

Kuhn, Peter; Shen, Kailing

Working Paper

Gender discrimination in Job ads: Theory and evidence

IZA Discussion Papers, No. 5195

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Kuhn, Peter; Shen, Kailing (2010) : Gender discrimination in Job ads: Theory and evidence, IZA Discussion Papers, No. 5195, Institute for the Study of Labor (IZA), Bonn

This Version is available at:

<http://hdl.handle.net/10419/45979>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

IZA DP No. 5195

**Gender Discrimination in Job Ads:
Theory and Evidence**

Peter Kuhn
Kailing Shen

September 2010

Gender Discrimination in Job Ads: Theory and Evidence

Peter Kuhn

*University of California, Santa Barbara,
NBER and IZA*

Kailing Shen

*WISE, Xiamen University
and IZA*

Discussion Paper No. 5195
September 2010

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

Any opinions expressed here are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit organization supported by Deutsche Post Foundation. The center is associated with the University of Bonn and offers a stimulating research environment through its international network, workshops and conferences, data service, project support, research visits and doctoral program. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

ABSTRACT

Gender Discrimination in Job Ads: Theory and Evidence^{*}

We study firms' advertised gender preferences in a population of ads on a Chinese internet job board, and interpret these patterns using a simple employer search model. The model allows us to distinguish firms' underlying gender preferences from firms' propensities to restrict their search to their preferred gender. The model also predicts that higher job skill requirements should reduce the tendency to gender-target a job ad; this is strongly confirmed in our data. We also find that firms' underlying gender preferences are highly job-specific, with many firms requesting men for some jobs and women for others, and with one third of the variation in gender preferences within firm*occupation cells.

JEL Classification: J71

Keywords: discrimination, gender, China, internet, search

Corresponding author:

Peter Kuhn
Department of Economics
University of California
Santa Barbara, CA 93106
USA
E-mail: pjkuhn@econ.ucsb.edu

^{*} The authors thank UC Santa Barbara's Institute for Social, Behavioral and Economic Research (ISBER) for financial support. Kuhn thanks UC Berkeley's Center for Labor Economics and the IZA for their generous hospitality during the research on this project. Catherine Weinberger, and seminar participants at Xiamen University, Tsinghua University, Renmin University China, ZEW (Centre for European Economic Research), University of Aarhus, the Chinese University of Hong Kong, the Trans-Pacific Labor Seminar, the all-UC labor economics conference, UC Denver, University of Heidelberg, IZA, Tilburg University, University of Amsterdam, Maastricht University and UCSB supplied helpful comments. Additional materials are available at:
<http://www.econ.ucsb.edu/~pjkuhn/Data/GenderDiscrim/GenderDiscrimIndex.htm>

1. Introduction

Not that long ago, it was commonplace for U.S. employers to explicitly discriminate on the basis of age, race and sex in their job advertisements.¹ While these practices are now illegal in most developed countries, the vast majority of the world's population still works in labor markets where such ads are permitted. In this paper, we use this opportunity to study gender discrimination in a large sample of job advertisements taken from an internet job board in China, with a view to understanding the practice and shedding light on the underlying sources of gender differentials in labor markets more generally. To guide our analysis, we develop a simple model of employer search from two populations in the presence of application processing costs.

Applied to the context of gender, our model unsurprisingly predicts that increases in a firm's preferences for men in a job should raise the share of ads for that job that explicitly request male applicants, and reduce the share that request women. Of greater interest, the model also predicts that a set of four 'search-related' factors act in a different way: Increases in application processing costs or in the expected number of applications should raise the likelihood that firms will impose gender restrictions against both men *and* women, while increases in the idiosyncratic variance of applicant productivity and in the job's skill level have the opposite effect (reducing the frequency of discrimination in both directions). We test the latter prediction in our data, and also use the model to interpret the cross-sectional relationship between job and firm characteristics on the one hand, and advertised discrimination on the other.

We find, first of all, that explicit, advertised gender discrimination is commonplace in our data. In particular, over one third of the firms that advertised on the board during our twenty-week sample period placed at least one ad stipulating a preferred gender. Thus, when it is legal to express such preferences, a large share of employers does so, presumably either for taste reasons, or because employers expect men and women to be differently productive in the job they are advertising. Second, as predicted by our model, we find overwhelming evidence that higher skill requirements—whether measured by the job's education level, the required level of experience, or the offered wage—are associated with lower levels of advertised gender discrimination, whether in favor of men or women. While previous authors (Becker 1957; Black and Strachan 2001) have argued that product market competition may be a potent deterrent to discrimination, our results suggest that rising skill demands may play a similar (and potentially more powerful) role, both in explaining the cross-sectional incidence of discrimination across jobs, and in understanding long-term trends and international differences in the extent to which explicit discrimination is accepted and practiced.

Using our model, we are also able to estimate the effects of a wide variety of firm and job characteristics on firms' underlying gender preferences. For example, large firms, state-owned firms, and firms seeking workers with high levels of experience tend to prefer men. Foreign-owned firms, and firms hiring for certain customer-contact occupations tend to prefer women, especially (in the latter case) tall, attractive ones. At the same time, we detect no association between a job's education requirements or its

¹ See Darity and Mason (1998) for examples of such ads in the U.S.

offered wage and firms' underlying relative preferences for men versus women in that job. Thus, *all* of the negative association between a job's offered wage and the probability that women are invited to apply in our data is attributed to search-related factors that vary with job skill levels.

Finally, we find that firms' gender preferences are highly job-specific. For example, over a quarter of the firms that advertised a gender preference requested men for some positions and women for others. More specifically, while firm fixed effects explain about a third of the variation in gender preferences in our data, neither firm-wide preferences towards one gender, nor inter-firm differentials in occupation mix, are very powerful explanations of the pattern of advertised gender preferences. Instead, ads for the same occupation are often targeted at men in some firms and at women in others, and one third of the variation in firms' gender preferences is within firm*occupation cells. Overall, rather than, for example, restricting women's access to highly skilled jobs, Chinese firms mostly use targeted job ads to divide their pool of less skilled positions into 'male' versus 'female' positions.

2. Related Literature

To our knowledge, Darity and Mason (1998) are the only economists who have examined discrimination in U.S. job ads; they reproduce examples of ads from 1960 newspapers, but do not conduct any statistical analysis. Goldin (1990, 2006) examines data from a Department of Labor Women's Bureau survey of employers concerning their 1939 employment policies for office workers. In a sample of several hundred firms, she finds that a majority reserved some positions for men, and others for women. Lawler and Bae (1998) is the only article we know of that studies discrimination in a recent sample of job ads. Their focus is on the impact of a multinational firm's home country culture on its stated gender preferences in a sample of 902 ads placed in an English-language newspaper in Thailand.²

Given the lack of previous research on advertised discrimination, it is perhaps useful to contrast ad-based indicators of discrimination to more well-known measures, such as those generated by audit-type studies (e.g. Bertrand and Mullainathan 2004). Bertrand and Mullainathan submitted resumes to U.S. employers *in response to* newspaper job ads, with the respondent's apparent race randomly assigned via race-specific first names. They found large differentials in callback rates for identical black and white resumes. Full audit studies, such as Neumark (1996), carry this procedure one step further and send matched, trained actors to interview for jobs in response to the callbacks.

Ad-based indicators of discrimination differ from audit-type indicators in two ways that have opposite implications for how much discrimination we should expect to observe. First, because ads are formulated before resumes arrive, ad-based measures do not condition on the information that appears in a worker's resume.³ For this reason, if

² Banerjee et al. (2009) study caste and other preferences in a small sample of marriage ads in India.

³ Indeed, the fact that no resumes are submitted (and no actors need to be trained) can be seen as an advantage of the ad-based approach: their comparability, realism and representativeness is not at issue. Another key advantage is cost: our data is collected costlessly by a web crawler; thus our sample consists

the employer expects to receive lower quality resumes from the ‘disfavored’ group, firms might choose to engage in discriminatory job advertising even when audit-type studies would show little or no discrimination. Second, however, according to our model, discrimination in job ads should only be observed when an employer’s preferences against (or prior beliefs about) a particular group are intense enough to exceed a strictly positive threshold. This is because targetting an ad causes a discrete drop in the number of applications received, by discouraging an entire group from applying. This feature of ad-based discrimination suggests, in contrast, that we should see it less frequently than in audit studies where even small employer preferences are in principle detectable.

A third and final difference between ad-based and ‘traditional’ measures is that advertised discrimination necessarily involves a conscious decision by the employer to invite only one group to apply. In contrast, audit studies should detect both the conscious choices and unconscious biases of employers.⁴ In sum, we should expect firms to post discriminatory ads when they *consciously* expect *large* differentials in both the observed (in a resume or interview) *and* unobserved (productivity and taste-related) characteristics of two groups; these conditions differ from the conditions in which we would be more likely to observe discrimination using more familiar methods, such as audit studies or wage regressions.

Finally, we note --as is widely recognized-- that neither ad-based nor audit-based measures of discrimination on their own can distinguish whether discrimination is statistical (i.e. based on actual or perceived between-group differences in average productivity that are unobserved by the investigator) or taste-based. Distinguishing these sources of discrimination requires additional evidence, for example on the amount of customer contact in the job, or the amount of product market competition faced by the employer. We examine such evidence here, but the fact that our discrimination measure is derived from job ads does not in itself confer any advantages or disadvantages in distinguishing among these motivations for discriminating.

Theoretically, our model draws on Becker’s (1957) seminal model of labor market equilibrium in the presence of discrimination, and on its recent elaboration by Charles and Guryan (2008). We generalize both these models by introducing search frictions and application processing costs: as in Altonji and Pierret (2001), firms in our model can use gender or other demographics as coarse screens for applicant ability; in our case we formally model firms’ decisions regarding whether or not to use such screens. Becker’s model --where essentially all jobs are segregated in equilibrium-- is a special case of ours where the idiosyncratic variation in worker quality approaches zero, or where application processing costs approach infinity.

of over one million observations, compared to about 5,000 in Bertrand-Mullainathan and much smaller numbers in most audit studies. The larger sample size, in turn, lets us go beyond the study of a few specific occupations to paint a broad statistical portrait of explicit gender-targetting in this labor market, across occupations, industries, and firm types.

⁴ See Crosby et al. (1980) for a review of studies of unconscious bias.

Our model also relates to a literature on optimal search and recruiting that has been inspired by Mortensen and Pissaridies (1994), among others.⁵ In most of these models, employers' strategy space is highly restricted --for example in many cases firms' only choices are whether to enter the market and what wage to post—and workers are identical.⁶ Further, while advertising by firms is sometimes modelled (e.g. Moen, 1997; Menzio 2007), the content of ads is typically restricted to announcements of wages or working conditions. Thus, to our knowledge, the theoretical search literature has not yet considered the possible optimality of advertised hiring restrictions, which invite some (but not all) worker types to apply. While our theoretical treatment is a simple one, it may prove a useful starting point for the modelling of employers' equilibrium decisions regarding *how broadly (across worker types) to search*, which to our knowledge have not received much attention in this literature.

3. A Simple Model of Discrimination in Job Ads

Consider a firm soliciting applications for a single vacant position; applications can come from two distinct groups, labelled M and F . Let the net value to the firm of an individual applicant, j , in a job with 'standard' skill requirements be

$$(1) \quad U_j = v^G + \varepsilon_j, \quad G \in (M, F),$$

where the ε_j represent independent draws from a distribution with *cdf* $F(\varepsilon_j)$. A worker's net value in a job with skill requirement θ is assumed to be θU_j . Importantly, the gender difference in baseline net value, $v^M - v^F$, includes not only between-group differences in revenue productivity in the job, but also differences in employer tastes, and in expected wage costs between the groups. We explore these differential sources of expected net value theoretically at the end of the current section, and empirically in Sections 5 and 6. For now we simply work with $v^M - v^F$ as a summary index of all these factors for a particular job, and use employers' "preferences towards men" or "tastes for men" as a shorthand for $v^M - v^F$.

Simple, closed-form solutions for the model are available when we assume a convenient functional form for $F(\varepsilon_j)$. Specifically, let $F(\varepsilon_j)$ be type-I extreme value, with $F(\varepsilon_j) = \exp(-\exp(-\varepsilon_j/\beta))$. It follows that $\text{Var}(\varepsilon_j) = \beta^2 \pi^2/6$, and $E(\varepsilon_j) = \beta\gamma$, where γ is Euler's constant ($\approx .577$). The firm is assumed to choose the individual worker with the highest

⁵ Our research also relates to microdata studies of vacancy durations, such as Van Ours and Ridder (1992, 1993), and Van Ommeren and Russo (2009). To our knowledge, only two papers in this literature -- Barron, Bishop and Dunkelberg (1985) and Van Ours and Ridder (1991)—have studied employers' advertised job restrictions (in their case, minimum education requirements) empirically. However, unlike us, both of these papers treat advertised requirements as exogenous vacancy characteristics, rather than as a choice variable for the employer.

⁶ For an excellent recent exception, see Teulings and Gautier (2004). Lang, Manove and Dickens (2005) develop a posted-wage search model with two worker types; they show that small employer preferences for one group can generate large equilibrium differentials in outcomes. Rosen's (1997) model has two worker types and assumes workers are better informed about match quality than firms; discriminatory equilibria can arise even when firms have no group-based preferences. Marimon and Zilibotti (1999) consider a world with heterogeneous employee types, but firms cannot (and do not want to) invite only a subset of the types to apply.

total value, U_j , from its pool of applicants. The only nontrivial choice facing the firm is which groups (M , F , or both) to invite to apply; this choice takes into account that it costs the firm a constant amount, c , to process each application that arrives, thereby learning its ε_j .⁷

Formally, the firm chooses D^M and D^F to maximize:

$$(2) \quad \Pi \equiv Emax(U_j; D^M, D^F) - D^M cM - D^F cF,$$

where D^M (D^F) is a (0,1) indicator for inviting men (women) to apply, and $Emax(U_j; D^M, D^F)$ gives the expected value of the maximum value of U_j drawn from the sample of applicants defined by D^M and D^F . M and F denote the numbers of applications that would arrive from the two groups, if invited.

Lemma 1.

(a) The expected value of the highest U_j in a sample of size G drawn from a single group, M or F , in a job with standard skill requirements, is:

$$(3) \quad U^{G*} = \mu^G + \beta \log(G), \quad G \in (M, F),$$

where $\mu^G \equiv v^G + \beta\gamma$ is the expected net value of a single applicant from group G .

(b) The expected value of the highest U_j drawn from the combined sample of all applicants in a job with standard skill requirements, is:

$$(4) \quad U^{C*} = \beta \log \left[\delta \exp \left(\frac{\mu^M}{\beta} \right) + (1 - \delta) \exp \left(\frac{\mu^F}{\beta} \right) \right] + \beta \log C$$

where $C=M+F$ and $\delta = M/(M+F)$.

Proof: See Appendix 1.

To keep the notation simple in what follows, we shall focus on the case of an equal number of applications from each group, i.e. $\delta=.5$ ⁸ In that case, (4) can be written:

⁷ Note that application processing costs are an essential component of our model: after all, in the absence of processing costs, firms could costlessly duplicate the effects of any advertised job requirement by soliciting applications from everyone, then just discarding the applications from the groups that are not wanted. Application processing costs differ from the usual costs assumed in search models, such as a fixed cost of opening a vacancy and the opportunity cost of keeping the job vacant; they will also be affected by a less familiar set of factors, including the firm's information-processing technology and the complexity of the methods used to evaluate job candidates.

⁸ Results for unequal numbers are presented in an earlier version of this paper (Kuhn and Shen, 2009); nothing of importance changes.

$$(5) \quad U^{C*} = \mu^M + \beta \log \left[1 + \left(\exp \left(\frac{\mu^F - \mu^M}{\beta} \right) \right) \right] + \beta \log N,$$

where $N = .5C$ is the (common) number of applications expected from each group.

We next define $z \equiv (\mu^M - \mu^F)/\beta$ as the standardized gap in expected net value between the groups.⁹ Overall, the firm's optimal recruiting policy is then described by:

Proposition 1. The firm's optimal recruiting policy is to:

Solicit men only if $z > z^*$,

Solicit women only if $z < -z^*$

Post no advertised restrictions if $-z^* \leq z \leq z^*$

where:

$z^* = -\ln[\exp(cN/\theta\beta) - 1] > 0$ if $cN/\theta\beta \in [0, \ln(2)]$ ("high variance" case), and

$z^* = 0$ if $cN/\theta\beta > \ln(2)$ ("low variance" case).

When $cN/\theta\beta \leq \ln(2)$, the firm's optimal policy is to invite women only when z is low, men only when z is high, and to accept applications from both groups for intermediate values of z . We refer to this as the "high variance" case because it corresponds to high levels of variance in idiosyncratic worker quality, i.e. high β ; however it also corresponds to higher levels of skill, lower levels of hiring costs, and smaller expected applicant pools. When $cN/\theta\beta > \ln(2)$ (the "low variance" case), firms always restrict their ads: to men only when $z > 0$ and to women otherwise.

Overall, Proposition 1 shows that the factors influencing a firm's optimal recruiting strategy fall naturally into two categories: Factors that raise the index z , which is the expected productivity, cost and taste advantage of men for this job, raise the 'likelihood' that firms will invite only men to apply, and reduce the likelihood that firms will invite only women.¹⁰ As a shorthand, we will refer to these factors as *relative preferences*. The remaining parameters in the model, c , N , θ , and β , operate only on the thresholds, z^* and $-z^*$. We refer to these factors as *search-related*.

To understand how the search-related factors work, consider first the high-variance case, where there exist values of z for which it is optimal not to gender-target the job ad. Here, the search-related factors (c , N , θ , and β) either move the thresholds $-z^*$ and z^* closer together, making it more likely that firms will engage in gender restrictions of

⁹ Since $\beta = \sigma_\varepsilon \sqrt{6} / \pi$, where σ_ε is the standard deviation of net value.

¹⁰ We formalize this likelihood in Section 5, where we posit a distribution of expected net values across jobs that are offered by employers, and estimate a maximum likelihood model of the incidence of advertised gender restrictions across jobs.

either type, or farther apart, with the opposite effect. Specifically, the model predicts that increases in β (i.e. greater idiosyncratic variance of applicant productivity), and increases in θ (the job's skill level) reduce the likelihood that firms will advertise gender restrictions *in either direction*. The intuition is that higher variance raises the option value of searching from a larger pool (i.e. raises the chance the best candidate will come from the group with the lower mean), and higher skill levels raise the importance to the firm of identifying the best candidate. In contrast, increases in c and N move $-z^*$ and z^* closer together, making advertised gender restrictions more likely. This is because both c and N directly raise the cost of doubling the applicant pool from N to $2N$ to include both men and women.

Turning now to the low-variance case, in this region of the parameter space firms will always direct their ads only to the group they prefer. To see how our model specializes to Becker's in this case, consider a labor market with many employers, indexed by i , who can hire either men or women for the same task. All employers in this market face the same wages, w^M and w^F , but firms' relative tastes for hiring men ($t_i^M - t_i^F$) and possibly the expected gender productivity gap, $q_i^M - q_i^F$, can vary across firms. Thus, a firm's baseline gender gap in total net value, $v_i^M - v_i^F$, can be decomposed into the following components:

$$(6) \quad v_i^M - v_i^F = (q_i^M - q_i^F) + (t_i^M - t_i^F) - (w^M - w^F)$$

If, for simplicity, we assume (as Becker does) that men and women are equally productive in these jobs, then in Becker's frictionless world and in our 'low variance' case, firms where $(t_i^M - t_i^F) > (w^M - w^F)$ will hire only men, and firms where $(t_i^M - t_i^F) < (w^M - w^F)$ will hire only women. The market wage differential ensures that enough firms of either type will exist to employ all the men and women. Our high-variance case thus generalizes Becker's analysis to a case where search frictions cause some job ads to *not* be targeted, as is in fact the case for the majority of job ads in China.

Since gender restrictions occur in only about one in ten ads in our data, we assume in our empirical work that the 'high variance' case applies to all employers (i.e. that there exists *some* expected gender value differential, perhaps infinitesimal, for which every firm would prefer not to issue a discriminatory ad). In our empirical work, we will use this model to interpret patterns of discriminatory advertising. We also test a key prediction of the model: that the incidence of both 'male-only' and 'female-only' ads should decline as the job's skill level rises.

4. Data and Descriptive Statistics

Our data is the universe of unique job advertisements posted on Zhaopin.com, the third largest online job board in China, during four observation periods: May 19 2008 - June 22 2008, January 19 2009 - February 22 2009, May 18 2009 - June 21 2009, and

January 18 2010 - February 21 2010.¹¹ Procedures for downloading the data and defining variables are discussed in Appendix 2. Like all samples of job ads, ads on Zhaopin.com will not be representative of all jobs in China; they will overrepresent jobs in expanding and high-turnover occupations and industries. In addition, the jobs on Zhaopin.com likely require a significantly higher skill level than the median job in China. Since we might expect firms in expanding and high-turnover industries to be less selective about their employees' gender, and since we show below that advertised discrimination is less common in skilled occupations, it seems likely that our data underestimates the overall extent of gender-targeting job advertising in China.

Another sampling issue arises from the fact that some of the ads in our data are for multiple vacancies. While we treat the ad as the unit of analysis throughout this paper, we address this issue by controlling for the number of vacancies the ad advertises.¹² A related issue is that ads for multiple vacancies can specify up to three occupations. Since the share of vacancies corresponding to the individual occupations is generally unknown in these cases, we restrict our sample to ads for a single occupation; this reduces our sample by about 20 percent.¹³ Finally, we note that, by construction, our data comprise the stock of unfilled ads rather the flow of new vacancies. This implies that long vacancy spells are overrepresented in our data, which would affect our estimates if there is parameter heterogeneity in the determinants of ad content that is correlated with vacancy durations.¹⁴ To address this concern, we replicated our estimates for a subsample of ads from near the end of each data collection period that consists, almost certainly, of newly posted ads. The results were very similar.

Descriptive statistics for our data are provided in Table 1. All told, we study a total of 1,057,538 job ads. Our principal measure of a job's skill level is the education requirement listed by the employer in the ad; by this metric a typical job on Zhaopin is quite highly skilled: about 87 percent of ads (1 - 136595/1057538) require at least some post-secondary education.¹⁵ Eighty-one percent require some experience, with the modal experience requirement between one and three years. A little more than one in ten ads expressed a gender preference; this was evenly split between men and women.¹⁶ As suggested by our model, however, employers' propensity to express a gender preference is strongly, and negatively related to the job's educational requirements: almost a quarter of jobs requiring high school education or less were explicitly 'gendered'; this fraction falls to a little over six percent for jobs requiring a university education.

¹¹ Note that firms frequently re-post the same ad; our sample treats all such renewals as the same ad. Our choice of Zhaopin is largely for the technical reason that its site structure allowed us to easily and accurately identify such renewals.

¹² We also estimated some specifications where we weight each ad by the number of vacancies it represents; the results are unchanged.

¹³ Our results were very similar when we included all ads and classified them according to the first occupation listed, or when we allocated ads fractionally, and equally, across all the occupations they listed.

¹⁴ See Bergeron et al. (2008) for a recent discussion of the effects of length-biased sampling.

¹⁵ By far the most common occupation (of the 40 categories used by Zhaopin on its site) is sales, at about 22 percent of the ads, with IT second at about 13 percent. The top five industries were construction, consulting, IT, marketing, and trade. 24 and 17 percent of the ads were for jobs in Beijing and Shanghai respectively, but all Chinese provinces are represented in our data.

¹⁶ This includes all intensities of preference, though the most typical employer statements were either "female[male] preferred" and "female[male] only".

About half of the ads in our sample specified the number of vacancies that were available. Half of these, in turn, were for a single position. That said, a significant share of the ads were for large numbers of job openings. More than half of the ads were placed by privately owned, Chinese firms (this includes privately held companies, publicly-traded companies and former State-Owned Enterprises where a majority of shares are still owned by the state). Another 36 percent of ads were from employers with some foreign connection. Most of these were Foreign Direct Investment (FDI) and joint ventures, though a small number of representative offices are also included. A further seven percent of ads were for jobs in State-Owned Enterprises. We also observed some ads from non-profit employers (e.g. in education or health care) or (local, provincial or federal) public service; while these are a very small share of the total, our large sample size allows us to study them as well.

A different, complementary picture of the frequency of discriminatory job ads in China emerges when we organize our data by firms rather than ads. Overall, 74,202 distinct firms placed ads on Zhaopin during our sampling period; thus the average number of ads per firm was $1,057,538/74,202 = 14.25$. Characteristics of these 74,202 firms' hiring policies are summarized in Table 2. According to Table 3, 19.9 percent of the firms in our data placed at least one ad that invited only men to apply; for women this number was 26.0 percent. For obvious reasons, these shares rise with the number of ads the firm placed on Zhaopin, and with the number of distinct occupations for which it advertised on Zhaopin during our sample period. Thus, for example, among firms that placed more than 50 ads, over 70 percent expressed a gender preference at least once, and 39 percent placed *both* male-only and female-only ads during our sample period.

In sum, Tables 1 and 2 illustrate three key features of advertised gender discrimination in China. First, a large share of employers engage in hiring practices that would be considered an illegal form of discrimination in the United States. Although we do not address the larger question of whether Chinese or American laws are more appropriate, we do discuss some consequences of such legislative differences in the conclusion to this paper. Second, advertised gender preferences vary significantly across jobs within the same firm. Finally, advertised gender preferences in favor of both men and women decline markedly as the job's advertised education requirement rises. We explore all of these, and many other features of discrimination in job ads in more detail in the following section.

5. Empirical Determinants of Gender Discrimination in Job Ads

To bring Section 2's model of advertised discrimination to the data, let the employer's net relative valuation of men in the position described in ad i be given by

$$(6) \quad z_i = \mathbf{x}_i \mathbf{b} + v_i$$

where \mathbf{x}_i includes all the observable determinants of firms' preferences towards men (and away from women) for that job, plus a constant term. According to Proposition 1, an ad will then be targetted at men if $v_i > z_i^* - \mathbf{x}_i \mathbf{b}$, targetted at women if $v_i < -z_i^* - \mathbf{x}_i \mathbf{b}$, and will not contain any gender restrictions otherwise. Suppose further that v_i is

independently and normally distributed across job ads with cdf $F(v_i)$. The likelihood of observing each of the three possible ad types can then be written:

$$\begin{aligned} \text{Prob(restrict ad to women)} &\equiv P^F = F(-z_i^* - \mathbf{x}_i \mathbf{b}) \\ (7) \quad \text{Prob(no gender restrictions)} &\equiv P^C = F(z_i^* - \mathbf{x}_i \mathbf{b}) - F(-z_i^* - \mathbf{x}_i \mathbf{b}) \\ \text{Prob(restrict ad to men)} &\equiv P^M = 1 - F(z_i^* - \mathbf{x}_i \mathbf{b}), \end{aligned}$$

If $z_i^* = z^*$ (a constant for all observations) and F is $N(0, \sigma_v^2)$, (7) describes an ordered probit model, which can be used to estimate the parameter vector \mathbf{b} up to a constant of proportionality (σ_v). An important feature of our theoretical model, however, is that a subset of the ad's observed characteristics—in particular the indicators of its skill requirements, but also any observable correlates of application processing costs, expected numbers of applications, and idiosyncratic worker quality—are expected to act on the two thresholds in this three-outcome ordered probit in a somewhat unusual way. Specifically, high skill requirements are predicted to move the two thresholds apart by equal amounts; this is reflected in (7) by the fact that the thresholds equal $-z^*$ and z^* respectively.

In order to model the dependence of these thresholds on ads' observable characteristics, we therefore assume in addition that:

$$(8) \quad z_i^* = \exp(-\mathbf{x}_i \mathbf{d})$$

which implicitly assumes that any variable that might affect firms' relative valuation of men versus women (z_i) can at least potentially affect z_i^* as well.¹⁷

Taken together, (7) and (8) plus a distributional assumption for F comprise a simple model of our data that can be estimated via maximum likelihood. This model allows all observable characteristics of a job or firm, including the job's skill requirements, to affect the firm's relative preference for men versus women in that job (z), and at the same time to affect the *gap* between the firm's two thresholds, i.e. the length of the interval of z 's in which the firm chooses not to target its ads. The latter is summarized by the scalar z^* . Importantly, the effects of any given observable on z^* are identified even if we believe that observable also affects a firm's 'tastes towards men' (z).¹⁸ This allows us to test the model's prediction concerning skill requirements without needing to assume, for example, that firms' tastes towards men are independent of the job's skill level. It also allows us to identify the effects of observable covariates on the firm's relative preferences for men while adjusting for differences between ads in search-

¹⁷ Note also that, according to our theoretical model, $z_i^* = -\ln[\exp(Q_i) - 1]$, where $Q_i = c_i N_i / \theta_i \beta_i$; therefore (by re-arranging) the estimated ratio Q_i can be recovered from our parameter estimates for each ad via the expression $Q_i = \log\{\exp[-\exp(-\mathbf{x}_i \mathbf{d})] + 1\}$.

¹⁸ It is of course possible to estimate the model in the presence of exclusion restrictions, but these are not required for identification. Intuitively, as we show below, this is because we have data on two distinct outcomes (P^M and P^F); \mathbf{d} is identified by the effects of \mathbf{x} on their sum ($P^M + P^F$) while \mathbf{b} is identified by \mathbf{x} 's effects on their difference ($P^M - P^F$).

related factors that would otherwise contaminate our estimates by affecting the firm's overall preferences to search narrowly versus broadly.

Finally, we note that (8) is formulated such that a positive d_k coefficient implies that covariate x_k *reduces* z^* , thus making discrimination of both types more common. This allows us to interpret the \mathbf{b} parameters, loosely, as the effects of the covariates on firms' relative preferences towards men (and away from women), and the \mathbf{d} parameters as firm's tendencies to gender-target their ads in general (i.e. as the effects of the covariates on *minus* z^*).

Maximum likelihood estimates of the parameter vectors \mathbf{b} and \mathbf{d} in (7) and (8) using the standard normal distribution for F are presented in columns (1) and (2) of Table 3. In addition to the variables shown, these estimates also control for the number of vacancies advertised, part-time jobs, and period fixed effects. Net of all the controls, column 1 shows that firms' underlying preferences for men (z) vary in a nonmonotonic way with the job's education requirements, at first falling, then rising. In contrast, as predicted by our model, the estimated effects of the propensity to discriminate in general are negative and monotonic, even while controlling for the observable ad characteristics in the Table 3 regressions.

According to Table 3, experience requirements have a similar qualitative effect on z^* as do education requirements: higher experience requirements are associated with broader search strategies and less total discrimination. To the extent that experience requirements also indicate a higher overall skill level for the job, this also supports our model's predictions. Interestingly, however, experience requirements also have a highly significant, positive association with firms' preferences towards men. In other words, we find that Chinese employers act as if men were better suited than women to jobs requiring high levels of experience.

Table 3 also shows that employers' relative preferences towards men, z , are higher in bigger firms, state-owned enterprises, and in government jobs, and lower in firms with some foreign ownership (all relative to Chinese private sector firms). Turning to firms' overall propensity to engage in advertised discrimination, this is lower in larger firms and in state-owned enterprises, and especially in foreign-owned firms. The opposite is the case for government jobs in China. We comment more on possible explanations for these patterns later in this section.

Our goal in the remainder of this section is to assess whether the above patterns, especially those involving skill requirements, are robust to a much more detailed set of controls for observed job characteristics. Such characteristics include occupation and industry fixed effects that would capture unobserved correlates of both skill requirements and employers' gender preferences. Introducing large numbers of fixed effects is however not computationally tractable in maximum likelihood models such as the one in columns (1) and (2) of Table 3. For that reason we next develop a linear approximation to our model and illustrate its properties in the remainder of Table 3.

To that end, consider first the effects of an infinitesimal increase in covariate x_k on the probability that an ad is targeted at men (P^M) or women (P^F) respectively in our

model. Differentiating the corresponding terms in (7), these marginal effects are given by:

$$\partial P^M / \partial x_k = (d_k \exp(-\mathbf{x}\mathbf{d}) + b_k) f(v_2^*)$$

$$\partial P^F / \partial x_k = (d_k \exp(-\mathbf{x}\mathbf{d}) - b_k) f(v_1^*),$$

where v_1^* (v_2^*) is the critical value of v below (above) which firms advertise a preference for men (women).

Combining these to yield the marginal effect of x_k on the probability that a firm engages in *some* type of gender discrimination:

$$(9) \quad \partial(P^M + P^F) / \partial x_k = d_k \exp(-\mathbf{x}\mathbf{d})(f(v_1^*) + f(v_2^*)) + b_k(f(v_2^*) - f(v_1^*)).$$

If $f(v_i)$ is uniform with density $m/2$, (9) reduces to

$$(10) \quad \partial(P^M + P^F) / \partial x_k = d_k m \exp(-\mathbf{x}\mathbf{d}),$$

while a parallel argument for $(P^M - P^F)$ yields:

$$(11) \quad \partial(P^M - P^F) / \partial x_k = b_k m.$$

In other words, up to a factor of proportionality, the parameter d_k is simply equal to x_k 's marginal effect on the probability that a firm discriminates *in some direction* in its ad. This is true regardless of x_k 's effects on the firm's preference towards men, z , because any such effects subtract out of (9). Similarly, b_k is identified by the marginal effect of x_k on the difference between the probabilities, $P^M - P^F$. Further, while (10) and (11) are true for all observations and data sets only when $f(v_i)$ is uniform, for any symmetric $f(v_i)$ they are satisfied whenever the predicted levels of P^M and P^F are equal. As already noted, this is essentially the case for an observation with mean characteristics ($\mathbf{x} = \bar{\mathbf{x}}$) in our data. Thus, especially given our large sample size, any consistent estimate of the marginal effect $\partial(P^M + P^F) / \partial x_k$ should yield (up to a constant) a relatively accurate estimate of d_k . By the same token, $\partial(P^M - P^F) / \partial x_k$ should provide a good estimate of b_k . The simplest approach is just to run OLS regressions of the sum (difference) of P^M and P^F on observables.

The remaining columns of Table 3 examine the accuracy of this approximation in our data, by comparing the marginal effects estimated by ML versus OLS approaches. Columns (3) and (4) computed the estimated marginal effects $\partial(P^M + P^F) / \partial x_k$ and $\partial(P^M - P^F) / \partial x_k$ from our ML estimates of \mathbf{b} and \mathbf{d} for an ad with mean characteristics ($\mathbf{x} = \bar{\mathbf{x}}$). Columns (5) and (6) compute the same marginal effects from a linear probability model regression. Clearly, these estimated marginal effects (and their standard errors) are very similar. In the remainder of the paper we will therefore estimate the determinants of z^* and z using OLS regressions of $P^M + P^F$ and $P^M - P^F$ on \mathbf{x} respectively.

Table 4 presents results of OLS regressions where the dependent variable is $P^M + P^F$, where P^M (P^F) is a (0,1) indicator variable for whether the ad is targeted at men (women).¹⁹ As argued, up to a constant, coefficients in these regressions are estimates of each variable's effects on $-z^*$, with positive coefficients moving the thresholds $-z^*$ and z^* closer together, thus reducing the frequency of advertised discrimination in both directions. Column 1 simply adds province fixed effects to the regression reported in column (8) of Table 3; the results change very little. Moving across the columns, we then add occupation and industry fixed effects (column 2), fixed effects for occupation*industry interactions (column 3), for occupation*industry*province interactions (column 4); for individual firms and occupations (column 5), and finally in column 6 for a full set of 260,228 firm*occupation interactions. As already noted, a key motivation for adding these fixed effects is to ascertain whether firms' tendency to refrain from gender discrimination when jobs require a higher skill level is associated with the skill requirement itself, rather than other features of the type of work that is required, the industry, or even the specific firm doing the hiring.

While the magnitudes of the estimated effects vary somewhat across specifications, Table 4 clearly shows that the tendency to refrain from gender discrimination in general as skill requirements rise is a highly robust feature of our data. Even when we compare the same firm hiring for the same occupation at different times (i.e. in the column 6 specification), that firm is less likely to stipulate a gender preference when the job's required skill level is high than when it is lower. The effects also remain large in magnitude: raising education requirements from high school or less to some postsecondary reduces the probability that a firm will engage in some form of gender discrimination by 6 percentage points, relative to a mean of about 10 percentage points.

As in columns (3) and (5) of Table 3, all the columns of Table 4 show that, like education requirements, higher experience requirements strongly reduce gender-targeting in job ads (though the effect is not monotonic at the highest experience levels in all specifications). Once again, these estimated effects are consistent with our predictions regarding skill requirements and are large in magnitude: raising experience requirements from less than one year to 3-5 years reduces the probability that a firm will engage in some form of gender discrimination by about 3 percentage points in all specifications.

While it is not possible to estimate the effects of firm characteristics in the presence of firm fixed effects, columns (1)-(4) of Table 4 show that the estimated effects of firm size and type on advertised discrimination are also highly robust to specification. For example, larger firms are less likely to restrict their job ads to a particular gender, but the effect is small in magnitude. Foreign ownership reduces the likelihood that firms will engage in some form of advertised gender discrimination by about 3 percentage points in all specifications. Since this effect is robust to industry, occupation and other controls, it seems likely to reflect a pure effect of those international connections, such as international differences in corporate culture, or the influence of laws or public opinion in the home country on a firm's operations in China. The only other employer type that

¹⁹ Coefficients of the 'underlying' regressions for P^M and P^F separately can be computed by simple addition or subtraction of the coefficients in Tables 4 and 5. Tables (including standard errors) are also available from the authors.

differs significantly from the base category (Chinese private sector firms) is the public sector, which is much more likely to express a gender preference. These large effects however also come with large standard errors, since our sample of public sector ads is very small.

Table 5 presents results of OLS regressions where the dependent variable is $P^M - P^F$. As argued above, up to a scale factor these coefficients give the effect of observable characteristics on an employer's net relative valuation of men (relative to women) for the job on offer (z). Importantly, under the assumptions of our model, these estimates are purged of the effects of observables on the propensity to search broadly (without restrictions) or narrowly that would contaminate other estimates, especially if the same observables affect search-related factors (such as the number of expected applications and application processing costs) as affect employers' relative valuations.

In sharp contrast to Table 5, a job's education requirements have mostly weak and insignificant effects on whether employers prefer men versus women to fill it. Thus, the strong effects of education on the tendency to discriminate is almost entirely attributable to its effects on thresholds, which were predicted by our model. In an important sense, then, Chinese employers are not using discriminatory job ads to 'keep women out of' jobs requiring high levels of education. The same, however cannot be said about experience: employers are much more likely to prefer men to women in jobs with higher experience requirements than in other jobs.²⁰ Large employers also appear to have greater preferences in the direction of men.

Table 5 also shows a negative effect of foreign ownership on firms' preferences towards men, though this effect (of less than a percentage point) is much smaller than their negative effect on the propensity to discriminate in general. SOEs and governments, on the other hand, seem to have a stronger preference in favor of men than other firms (the government effect very large but with a correspondingly large standard error). Given that these two employer types face less product-market competition than others in our sample, this finding is consistent with the prediction of taste-based discrimination models, that employers will be more able to indulge discriminatory tastes when competition is low.²¹

It may also be of interest to examine the estimated occupation fixed effects in Tables 4 and 5 for clues regarding when firms want men versus women in a job. These fixed effects, shown in Figure 1, are derived from regressions identical to column 2 in Tables 4 and 5 with one exception: education was removed from the list of controls, in order to illustrate its effects in the Figure itself. Occupations in the Figure are divided

²⁰ It may be interesting to note that these effects would be masked in a simple regression of P^M on experience requirements: those coefficients are essentially zero in the column 6 specification because the effect of experience on preferences is totally masked by the negative effect of experience on thresholds.

²¹ See Black and Strachan (2001) and Black and Brainerd (2004) for other recent evidence of the effects of product market competition on gender discrimination. Our findings regarding gender, SOEs and the public sector are consistent with Zhang, Han, Liu and Zhao (2008), who find that the share of the unadjusted gender wage gap that is not accounted for by observable productivity-related characteristics in China is smaller in market-oriented activities than state-owned ones. For other recent studies of gender differentials in China, see Gustafsson and Li (2000) and Liu, Meng and Zhang (2000).

into two groups, based on our *a priori* impression of whether they are likely to involve a considerable amount of customer contact. The six customer-contact occupations, indicated by triangles, are sales, customer service, hospitality/tourism/entertainment (“tourism”), editing/media/film/news (“media”), retail, and “healthcare/beauty/fitness” (“health”). Symbol sizes are proportional to the inverse of the variance of the estimated fixed effect, and a regression line (estimated with these weights) and the 95% confidence band is shown.

Part (a) of Figure 1 shows the estimated fixed effects on $-z^*$ for the 40 occupations in our data from the Table 4 regressions. As predicted by our model (and as was apparent from the regressions), ads for the least-skilled occupational group (labor and domestic service) are almost 30 percentage points more likely to stipulate a preferred gender than in the reference occupation (sales). Aside from public service, which is based on a very small sample, the two most positive outliers in the tendency to gender-target ads are administration and tourism occupations.

Part (b) of Figure 1 shows the estimated fixed effects from the Table 5 regressions for firms’ relative preferences toward men (z). Here, the strong negative association in part (a) is replaced by essentially a zero overall relation to education. Large positive outliers in the employers’ preferences towards men are occupations involving manual labor, technical occupations, and communications/logistics; large negative outliers (indicating a preference for women that cannot be accounted for by observable features of the firm, industry, or ad) are tourism, retail, health occupations, and administration. Three of these four are customer-contact occupations; we will shed additional light on why employers prefer women in these jobs in the following Section.

Next, we note that the R^2 s in Tables 4 and 5 provide additional information on the structure of the cross-sectional variation in employers’ gender preferences (z) and search-related factors ($-z^*$). Notably, less than 10 percent of the variation in either of these factors is explainable by a full set of occupation fixed effects, or even by a full set of over 1600 occupation*industry interactions. Firm fixed effects add a considerable amount of explanatory power, raising R^2 to .28 and .37 respectively. We note, however, that removing occupation effects from the model with firm effects (not shown) reduces R^2 imperceptibly: thus, *almost none of the between-firm differences in gender preferences can be explained by the fact that firms hire different mixes of occupations*. On the other hand, R^2 for both z and $-z^*$ rise to about two thirds with a full set of occupation*firm interactions. This provides further support for the notion that firms’ gender preferences are job-specific, in the sense that they vary across occupations within firms, *and* that different firms tend to have different gender preferences for the same occupations. Finally, we note that the remaining one third of the variation in employers’ gender preferences (and of search-related factors as well) is within firm*occupation cells. This suggests that firms engage in gender-job typing, or even gender segregation, at the level of highly detailed job descriptions, as documented, for example by Bielby and Baron (1984).

Finally, as outlined in Appendix 3, we calculated the share of total (observed and unobserved) variation in firms’ advertised preferences for men that was attributable to variation in z versus $-z^*$. We did the same for women. In both cases, for all regression

specifications reported in Tables 4 and 5 we found that about half of both the observed and unobserved variation was attributable to z versus $-z^*$, with a small covariance term. In other words, about half the cross-sectional variation in advertised discrimination in favor of, say, men, is not associated with differences in firms' net preferences for men over women as employees (whether related to tastes, expected productivity differences, or wage differences). Instead this variation is associated with search-related factors that make some firms reluctant to restrict their applicant pools and others to be happy to do so. This underscores the importance of accounting for search-related factors when attempting to infer employers' gender preferences from data on discriminatory job ads.

6. Supporting Evidence

In this section we present two additional types of evidence to further probe our hypothesis that high job skill requirements reduce firms' incentives to explicitly discriminate in the recruiting process, and that they do so because higher skill demands raise the option value of searching from a larger pool of candidates. First, we examine firms' use of demographic signals other than gender; specifically age, beauty and height. If our hypothesis about why education reduces gender-targeting in ads is correct, then firms' use of these other screens should also decline with job skill levels. Second, we examine the effects of a third indicator (in addition to education and experience requirements) of job skill levels: the advertised wage. While this indicator has both advantages and disadvantages relative to the measures use so far—which we discuss in detail below—we shall see that it also dramatically confirms our main hypothesis.

a) Other forms of advertised “discrimination”:

Table 6 presents descriptive statistics on advertised requirements for some other ascriptive demographic characteristics which, like gender, are typically prohibited (or at least widely disapproved of) in U.S. job ads: age, beauty and height.²² According to Table 6, slightly less than one in four ads on Zhaopin.com expressed an age preference; perhaps surprisingly, minimum age requirements were almost as common as maxima. Indeed, 12.8 percent of ads specified both a minimum and a maximum age, and fewer than one percent of advertised minima were below 18. That said, firms seem overall to be seeking younger workers: the mean minimum and maximum ages were about 25 and 36 respectively, and fewer than 5 percent of the maximum ages were over 48.

Unlike gender and age requirements, which can go in both ‘directions’ (excluding either men or women, ruling out both the too-old and the too-young), we could find no ads in our sample of over a million that requested short or unattractive applicants. All together, 7.7 percent of ads requested that the applicant be physically attractive (“*xingxiang*”). Given the relative rarity of gender restrictions, a large majority of the requests for beauty in our sample were in ads that did not express a gender preference. Among ads that did express a gender preference, however, beauty was much more valued among women than men: fully one out of every three ads targeted at female applicants required the applicant to be physically attractive, compared to 6.7 percent for ads targeted

²² We also searched for evidence of ethnic or racial discrimination in our sample of ads. Only 56 ads in our sample explicitly requested that the applicant be Han (China's dominant ethnic group). Ads requesting minority ethnicities were actually more common.

at men. This contrasts starkly with some U.S. studies (e.g. Hamermesh and Biddle 1994), which did not find that the labor market returns to beauty were highly ‘gendered’.

At 2.6 percent of job ads, height requirements are the least common of the ‘US-prohibited’ job requirements on which we have data. Moreover, minimum height requirements take several distinct forms on Zhaopin.com. Most commonly (in 1.1 percent of ads overall), these requirements appeared in ads directed at women, and stipulated a minimum height (of 162.1 cm on average) for (presumably female) applicants. In contrast, 0.4 percent of ads overall had a height requirement (of 167.1 cm on average) and were directed specifically at men. 0.9 percent of ads listed a single height requirement (of 165.2 cm) without mentioning gender, while a small but interesting share (0.2 percent) listed two gender-specific height requirements (which averaged 171.0 cm for men and 162.2 cm for women). Since it is unlikely that this type of height requirement is related to a specific job task, we speculate that firms posting such ads use them either as signals of health or cognitive ability (as argued by Case and Paxson 2008), or because being tall for one’s gender is valued directly, perhaps by a firm’s customers. Finally, we note that, like beauty, height requirements are highly gendered in China: over one fifth of all job ads directed at women specified a minimum height, compared to only 6.7 percent of job ads directed at men. We provide additional evidence on firm’s motivations for these requirements in our analysis of occupation fixed effects below.

Turning to our main hypothesis, Table 6, like Table 1, shows a strong negative association between a job’s skill requirements and its tendency to have age, beauty and height requirements. Among jobs requiring high school education or less, 40, 15 and 9 percent had an age, beauty or height requirement; for jobs requiring university education these numbers fall to 17, 4 and 1 percent respectively. Table 7 confirms the robustness of this pattern by showing linear probability model regression results with the same specifications as columns (4) and (6) of Tables 4 and 5. Because age restrictions, like gender restrictions are ‘bilateral’ in our data, columns (1)-(4) adopt a similar strategy of separately identifying firms’ preferences in the direction of older workers (z) (or alternatively, their ‘ideal’ employee age for that job) from their propensity to impose age restrictions in general ($-z^*$). The latter effects come from regressions in which the dependent variable equals one if the ad had either a minimum or maximum age (or both). The regression underlying the former uses the difference between two dummies (for the presence of a minimum and maximum age respectively) as the dependent variable. Since ads for beauty and height only go in one direction, we simply present linear probability models for the presence of these restrictions; z and $-z^*$ cannot be separately identified here and it is important to take note of this in interpreting the estimates.

Table 7 clearly shows that, even in the presence of highly detailed controls, firms’ propensity to age-target ads (in any way) declines sharply with jobs’ education requirements: in the most saturated regression specification (column 4) jobs requiring some postsecondary education (a university degree) are 8 (11) percentage points less likely to specify an age requirement of any kind. Firms’ relative valuation of older workers also seems to rise with education requirements, but the effect is much smaller in magnitude and not consistently statistically significant. For beauty and height it is not possible to separate z and z^* factors, but the strong negative effect of job skill

requirements on firms' propensities to specify these requirements is again consistent with a strong negative effect on $-z^*$ combined with weaker (or zero) effects on z .

Turning to the other covariates in Table 7, consistent with our findings for gender we also find that firms with some foreign ownership are much less (8 percentage points) likely to advertise any age restrictions for their jobs, and less likely to request either beauty or a minimum height. Once again, this suggests an effect of corporate culture, or of antidiscrimination laws or sentiments in other countries. We also find that non-profit employers and state-owned enterprises have strong preferences for younger workers, while foreign-owned firms have a slightly greater preference for older workers than Chinese private-sector firms.

Finally, Figure 2 illustrates the occupation fixed effects associated with the Table 7 regressions in the same way as Figure 1 did for Tables 4 and 5. Part (a) shows the strong negative relationship between education requirements and the use of age restrictions in ads, while part (b) general shows a positive relation between education requirements and the firm's 'ideal' employee age for the job. In part since education itself takes time to acquire, this relationship does not seem surprising. Neither figure contains obvious outliers except perhaps a disproportionate preference for young researchers and old public servants, and a greater tendency to specify a desired age in ads for managerial jobs.

Parts (c) and (d) of Figure 2 show that advertised beauty and height requirements both become less common as jobs' skill requirements rise, but of particular interest here are some dramatic outliers. Specifically, retail, tourism, administration and health occupations all have much higher beauty requirements than one would predict based on ads' other observable characteristics, including education requirements. Interestingly, these same four occupations also show above-average employer requests for height, and (recalling Figure 1(b)) strong relative preferences towards women. Further, three of the four are customer contact occupations. When we looked further into the exception – administration—we found that the predominant type of job advertised in this category was secretarial.²³ Thus, an examination of occupational patterns suggests some support for taste discrimination in our data, at least to the extent that customers, plus persons who hire secretaries, prefer to interact with tall, attractive women. Height requirements are however also disproportionately used in ads for unskilled workers, where it is easier to imagine that they are associated with physical job requirements.

b) Advertised wages as a skill indicator:

While gender or racial wage gaps are the focus of most studies of labor market discrimination, we have so far presented no data on wages. In part, this decision is data-driven, since only about 16.5 percent of the ads in our sample contain usable information about offered wages.²⁴ Thus, any analysis of wage effects must be conditional on the

²³ Confirming a strong employer preference for women in these positions, Bertrand and Mullainathan (2004) were forced to stop sending male resumes in response to administrative job ads due to extremely low callback rates.

²⁴ On Zhaopin.com, firms typically indicate wages by entering a minimum and maximum amount into fields on a form. Overall, only 31.5% of ads contained any information in these fields whatsoever; an

decision to advertise the wage, a decision we know little about.²⁵ In part, however, this choice is also due to a difference in goals between our paper and papers that focus on wage gaps, such as Charles and Guryan (2008) and a large number of regression-based studies of wage gaps. While both our model and Charles-Guryan's treat individual firms as wage takers, their main goal is to explain why wage gaps (in their case on the basis of race) are larger in some labor markets than others.²⁶ Ours, in contrast, is to look *within* markets, and to understand *which* firms decide to advertise their jobs for men, which for women, and which will impose no gender restrictions in their ads. The rewards to this change in focus are new insights about the micro-level determinants of employers' preferences regarding employees' demographic attributes.

This said, as equation (6) of our model makes very clear, it remains true that the advertising decisions made by a wage-taking firm in our model depend on the wages it faces, and that it is therefore desirable to control for these wages in our empirical work, at least if we wish to interpret our \mathbf{b} coefficients as reflective of firms' tastes and productivity expectations. To address this issue, we note two important features of how wages are predicted to affect firms' advertising decisions in our model. First, equation (6) indicates that an exogenous increase in the gender wage gap ($w^M - w^F$) reduces z , and thus should raise the share of ads requesting women, and reduce the share requesting men. Unfortunately, our data do not allow us to generate reliable job-specific measures of the gender wage gap ($w^M - w^F$).²⁷ Therefore we rely on our controls, especially the occupation, industry and region effects and their interactions to capture market-level variation in the relative cost of male and female labor facing employers. This seems reasonable, in part, because—following Becker's seminal intuition-- men and women are mobile across jobs; one would therefore not expect the gender-wage gap to vary a great deal between jobs, at least within an industry*occupation*region cell in our data.

Second, (6) also predicts that equal increases in both w^M and w^F should have no effect on advertised discrimination. Thus, if differences in the overall *level* of the offered wage across the jobs in our sample truly represent differences in the price firms must pay per efficiency unit of labor, our model predicts no association between wages and the incidence of discrimination in job advertising. Another possibility, however, is that higher wages largely indicate the presence of higher job skill requirements (i.e. the need for more labor efficiency units) that are not captured by the observables in our model. In this case, our model predicts that higher-wage jobs should be less likely to impose gender

additional 14 percent selected both the lowest minimum and highest maximum allowed (1000 and 50,000 yuan/month respectively) allowed on the web form. An additional one percent specified a wage range in excess of 20,000 yuan. All together, this leaves us with only about 16.5 percent of ads that had reasonably informative wage data. Among these ads, the mean midpoint of the advertised wage range was 4279 yuan/month.

²⁵ In fact, we plan to study this decision in a separate paper, using partially-directed search models such as Menzio (2007) as a source of hypotheses and analytical framework.

²⁶ In their case, a labor market is defined as a state; we are able to implement much more narrow definitions, such as occupation*industry*province cells.

²⁷ Each individual ad, of course, only gives wage information for one gender at most; the wage for the counterfactual gender would thus need to be imputed. While one could imagine doing this at, say, the occupation level, note that, for example, only 1/10 of ads refer to a specific gender, and only about 16.5 percent of ads have wage information. Thus we would be computing a wage gap for the entire occupation (or any other observable category) based on only 1.65 percent of the ads in that category. This strikes us as highly questionable, and we have not attempted it.

requirements in either direction. Since, once again, we expect labor market competition to roughly equalize the market price of a given number of efficiency units of labor across jobs, we consider this scenario much more likely, especially in the presence of detailed controls for occupation, region, industry, and even firm fixed effects. Since we have offered wage level information for 16.5% of the ads in our sample, we test this prediction in Table 8.

Table 8 presents coefficients on a job's advertised wage when it is added to the regressions for gender in columns (4) and (6) of Tables 4 and 5, and to the equivalent regressions for age, beauty and height in Table 7. Taken together, the results are strongly supportive of the notion that higher skill requirements, as measured by higher offered wages, lead to reductions in firms' tendencies to gender-target ads (column 2), and to specify either beauty or height requirements in the ad (columns 5 and 6). We do not detect a robust effect of wages on firms' tendencies to age-target job ads, or on firms' preferences for older versus younger workers. According to columns (1)-(3), we also find that firms' net preferences towards men for a job are essentially unrelated to the job's overall wage level. While firms likely have many reasons, both socially acceptable and not, for gender-discriminating in their ads, this finding suggests that 'keeping women out of high-paid jobs' is not a good overall description of firms' motivations for gender discrimination in this data.

7. Conclusions

In a legal environment where firms are allowed to engage in explicit gender discrimination when advertising their jobs, when will they choose to do so? Our data show that firms in such an environment will use the option to discriminate much more often when hiring for positions requiring lower levels of skill, whether skill is measured by education requirements, experience requirements, or the offered wage. This pattern holds both for discrimination against women and for discrimination against men. We see this potent role of skill demands as a deterrent to discrimination as complementary to the role of product market competition as emphasized by Becker (1957), and suspect that rising skill demands may play an important role in explaining why nations tend to abandon explicit discrimination as they develop economically.

What underlying economic processes might explain this robust effect of skill demands? In this paper, we present a simple model of employer search from two populations. According to the model, regardless of whether firms prefer men or women for the job they are advertising, firms should be less likely to restrict their search to their preferred gender as the job's skill requirements rise. The intuition is straightforward: as skill requirements rise, it becomes increasingly important for firms to identify the best individual candidate for the job. Explicitly 'disinviting' an entire group of candidates from submitting an application makes less sense in these situations.

Another useful feature of our model is that it allows us to separately identify the effects of observable ad and firm characteristics on 'search related' factors –which reduce advertised discrimination against both men and women--, and employers' net preferences towards men (and away from women) for a particular job. Since search-related factors account for almost half of the cross-job variation in advertised discrimination, it is

important to account for them when attempting to make inferences about firms' gender preferences. Using the framework of our model, we find that employers' underlying preferences for men versus women in a job are unrelated to the job's education and wage level, but increase with the job's required level of experience. Large firms, and state-owned enterprises also tend to disproportionately prefer men over women, a pattern that is consistent with the hypothesis that lower product market competition facilitates discrimination based on employers' preferences in favor of men.

Foreign ownership, on the other hand, corresponds with a preference by firms towards women in our data; this is accompanied by a strong disinclination by firms with some foreign ownership to gender-target their job ads in general and to use other demographic signals such as age, beauty and height in those ads. Overall, this pattern suggests a role for corporate culture, or for the influence of other countries' laws or public opinion on firms' hiring policies in China. We also find large, unexplained employer preferences for tall, attractive women in retail, tourism, health/beauty/fitness, and secretarial jobs, suggesting a role for customer and co-worker (or supervisor) tastes.

Finally, an important feature of our data is that employers' estimated gender preferences vary widely across jobs *within* firms. Indeed, the broad statistical portrait that emerges from our data is one where gender-targetted ads are primarily used to allocate some of each firm's unskilled jobs to men, and others to women. Further, since these occupational gender patterns differ substantially across firms, their explanations may need to consider factors beyond the nature of the job itself. One such possibility is the existence of productivity gains (or wage savings) associated purely with gender *homogeneity* in a detailed job title. Whether due to a signal it might send about changes in job skill requirements (Goldin 2006) or simple employee discrimination, departures from complete gender segregation at these detailed levels might entail costs that are sufficient to motivate explicit gender-targetting by firms of the type we document here. This suggests that future research into the causes of gender differentials, especially in emerging-country labor markets such as China's, might do well to focus on the nature of, explanations for, and consequences of within-firm gender segregation.

Should China and other developing nations follow the U.S.'s example and ban the mention of sex, age, and perhaps other ascriptive characteristics in job ads? While such normative questions are beyond the scope of this paper, we note on the one hand that allowing explicit discrimination in job ads does make it easier for employers to engage in taste-based discrimination. On the other hand, we note that a much higher share of U.S. than Chinese workers is employed in highly skilled jobs, where both our model and data indicate that advertised discrimination is less useful to employers. Also, our results suggest that three ongoing developments –upskilling of the Chinese labor force, expansion of the share of Chinese firms that face meaningful product market competition, and an increasing presence in China of firms with some foreign ownership—may have powerful effects in reducing the incidence of discriminatory job ads even in the absence of policy interventions.

References

- Altonji, J. and C. Pierret. "Employer Learning and Statistical Discrimination" *Quarterly Journal of Economics*, Vol. 116, No. 1. (Feb., 2001), pp. 313-350
- Arcidiacono, Peter and Robert A. Miller. "CCP Estimation of Dynamic Discrete Choice Models with Unobserved Heterogeneity" Unpublished paper, Carnegie Mellon University, February 20, 2008
- Banerjee, Abhijit, Esther Duflo, Maitreesh Ghatak, and Jeanne Lafortune. "Marry for What: Caste and Mate Selection in Modern India" NBER working paper no. 14958, May 2009.
- Barron, John M., John Bishop, and William C. Dunkelberg. "Employer Search: The Interviewing and Hiring of New Employees". *Review of Economics and Statistics* 67 (1) (Feb. 1985): 43-52.
- Becker, Gary S. *The Economics of Discrimination*. 2nd ed. Chicago: U. of Chicago Press. [1957] 1971.
- Bergeron, Pierre-Jerome, Masoud Asgharian, and David B. Wolfson. "Covariate Bias Induced by Length-Biased Sampling of Failure Times" *Journal of the American Statistical Association* Vol. 103 (482). p 737-42. (June 2008).
- Bertrand, Marianne and Sendhil Mullainathan. "Are Emily And Greg More Employable Than Lakisha And Jamal? A Field Experiment On Labor Market Discrimination," *American Economic Review* 94(4) (September 2004): 991-1013.
- Bielby, W. T., and J. N. Baron. (1984) "A woman's place is with other women: Sex segregation within organizations", in B. F. Reskin, ed. *Sex segregation in the workplace: Trends, explanations, remedies*. Washington, D. C.: National Academy Press.
- Black, Sandra E. and Elizabeth Brainerd. "Importing Equality? The Impact of Globalization on Gender Discrimination" *Industrial and Labor Relations Review*. July 2004; 57(4): 540-59
- Black, S. and P. Strachan. "The Division of Spoils: Rent-Sharing and Discrimination in a Regulated Industry". *American Economic Review* 91(4) (September 2001): 814-831.
- Case, A. and C Paxson, "Stature and Status: Height, Ability and Labor Market Outcomes" *Journal of Political Economy* 116(3) (June 2008): 499- 532.
- Charles, Kerwin Kofi and Jonathan Guryan. 2008 "Prejudice and Wages: An Empirical Assessment of Becker's The Economics of Discrimination" *Journal of Political Economy*, 116(5): 773-809
- Crosby, F., Bromley, S., & Saxe, L. (1980). "Recent unobtrusive studies of Black and White discrimination and prejudice: A literature review" *Psychological Bulletin*, 87, 546-563.
- Darity, William A. Jr., and Patrick L. Mason. "Evidence on Discrimination in Employment: Codes of Color, Codes of Gender". *Journal of Economic Perspectives* 12(2) (Spring 1998):63-90.
- Goldin, Claudia. *Understanding the Gender Gap: An Economic History of American Women*. New York: Oxford University Press, 1990.
- Goldin, Claudia. "The Rising (and then Declining) Significance of Gender, in *The declining significance of gender?* Eds. Francine D. Blau, Mary C. Brinton, and David B. Grusky. New York: Russell Sage Foundation, 2006.

- Gustafsson, Bjorn and Shi Li “Economic transformation and the gender earnings gap in urban China” *Journal of Population Economics* (2000) 13: 305-329
- Hamermesh, Daniel S. and Jeff E. Biddle. “Beauty and the Labor Market” *The American Economic Review*, Vol. 84, No. 5 (Dec., 1994), pp. 1174-1194
- Kuhn, Peter and Kailing Shen. “Employers’ Preferences for Gender, Age, Height and Beauty: Direct Evidence”. NBER working paper no. 15564, December 2009
- Lang, Kevin, Michael Manove and William T. Dickens. “Racial Discrimination in Labor Markets with Posted Wage Offers” *American Economic Review*. Vol. 95 (4). p 1327-40. September 2005.
- Lawler, John J. and Johnseok Bae. 1998. “ Overt Employment Discrimination by Multinational Firms: Cultural and Economic Influences in a Developing Country *Industrial Relations* 37(2): 126-152.
- Lindbeck, Assar, and Dennis J. Snower. “Cooperation, Harassment, and Involuntary Unemployment: An Insider-Outsider Approach” *American Economic Review*, Vol. 78, No. 1 (Mar., 1988), pp. 167-188
- Liu, Pak-Wai, Xin Meng and Junsen Zhang. “Sectoral gender wage differentials and discrimination in the transitional Chinese economy”. *Journal of Population Economics* (2000) 13: 331-352
- Menzio, Guido. “A Theory of Partially Directed Search” *Journal of Political Economy*. Vol. 115 (5). p 748-69. October 2007.
- Moen, Espen R. “Competitive Search Equilibrium” *Journal of Political Economy*. Vol. 105 (2). p 385-411. April 1997.
- Mortensen, Dale, and Christopher Pissaridies. “Job Creation and Job Destruction in the Theory of Unemployment.” *Review of Economic Studies*. July 1994; 61(3): 397-415
- Neumark, David. “Sex Discrimination in Restaurant Hiring: An Audit Study” *Quarterly Journal of Economics* 111(3) (August 1996): 915-42.
- Rosen, Asa. “An equilibrium search-matching model of discrimination.” *European Economic Review* 41 (1997) 1589-1613
- Teulings, Coen N. and Pieter A. Gautier. “The Right Man for the Job” *The Review of Economic Studies*, Vol. 71, No. 2 (Apr., 2004), pp. 553-580
- Van Ommeren, Jos and Giovanni Russo. “Firm Recruitment Behaviour: Sequential or Non-Sequential Search?” IZA Discussion Paper No. 4008, February 2009
- Van Ours, Jan, and Geert Ridder. “Job requirements and the recruitment of new employees” *Economics Letters* 36 (1991): 213-218.
- Van Ours, Jan, and Geert Ridder. “Vacancies and the Recruitment of New Employees”. *Journal of Labor Economics* 10(2) (April 1992): 138-155.
- Van Ours, Jan, and Geert Ridder. “Vacancy Durations: Search or Selection?” *Oxford Bulletin of Economics and Statistics* 55(2) (1993).
- Zhang, Junsen, Jun Han, Pak-Wai Liu and Yaohui Zhao. “Trends in the Gender Earnings Gap in Urban China, 1988-2004” *Industrial and Labor Relations Review*, Vol. 61, No. 2 (January 2008).

Appendix 1: Proofs

Proof of Lemma 1:

We begin by normalizing the net value of an applicant, defining $u_j \equiv U_j/\beta = v^G/\beta + e_j$, where $e_j = \varepsilon_j/\beta$ follows a “standard” extreme value distribution with $\text{Var}(e_j) = \pi^2/6$ and $E(e_j) = \gamma$, j indexes applicants, and $G \in (M, F)$ indexes groups. This normalization does not affect the firm’s optimal selection of a worker –the draw of e_j that maximizes u corresponds to the draw of ε_j that maximizes U -- and the maximized value of U can be calculated as βu^* , where u^* is the maximized value of u . Further, this normalization expresses the problem in a standard multinomial logit format, which allows us to draw on some results from that literature.

Among these, it is well known that the expected value of the maximum of $v^G/\beta + e_j$ when e_j is independently drawn N times from a “standard” extreme value distribution is $v^G/\beta + \gamma + \log(N)$.²⁸ Multiplying through by β the expected maximum of U when the firm samples from either the M or F pool separately is

$$(A1) \quad U^{G*} = v^G + \beta\gamma + \beta\log(G),$$

which proves part (a) of the Lemma.

Turning back to standardized net values, the expected value of the highest u_j in the “combined” sample, u^{C*} , equals $u^{M*}q^M + u^{F*}(1 - q^M)$, where u^{G*} is the expected value of the best *overall* worker given the best overall worker is from group G , and q^M is the probability that the best overall worker turns out to be an M . Again using results from the MNL literature, we know that $u^{M*} = v^M/\beta + \gamma - \log(p^M)$, where:

$$p^M = \frac{\exp(v^M/\beta)}{M \exp(v^M/\beta) + F \exp(v^F/\beta)}$$

is the probability that an individual type- M applicant turns out to be the best in the entire, combined pool. Similarly, we have $u^{F*} = v^F/\beta + \gamma - \log(p^F)$, where:

$$p^F = \frac{\exp(v^F/\beta)}{M \exp(v^F/\beta) + F \exp(v^F/\beta)}.$$

Finally, the probability that the firm’s preferred applicant from this combined pool is drawn from the M ’s is just:

$$q^M = \frac{M \exp(v^M/\beta)}{M \exp(v^M/\beta) + F \exp(v^F/\beta)}.$$

Note that, as the variance of individual productivity (β) falls towards zero, the probability that the best overall worker will be from the group with the higher net value (v) approaches one; conversely as β approaches infinity, q^M approaches the share of M ’s in the population, i.e. $M/(M+F)$.

²⁸ See Arcidiacono and Miller (2008, p. 8) for a general proof.

Combining all the necessary expressions and simplifying, the expected standardized value of the best worker from the combined pool can be written as:

$$u^{C*} = \gamma + \log [M \exp(v^M/\beta) + F \exp(v^F/\beta)] .$$

Letting $\delta = M/(M+F) \equiv M/C$ be the fraction of M 's in the combined pool, this becomes:

$$u^{C*} = \gamma + \log [\delta \exp(v^M/\beta) + (1-\delta) \exp(v^F/\beta)] + \log C .$$

Multiplying through by β , the corresponding maximized unstandardized value is therefore:

$$U^{C*} = \gamma \beta + \beta \log [\delta \exp(v^M/\beta) + (1-\delta) \exp(v^F/\beta)] + \beta \log C .$$

Expressing this in terms of the means of the unstandardized distributions, $\mu^G \equiv v^G + \beta\gamma$, yields after some algebra:

$$(A2) \quad U^{C*} = \beta \log \left[\delta \exp\left(\frac{\mu^M}{\beta}\right) + (1-\delta) \exp\left(\frac{\mu^F}{\beta}\right) \right] + \beta \log C ,$$

which proves part (b).

Proof of Propositions 1 and 2:

Consider first the difference in the firm's objective function ("profits") between recruiting strategy M (invite men only) and C (invite all). Expected profits from inviting only men to apply are (from (2) and (3)):

$$\Pi^M = U^{M*} - cN = \mu^M + \beta \log(N) - cN.$$

Expected profits from a combined strategy are (from (2) and (5)):

$$\Pi^C = U^{C*} - 2cN = \mu^M + \beta \log \left[1 + \exp\left(\frac{\mu^F - \mu^M}{\beta}\right) \right] + \beta \log N - 2cN.$$

Subtracting and simplifying yields:

$$(A3) \quad \Pi^M - \Pi^C = -\beta \log[1 + \exp(-z)] + cN \equiv R^M(z, \beta) + cN$$

where $N = .5C$ is the (equal) number of applications expected from each group, and $z = \frac{\mu^M - \mu^F}{\beta}$ is the standardized expected net value advantage of group M .

By symmetry,

$$(A4) \quad \Pi^F - \Pi^C = -\beta \log[1 + \exp(z)] + cN = R^M(-z, \beta) + cN \equiv R^F(z, \beta) + cN$$

Inspection of (A3) and (A4) shows that $R^M(z, \beta)$ is always negative and increasing in z . $R^M(-z, \beta)$ is thus also always negative and decreasing in z . Further, these two functions intersect when $z = 0$, at the level $-\beta \log 2$, as shown in Figure A1 below.

When $-cN > -\beta \log 2$, as is the case when $cN=4$ in Figure A1, it follows from (A4) and (A5) that firms prefer to advertise only to men when $z > z^*$, to advertise only to women when $z < -z^*$, and not to restrict their ads when $-z^* < z < z^*$. When $-cN < -\beta \log 2$, as is the case when $cN=1$ in Figure A1, the combined search strategy is never preferred to *both* of the restricted strategies, so the firm restricts to men when $z > 0$, and to women when $z < 0$.

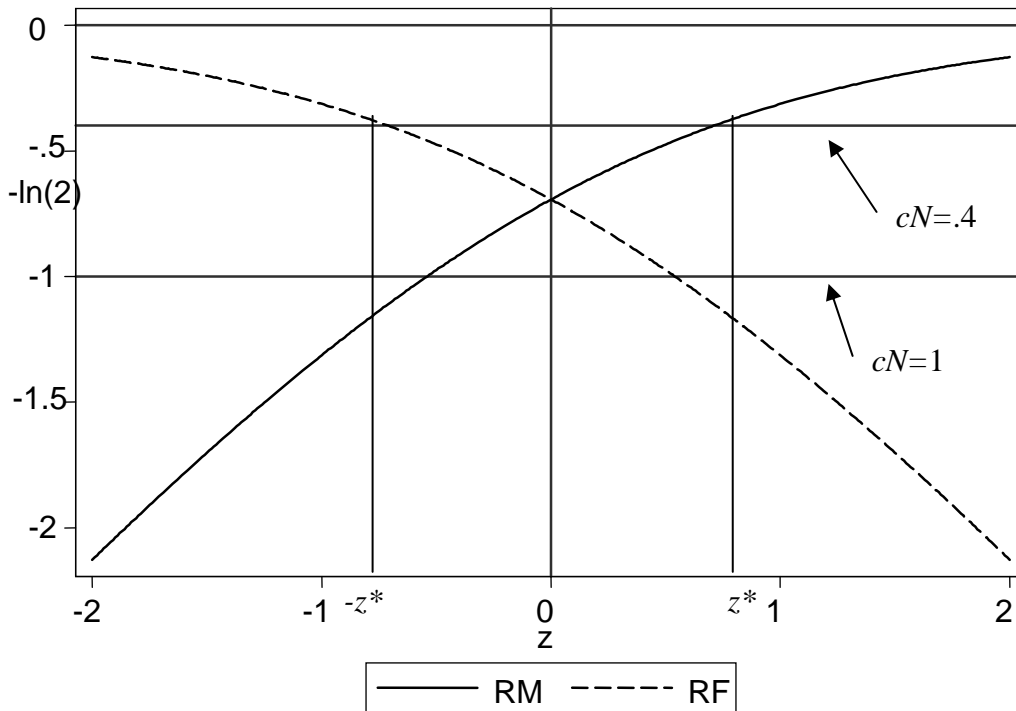


Figure A1: Gains and Costs to Restricted Searches, $\beta=1$

The critical values, z^* and $-z^*$, can be found by setting A3 or A4 equal to zero, yielding:

$$(A5) \quad z^* = -\log[\exp(cN / \beta) - 1]$$

This completes the proof for a job with standard skill requirements. To generalize the analysis to any job, recall that by assumption skill requirements are represented by a constant, θ , that multiplies all realizations of U_j . Thus, changes in θ multiply both the means (μ^M and μ^F) and standard deviation ($\sigma = \beta\pi / \sqrt{6}$) of the applicants' net values (U_j) by the same constant, leaving the standardized expected gender gap in net values for a particular job, $z = \frac{\mu^M - \mu^F}{\beta}$ unchanged. Therefore, the only

change in firms' decision rules involves the threshold, z^* , which becomes, for a job with skill requirement θ : $z^* = -\log[\exp(cN / \theta\beta) - 1]$, as claimed in Proposition 2.²⁹

Appendix 2: Data

As noted, our overall sample consists of all job ads which appeared on Zhaopin.com between during four observation periods: May 19 2008 - June 22 2008, January 19 2009 - February 22 2009, May 18 2009 - June 21 2009, and January 18 2010 - February 21 2010. At the end of each day, our program automatically searches for job ads that were posted on Zhaopin that day. The program starts at 11:30pm sharp each day for consistency. On the first day of data collection, all ads that were posted that day were kept. On subsequent days, all ads posted that day are compared with the master list of previously-posted jobs; since many such jobs are just renewals that are re-posted (employers can re-post and existing ad; this entails a small marginal financial cost but does require action on the employer's part), we do not download these refreshed jobs but maintain a count of the number of renewals that occur during this time period. A similar procedure was applied to the list of firms. As a result, our data have information on every job that was posted or renewed during this time period, linked to information about the firm posting the job. All of our regression analysis is restricted to the sample of jobs for which we have matching firm information. The matching rate varies somewhat across specifications but was about 80%.

Age, gender and other job requirements were extracted from each job's html file. For example, in the case of gender, we look for "nue"(female) and "nan"(male) characters in the job description section of the file. We then constructed a match table summarizing about 1468 ways for a job ad to mention "nue"(female) and "nan"(male). After that, we use a program and this match table to derive the gender discrimination variable automatically. We consider our table quite exhaustive. In addition, we also visually check all the job ads that mentioned gender in a way that did not match these tables. Only about 100 jobs out of our entire sample fell into this category. For age variables, we search for "sui" (year of age); our approach could therefore miss jobs that ask for age only using numbers "25-35". Therefore, the variables that we use here should be interpreted as having very explicit requirements for gender, age and other characteristics.

Occupation and industry categories are those supplied by Zhaopin.com (firms choose from a list on the website when submitting their ad). Note that our occupation and industry dummy variables are not mutually exclusive, as firms are allowed to check multiple categories. As noted in the paper, we handle this in the results reported here by restricting attention to ads for a single occupation. The analysis sample for the current paper also excludes the approximately 20 percent of ads that did not specify what education level was required (inspection of these ads showed that these were not necessarily unskilled jobs).

²⁹ Since for given $\mu^M - \mu^F$, z depends by definition on β , Proposition 1 and 2's predictions for the effects of the idiosyncratic variance parameter, β , must be interpreted as conditional on a given z , i.e. conditional on a given *standardized* gap in expected values. In consequence the effects of β are, in fact, identical to the effects of rescaling workers' value by θ . However, it is easy to show that the effects of an increase in β conditional on a given *absolute* gap in expected values, i.e. a given $\mu^M - \mu^F$, is qualitatively the same but stronger in magnitude. To see this, note that for given $\mu^M - \mu^F$, an increase in β 'shrinks' all the z 's towards the origin. This effect reinforces the effects of β on the thresholds (z^* 's), thus reinforcing the decline in the 'probability' that firms will adopt gender restrictions of either kind.

Appendix 3: Variance Decomposition

In this exercise, we decompose the cross-sectional variation in advertised preferences for men (P^M) and in advertised preferences for women (P^F) in a linear probability model into three components:

- i) Variation in firms' *relative preference* for men versus women in the job: productivity differences, tastes and wage differences. (associated with parameter vector \mathbf{b} below)
- ii) Variation across jobs and firms in *search-related factors*: expected number of applicants, application processing costs, and variance in match quality? (associated with parameter vector \mathbf{d} below)
- iii) The covariance between the above.

Specifically, we suppose that:

$$\text{Prob (request male)} = P_i^M = (\mathbf{b} + \mathbf{d})\mathbf{x}_i + e_i^M$$

$$\text{Prob (request female)} = P_i^F = (-\mathbf{b} + \mathbf{d})\mathbf{x}_i + e_i^F, \quad \text{where } i \text{ indexes ads.}$$

Thus, the parameter b_k gives the effect of ad characteristic x_k on firms' relative preference towards men (z), and d_k gives its effect on firms' propensity to restrict in general ($-z^*$). (To simplify the presentation, note that this notation departs slightly from the body of the paper, where \mathbf{b} and \mathbf{d} determine the underlying indexes, not the probability itself.)

Then, if we estimate separate linear probability models for P_i^M and P_i^F :

$$P_i^M = \boldsymbol{\beta}^M \mathbf{x}_i + e_i^M$$

$$P_i^F = \boldsymbol{\beta}^F \mathbf{x}_i + e_i^F,$$

the estimated coefficients will exactly identify \mathbf{b} and \mathbf{d} , because

$$(A5) \quad \boldsymbol{\beta}^M = \mathbf{b} + \mathbf{d}, \quad \text{and}$$

$$(A6) \quad \boldsymbol{\beta}^F = -\mathbf{b} + \mathbf{d}.$$

After solving (A5) and (A6), for \mathbf{b} and \mathbf{d} , columns (1)-(6) of Table A1 then decompose the explained variation in P_i^M and P_i^F using:

$$\text{Var}(\boldsymbol{\beta}^M \mathbf{x}) = \text{Var}(\mathbf{b}\mathbf{x}) + \text{Var}(\mathbf{d}\mathbf{x}) + 2\text{Cov}(\mathbf{b}\mathbf{x}, \mathbf{d}\mathbf{x})$$

$$\text{Var}(\boldsymbol{\beta}^F \mathbf{x}) = \text{Var}(\mathbf{b}\mathbf{x}) + \text{Var}(\mathbf{d}\mathbf{x}) - 2\text{Cov}(\mathbf{b}\mathbf{x}, \mathbf{d}\mathbf{x}).$$

The regression specifications underlying columns (1)-(6) are identical to those in Tables 4 and 5. Column 7 decomposes the unexplained variance in the same manner, using the residuals e_i^M and e_i^F , from the column 6 regressions

Table A1: Variance Decomposition for Determinants of Gender Preferences

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Explained Share of Variance with the following Fixed Effects:						Unexplained Variance in Specification (6)
	Province	Occupation, Province	Occ*Ind, Province	Occ*Ind* Province	Firm, Occ	Firm*Occ	
Variance in Advertised Preferences for Men:							
1. Total	.026	.061	.082	.149	.324	.639	.361
2. Related to tastes and productivities (z)	.007	.032	.042	.073	.143	.324	.182
3. Related to frictions ($-z^*$)	.020	.035	.043	.070	.166	.303	.150
4. Related to covariance between these	.000	-.007	-.004	.006	.016	.013	.030
Variance in Advertised Preferences for Women:							
5. Total	.030	.081	.098	.150	.319	.671	.329
6. Related to tastes and productivities (z)	.008	.035	.046	.080	.156	.354	.198
7. Related to frictions ($-z^*$)	.021	.039	.047	.077	.181	.331	.164
8. Related to covariance between these	.000	.007	.004	-.006	-.017	-.014	-.032

With the exception of column 1, rows 2 and 3 are approximately equal. So are rows 6 and 7. We conclude that variation in z and z^* contribute about equally to the observed variance in advertised preferences for men. The same is true for women.

Table 1: Descriptive Statistics

	Advertised Education Requirement			
A. AD CHARACTERISTICS	High School	Some Postsecondary	University	Combined
Gender requirement				
No gender preference	.766	.892	.938	.895
Prefer male?	.120	.049	.042	.055
Prefer female?	.114	.059	.021	.050
Advertised Experience requirement				
Unspecified	.343	.204	.136	.194
1 Year or less	.030	.013	.005	.012
1 to 3 years	.467	.482	.287	.399
3 to 5 years	.120	.209	.305	.237
5 to 10 years	.037	.085	.232	.139
10 Years or above	.004	.007	.037	.019
Job is Part Time	.015	.008	.009	.009
Number of positions advertised:				
Unspecified	.546	.483	.456	.480
1	.159	.260	.358	.287
2	.089	.104	.094	.098
3-5	.102	.094	.067	.084
6-15	.070	.046	.021	.038
16-50	.028	.013	.005	.011
51+	.006	.001	.000	.001
B. FIRM CHARACTERISTICS				
Firm size (number of workers):				
1-19	.067	.071	.081	.075
20-99	.333	.336	.316	.327
100-499	.332	.325	.335	.330
500-999	.108	.097	.095	.098
1,000-9,999	.124	.134	.138	.135
10,000 +	.035	.036	.036	.036
Firm ownership type:*				
Private, Domestic	.672	.606	.477	.561
Foreign	.259	.326	.430	.360
NonProfit	.003	.003	.005	.004
State-Owned Enterprise	.066	.065	.087	.074
Government	.000	.000	.001	.001
Number of Ads	136,595	482,697	438,246	1,057,538

* “Private, Domestic” includes privately held companies, publicly-traded companies and reformed State-Owned Enterprises where a majority of shares are still owned by the state. “Foreign” includes Foreign Direct Investment, joint ventures, plus a small number of representative offices.

Table 2: Advertised Gender Preferences, by Firm

Total Number of Ads Placed by the Firm:	Share of Firms Specifying a Preference For:				N
	Any Gender	Men	Women	Both Genders	
1	.165	.056	.109	.000	12,834
2-10	.326	.155	.224	.053	41,233
11-50	.549	.345	.392	.188	16,343
51 and over	.708	.536	.560	.388	3,792
All Firms	.367	.199	.258	.091	74,202

Table 3: Maximum Likelihood and OLS estimates of structural parameters (b and d) and associated marginal effects.

	<i>Maximum Likelihood Estimates</i>				<i>OLS Estimates</i>	
	<i>b</i>	<i>d</i>	$\partial(P^M+P^F)/\partial x$	$\partial(P^M-P^F)/\partial x$	$\partial(P^M+P^F)/\partial x$	$\partial(P^M-P^F)/\partial x$
	(1)	(2)	(3)	(4)	(5)	(6)
Education Requirement:						
Some Postsecondary	-.1090** (.0041)	-.2899** (.0028)	-.0962** (.0009)	-.0300** (.0008)	-.1215** (.0009)	-.0267** (.0010)
University	.0173** (.0046)	-.4289** (.0030)	-.1390** (.0010)	-.0101** (.0009)	-.1616** (.0010)	-.0109** (.0011)
Experience Requirement:						
1-3 years	.0948** (.0039)	-.0516** (.0024)	-.0150** (.0008)	.0166** (.0008)	-.0202** (.0008)	.0273** (.0009)
3-5 years	.3084** (.0048)	-.1047** (.0028)	-.0283** (.0009)	.0560** (.0009)	-.0304** (.0009)	.0656** (.0010)
More than 5 years	.4664** (.0060)	-.1022** (.0033)	-.0246** (.0010)	.0865** (.0011)	-.0157** (.0010)	.0878** (.0011)
Log (Firm Size)	.0213** (.0008)	-.0040** (.0005)	-.0009** (.0002)	.0040** (.0002)	-.0013** (.0002)	.0046** (.0002)
Firm Ownership Type:						
Foreign Ownership	-.0359** (.0035)	-.1266** (.0019)	-.0418** (.0006)	-.0109** (.0007)	-.0380** (.0006)	-.0101** (.0007)
Non-profit Organization	-.0192 (.0248)	-.0182 (.0143)	-.0063 (.0046)	-.0043 (.0048)	-.0097 (.0048)	-.0038 (.0051)
State-owned Enterprise	.0777** (.0059)	-.0241** (.0035)	-.0064** (.0011)	.0142** (.0011)	-.0081** (.0012)	.0147** (.0012)
Government	.2534** (.0513)	.1665** (.0338)	.0588** (.0107)	.0540** (.0096)	.0743** (.0110)	.0821** (.0118)

** p<0.01, * p<0.05.

Regressions also control for the number of vacancies advertised, a dummy for part-time jobs and period fixed effects in both equations. The omitted firm type is for-profit firms with no government or foreign connection. Sample size = 1,057,538 ads

Table 4: Effects of Selected Covariates on Employers' Tendency to Gender-Target Ads (-z*), Linear Probability Model Estimates:

	(1)	(2)	(3)	(4)	(5)	(6)
Education Requirement:						
Some Postsecondary	-.1204** (.0073)	-.0743** (.0050)	-.0688** (.0048)	-.0681** (.0048)	-.0923** (.0044)	-.0602** (.0049)
University	-.1585** (.0092)	-.1005** (.0057)	-.0947** (.0055)	-.0944** (.0056)	-.1220** (.0059)	-.0808** (.0058)
Experience Requirement:						
1-3 years	-.0203** (.0030)	-.0158** (.0023)	-.0176** (.0023)	-.0179** (.0024)	-.0250** (.0024)	-.0220** (.0025)
3-5 years	-.0302** (.0041)	-.0324** (.0027)	-.0327** (.0027)	-.0324** (.0027)	-.0394** (.0044)	-.0325** (.0032)
More than 5 years	-.0154** (.0048)	-.0290** (.0035)	-.0277** (.0034)	-.0292** (.0033)	-.0359** (.0049)	-.0345** (.0038)
Log (Firm Size)	-.0017* (.0007)	-.0028** (.0006)	-.0034** (.0006)	-.0034** (.0005)		
Firm Ownership Type:						
Foreign Ownership	-.0309** (.0025)	-.0313** (.0027)	-.0308** (.0026)	-.0305** (.0027)		
Non-profit Organization	-.0070 (.0104)	-.0059 (.0099)	-.0072 (.0097)	-.0013 (.0099)		
State-owned Enterprise	-.0054 (.0042)	-.0061 (.0036)	-.0049 (.0032)	-.0034 (.0032)		
Government	.0699** (.0272)	.0680** (.0230)	.0742** (.0287)	.0711* (.0313)		
Fixed Effects (number of groups)	Province (31)	Occ, Ind, Province (115)	Occ*Ind, Province (1,638)	Occ*Ind* Province (22,909)	Occ, Firm, Province (74,232)	Occ*Firm, Province (260,322)
R^2	.043	.078	.096	.156	.366	.669

** p<0.01, * p<0.05. OLS estimates. Regressions also control for a the number of vacancies advertised, a dummy for part-time jobs, and period fixed effects. Standard errors are clustered at the occupation*province level. The omitted firm type is for-profit firms with no government or foreign connection. Sample size = 1,057,538 ads.

Table 5: Effects of Selected Covariates on Employers' Relative Valuation of Men (z), Linear Probability Model Estimates:

	(1)	(2)	(3)	(4)	(5)	(6)
Education Requirement:						
Some Postsecondary	-.0256*	-.0052	-.0053	-.0029	-.0443**	-.0125
	(.0112)	(.0067)	(.0064)	(.0064)	(.0094)	(.0082)
University	-.0071	.0044	.0057	.0097	-.0323**	.0005
	(.0125)	(.0077)	(.0075)	(.0076)	(.0103)	(.0089)
Experience Requirement:						
1-3 years	.0275**	.0170**	.0138**	.0127**	.0258**	.0131**
	(.0036)	(.0027)	(.0026)	(.0027)	(.0037)	(.0030)
3-5 years	.0657**	.0430**	.0407**	.0397**	.0624**	.0387**
	(.0070)	(.0045)	(.0045)	(.0047)	(.0077)	(.0057)
More than 5 years	.0869**	.0616**	.0599**	.0573**	.0787**	.0486**
	(.0082)	(.0056)	(.0056)	(.0057)	(.0089)	(.0068)
Log (Firm Size)						
	.0042**	.0046**	.0045**	.0047**		
	(.0007)	(.0006)	(.0007)	(.0007)		
Firm Ownership Type:						
Foreign Ownership	-.0072**	-.0101**	-.0088**	-.0080**		
	(.0022)	(.0022)	(.0021)	(.0021)		
Non-profit Organization	-.0028	.0018	-.0010	.0059		
	(.0092)	(.0100)	(.0092)	(.0094)		
State-owned Enterprise	.0160**	.0129**	.0144**	.0141**		
	(.0035)	(.0030)	(.0030)	(.0029)		
Government	.0831	.1087*	.0908	.0666		
	(.0417)	(.0502)	(.0469)	(.0329)		
Fixed Effects (number of groups)	Province (31)	Occ, Ind, Province (115)	Occ*Ind, Province (1,638)	Occ*Ind* Province (22,909)	Occ, Firm, Province (74,232)	Occ*Firm, Province (260,322)
R^2	.014	.064	.084	.144	.282	.640

** p<0.01, * p<0.05. OLS estimates. Regressions also control for a the number of vacancies advertised, a dummy for part-time jobs, and period fixed effects. Standard errors are clustered at the occupation*province level. The omitted firm type is for-profit firms with no government or foreign connection. Sample size = 1,057,538 ads.

Table 6: Descriptive Statistics for other “discriminatory” preferences

	Advertised Education Requirement			
	High School	Some Postsecondary	University	Combined
Age requirement				
No age restrictions	.604	.733	.831	.757
Minimum age requirement?	.287	.192	.108	.169
Maximum age requirement?	.348	.218	.139	.202
Both minimum and maximum age requirement	.239	.143	.077	.128
Minimum age, when required	22.31	24.95	28.10	25.20
Maximum age, when required	34.70	35.54	37.78	35.99
Beauty requirement				
Job requires beauty (“xingxiang”)	.146	.091	.041	.077
Requires beauty given preference for men	.072	.048	.046	.054
Requires beauty given preference for women	.400	.361	.343	.369
Requires beauty given no gender preference	.120	.075	.034	.063
Type of Height requirement				
Any height requirement?	.093	.022	.009	.026
A single height requirement and preference for men	.023	.002	.001	.004
A single height requirement and preference for women	.037	.011	.003	.011
One gender-independent height requirement	.027	.008	.004	.009
Two gender-specific height requirements	.006	.001	.001	.002
Requires height given preference for men	.183	.024	.017	.067
Requires height given preference for women	.321	.177	.153	.215
Requires height given no gender preference	.045	.012	.005	.013
Minimum heights required (centimeters)				
Minimum male height, given preference for men	166.5	168.2	169.2	167.1
Minimum female height, given preference for women	161.0	162.8	163.2	162.1
Minimum common height requirement	165.6	164.5	166.1	165.2
Minimum male height, given gender-specific requirements	170.4	171.5	172.0	171.0
Minimum female height, given gender-specific requirements	161.5	162.5	164.0	162.2

Table 7: Effects of Selected Covariates on Preferences for Other ‘US-Prohibited’ Characteristics:

	Relative Valuation of Older Workers (Any Minimum Age? – Any Maximum Age?)		Propensity to Age-Target Ads (Any Minimum Age? + Any Maximum Age?)		Request Beauty?		Height Requirement?	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education Requirement:								
Some Postsecondary	.0123** (.0045)	.0219** (.0038)	-.1468** (.0078)	-.0784** (.0089)	-.0248** (.0042)	-.0298** (.0046)	-.0336** (.0039)	-.0342** (.0037)
University	-.0051 (.0046)	.0319** (.0042)	-.2627** (.0101)	-.1108** (.0100)	-.0420** (.0043)	-.0442** (.0053)	-.0367** (.0039)	-.0389** (.0044)
Experience Requirement:								
1-3 years	-.0056** (.0021)	-.0047* (.0023)	-.0341** (.0056)	-.0089* (.0044)	-.0157** (.0020)	-.0162** (.0027)	-.0126** (.0016)	-.0132** (.0022)
3-5 years	.0120** (.0029)	.0108** (.0031)	-.0001 (.0070)	.0140** (.0052)	-.0424** (.0041)	-.0400** (.0055)	-.0200** (.0024)	-.0224** (.0038)
More than 5 years	.0240** (.0036)	.0243** (.0036)	.0535** (.0093)	.0584** (.0073)	-.0516** (.0045)	-.0473** (.0059)	-.0202** (.0025)	-.0252** (.0043)
Log (Firm Size)								
	.0000 (.0008)		.0136** (.0021)		-.0026** (.0006)		.0005 (.0003)	
Firm Ownership Type:								
Foreign Ownership	.0140** (.0018)		-.0844** (.0068)		-.0072** (.0023)		-.0033** (.0010)	
Non-profit Organization	-.0784** (.0112)		.0255 (.0201)		.0089 (.0118)		.0078 (.0061)	
State-owned Enterprise	-.0382** (.0037)		-.0285** (.0070)		-.0113** (.0028)		-.0052** (.0014)	
Government	-.0583 (.0371)		.0295 (.0843)		.0075 (.0569)		.0345 (.0325)	
Fixed Effects (number of groups)	Occ*Ind* Province (22,909)	Occ*Firm, Province (260,322)	Occ*Ind* Province (22,909)	Occ*Firm, Province (260,322)	Occ*Ind* Province (22,909)	Occ*Firm, Province (260,322)	Occ*Ind* Province (22,909)	Occ*Firm, Province (260,322)
R^2	.090	.650	.155	.692	.170	.659	.217	.668

** p<0.01, * p<0.05. OLS estimates. Regressions also control for a the number of vacancies advertised, a dummy for part-time jobs and period fixed effects. Standard errors are clustered at the occupation*province level. The omitted firm type is for-profit firms with no government or foreign connection. Sample size = 1,057,369 ads.

Table 8: Effects of Advertised Wages on Gender and Other Preferences

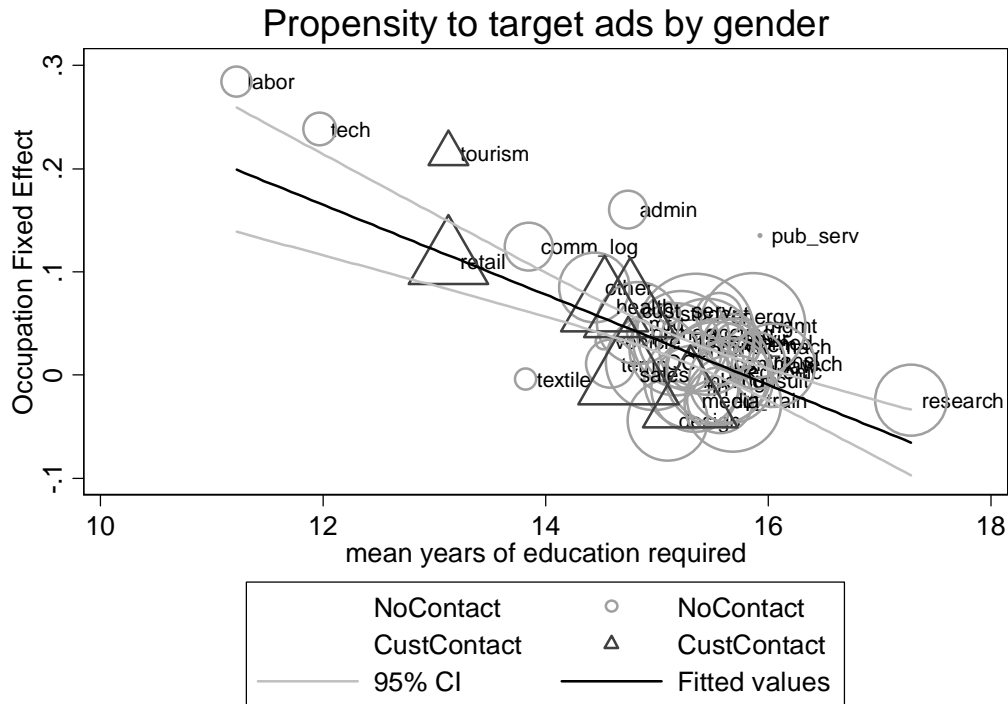
	Dependent Variable:					
	(1)	(2)	(3)	(4)	(5)	(6)
Fixed Effects Included in Regression:	Relative Valuation of Men	Tendency to Gender-Target Ads	Relative Valuation of Old Workers	Tendency to Age-Target Ads	Request Beauty?	Height Requirement?
1. Occupation*Industry* Province	.0043 (.0053)	-.0497** (.0040)	.0256** (.0059)	.0191 (.0106)	-.0188** (.0042)	-.0026 (.0027)
2. Occupation*firm, Province	.0150 (.0089)	-.0405** (.0058)	.0098 (.0061)	.0136 (.0132)	-.0180** (.0055)	-.0097* (.0041)

Notes: ** $p < 0.01$, * $p < 0.05$. OLS estimates. Sample size = 173,945 ads.

All regressions also control for education and experience requirements, the number of vacancies advertised, a dummy for part-time jobs, and period fixed effects. Row 1 regressions also control for firm size and ownership. Standard errors are clustered at the occupation*province level. All wages are measured in logs.

Figure 1: Occupation Fixed Effects, by Mean Education Requirements

a) Dependent Variable: Tendency to Gender-Target Ads ($P^M + P^F$)



b) Dependent Variable: Employer's Relative Preference towards Men ($P^M - P^F$)

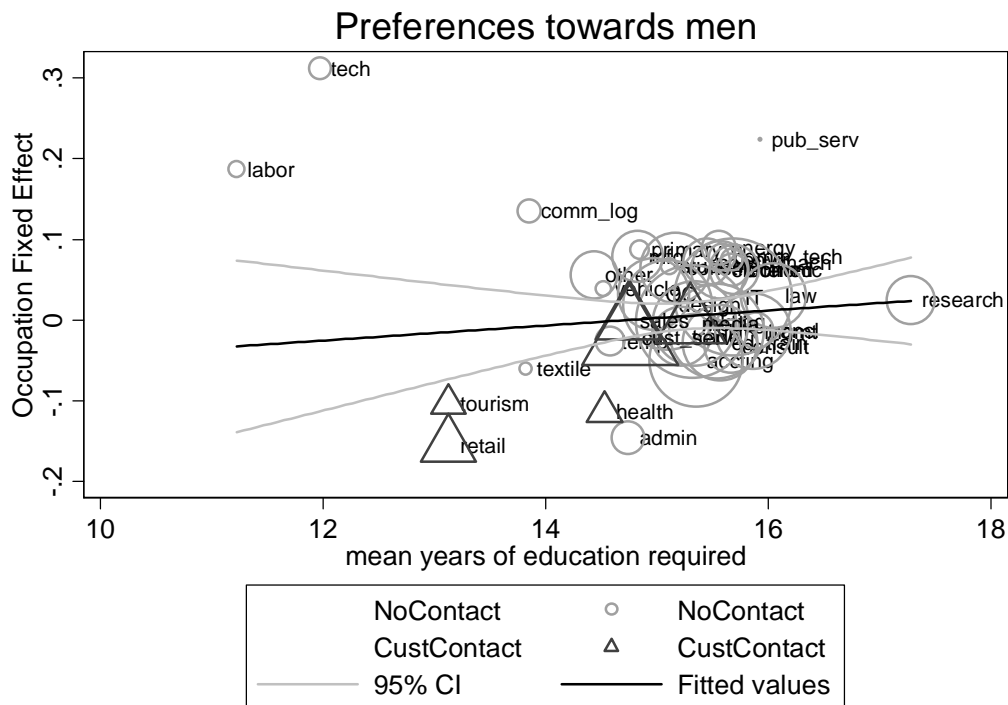
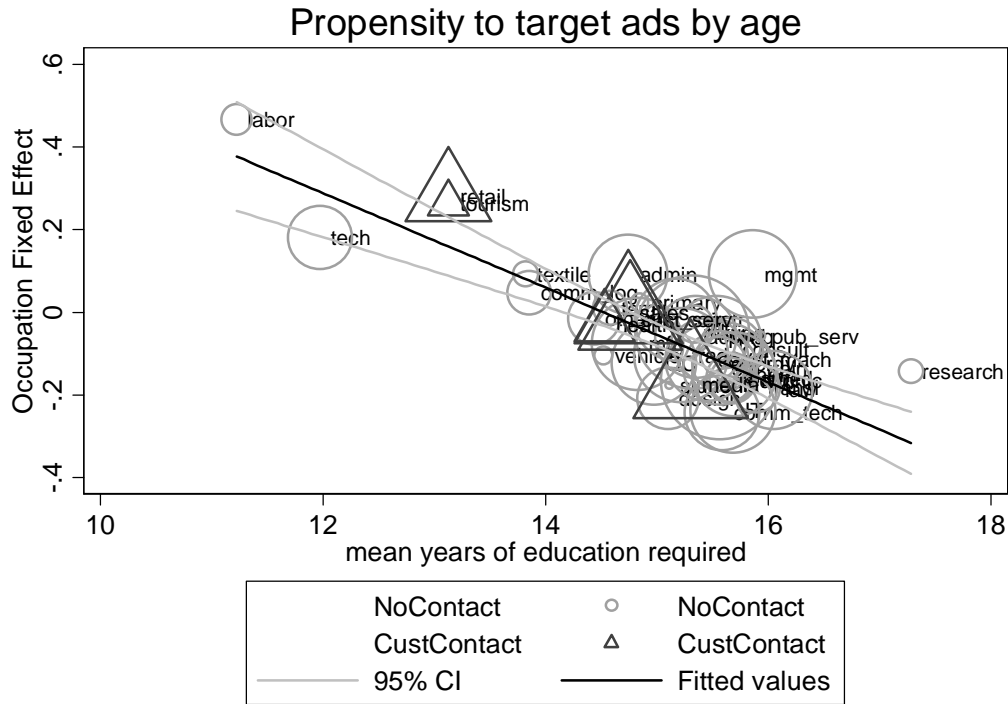
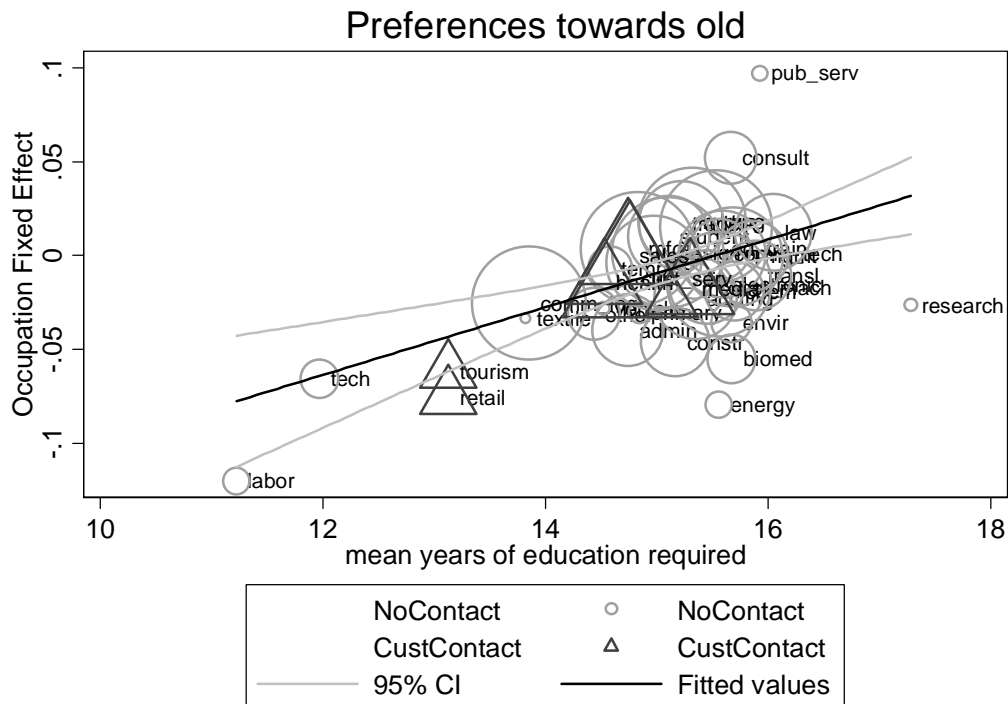


Figure 2: Occupation Fixed Effects for Age, Beauty and Height, by Mean Education Requirements

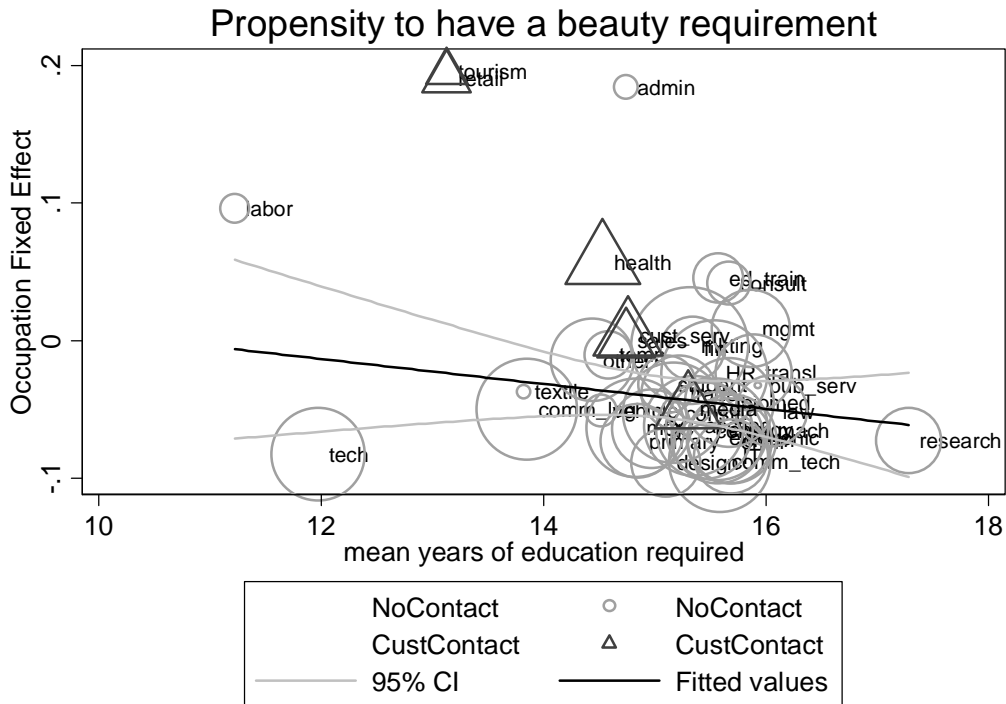
a) Dependent Variable: Probability the Ad is Age-Targetted



b) Dependent Variable: Employer's Relative Preference towards Older Workers



c) Dependent Variable: Probability the Ad has a Beauty Requirement



d) Dependent Variable: Probability the Ad has a Height Requirement

