Team Production in International Labor Markets: Experimental Evidence from the Field

Elizabeth Lyons[1]

For Online Publication

Additional Tables

Table A1—: Pair Characteristic Summary Statistics By Team Work and National Diversity Treatments

	Panel A		
Variable	**No Team Work**	**Team Work**	**p-value of difference**
Number of Job Posting	8.358	8.08	0.580
Applications	(0.328)	(0.378)	
oDesk Rating Prior	4.527	4.62	0.470
to Hire	(0.11)	(0.083)	
No Rating Prior	0.636	0.586	0.397
to Hire	(0.042)	(0.040)	
Number of oDesk Contracts	5.093	3.333	0.134
Prior to Hire	(1.036)	(0.542)	
Indicator for having a	0.815	0.87	0.191
Profile Picture	(0.033)	(0.026)	
Level of Education	1.87	1.821	0.649
	(0.077)	(0.076)	
Number of Offline Jobs	1.16	1.222	0.543
Listed on Profile	(0.075)	(0.067)	
Average Score on oDesk	3.416	3.44	0.736
Tests	(0.044)	(0.058)	
Number of oDesk Tests	2.531	2.488	0.905
Taken	(0.239)	(0.269)	
Wage Bid on the Job	3.729	3.789	0.527
	(0.070)	(0.065)	
Wage Posted on Profile	7.422	6.355	0.326
	(0.329)	(0.447)	
Indicator for Female	0.13	0.16	0.440
Contractor	(0.029)	(0.028)	
Indicator for Agency	0.228	0.278	0.315
Membership	(0.035)	(0.035)	
Number of Items in	3.92	3.821	0.896
Portfolio	(0.562)	(0.508)	
Number of Observations	80	82	

[1]School of Global Policy and Strategy, UC San Diego, 9500 Gilman Drive, La Jolla, CA 92093. lizlyons@ucsd.edu.

	Panel B		
Variable	**No National Diversity**	**National Diversity**	**p-value of difference**
Number of Job Posting	8.15	8.287	0.786
Applications	(0.318)	(0.386)	
oDesk Rating Prior	4.543	4.607	0.635
to Hire	(0.112)	(0.080)	
No Rating Prior	0.619	0.604	0.796
to Hire	(0.043)	(0.04)	
Number of oDesk Contracts	3.625	4.787	0.324
Prior to Hire	(0.713)	(0.927)	
Indicator for having a	0.863	0.823	0.356
Profile Picture	(0.029)	(0.031)	
Level of Education	1.875	1.817	0.594
	(0.079)	(0.074)	
Number of Offline Jobs	1.2	1.183	0.866
Listed on Profile	(0.076)	(0.067)	
Average Score on oDesk	3.464	3.394	0.335
Tests	(0.056)	(0.045)	
Number of oDesk Tests	2.175	2.835	0.066*
Taken	(0.207)	(0.288)	
Wage Bid on the Job	3.788	3.731	0.550
	(0.068)	(0.067)	
Wage Posted on Profile	6.611	7.159	0.326
	(0.329)	(0.447)	
Indicator for Female	0.131	0.159	0.495
Contractor	(0.029)	(0.027)	
Indicator for Agency	0.231	0.274	0.38
Membership	(0.036)	(0.034)	
Number of Items in	4.269	3.482	0.299
Portfolio	(0.588)	(0.477)	
Number of Observations	80	82	

Notes: Standard errors are in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A2—: Effect of Team Work & National Diversity on Team Performance, Robustness to Pairs with Contractors who Lost Contact

Pairs with Lost Contractors	(1)	(2)	(3)	(4)
	Average Performance Assigned		Dropped from Sample	
	Ouput	Producitivity	Output	Productivity
Team Work	0.315*	0.068**	0.359**	0.076**
	(0.164)	(0.033)	(0.170)	(0.034)
National Diversity*Team Work	-0.692***	-0.168***	-0.780***	-0.187***
	(0.232)	(0.049)	(0.245)	(0.053)
H_o: Team Work+National Diversity *Team Work=0	0.007***	0.002***	0.003***	0.001***
Observations	162	162	153	153
Mean Dependant Variable Independent Work	1.115	0.13	1.115	0.137
R-squared	0.278	0.262	0.301	0.279

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included in all regressions. Controls included in all regressions are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. The H_o: Team Work+National Diversity*Team Work=0 row reports the p-values of this test. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A3—: Effect of Team Work & National Diversity on Team Performance, Full Set of Controls

	(1) Output	(2) Productivity
Team Work	0.344**	0.076**
	(0.165)	(0.033)
National Diversity*Team Work	-0.707***	-0.170***
	(0.236)	(0.050)
Number of oDesk Contracts Prior to Hire	-0.010	-0.002
	(0.012)	(0.002)
Indicator for having a Profile Picture	0.203	-0.068
	(0.258)	(0.052)
Level of Education	-0.021	-0.004
	(0.099)	(0.016)
Number of Offline Jobs Listed on Profile	-0.001	0.021
	(0.121)	(0.024)
Number of oDesk Tests Taken	-0.007	0.011
	(0.034)	(0.011)
Wage Bid on the Job	0.213**	0.004
	(0.106)	(0.017)
Indicator for Agency Membership	-0.576***	-0.086***
	(0.213)	(0.031)
Indicator for Female Contractor	-0.102	-0.045
	(0.286)	(0.036)
Observations	162	162
Mean Dependant Variable Independent Work	1.062	0.135
R-squared	0.276	0.269

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included in all regressions. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A4—: Effect of Team Work & National Diversity on Output, Ordered Logit

	(1) Output	(2)	(3)	(4)	(5)
		Predicted Values			
	Coefficient Estimates	No Features Added	One Feature Added	Two Features Added	Three Features Added
Team Work	0.922***	0.240	0.467	0.260	0.033
	(0.321)				
National Diversity* Team Work	-1.961***	0.355	0.478	0.153	0.013
	(0.466)				
Independent Work		0.225	0.490	0.256	0.029
Observations	162				
Pseudo R-squared	0.1308				
Wald Chi Squared	50.89				

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included in all regressions. Controls included in all regressions are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Output is the total number of features added by a pair of workers. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A5—: Effect of Team Work & National Diversity on Number of Hours Worked

	Hours Worked
Team Work	-0.215
	(1.140)
National Diversity*Team Work	0.516
	(1.570)
H_o: Team Work+National Diversity*Team Work=0	0.665
Observations	162
Mean Dependant Variable Independent Work	9.139
R-squared	0.233

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included in all regressions. Controls included in all regressions are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. The H_o: Team Work+National Diversity*Team Work=0 row reports the p-values of this test. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A6—: Effect of Team Work & India Pairs on Output and Productivity

	(1)	(2)	(3)	(4)
	Output		Productivity	
Team Work	0.262	0.176	0.027	0.027
	(0.253)	(0.326)	(0.028)	(0.034)
India Pair	0.100	-0.125	0.010	0.010
	(0.280)	(0.276)	(0.031)	(0.062)
India Pair * Team Work	0.147	0.293	0.079	0.107
	(0.361)	(0.439)	(0.062)	(0.070)
H_o: India Pair+India Pair* Team Work=Team Work	0.959	0.987	0.159	0.210
Controls	No	Yes	No	Yes
Observations	80	80	80	80
Mean Dependant Variable Independent Work, Non-Indian Pairs	0.909	0.909	0.088	0.088
R-squared	0.062	0.537	0.087	0.501

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Week fixed effects and controls for team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership are included in columns 2 and 4. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. The H_o: North-South India Pair+North-South India Pair*Team Work=Team Work row reports the p-values of this test. The sample is restricted to pairs of contractors from the same country. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A7—: Effect of Team Work & North-South India Pairs on Output and Productivity

VARIABLES	(1) Output	(2) Productivity
Team Work	-0.076	-0.045
	(0.276)	(0.082)
North-South India Pairs	-0.539	-0.120
	(0.504)	(0.106)
North-South India Pairs* Team Work	0.652	0.330
	(0.567)	(0.268)
H_o: North-South India Pair+ North-South India Pair*Team Work=Team Work	0.710	0.332
Observations	45	45
Mean Dependant Variable Independent Work, Same Region of India	0.929	0.084
R-squared	0.797	0.635

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Week fixed effects are included in all regressions. Controls included in all regressions are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair.The H_o: North-South India Pair+North-South India Pair*Team Work=Team Work row reports the p-values of this test. The sample is restricted to pairs of contractors from India. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A8—: Effect of Team Work & Ethnically Similar Nationally Diverse Pairs on Output and Productivity

	(1)	(2)	(3)	(4)
	Output		Productivity	
Team Work	-0.337*	-0.335*	-0.076**	-0.083**
	(0.171)	(0.174)	(0.037)	(0.039)
Diverse Pairs in Ethnically Similar Regions	-0.082	-0.059	-0.060	-0.033
	(0.262)	(0.276)	(0.044)	(0.035)
Diverse Pairs in Ethnically Similar Regions *	-0.214	-0.238	0.071	0.072
Team Work	(0.398)	(0.395)	(0.069)	(0.071)
H_o: Diverse Pairs in Ethnically Similar Regions+ Diverse Pairs in Ethnically Similar Regions* Team Work=Team Work	0.912	0.918	0.189	0.125
Country Pair Fixed Effects	No	Yes	No	Yes
Mean Dependant Variable Independent Work, Non-Similar Pairs	1.146	1.146	0.170	0.170
Observations	97	97	97	97
R-squared	0.275	0.279	0.303	0.351

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Week fixed effects are included in all regressions. Controls included in all regressions are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. Ethnically similar diverse pairs are pairs made up of one contractor from Punjab in India and one from Pakistan, or one contractor from West Bengal in India and one from Bangladesh. The H_o: Diverse Pairs in Ethnically Similar Regions+Diverse Pairs in Ethnically Similar Regions*Team Work=Team Work row reports the p-values of this test. The sample is restricted to nationally diverse pairs of contractors. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A9—: Effect of Team Work & National Diversity on Individual Performance

	(1) Individual Output	(2) Individual Productivity
Team Work	0.180*	0.027
	(0.107)	(0.029)
National Diversity*Team Work	-0.370**	-0.105***
	(0.145)	(0.039)
H_o: Team Work +National Diversity*Team Work=0	0.048**	0.003***
Observations	324	324
Mean Dependant Variable, Independent Work	0.580	0.117
R-squared	0.179	0.137

Notes: An observation is an individual worker. Robust standard errors in parentheses. Country pair and week fixed effects included in all regressions. Controls included in all regressions are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Individual Output is the total number of features added by an individual. Individual productivity is the total number of features added by an observation divided by the number of hours worked on the task by the individual. The H_o: Team Work+National Diversity*Team Work=0 row reports the p-values of this test. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A10—: Effect of National Diversity on Output and Productivity Among Teams

	(1) Team Output	(2) Team Productivity
National Diversity	-0.526***	-0.112**
	(0.178)	(0.051)
Observations	81	81
Mean Dependent Variable, No National Diversity	1.375	0.173
R-squared	0.458	0.329

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included in all regressions. Controls are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Team Output is the total number of features added by an observation. Team Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. Sample is restricted to pairs of workers in the team treatment of the experiment. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A11—: Effect of Geographic Distance & National Diversity on Pair Performance

	(1)	(2)	(3)	(4)
	Output		Productivity	
Team Work	0.433	0.176	0.154***	0.130**
	(0.422)	(0.459)	(0.056)	(0.059)
Log of Geographic Distance s	0.035	0.011	0.019**	0.011
Between Pair Member	(0.044)	(0.056)	(0.009)	(0.009)
Log of Geographic Distance Between	-0.069	0.026	-0.029**	-0.016
Pair Members* Team Work	(0.066)	(0.092)	(0.011)	(0.013)
National Diversity*Team Work		-0.623		-0.113**
		(0.387)		(0.043)
H_o: Team Work+National Diversity* Team Work=0		0.100*		0.001***
Observations		119		
Mean Dependant Variable, Independent Work	1.000		0.123	
R-squared	0.265	0.305	0.288	0.356

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included in all regressions. Controls are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Sample includes all pairs for which city of residence was available for both contractors. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. The H_o: Team Work+National Diversity*Team Work=0 row reports the p-values of this test. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A12—: Effect of Team Work & National Diversity on Performance by Pair Skill Differences, Interaction

	(1) Output	(2) Productivity
Team Work	0.253	0.045
	(0.227)	(0.032)
Different Skill Sets	-0.336	-0.022
	(0.253)	(0.044)
National Diversity*Team Work	-0.395	-0.128**
	(0.338)	(0.053)
National Diversity *	0.347	-0.023
Different Skill Sets	(0.363)	(0.072)
Team Work *	0.197	0.059
Different Skill Sets	(0.329)	(0.062)
National Diversity * Team Work *	-0.573	-0.085
Different Skill Sets	(0.465)	(0.086)
H_o: Team Work+National Diversity*Team Work=0	0.572	0.045*
Observations	162	162
Mean Dependant Variable Independent Work	1.062	0.135
R-squared	0.298	0.288

Notes: An observation is a pair of workers. Robust standard errors in parentheses. Country pair and week fixed effects are included. Controls included in regression are team averages for member education, platform experience, non-platform work experience, number of platform tests, presence of a profile page, gender, wage bid, and agency membership. Output is the total number of features added by an observation. Productivity is the total number of features added by an observation divided by the number of hours worked on the task by the pair. The H_o: Team Work+National Diversity*Team Work=0 row reports the p-values of this test. * significant at 10%; ** significant at 5%; *** significant at 1%

Data Appendix[2]

Below is the document sent to contractors hired for the job used in this experiment.
I would like some customizations made to DokuWiki, an open source PHP-based wiki engine. DokuWiki uses plan text files so it does not need a database. The site is internal, not available to the public internet so I cannot share the URL with you. For more information on DokuWiki, see http://en.wikipedia.org/wiki/DokuWiki and https://www.dokuwiki.org/features.
The task is as follows: Please add as many of the below *Javascript/PHP* features in the attached code as possible and submit the code with the added features as soon as you have added everything you are able to. One feature is*Javascript/PHP* only and one uses both *Javascript/PHP* and *PHP/Javascript* (you are to work on the *Javascript/PHP* part of this task). You will be paid for eight hours of work on this project and all eight hours of work must be performed on Day of the week, Month Date. Another contractor from country teammate is from has been hired to work on the *PHP/Javascript* features in this code. **You and this contractor will be working on this in the team room at the same time so please communicate with each other to work through this task together/You will work independently of this contractor**. Unfortunately I am the hiring manager and I have little knowledge of the technical aspects of the task. Therefore, I am not available to answer questions so just do the best you can. Please send me your output and let me know which features you were able to add once the eight hours is up. Please also update your memo to let me know what you are working on. Thanks again!
You can login with the username "admin" and the password "asdf".
You'll likely need to fix the permissions on the data/ directory so that the web server can write to them (probably chwon -R www-data data/, where www-data is the user which your webserver runs as).

PHP Task

Login using either username or email address
Currently users must use their username to login. Allow them to use either their username or their email address to login.
For example, the "admin" user has the email address "admin@example.com" and the password "asdf". Allow the "admin" user to login either by entering the username "admin" and the password "asdf" OR by entering the email address "admin@example.com" and the password "asdf".

Javascript Task

Make a popup for the login dialog.
Currently clicking "login" directs the user to a new page. Update this link so that, when clicked, a popup containing the login form is shown (similar to, for example, http://www.meetup.com/).

Combined Javascript & PHP Task

Show when a page is being edited.
Make the "edit page" text red when the current page is being edited.
Use AJAX to poll the server every 15 seconds checking to see whether the current page is being edited. If it is, change the color of the "edit page" text to red. Change it back to the original blue when the page is no longer being edited.
For example, if Alice and Bob both have the start page open, then Alice clicks "edit this page", the color of the "edit page" text in Bob's web browser should change to red. Once Alice finished editing the page (either by cancelling the edit or saving the new page) the color of the "edit page" text should return to the original blue.

Appendix B1. Supplementary Job Posting Information

This section describes additional information about the job posting information beyond what was described in section II of the paper. Other than the title of the job and the job description, the information available to contractors on job postings is standardized by oDesk. In particular, oDesk posts employer information on all job postings to applicants can see how many contracts employers have hired for on the site, how much they have spent and feedback from previous hires. In addition, all job postings have to specify the estimated time the contract will last and the approximate number of hours per week the job will require. Both of these measures must be selected by the employer from a list of pre-specified options. Screenshots of the Javascript and PHP job postings used for the experiment are provided in the appendix of this paper.

[2]Italicized words indicate content that varies by the type of coding language the contractor was hired to complete. Bolded words indicate content that varies by whether contractors are in the team work treatment or not.

An important requirement of oDesk job postings for the purposes of this experiment is that employers must specify at the time of posting which team room contractors hired for the job will work in. Once hired, contractors cannot be removed from this team room. Therefore, to ensure that contractors in the team work treatment were only able to communicate about this task with their teammate and that those in the independent work treatment were not able to communicate with any other contractors about the task, one job posting for each participant was required. This institutional feature of the site made it necessary to determine which jobs would allow team work among pairs of contractors and which would not before contractors were able to apply for them. However, job postings do not indicate which team room the hired contractor will work in, and the job postings do not differ by treatment group so applicants cannot have known in advance of being hired whether they would be working with a teammate or not.

Below are screenshots of the Javascript job posting and the PHP job posting. The employer work history and feedback is blocked out to protect the privacy of contractors on the site.

Figure B1. : Javascript Job Posting

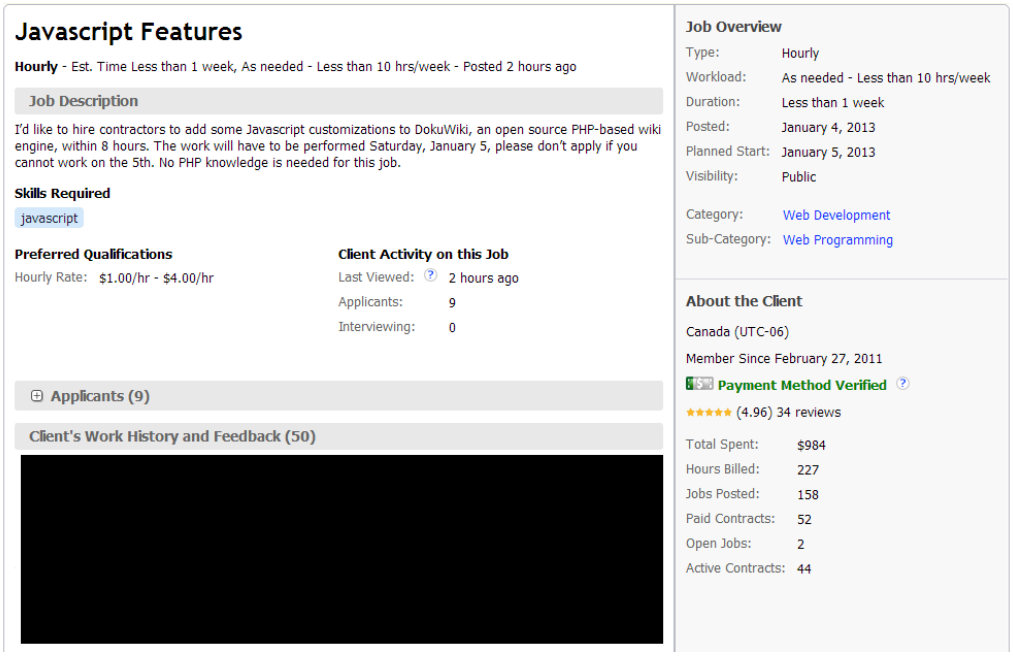
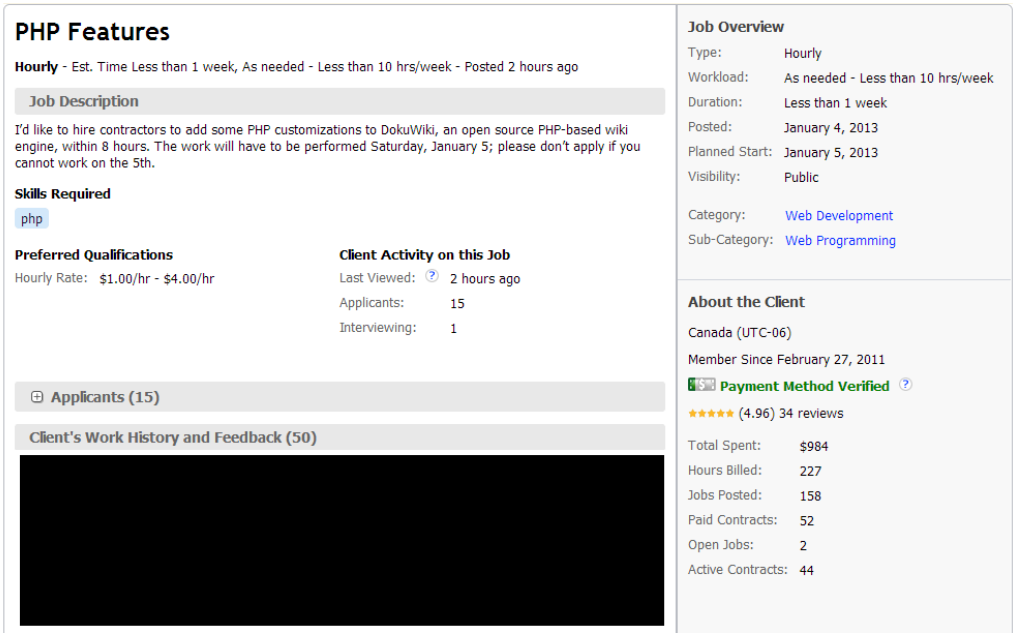


Figure B2. : PHP Job Posting



Appendix B2. Supplementary Interview Information

Below is the text provided to interviewees for the Javascript job.
Hello, thanks for applying to my job. I have four interview questions for you to answer. Please answer as honestly as possible as we are looking to hire the person best suited to this job. Please answer all questions in an oDesk message; Im not available to communicate over Skype.
1) If you have any Javascript experience, please give up to 5 examples of your experience.
2) PHP knowledge is not needed for this job but if you do have any PHP experience, please give up to 5 examples of your experience.
3) Please list all the countries you have lived and/or worked in.
4) In one paragraph, please describe why you think you are well suited for this job.
Also, please confirm whether you are able to work your hours on this job on *(Date job is to be completed on)*.
Below is the text provided to interviewees for the PHP job.
Hello, thanks for applying to my job. I have four interview questions for you to answer. Please answer as honestly as possible as we are looking to hire the person best suited to this job. Please answer all questions in an oDesk message; Im not available to communicate over Skype.
1) Javascript knowledge is not needed for this job but if you do have any Javascript experience, please give up to 5 examples of your experience.
2) If you have any PHP experience, please give up to 5 examples of your experience.
3) Please list all the countries you have lived and/or worked in.
4) In one paragraph, please describe why you think you are well suited for this job.
Also, please confirm whether you are able to work your hours on this job on *(Date job is to be completed on)*.