

ARE ONLINE WORK PLATFORMS CREATING A FRICTIONLESS GLOBAL LABOR MARKET?

Analyzing data from the largest Spanish-speaking freelance portal

Hernan Galperin & Catrihel Greppi, Guest Contributors

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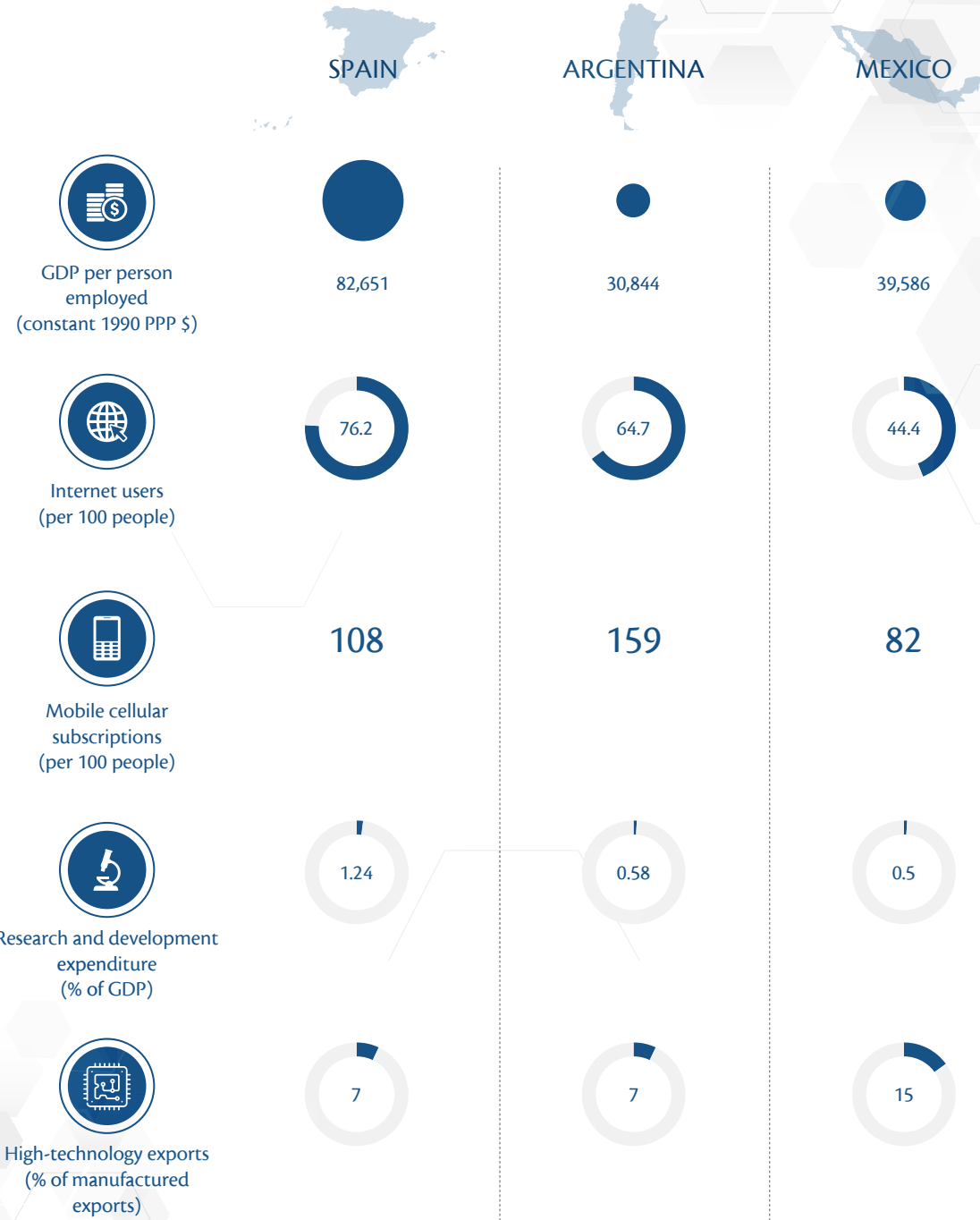
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WAGE AND EMPLOYMENT INDICATORS



Note: Figures are from the most recent year when data were available.

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Introduction

There is a familiar narrative about new communication technologies and their effect on white-collar labor offshoring. In the pre-internet days, geography generally protected workers in developed countries against competition from lower-cost providers in the rest of the world. As much as spatial distance discouraged a U.S. resident from getting a haircut in China, it also discouraged firms from outsourcing back-office operations or software development to other countries. Exponential increases in global telecommunications capacity and steep drops in per-unit communication costs since the 1980s have made distances less relevant, creating a globally contested market for workers. This has depressed wages and relocated white-collar jobs

to developing countries, in a process that closely mirrors the offshoring of blue-collar jobs in the manufacturing sector.

From a development perspective, a similar narrative – but opposite in valence – celebrates the rapid diffusion of the internet and the emergence of digital labor platforms as potential drivers of employment and wage growth in emerging regions. The argument is based on a number of stylized facts. First, the majority of employers in online labor markets are based in high-income countries, while the majority of workers are based in middle- and low-income countries.¹ This simple fact suggests that workers may be able to earn higher (hourly) wages

The rapid diffusion of the internet and the emergence of digital labor platforms are seen as potential drivers of employment and wage growth in emerging regions.

relative to opportunities in local labor markets. Second, online markets dramatically expand the number and types of labor opportunities, facilitating access to employers in higher-wage countries and increasing the likelihood that individual skills will be matched with available jobs. Third, online labor platforms allow employers to break down large processes into “microtasks,” enabling individuals or small firms in developing countries – who do not enjoy economies of scale – to compete alongside traditional offshoring firms.

Both narratives share the premise of a frictionless market for labor through digital platforms. In this narrative, white-collar or knowledge workers around the world compete for contracts on a level playing field regardless of nationality, gender or other characteristics unrelated to individual productivity. Further, some scholars have suggested that digital labor is particularly promising for groups facing higher barriers in traditional labor markets, such as women and youth. For example, Rossotto et al. argue that flexible schedules enable workers to balance online labor with other responsibilities such as childcare and education.² Raja et al. also suggest that, by making location irrelevant, digital labor allows women to overcome

biases that restrict their careers in traditional workplaces.³ Finally, digital labor tends to be associated with IT literacy. This naturally favors younger workers, who are more likely to have the skills and familiarity with technology required by employers.

This chapter seeks to test the narrative of a frictionless global market for digital labor, in

Some scholars have suggested that digital labor is particularly promising for groups facing higher barriers in traditional labor markets, such as women and youth.

which cost differentials gradually shift jobs from high-wage to low-wage countries. The empirical strategy is based on the examination of internal data from Nubelo, the largest online labor platform for Spanish-speaking employers and workers. The authors obtained records for all transactions in Nubelo over a 44-month period between March 2012 and December 2015. The dataset includes basic demographic characteristics of employers and contractors, and extensive platform-specific information about contracted jobs.

The results suggest that information-related frictions characteristic of traditional labor markets are exacerbated in online contract platforms, resulting in a significant penalty for foreign job seekers. This results in two ways. First, after controlling for observable individual

characteristics and bid amount, workers based in less developed countries are 42 percent less likely to win contracts from employers in Spain, the highest-wage country in the sample and where the majority of Nubelo employers are based. Second, Spanish workers in the sample command a significant wage premium of about 16 percent over similarly qualified workers based in developing countries.

We offer two complementary explanations for these results. The first relates to the nature of the contracts outsourced through online labor platforms. Most of the job opportunities available in Nubelo require a degree of co-production between the buyer and seller, which implies iterative communication between the parties. This differs from other digital labor marketplaces, in particular Mechanical Turk, where demand is typically for very small, low-skill tasks that require minimal communication between the employer and contractor.

The hiring penalty for developing country workers seems to increase with task complexity. This indicates that employers anticipate higher communication costs when working with

foreign contractors. Interestingly, this finding is consistent with studies of other digital labor platforms in which spatial distance and cultural differences between parties are greater, such as Hong and Pavlou.⁴ In this study, communication costs continue to be salient even in the context of a region-specific platform in which cultural and time zone differences between employers and contractors are relatively small.

The second explanation relates to information asymmetry and uncertainty about worker quality. Employers, lacking verifiable information and unable to personally screen workers, tend to attribute quality to individual workers based on their country of origin. As more information about individual workers' productivity becomes available, and as employers acquire more experience with foreign workers, the foreign worker penalty falls. This suggests that the preferences of Spanish employers are affected by information uncertainty rather than distaste for workers from developing countries.

This chapter contributes to the emerging literature on the dynamics and distributional effects of digital labor markets. In general, the literature

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detects persistent frictions that significantly diminish potential gains for job seekers in developing countries, as well as potential losses for workers in developed countries. This chapter adds value to this literature in two ways. First, the analysis corroborates previous findings in a setting where language and other cultural factors

are by and large irrelevant, thus establishing the continued relevance of communication frictions in digital labor markets. Second, it provides a novel measure to quantify wage differentials between foreign and domestic workers, and explore how wage penalties change with job experience and individual reputation.

Digital labor and information uncertainty

Information and Communication Technologies (ICTs) are significantly changing how labor markets operate. Following Autor we identify three mechanisms of such change.⁵ First, search costs are significantly reduced, potentially improving matching between employers and employees. Second, the digitalization of labor enables more workers, particularly in the service sector, to perform their work remotely. Third, online delivery of labor services makes location much less relevant, freeing both employers and employees from the constraints of local job markets.

Online labor platforms enable knowledge workers in poor countries to access labor markets in rich countries, which were previously inaccessible to them due to high communication costs and barriers to labor migration.

The third mechanism is of particular relevance for development debates. Online labor platforms enable knowledge workers in poor countries to access labor markets in rich countries, which were previously inaccessible to them due to high communication costs and barriers to labor migration. Following standard economic theory, the predicted effect would be a reduction in income differentials between workers until wages reflect individual productivity rather than geographic proximity to employers. In the final equilibrium, workers in high-wage countries are made worse off as jobs migrate overseas, driving down wages and reducing employment. At the same

time, virtual labor mobility benefits workers in poor countries, expanding market access and improving matching with individual skills.

Several recent studies have examined this hypothesis. In general, the results suggest the persistence of communication costs and information frictions that significantly limit the offshoring of labor to lower-wage countries. For example, Gefen and Carmel find that most contracts in an online programming market are awarded to domestic contractors.⁶ When jobs are offshored, employers prefer workers from countries with minimal cultural distance, rather than simply lower costs; for instance, U.S. employers would hire programmers from English-speaking countries such as Canada and Australia. Hong and Pavlou find that differences in language, time zone, cultural values and levels of economic development negatively affect hiring probabilities in a global platform for IT contracts.⁷ Similar results are reported by Lehdonvirta et al. who find that the hiring penalty for foreign contractors increases when tasks require knowledge of local formal institutions- for instance, legal work - or regular interaction with employers.⁸

These studies also identify several mechanisms that mitigate information frictions in digital labor, which generally work to the advantage of workers in less developed countries. For example, Stanton

and Thomas show that being affiliated with an outsourcing agency increases hiring and wages among inexperienced workers, helping them overcome the first-job barrier.⁹ The disadvantage developing country workers face dissipates over time and jobs, as more information becomes available about the quality of individual workers. Mill finds that feedback from previous contracts significantly reduces the effect of geographical location in hiring probabilities.¹⁰ Similarly, Agrawal et al. find that the benefit of platform-verified information is disproportionately large for contractors from less-developed countries, which suggests that employers face more difficulty in evaluating quality among foreign workers.¹¹

In general, the results are consistent with statistical discrimination models whereby employers, faced with uncertainty about worker productivity, attribute values based on perceived group averages.¹² At its core, statistical discrimination is a theory of stereotyping. When hiring workers, employers seek information that helps predict future productivity. If this information is too noisy or simply unavailable, stereotypes provide cognitive shortcuts that help orient employers' choices. Stereotyping has long been studied in the context of traditional labor markets. However, there are several reasons why it may play an even bigger role in hiring decisions in online labor markets.

First, online employers are unable to screen workers in person. Second, while job seekers are encouraged to upload as much information as possible to their online profiles, the amount of platform-verified information is typically very limited. As Pallais shows, even small differences in the amount of information available on workers' profile can have a significant effect on future hiring and earnings.¹³ Finally, given the value and short-term nature of a typical digital labor contract,

it is unlikely that employers would be willing to incur high screening costs. In short, faced with several dozen applicants, limited verifiable information and a tight deadline, employers are likely to activate cognitive shortcuts in making hiring decisions. Prior beliefs about the average productivity of workers based on available signals – for example, country of residence, ethnicity, gender and so forth – are likely to become highly salient in such contexts.

Data and descriptive results

Nubelo is a leading online labor platform serving Spanish-speaking markets, with more than 1 million workers offering services to about 100,000 employers. The platform matches employers who post contracts for short-term jobs (the demand side) with workers who bid for these jobs (the supply side). Job postings typically describe the tasks required, the job category, the expected date of delivery, and the country where the employer is located. A successful match occurs when an employer selects a worker, based on her bid as well as other characteristics that are visible on the contractor's online profile. These include name, country of residence, prior work experience

on the platform and a summary feedback score from previous contracts. In addition, contractors can voluntarily include other information such as a CV, a brief description of offline work experience and skills, portfolio samples, and a personal picture.

Our dataset includes records for all transactions in Nubelo for a 44-month period between March 2012 and December 2015. The data includes information on all jobs posted by employers and on all bids placed by contractors, both winning and unsuccessful.ⁱ Unlike other platforms, Nubelo actively discourages employer-contractor

ⁱ The units of observation are the bids made by contractors. Therefore, the dataset is restricted to active contractors, i.e. those who have submitted at least one bid during the 44-month study period. The full dataset includes 81,497 bids made by 18,356 contractors for a total of 5,262 jobs posted by 2,517 employers. We note appropriately when partial data subsets are used in the analysis.

interaction prior to hiring. Therefore, all the information visible to employers is available in our dataset, reducing concerns about omitted variables in our estimation models.

Nubelo primarily serves Spanish-speaking markets. Therefore, while 63 countries are represented in our dataset, Spain and a few large countries in Latin America account for the majority of active workers (see **Table 1**). The distribution of employers is even more skewed towards Spain, which accounts for about two-

thirds of all employers. The share of jobs posted follows a similar distribution: about two-thirds originate in Spain, with the remaining third distributed between Argentina and other Latin American countries.

Descriptive results suggest that employers tend to favor Spanish contractors. As shown in **Figure 1**, Spanish contractors win a larger-than-expected share of jobs posted, though this advantage seems to be relatively small in magnitude, about 11 percentage points. Yet when the sample

Table 1
Contractors, employers and jobs posted by country

Work	Contractors	%	Employers	%	Jobs Posted	%
Spain	6820	37.15	1639	65.12	3528	67.05
Argentina	4045	22.04	390	15.49	689	13.09
Colombia	2144	11.68	139	5.52	222	4.22
Mexico	1326	7.22	175	6.95	419	7.96
Venezuela	1268	6.91	8	0.32	13	0.25
Chile	648	3.53	49	1.95	147	2.79
Peru	399	2.17	9	0.36	17	0.32
Uruguay	239	1.30	10	0.40	16	0.30
Ecuador	175	0.95	9	0.36	50	0.95
Dominican Republic	144	0.78	6	0.24	6	0.11
Others	1148	6.25	83	3.30	155	2.95
Total	18356	100.00	2517	100.00	5262	100.00

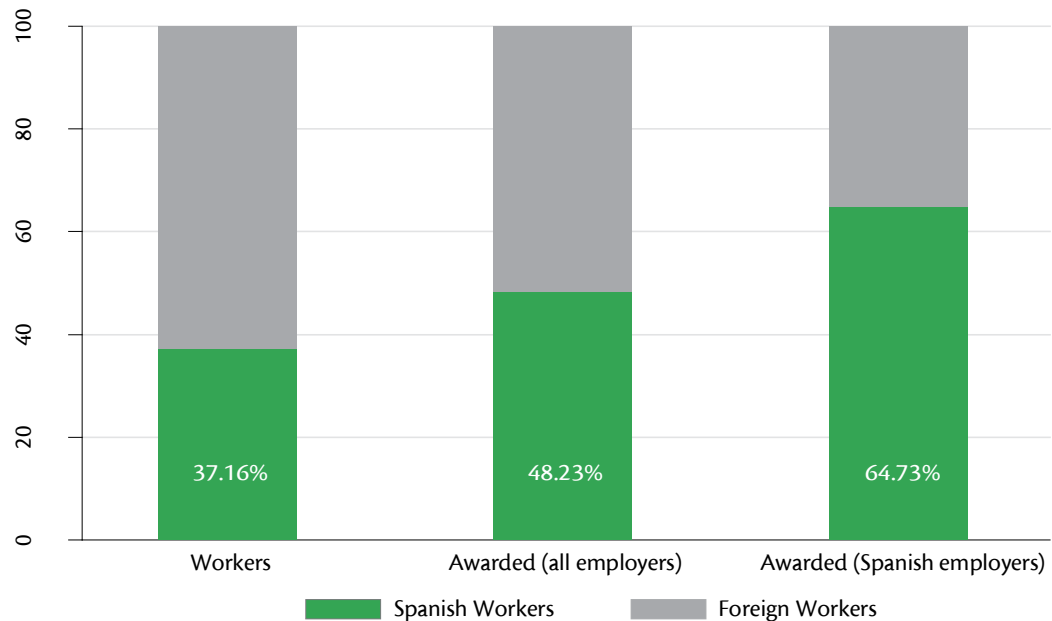
Source: Authors' calculations based on Nubelo data.

is restricted to projects posted by Spanish employers, the difference grows significantly, to about 28 percentage points.

A key question is whether online platforms promote the movement of white-collar employment from high- to middle- and low-income countries. In order to examine this question, we look at the distribution of awarded

contracts using the World Bank’s country wealth classification. **Table 2** shows that two-thirds of jobs originating in high-income countries are awarded to contractors in high-income countries, with only a third going to contractors in lower-income countries. This by and large reflects the fact, noted above, that Spanish employers tend to contract domestically.ⁱⁱ Interestingly, employers in lower- and middle- income countries tend to hire

Figure 1
Workers and contracts won by country of residence



Source: Authors’ calculations based on Nubelo data.

ⁱⁱ It is worth noting that due to government-set limitations to international currency trade in Argentina during our study period, Nubelo required that employers in Argentina hire Argentine contractors. This artificially inflates the value for trade within upper-middle income countries.

Table 2

Employer/worker matches by country income category

		Workers			
	Income Category	High	Upper-middle	Lower-middle	Total
Employers	High	66.64%	30.01%	3.35%	100%
	Upper-middle	28.32%	66.62%	5.06%	100%
	Lower-middle	28.57%	65.71%	5.71%	100%

Source: Authors' calculations based on Nubelo data.

in higher-income countries, which may reflect a scarcity of human capital available in local labor markets.

Figure 2 maps the distribution of contracts awarded to foreign workers. Lines represent

bilateral hiring in both directions, with line width proportional to volume. This visual representation corroborates that much of the trade takes place between Spain and Latin America, with only limited within-region trade.

Method and results

Descriptive results suggest a hiring bias in favor of Spanish contractors, particularly among Spanish employers. Further, most job seekers have never been hired in the platform, which suggests that landing the first job is a key barrier to online employment. We also find Spanish contractors bid more actively on the platform, which may both reflect and reinforce their higher probability of being hired.

In order to test these propositions, we first build a linear model that estimates the probability of being hired, conditional on country of residence and covariates that capture bid competition, freelancer characteristics and country reputation. In addition, the model includes contractor-level characteristics such as the number of previous jobs that the contractor has held in the platform, whether or not they have completed their online

profile at or above the sample average of 80 percent, if they have received positive feedback from previous jobs (an average of 4 points or more on a 5-point scale), and whether they have previously worked with a given employer. It also accounts for job-specific effects. The details of the model are included in the Appendix.

We restrict the sample to job postings from Spanish employers, for a number of reasons. First, jobs originated in Spain represent the large majority, 67 percent, of jobs posted. Second, our

interest lies in labor offshoring from high-income to lower-income countries. With a GNI per capita of US\$ 28,520 in 2015 (in current terms), Spain's average income is about twice that of Argentina, the second largest employer. Further, Argentine employers were prevented from hiring outside Argentina due to government regulations, which eliminates variance in our main variable of interest. Mexico, which is the third largest employer and accounts for about 8 percent of all jobs posted, has only half of Spain's per capita Gross National Income (GNI).ⁱⁱⁱ

Figure 2
Bilateral contract activity by country



Source: Authors' mapping based on Nubelo data.

ⁱⁱⁱ Given our interest in examining whether Spanish employers discriminate statistically in favor of domestic workers, we further restrict the sample to job postings that received at least one proposal from a Spanish contractor and one proposal from a non-Spanish (i.e., foreign) contractor. Filtering for job postings that did not result in a positive match (i.e., where the employer did not hire a contractor), our restricted sample comprises of 46,799 bids for 2,500 job postings.

Hiring penalty

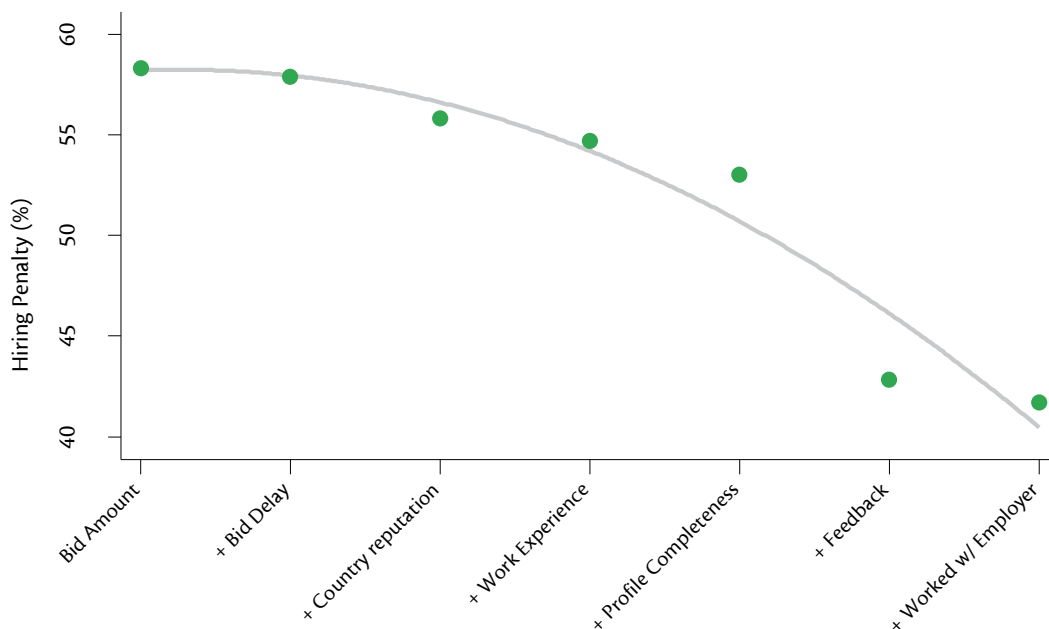
Non-Spanish contractors are less likely to be hired by Spanish employers. The full model – which controls for bid amount, bid delay, country reputation, previous contracts between employer and contractor, and covariates related to individual productivity – shows that, on average, being a foreign worker reduces the winning odds

by 2.2 percentage points. Relative to the average winning odds of 5.3 percent in the full sample, this represents a hiring penalty of about 42 percent for foreign workers. **Appendix Table A1** provides the complete results from the linear model.

It is interesting to note how the penalty varies as different covariates are introduced in the model. When we only isolate the effect of bid amount

Figure 3

Hiring penalty in alternative model specifications



Source: Authors' calculations based on Nubelo data.

and worker's country of residence on hiring, the hiring penalty is about 3.1 percentage points, which represents a 58 percent penalty, relative to the average winning odds of 5.3 percent in the full sample. As more contractor characteristics are included in the model, the hiring penalty gradually falls, as shown in **Figure 3**.

As expected, job experience in the platform is a strong predictor of hiring, with every previous contract increasing the likelihood of being hired by about 5 percent. Likewise, having a more complete profile than the average contractor profile increases the likelihood of being hired by about 50 percent. This effect is surprisingly strong, given that this information is voluntarily disclosed and cannot be verified by the employer. It is likely that a more complete profile signals to employers a higher level of commitment on the part of the worker, especially with respect to online jobs and relative to offline alternatives.

As shown in **Figure 3**, the hiring penalty for foreign workers falls sharply when the model accounts for individual reputation, i.e. feedback from previous jobs. This strongly suggests that in the absence of reliable information about individual workers, Spanish employers attribute quality to

In the absence of reliable information about individual workers, Spanish employers attribute quality to workers based on their country of origin.

workers based on their country of origin. When such information is available, the hiring penalty falls from about 53 percent to nearly 43 percent. Lastly, when the model captures previous contracts between the employer and contractor, the hiring penalty remains unchanged. However, as expected, given the fact that most hires result

in positive matches, the effect of a previous relationship between the employer and contractor on hiring is large, and partly reduces the effect of other covariates such as individual reputation and profile completeness.

Wage premium

Descriptive statistics suggest that Spanish employers are willing to pay a wage premium for hiring domestically. In order to quantify this wage premium, we build another linear model that estimates the bid amount (in logarithm) conditional on the contractors' country of residence, the time delay between the employer posting the job and the contractor submitting the bid and other contractor characteristics. Again, the model includes job-specific effects. The model is described in greater detail in the Appendix.

We then restrict the sample to projects that resulted in a Spanish worker being hired, even

though foreign contractors may have submitted bids for the job. This helps gauge how much employers are willing to pay to hire domestically rather than hire similarly-qualified foreign workers. **Table A2** in the Appendix presents the results from this model. The results indicate that, when hiring locally, Spanish employers rejected alternative bids by foreign contractors that were, on average, 14 percent lower in cost. For Spanish workers, this translates into a wage premium of about 16 percent, when calculated as a premium over alternative bids.

Wage premium when employers possess more information

Next we examine if the wage premium varies when more information about individual-level productivity is available. The hypothesis is that the wage premium will be higher among inexperienced workers, workers without

feedback, and workers with less complete profiles. In order to test this, we run the full model for job postings that ultimately resulted in a Spanish worker being hired but with different pools of job seekers - foreign and domestic contractors. **Table 3** below summarizes the results in euros (EUR). The complete results are presented in **Table A3** in the Appendix.

The results highlight that, in the absence of information about a contractor's previous job experience, the wage premium is larger. Put differently, when we restrict the sample to job postings that only received bids from inexperienced workers, the wage premium for Spanish workers is larger than when the sample is restricted to job postings that only received bids from experienced workers. This effect is even larger when feedback from previous jobs is lacking. Further, the wage premium is reduced

Table 3
Wage premium by worker characteristics (in EUR)

Worker	Experience		Feedback		Profile	
	No	Yes	Low	High	Incomplete	Complete
Spanish	378	214	527	225	392	236
Foreign	332	197	443	213	345	206
Diff (Eur)	46	17	84	12	47	30
Diff (%)	-0.12	-0.08	-0.16	-0.05	-0.12	-0.13

Source: Authors' calculations based on Nubelo data.

to a third when employers factor in individual reputation in hiring choices. As expected, the availability of information in workers' profiles only marginally affects the magnitude of the wage premium, since this information is not verifiable.

Discussion and policy recommendations

The internet is rapidly reshaping labor markets. This study contributes to our understanding of the dynamics of hiring and wages that result from digital labor. In online work platforms, employers can easily search and screen job seekers, while platforms standardize key functions such as contracting and payment mechanisms. In theory, the result could be a global labor market in which frictions are minimized and workers are paid regardless of geographical location and other characteristics unrelated to individual productivity.

Our findings detect a number of information-related frictions in online labor platforms that significantly favor workers located in geographical proximity to employers, which

mitigate the migration of white-collar jobs to less-developed countries. Online hiring typically takes place in a context of very limited information about the quality of alternative job seekers. Unable to personally screen workers, employers are more risk-averse than in traditional labor markets, activating stereotypes that substitute for verifiable information. This has two important implications. First, we find that foreign workers are less likely to be hired, after controlling for the same productivity-related characteristics observed by online employers. Second, we find that employers are willing to pay a wage premium for domestic workers. This premium increases in the absence of verifiable information about previous job experience and individual reputation.

Both findings are consistent with models of statistical discrimination, in which biases result not from taste preferences but rather from imperfect information about the distribution of workers' skills. Lacking reliable information about individual workers, employers infer quality from country of origin. Since it is likely that employers are less certain about the distribution of quality among foreign

There is ample room for collaboration between governments in developing countries, and platform operators for promoting skills training and for the development of certification mechanisms to reduce quality uncertainty among foreign employers.

(relative to domestic) contractors, a hiring penalty results. As more information is available, employers adjust expectations, thus reducing the hiring penalty and the wage premium paid to domestic contractors.

Two key policy insights emerge from our findings and are suggested below.

1. There is ample room for collaboration between governments in less-developed countries and platform operators for promoting skills training and for the development of certification mechanisms to reduce quality uncertainty among foreign employers. An example is the partnership

between Nubelo, Coursera — an online learning platform and Colombia’s Ministry of Information Technologies, which offers online training in high-demand job categories such as web development and digital marketing.

2. Many governments have established programs that encourage local firms or the government itself to hire inexperienced, mostly young workers. These policy instruments can be expanded to include contract work in online labor platforms, thus helping workers overcome the first-job barrier.

Appendix

Linear model to assess the probability of a contractor getting hired

We set up a linear model that estimates the probability of being hired, conditional on country of residence, and covariates that capture bid competition, freelancer characteristics and country reputation. More formally:

$$Hiring_{ij} = \alpha_{ij} + \gamma Foreign_{ij} + \delta \log Price_{ij} + \eta CountryRep_{ij} + \beta Z + \sigma_i + \varepsilon_{ij}$$

where *Hiring* is the probability of contractor's bid *i* being selected for job posting *j*, *Foreign* is a dummy (yes=1) that identifies non-Spanish workers, *Price* denotes bid amount (in log), *Delay* is the difference (in hours) between the job posting and bid submission (in log), *CountryRep* denotes whether the employer has previously hired from the same country of the contractor submitting bid *i* at the time of job posting *j*, *Z* is a vector of contractor characteristics that vary over

time, σ controls for job fixed effects, and ε is an error term.

The vector of contractor characteristics includes the number of previous jobs in the platform, a dummy for having completed the online profile at or above the sample average of 80 percent, a dummy for positive feedback from previous jobs (an average of 4 points or more on a 5-point scale), and a dummy that indicates whether the contractor has previously worked with the employer. We choose a fixed-effects specification at the level of each job posting, in order to allow contractor characteristics to vary over the study period while reducing bias from sorting effects across job postings. As discussed in the main text, we restrict the sample to job postings from Spanish employers.

Table A1 reports the results from an Ordinary Least Squares (OLS) regression using the above specification.

Table A1

Hiring probabilities (OLS with fixed effects)

Dependent Variable : Hiring Probability							
	1	2	3	4	5	6	7
Foreign Worker Hiring Penalty	-0.0309*** [0.00214]	-0.0307*** [0.00214]	-0.0296*** [0.00220]	-0.0290*** [0.00219]	-0.0281*** [0.00219]	-0.0227*** [0.00217]	-0.0221*** [0.00204]
Controls							
Bid Amount	✓	✓	✓	✓	✓	✓	✓
Bid Delay		✓	✓	✓	✓	✓	✓
Country Reputation			✓	✓	✓	✓	✓
Work Experience				✓	✓	✓	✓
Profile Completeness					✓	✓	✓
Feedback						✓	✓
Worked with Employer							✓
Constant	0.152*** [0.00501]	0.168*** [0.00535]	0.167*** [0.00539]	0.148*** [0.00544]	0.128*** [0.00569]	0.0789*** [0.00580]	0.0743*** [0.00545]
N	46,799	46,799	46,799	46,799	46,799	46,799	46,799
R2	0.001	0.013	0.013	0.022	0.025	0.050	0.161
Number of Projects	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Mean of Hiring Probability	0.0530	0.0530	0.0530	0.0530	0.0530	0.0530	0.0530
Standard error in brackets *** p<0.01, **p<0.05, *p<0.1							

Source: Authors' calculations based on Nubelo data.

Linear model to assess wage premium

We build another linear model that estimates the bid amount (in logarithm) conditional on the country of residence and a vector of contractor characteristics. More formally,

$$\text{Log}(\text{Price})_{ij} = \alpha_{ij} + \gamma \text{Foreign}_{ij} + \lambda \text{logDelay}_{ij} + \beta Z + \sigma_{ij} + \varepsilon_{ij}$$

where *Price* is the bid by contractor *i* for job posting *j*, *Foreign* is a dummy (yes=1) that identifies non-Spanish workers, *Delay* is the difference (in hours) between the job posting and the bid submission (in log), *Z* is a vector of contractor characteristics that vary over time, σ controls for job fixed effects, and ε is an error term.

We then restrict the sample to projects that resulted in a Spanish worker being hired. Hence, our coefficient of interest γ indicates the marginal change in bid amount when bids were submitted by foreign contractors for jobs in which a Spanish worker was ultimately selected. In other words, it quantifies the premium that the employer was willing to pay to hire domestically relative to alternative bids by similarly-qualified (per observable characteristics) foreign workers.

The results in **Table A2** indicate that, when hiring locally, Spanish employers rejected alternative bids by foreign contractors that were, on average, 14 percent lower (column 6). This translates into a wage premium for Spanish workers of about 16 percent when calculated as a premium over alternative bids.

Table A2

Wage premium (OLS with fixed effects)

Dependent Variable: Log of Bid Amount						
	1	2	3	4	5	6
Foreign Worker Hiring Penalty	-0.120*** [0.0123]	-0.122*** [0.0122]	-0.124*** [0.0122]	-0.125*** [0.0123]	-0.140*** [0.0123]	-0.141*** [0.0123]
Controls						
Bid Delay		✓	✓	✓	✓	✓
Work Experience			✓	✓	✓	✓
Profile Completeness				✓	✓	✓
Feedback					✓	✓
Worked with Employer						✓
Constant	4.738*** [0.00802]	4.615*** [0.0146]	4.644*** [0.0152]	4.660*** [0.0178]	4.746*** [0.0190]	4.747*** [0.0190]
N	31,516	31,516	31,516	31,516	31,516	31,516
R2	0.003	0.007	0.008	0.008	0.014	0.014
Number of Projects	1,626	1,626	1,626	1,626	1,626	1,626
Mean of Bid Amount	281.0	281.0	281.0	281.0	281.0	281.0
Standard error in brackets *** p<0.01, **p<0.05, *p<0.1						

Source: Authors' calculations based on Nubelo data.

Wage premium when employers possess more information

We again run the same linear model as above,

$$\text{Log}(\text{Price})_{ij} = \alpha_{ij} + \gamma \text{Foreign}_{ij} + \lambda \text{logDelay}_{ij} + \beta Z + \sigma_{ij} + \varepsilon_{ij}$$

However, similar to the regression in Column 6 of **Table A2**, we restrict the sample to instances where ultimately a Spanish worker was hired but different pools of job seekers (foreign and Spanish contractors) had submitted bids for the position.

Table A3 presents the results.

In column 1, the sample is restricted to job postings that only received bids from inexperienced workers, whereas in column 2 the sample is restricted to job postings that only received bids from experienced workers. As shown, the wage premium is larger in the absence of information about previous job experience. This effect is even larger when feedback information from previous jobs is lacking (columns 3 and 4). Put differently, the wage premium is reduced to a third when employers factor in individual reputation in hiring choices. Interestingly, the availability of non-verified information (in workers' profiles) only marginally affects the magnitude of the wage premium, as shown in columns 5 and 6.

Table A3

Wage premium (OLS with fixed effects)

	No Experience	Positive Experience	Feedback Less than 4	Feedback 4 or more	Profile less than 80%	Profile more than 80%
	1	2	3	4	5	6
Foreign Worker Hiring Penalty	-0.119*** [0.0285]	-0.0792*** [0.0203]	-0.164** [0.0655]	-0.0518*** [0.0174]	-0.122** [0.0480]	-0.135*** [0.0156]
Controls						
Bid Delay	✓	✓	✓	✓	✓	✓
Profile Completeness	✓	✓	✓	✓	✗	✗
Feedback	✓	✓	✗	✗	✓	✓
Work Experience	✗	✗	✓	✓	✓	✓
Worked with Employer	✓	✓	✓	✓	✓	✓
Constant	4.916*** [0.0413]	4.421*** [0.0493]	4.856*** [0.0926]	4.482*** [0.0257]	4.768*** [0.0638]	4.737*** [0.0224]
N	7,463	8,831	1,790	13,089	2,877	17,124
R ²	0.007	0.008	0.006	0.004	0.010	0.017
Number of Projects	518	1,108	144	1,482	321	1,306
Mean of Dependent Variable	377.5	214.0	527.3	224.6	392.1	236.6
Standard error in brackets *** p<0.01, **p<0.05, *p<0.1						

Source: Authors' calculations based on Nubelo data.

Endnotes

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