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Shocking O□ers: Gender, Wage Inequality, and Recessions in Online Labor Markets*

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Abstract

Using data from the largest online job portal in Nigeria, we document: (a) gender differences in salary offers for jobs, and (b) the response of (a) to recessions. Jobs in industries where the number of job applicants skews female, offer lower starting salaries than jobs in industries where applicants skew male. During Nigeria's 2016 recession, overall job applications rose, but applications to jobs in industries that skew male increased more than applications to jobs in industries that skew female. Salary offers fell sharply for jobs in male-skewed industries compared to female-skewed industries. In accordance with this relative shift in applications, in 2016, the salary-offer gender gap almost disappeared.

JEL classification: J16, J71, J64, J78, L86, O12

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1 Introduction

Economists care about discrimination in the labor market because it reduces productivity and standards of living. Between 20 and 40 percent of the increase in output per person

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in the United States between 1960 and 2010, for example, is explained by a more e□cient allocation of workforce talent, and a significant fraction of that reallocation stemmed from a reduction in labor market discrimination against talented women and Black men (Hsieh et al., 2019).

Yet most of what economists know about discrimination in labor markets comes from advanced economies, where the size of the labor force is stagnating in absolute terms and shrinking relative to the size of the global labor force. We know far less about the impact of labor market discrimination on the economic e□ciency of countries in Sub-Saharan Africa, whose current number of labor market participants—600 million—will double by 2050, and quadruple by 2100, at which time the region will account for 40 percent of world labor (Lam, Leibbrandt, and Allen, 2019). To understand the future consequences of labor market discrimination on the global economy we must understand its impact in Africa.

This paper provides a step forward by presenting the first systematic set of facts about the market for highly compensated employees in Nigeria and examining whether these facts suggest that Nigerian employers discriminate against women. Nigeria is a natural place to pursue this line of research for two reasons. First, with a working age population that will expand from 106 million in 2020, to 244 million in 2050, Nigeria is the world's seventh largest labor market, and the epicenter of the explosion in the size of Africa's workforce. Second, recent research suggests that women in Nigeria face obstacles to participation in the labor market. They are less likely to apply for senior level jobs than men, despite being equally qualified, and women are less likely to be hired (Archibong et al., 2022).

Is gender discrimination operative in the Nigerian labor market? If the Nigerian labor market e□ciently allocates male and female talent, then we would expect the cross-sectional variation in the level of human capital of male and female Nigerian employees to explain the cross-sectional variation in the level of their salaries (Mincer, 1958). The challenge with

examining this link, however, is the paucity of knowledge on salaried employees in Africa (Bandiera et al., 2022)

We begin filling the knowledge gap by using data from Nigeria's largest online job portal between May 2014 and May 2020 to compile the first comprehensive dataset on salaried employees in Nigeria. Relative to previous studies of African labor markets, our data contains unique features that allow us to directly examine questions of e□ciency. For every given job posting, for instance, Table 1 provides data on: (a) the size of the firm that posted the job—87 percent are small and medium-sized enterprises with 100 workers or less; (b) industry; (c) level of seniority; (d) the employer's list of preferred qualifications; and (e) the minimum-to-maximum salary range.

Likewise, for every application submitted for a given job posting, Table 1 provides data on the applicant's age, experience, years of schooling, and gender. The average age of applicants is 31. They average 4.6 years of experience. Seventy-nine percent of participants in the portal are college graduates or higher, and ninety-eight percent have some tertiary education. The share of female applicants on the platform is 33 percent, a figure that is consistent with other studies of online labor markets in Africa (Archibong et al., 2022). 55% of the jobs are in male-skewed industries, those industries where most applicants are men. Figure 1 provides a full breakdown of industries by gender skew.

If men and women have similar salary preferences, and Nigerian employers behave in a Mincerian fashion, then controlling for di□erences in the education, skill level, and experience of job applicants, gender will not be correlated with salary o□ers. Figure 2 provides an ocular test of this prediction—Section 3 examines it econometrically—by plotting salary o□ers for jobs according to the gender skew of the pool of applicants to those jobs. The figure does not support the prediction that gender and salary o□er are uncorrelated. In 2014, the average salary o□er for jobs in industries where applications skew male (orange line) was roughly

400,000 Naira per month. Since the average monthly exchange rate for Nigeria in 2014 was 165 Naira per US dollar, this salary amounts to around $2,424 per month, or $29,090 per year. In contrast, the average salary o□er for jobs in industries where applications skew female (blue line) was about 240,000 Naira ($1,455) per month, or three-fifths of the average o□er for jobs in industries that skew male. As GDP per person in Nigeria is about $2,280 per year, the annual incomes implied by the average salary o□ers for both male and female workers are much higher than the income of the average Nigerian.

Figure 2 also documents the response of salary o□ers to two recessions. From the middle of 2014 through early 2016, the real price of oil fell by 70 percent (Stocker et al., 2018). This exogenous shock to Nigeria's principal export reduced growth in 2015, caused GDP to contract by 1.6 percent in 2016, and had attendant consequences for the labor market. Unemployment rose from 7.8 percent in 2014 to 17.5 percent in 2017. During Nigeria's 2016 recession, the number of applications to jobs in industries that skew male increased more than applications to jobs in female-skewed industries. In accordance with this relative shift in the number of applications, the salary-o□er gap fell sharply and virtually disappeared in 2016.

As the economy recovered, the salary-o□er gap re-widened, but less dramatically, before narrowing again with the onset of the COVID-19-induced recession of 2020. The information we have on salary o□ers for 2020 does not cover the full year, but the facts from 2016 suggest that recessions may increase the bargaining power of groups like women who are under-represented in the labor market, while decreasing the bargaining power of those in the majority.

2 Data

The online hiring platform consists of 227,194 unique applicants, 63,837 job listings, and 2,281,118 applicant-job matches. 83% of the job listings are in major cities from 3 states

in Nigeria: Lagos (70%), Abuja (11%) and Rivers (2%) (Archibong et al., 2022). How representative are the jobs on the online platform of the general labor market in Nigeria? As expected, Agriculture, the largest employment category in Nigeria, is underrepresented, given the urban focus of online job listings.[1] The proportions of other industries, like Consulting, Construction, and Manufacturing are comparable to the national level labor statistics. ICT, Banking/Financial Services and Trade jobs are overrepresented.

Table 1 shows that the jobs require about 2.6 years of work experience and a higher national diploma or 1-2 years of post-secondary education on average. Senior level jobs, at the experienced non-manager level or higher, make up about 73% of the applied to listings. Job listings also include a range of salary o□ers. Minimum salary o□ers in female-skewed industries are significantly lower (43% lower), on average, than salaries in male-skewed industries.[2]

3 Empirical Strategy and Results

How do recessions, specifically, Nigeria's 2016 oil recession, a□ect the industry gender gap in salary o□ers apparent in Figure 2? To focus on the e□ects of the 2016 recession, we limit the sample to job postings between 2014 and 2019, and use a regression of the following general form:

$$\text{Y}_{idst} = \alpha \text{Female-skew Ind.}_{ids} + \beta \text{Recession}_t + \gamma \text{Female-skew Ind.}_{ids} \times \text{Recession}_t + \mathbf{X}'_{idst}\tau + \phi_s + \epsilon_{idst} \quad (1)$$

[1] Source: 2017 Nigerian National Bureau of Statistics (NBS) data.

[2] Average minimum monthly salaries in female-skewed industries are about 106,000 Naira versus 185,000 Naira in male-skewed industries.

where i and d index the individual job listing and industry respectively. s is the location of the job listing in one of Nigeria's 37 administrative states[3] or outside of Nigeria, and t is the date or year of the job posting. The outcomes of interest include the minimum salary o□er posted by the employer on the job listing, and the number of applications the job listing receives. Female-skew Ind. is an indicator that equals 1 if the job listing is in a female-skewed industry and 0 otherwise. Recession is an indicator that equals 1 if the job was posted during the recession year in 2016. The key parameter of interest is γ, which measures the e□ect of the 2016 recession on salary o□ers and number of applications in female-skewed industries relative to male-skewed industries. All regressions include job listing level controls for firm size, the job required education and years of experience, job type (full time or other) and job level, $\mathbf{X}'_{idt}$, and job location fixed e□ects.

The estimate of α, presented in Row 1, Column (1), is -98.034. This means that in non-recession years, jobs in female-skewed industries o□er an average salary of 98,034 Naira per month ($495 in 2016) less than jobs in male-skewed industries. The results change during the recession. The estimate of β, presented in Row 2, Column (1), is -128.631. This means that the e□ect of the recession is for salary o□ers to jobs in male-skewed industries to decline by an average of 128,631 Naira per month. Row 3, Column (1) shows that the estimate of γ is 86.537, or 86,537 Naira per month. It follows from γ that, holding constant whether the job is in a male-skewed industry, the e□ect of the recession is for jobs in female-skewed industries to decline by 42,094 (-128,631 plus 86,537) Naira per month. Hence, during the recession, the salary o□er gap narrows, and jobs in female-skewed industries pay an average of 11,497 Naira less than jobs in male-skewed industries. The parameter estimates presented in Column (2) indicate that while overall job applications rose during the recession, applications to jobs in industries that skew male increase more than applications to jobs in industries that skew female.

[3] 36 states plus the capital at Abuja.

Do the results in Column (1) of Table 2 suggest that Nigerian employers discriminate against women, or do they reflect the reality that Nigerian women prefer to work in industries with a constellation of jobs that o□er lower pay? Jobs in information, communications, and technology (ICT) pay more than jobs in education. If highly educated Nigerian women prefer to work as teachers rather than coders, for example, then the results might spuriously suggest employer discrimination is operative when the salary-o□er gap simply reflects that women prefer teaching to coding.

To determine whether the salary-o□er results reflect industry-specific discrimination against women by employers, or industry-specific preferences for employment by women, we report in columns (3) and (4) of Table 2 the results of running an additional set of regressions. These regressions test whether, for the same job, salary o□ers by employers reflect a gender-specific industry skew. Specifically, Columns (3) and (4) of Table 2 report the results of regressions from Equation 1 limiting the sample to job listings for accountant job roles only. The logic of this regression is as follows. The work of accountants is largely invariant to the industry in which they are employed. Therefore, if employers do not take into consideration the gender skew of the industry when making salary o□ers for jobs, then the gender-skew of the industry in which applicants apply for accounting jobs should be statistically and economically insignificant in the accountant-specific salary regression. This is not the case. Table 2 and Figure 2(c) indicate that the accountants results mimic the main results in Column (1).

4 Conclusion

For countries to develop, the organization of labor markets must shift from informal self-employment to formal salaried jobs. Because the Nigerian dataset used in this paper is the first large scale source of information on salaried employees in Africa, it provides a foundation for beginning to understand whether formal labor markets in the region behave in accordance

with standard models.

Holding constant the education and years of experience they require of applicants for a given job listing, Nigerian employers systematically o□er higher salaries for jobs listed in industries where the applicants for jobs skew male than they do in industries where the applicants skew female. This salary-o□er gap cannot be explained by a preference of female candidates for jobs in industries that happen to have lower pay, and the gap decreases during recessions. There may be alternative explanations of our results, but the facts in this paper do not support the view that Nigerian employers make gender neutral salary o□ers based exclusively on the education, skills, and experience of applicants. Future work can build on these results to create a set of stylized facts about the extent to which one of the world's largest and fastest growing labor markets functions e□ciently.

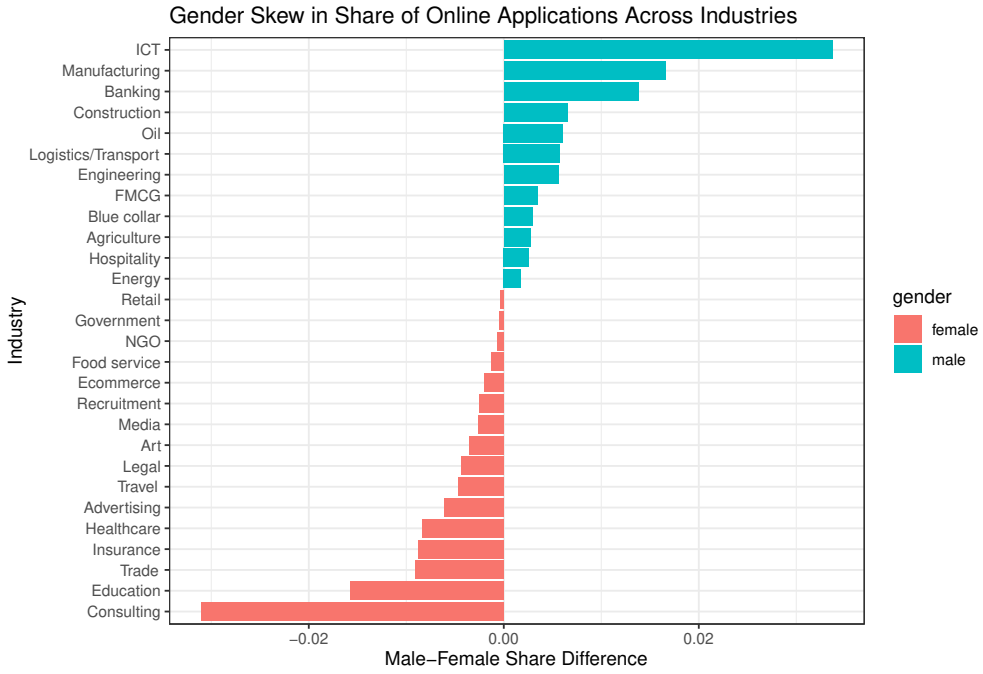

Figure 1: Gender skew in online applications by industry, 2014-2020

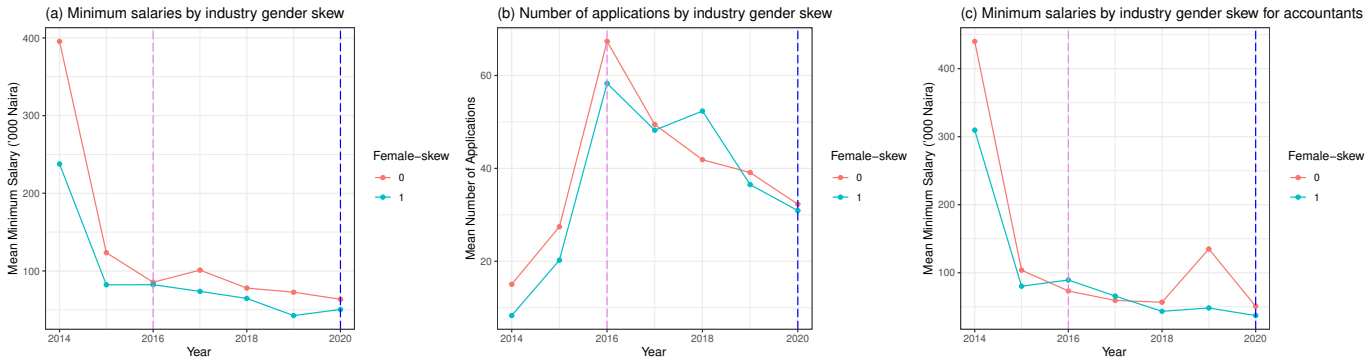

Figure 2: Salary o□ers in industries where job applications skew male are higher than in those that skew female

Table 1: Summary statistics: The online job portal captures a significant fraction of the universe of highly educated Nigerian workers

Variable	N	Mean	St. Dev.	Min	Max
Job Listings Summary					
Firm size	63,793	1.92	1.46	1.00	7.00
SME size	63,793	0.87	0.34	0.00	1.00
Job type	63,837	2.92	0.31	1	3
Job YOE	56,008	2.62	2.38	0.00	20.00
Job level	59,588	3.82	0.86	1.00	6.00
Senior job level	59,588	0.73	0.44	0.00	1.00
Job education	62,866	4.94	1.63	1.00	9.00
Full time job	63,837	0.94	0.24	0	1
Minimum salary (Naira)	63,837	149,852.20	457,223.80	0	25,000,000
Maximum salary (Naira)	63,837	6,823,496.00	118,457,472.00	0	2,147,483,647
Female-skewed industry	63,837	0.45	0.50	0	1
Unique Applicant Summary Statistics					
Number of jobs applied	227,194	10.04	33.66	1	2,065
Female	216,653	0.33	0.47	0.00	1.00
Age	193,043	31.26	6.15	16.00	82.00
Years of experience (YOE)	226,696	4.58	4.25	0.00	50.00
Bachelor's degree or higher	223,320	0.79	0.41	0.00	1.00
Tertiary education	223,320	0.98	0.13	0.00	1.00

Table 2: During recessions, the gender-skew salary gap shrinks and the number of applications to female-skew jobs falls

Sample:	All Job Roles		Accountants	
Outcome	Minimum Salary	Nos Applications	Minimum Salary	Nos Applications
	(1)	(2)	(3)	(4)
Female-skew	−98.034***	1.845***	−103.160***	7.462***
	(5.190)	(0.495)	(25.134)	(1.966)
Recession	−128.631***	41.309***	−169.413***	43.063***
	(5.157)	(1.433)	(19.984)	(4.557)
Recession x Female-skew	86.537***	−12.467***	118.120***	−3.223
	(6.579)	(1.823)	(27.895)	(6.980)
Mean of outcome	154.840	35.951	165.307	52.273
N	49,313	49,313	1,799	1,799
R^2	0.049	0.099	0.054	0.208
Job Level controls	Yes	Yes	Yes	Yes
Job Location FE	Yes	Yes	Yes	Yes

Notes: Regressions estimated by OLS. Observations are job listings from 2014-2019. Robust standard errors in parentheses clustered by job listing. Sample in columns (1) and (2) include all job roles and listings posted from 2014-2019. Sample in (3) and (4) include job listings for job roles for accountants only. Recession is an indicator that equals 1 if the year is the 2016 oil recession year and 0 otherwise. Female-skew is an indicator that equals 1 if the industry the job listing is posted gets majority female applicants, as described in text. Dependent variable for minimum salary is in thousands of Naira. Job Level controls include firm size, job required education and years of experience, and job level and job type as described in text. Job location fixed effects are Nigerian state fixed effects. ***Significant at the 1 percent level, **Significant at the 5 percent level, *Significant at the 10 percent level.

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