	(0.023)	(0.022)	(0.049)
BidOrder	0.086***	-0.118***	0.055*	-0.175***	0.904***
	(0.014)	(0.015)	(0.030)	(0.031)	(0.112)
BidAmountPosition	0.005	0.165***	0.016	0.036	-0.099
	(0.027)	(0.029)	(0.058)	(0.059)	(0.130)
SameCountry	0.039	-0.102***	-0.023	-0.267***	0.158
	(0.033)	(0.034)	(0.063)	(0.063)	(0.148)
EmployerReg(months)	-0.057***	-0.131***	-0.048**	-0.118***	-0.070
	(0.010)	(0.010)	(0.021)	(0.021)	(0.051)
EmployerExperience	0.094***	0.171***	0.108***	0.177***	0.119***
	(0.008)	(0.008)	(0.017)	(0.017)	(0.041)
DescriptionLength	0.268***	-0.091***	0.304***	-0.014	-0.337***
	(0.009)	(0.008)	(0.019)	(0.018)	(0.050)
MsgSentiment					-0.877***
					(0.156)
MsgLen(log)					0.431***
					(0.043)
Readability(fkg)					-0.475***
					(0.056)
CertRatio					2.394***
					(0.106)
#OfCertBids					-2.875***
					(0.159)
Constant		-0.515***		-0.599***	-7.050***
		(0.071)		(0.066)	(0.627)
Observations	21,334	21,334	24,636	24,636	6,604
Project Category	YES	YES	YES	YES	YES
Project-value Type Fixed Effects	YES	YES	YES	YES	YES
Year-month Fixed Effects	YES	YES	YES	YES	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table F5. Test Scores on Hiring and Perceived Quality of Work (Corresponding to Table 10)

Variables	All Bids from Certified Workers		Winning Bids from Certified Workers			
	3 Mons Before Policy	3 Mons After Policy	3 Mons Before Policy (Workers Certified Before Policy)		3 Mons After Policy (Workers Certified After Policy)	
	DV: *Awarded*	DV: *Awarded*	DV: *WorkerRating*	DV: *Rehire*	DV: *WorkerRating*	DV: *Rehire*
Test_Scores	0.020***	0.002	0.014***	0.019***	0.006***	0.011***
	(0.005)	(0.002)	(0.004)	(0.004)	(0.002)	(0.002)
#OfRatings	0.163***	0.235***	0.236***	0.001	0.148***	0.025
	(0.046)	(0.019)	(0.037)	(0.037)	(0.019)	(0.019)
AvgRating	0.019	0.140***	0.051	0.096**	0.007	-0.009
	(0.043)	(0.013)	(0.043)	(0.044)	(0.013)	(0.014)
WorkerReg(months)	-0.279***	-0.136***	0.011	-0.103	-0.087***	0.073***
	(0.077)	(0.025)	(0.069)	(0.068)	(0.024)	(0.023)
HavingPic	-0.174	0.050	-0.338***	0.161*	0.072*	-0.012
	(0.113)	(0.044)	(0.094)	(0.092)	(0.043)	(0.042)
BidAmount	-0.483***	-0.481***	-0.169***	0.064	-0.084***	0.056**
	(0.055)	(0.024)	(0.050)	(0.048)	(0.025)	(0.024)
BidOrder	0.991***	0.902***	-0.012	-0.230***	0.065**	-0.166***
	(0.125)	(0.051)	(0.072)	(0.079)	(0.033)	(0.034)
BidAmountPosition	-0.274*	-0.305***	0.049	0.382**	0.025	0.037
	(0.154)	(0.059)	(0.151)	(0.159)	(0.062)	(0.064)
SameCountry	0.076	0.201***	0.339**	-0.170	-0.034	-0.332***
	(0.151)	(0.072)	(0.135)	(0.131)	(0.069)	(0.072)
ComplSimiJobs	0.632*	-0.128	-0.448	0.056	-0.014	0.228**
	(0.324)	(0.098)	(0.346)	(0.345)	(0.100)	(0.103)
EmployerReg(months)	0.038	-0.026	-0.207***	-0.253***	-0.033	-0.113***
	(0.059)	(0.024)	(0.053)	(0.053)	(0.023)	(0.023)
EmployerExperience	0.107**	0.113***	0.281***	0.275***	0.096***	0.177***
	(0.046)	(0.019)	(0.040)	(0.039)	(0.019)	(0.019)
DescriptionLength	-0.350***	-0.306***	0.287***	-0.110***	0.327***	-0.001
	(0.057)	(0.023)	(0.043)	(0.041)	(0.020)	(0.020)
MsgSentiment	-0.759***	-0.514***				
	(0.171)	(0.073)				
MsgLen(log)	0.320***	0.475***				
	(0.048)	(0.021)				
Readability(fkg)	-0.532***	-0.278***				
	(0.067)	(0.025)				
CertRatio	2.282***	2.384***				
	(0.110)	(0.049)				
#OfCertBids	-3.778***	-2.924***				
	(0.357)	(0.072)				
Constant	-5.393***	-7.674***		-2.372***		-2.396***
	(0.753)	(0.312)		(0.565)		(0.235)

Observations	4,574	34,817	1,019	1,019	4,793	4,793
Project Category	YES	YES	YES	YES	YES	YES
Project-value Type Fixed Effects	YES	YES	YES	YES	YES	YES
Year-month Fixed Effects	YES	YES	YES	YES	YES	YES

Note. Reported results are coefficients. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

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