

Elite University Graduates' Job Search Advantages and the Heterogeneity of Application Profiles

Kailing Shen

9 November 2015

Research School of Economics, Australian National University

Research Question:

Do employers prefer elite university graduates in terms of contacting probabilities? If not, then do elite university graduates apply to jobs differently? If so, how?

Outline

1. Motivation & Background
2. The Category of Universities in China
3. Data, Descriptive Statistics and Empirical Exploration
4. A Simple Theory of Job Application Profile
5. Next step?



Let the Hiring Season Begin!

[Login](#)



Introducing: AEA's NEW JOE Network... for candidates, employers, & faculty

The AEA is proud to announce the new enhanced JOE (Job Openings for Economists) targeted to the comprehensive needs of all participants in the annual economics job market cycle. In 2014, JOE listed 3,051 jobs, an increase of 9.4 percent from the total in 2013! Take advantage of JOE features to maximize your career opportunities in 2015.

The new JOE Network automates the hiring process. Users share materials, communicate confidentially, and take advantage of new JOE features to easily manage their files and personal data. Everything is securely maintained and activated in one location. The JOE Network is accessible right from your desktop at the AEA website.

What's New in the JOE Network?



[Employers](#)



[Job-Seekers](#)



[Reference Letter Writers](#)

[Surrogates](#)

Links

- [About JOE](#)
- [Available Retired Faculty](#)
- [Job Market Signaling](#)
- [2014-2015 Job Market Guide and Advice \(by John Cawley\)](#)
- [View Current Listings](#)
- [View Archived 2014 JOE Listings](#)

[Contact us](#)

[JOE Email Notification Alert](#) - Receive an email notification when news is available about JOE!



[Follow JOE on Twitter!](#)

Find the Right Job. **Right Now.**

Job Title, Skills, or Company

e.g. web developer or sales

Location

e.g. New York or 10011

Find Jobs

Advanced Search

Add your resume today.
Employers can find you without even applying to a job.

Add Your Resume

Popular **job searches**

By Category

Sales • Customer Service • Accounting •
Entry Level • Administrative Assistant •
Registered Nurse • Work from Home

 [Browse All Categories](#)

By City

Chicago • Houston • Dallas • Boston •
New York • Atlanta • San Francisco •
Miami • Denver • Milwaukee

 [Browse All Locations](#)

By Company

Macy's • UnitedHealth Group •
Firestone • Chipotle • Vitamin Shoppe •
Securitas • UPS • TruGreen • Enterprise
Rent-A-Car

 [Browse All Companies](#)



SMALL BUSINESS RESUME DATABASE

FIND THE RIGHT CANDIDATES FOR YOUR OPEN POSITIONS – EASILY AND ON YOUR OWN SCHEDULE -- WITH RESUME DATABASE. COMPARE PLANS & SAVE TODAY!

With access to over 45 million resumes, you'll be able to find the most relevant candidates; and with the added help of our technology, we'll help you find them faster.

KEY FEATURES	SEARCH LITE	SEARCH STANDARD	SEARCH PROFESSIONAL
Resume Database Access	✓	✓	✓
Resume Actions	50/day	3000/month	3000/month
Recruitment Edge Access	✗	✓	✓
Supply & Demand Access	✗	✗	✓
# of Users	1 only	1 - 1000+	1 - 1000+

VIDEOS

CareerBuilder ResumeFlip



1. Motivation & Background

1.1 Some observations about job search theory and job market:

- **Search theory** has long been the workhorse in economics to study labour market outcomes.
- **Job search** involves multiple workers and multiple firms solving a many-to-many matching problem in a decentralized setting.
- **Job market** is also a typical two-sided market. Workers and jobs are not divisible or replicable.
- **Heterogeneous** agents and **congestions** on both sides are the two key characteristics of the job search market.

- The search theory has mostly been used to study **unemployment duration**, unemployment rate and the impact of unemployment insurance on these measures.
- The very familiar dynamic programming problem of an unemployed worker is to make a choice of either accepting a random job offer or waiting for another draw next period.

$$v(w) = \max \left\{ \frac{w}{1 - \beta}, b + \beta \int_{\mathbb{W}} v(w) dF(w) \right\}$$

1.2 But how do workers get an offer?

The offer is an outcome of interactions between M workers and N firms.

At the micro level, we can think of at least 3 stages in this game:

- (1) job ads posting (firm)
- (2) application (worker)
- (3) interview and recruiting (firm)

Current literature have very limited understanding about any of these behaviours.

As online job boards become an increasing important change of job search, micro data on application and interview become available. We are able to explore how heterogeneous workers are matched with heterogeneous jobs empirically.

1.3 Heterogeneity in which aspect? Ability!

Workers differ in many aspects. Some can be easily identified (gender, education, experience). Some cannot, for example, ability.

It would be interesting to explore workers' heterogeneity in terms of ability and to examine how workers with different ability are matched with different jobs.

1.4 Quality of education as a signal of ability.

Black and Smith (2004) shows there is important sorting of individuals' ability into universities of different qualities. As workers with university education become an increasing share of the labor force. The quality of the universities becomes an increasing important signal of individuals' ability.

In this study, I will focus on job search competitions among individuals with same level of education (university) but different quality of education (thus, ability signals). I assume firms consider elite university graduates more likely to be high ability type and examine the role of ability on workers and firms' job search and matching dynamics.

2. The Category of Universities in China

There are **2,246** universities in mainland China according to the Ministry of Education in 2014.

- Among them, only **131** (5.8%) are tier 1 universities;
- Among the tier one universities, **111** are “211” universities;
- Among the “211” universities, only **39** are “985” universities.

Such categorization of universities are commonly recognized. Some employers explicitly limit their recruitment to "985/211" graduates.

Tier 1 universities (*YiBen*):

- College admissions in China proceed sequentially in tiers. Colleges are categorized into different tiers in decreasing prestige: Key colleges belong to the first tier; ordinal colleges belong to the second tier; and vocational training colleges are included in the third tier. Only when assignments in the first tier are finalized, admissions in the second tier start, and so on.
- In each province, there is a student placement office that assigns resident students to college.
- Sequential choice algorithm, Zhu (2014)

“211” universities:

- As a response to the challenge of 21st century, the Chinese government will provide preferential investment to 100 universities.
- Officially started in November 1995 upon approval of the State Council.
- Project components: overall university infrastructure; strengthen of key subjects; higher education’s public service system (internet connection & library resources)

“985” universities:

- Announced 4 May 1998 by the then General Secretary of CCP, Zein Jiang, to build a world renowned universities.

3. Data, Descriptive Statistics and Empirical Exploration

Our data consist of internal records of XMRC.com, an Internet job board serving the city of **Xiamen**.

XMRC (<http://www.xmrc.com.cn>):

- went online in early 2000; nationally renowned for quality and dominance in Xiamen
- is one of two job boards specializing in the Xiamen metro area, both commissioned by the local government.
- both boards serve private sector employers almost exclusively (SOEs and the public sector recruit through other channels).
- XMRC (nominally private) is a US-style job board, with posted ads and resumes, on-line job applications, and on-line callbacks. It specializes in white collar jobs.
- XMZYJS is a government-run job posting service, specializing in blue collar jobs. Resumes aren't posted, and applications take place by phone or in person.

We've constructed an *inflow* sample of *ads* that received their first application in our designated time frame (May 1st, 2010 to October 30th, 2010).

We also have:

- all the resumes that applied to those ads
- a mapping of which resumes applied to which ads
- for each ad, a record of which resumes were contacted *via XMRC*.

We kept all workers with age 21-35 and university education;

We kept all jobs with experience requirement less than 5 years, and education requirement of college or university, minimum age requirement less than 35 if any.

- In all, we have 46,869 applications, made by 17,580 workers (resumes), to 1,668 ads, placed by 966 firms, resulting in 4,142 contacts.
- This implies 28 applications per ad; 2.48 contacts per ad; 2.7 applications per resume;
- -one in eleven applications gets a contact; one in four resumes gets a contact.

Figure 1. Time of the Day Distribution

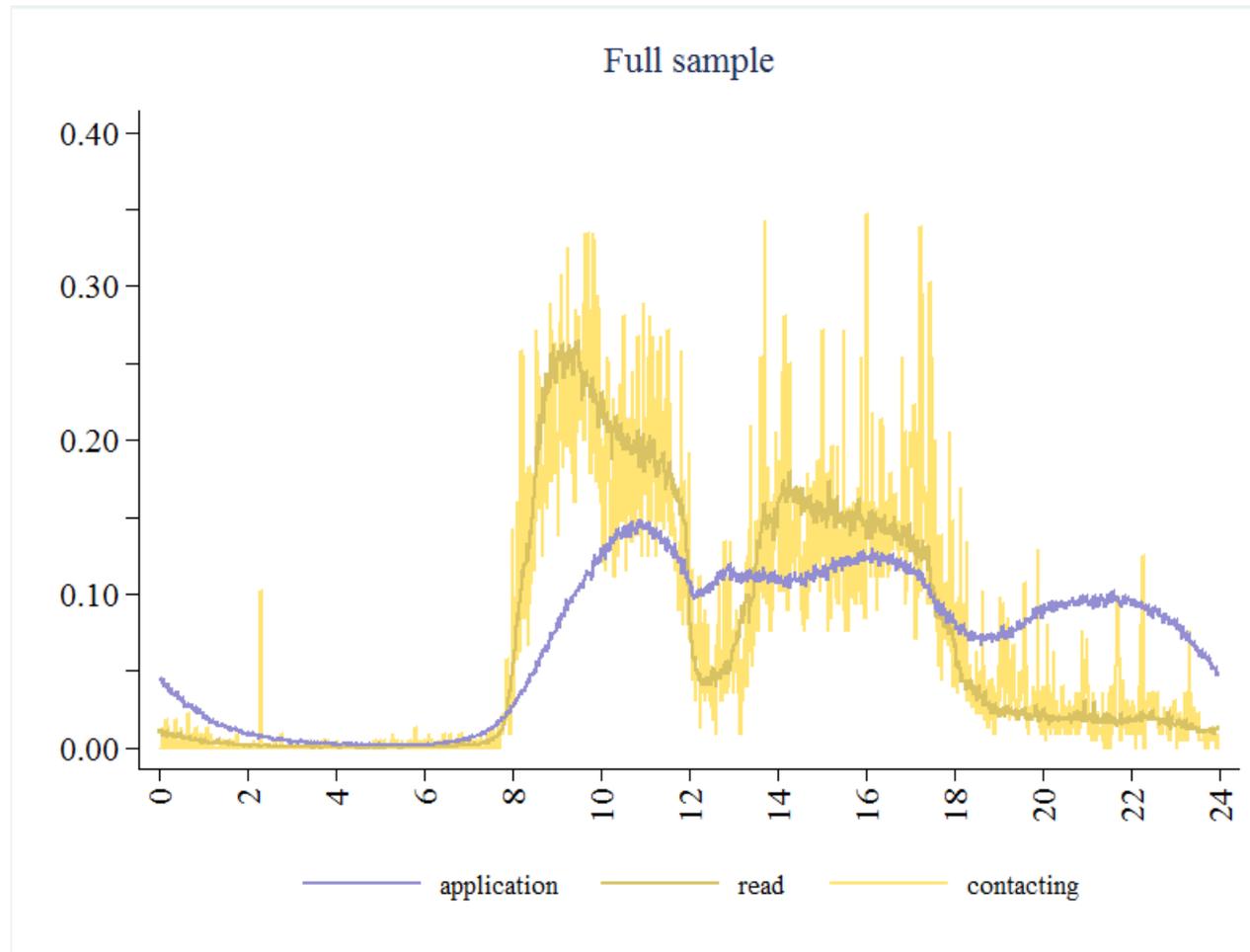


Figure 2. Distribution of Minutes between Consecutive Actions

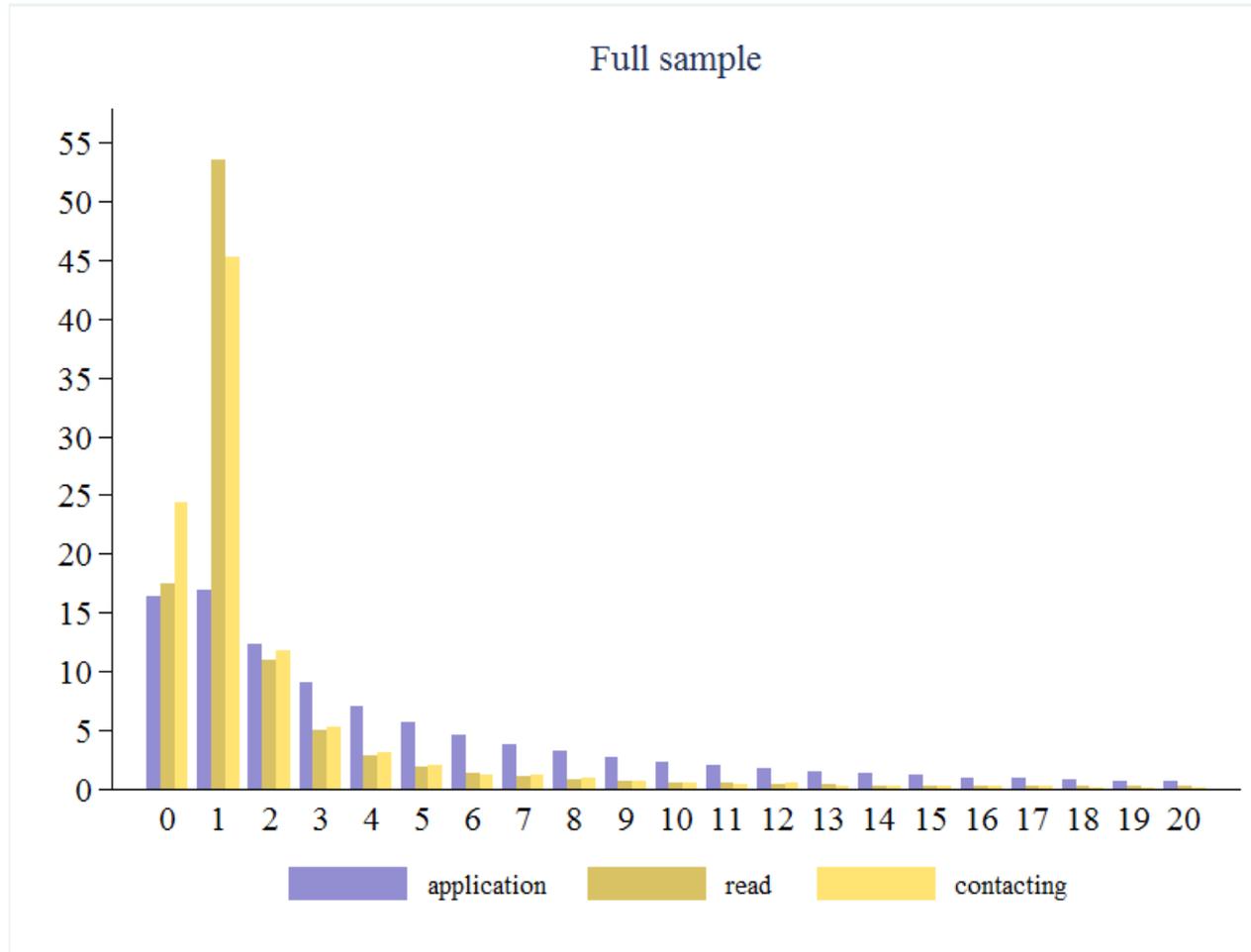


Table 1: Descriptive Statistics by the Ranking of Applicants' Universities

	"985" graduates	"211" graduates	Tier 1 graduates	Graduates from other universities
# of applicants	1,329	1,699	4,699	9,853
Contacted by firm?	8.44%	9.27%	8.64%	8.91%
Contacted by firm? discounted by number of vacancies/# of total contacts sent out	3.75%	5.66%	4.56%	5.11%
Average number of all contacts for workers contacted	1.397	1.408	1.428	1.432
Number of contacts sent out	5,935	6,453	6,819	7,174
Panel 1: Applicants characteristics				
Age	26.52	25.43	24.82	24.25
Years of experience	3.95	2.60	1.96	1.46
New graduates	15.0%	19.8%	30.6%	37.0%
Female	48.5%	48.6%	51.0%	51.9%
Married	26.5%	15.8%	11.2%	7.4%
Not local hukou	89.7%	91.9%	86.0%	92.3%
Eyesight myopic	49.3%	49.2%	51.1%	46.8%
Height	167.0	166.4	165.9	166.1
No current wage?	40.6%	36.4%	41.1%	41.5%
Current wage (if reported)	3,353	2,983	2,630	2,413
Panel				
Application behavior				
Number of wage levels applied	1.356	1.362	1.367	1.390
lowest wage applied	2,877	2,750	2,592	2,512
highest wage applied	3,385	3,219	3,048	2,997
# of jobs with posted wage (A)	1.91	1.98	2.07	2.15
# of jobs w/o posted wage (B)	1.75	1.80	1.86	1.84
(A+1)/(B+1)	1.28	1.31	1.36	1.39
number of application made	3.06	3.20	3.45	3.61
Only apply to jobs with posted wage?	32.4%	32.5%	32.8%	31.8%
Only apply to jobs w/o posted wage?	37.1%	34.5%	32.2%	31.2%

Table 1(*continued*): Descriptive Statistics by the Ranking of Applicants' Universities

	"985" graduates	"211" graduates	Tier 1 graduates	Graduates from other universities
Panel 2: Jobs characteristics				
require university education	30.2%	29.6%	28.3%	27.1%
Experience requirement	1.36	1.11	0.98	0.93
require new graduates	4.6%	6.1%	7.4%	8.1%
wage posted	2,992	2,850	2,700	2,640
no posted wage?	49.6%	48.4%	47.2%	45.8%
no gender preference	69.4%	68.5%	66.6%	66.3%
prefer male	7.2%	7.7%	7.6%	7.1%
prefer female	23.4%	23.8%	25.9%	26.6%
No minimum age specified?	42.8%	42.7%	42.4%	42.5%
Minimum age specified	23.25	22.69	22.33	22.15
No maximum age specified?	48.2%	48.7%	47.4%	47.3%
Maximum age specified	33.92	33.28	32.68	32.49
number of positions	2.58	2.87	3.19	3.40
number of positions not specified	4.5%	5.5%	6.0%	5.8%
Panel 3: Firms characteristics				
Firm ownership				
foreign owned	19.2%	19.9%	19.8%	19.1%
domestic private	65.0%	65.3%	66.1%	67.0%
other	6.3%	6.3%	6.4%	6.2%
Taiwan/Hong Kong	9.5%	8.5%	7.7%	7.7%
in Xiamen	92.0%	90.8%	92.1%	92.9%
Number of workers in the firm	1167	1122	1154	1064
Panel 4: Matching between applicants and jobs				
experience lower than required	13.7%	17.7%	23.0%	26.8%
experience higher than required	34.7%	25.4%	18.3%	13.5%
gender differ than required	3.5%	3.4%	3.5%	3.4%
new graduates status differ from required	14.1%	21.1%	30.6%	35.5%
worker younger than required	5.0%	4.6%	4.9%	4.9%
worker older than required	3.1%	2.5%	2.2%	1.4%

Table 2: Effects of University Ranking on Contact Rates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
College graduates	-0.0104***	-0.0103**	-0.0133**	-0.0101	-0.0112*	-0.0103**	-0.0110**
Tier 1 univ graduates	-0.0026	-0.0026	-0.0020	-0.0009	-0.0012	-0.0001	-0.0010
211 univ graduates	0.0058	0.0048	0.0049	0.0061	0.0045	0.0011	0.0023
985 univ graduates	-0.0034	-0.0046	-0.0040	-0.0056	-0.0058	-0.0095	-0.0101
Age less than requested		-0.0109	-0.0116	-0.0130	-0.0183**	-0.0111*	-0.0123**
Age more than requested		-0.0135	-0.0124	-0.0114	-0.0122	-0.0098	-0.0120*
Experience less than requested		-0.0113*	-0.0114*	-0.0109*	-0.0115**	-0.0130***	-0.0129***
Experience more than requested		0.0000	0.0014	0.0004	0.0002	0.0002	-0.0001
Sex differs from requested		-0.0277***	-0.0280***	-0.0227**	-0.0215**	-0.0159**	-0.0161**
NewGraduatemisMatch		-0.0160**	-0.0159**	-0.0116*	-0.0071	-0.0067	-0.0069
Number of positions advertised					0.0058***	0.0030	
Number of applications received by the job (log)					-0.0342***	-0.0248***	
Detailed CV controls	---	---	Y	Y	Y	Y	Y
Occupation fixed effect	---	---	---	Y	Y	---	---
Occupation*Firm fixed effects	---	---	---	---	---	Y	Y
Job fixed effect	---	---	---	---	---	---	Y
Observations	90,362	90,362	90,362	90,362	90,362	90,362	90,362
R-squared	0.000	0.006	0.007	0.027	0.042	0.284	0.296

4. A Simple Theory of Job Application Profile

Let's first consider when the jobs are all the same. Then...

Case 1: Consider there are N jobs, all of which offer wage w , contact probability $\beta \in (0, 1)$, contact cost $c_{con} \ll w$, application cost $c_{app} \ll c_{con}$.

The risk neutral worker's problem is to choose the optimal number of applications, n , to maximize the expected payoff given as

$$F(w, \beta, c_{con}, c_{app}) = \max_{0 \leq n \leq N} f(n, w, \beta, c_{con}, c_{app})$$

Here, $f(n, w, \beta, c_{con}, c_{app}) =$

$$\underbrace{\left[1 - \underbrace{(1 - \beta)^n}_{\text{probability of no contact at all}} \right]}_{\text{probability of at least one contact}} \cdot w - \underbrace{[\beta c_{con} + c_{app}] \cdot n}_{\text{total application cost}}$$

expected benefit of making n applications

Assume, $f(1, w, \beta, c_{con}, c_{app}) = \beta \cdot w - [\beta c_{con} + c_{app}] > 0$

F.O.C. $\frac{\partial f(\cdot)}{\partial n} = [-\ln(1 - \beta)](1 - \beta)^{n^*} \cdot w - [\beta c_{con} + c_{app}] \equiv 0$

S.O.C. $\frac{\partial^2 f(\cdot)}{\partial n^2} = -[\ln(1 - \beta)]^2(1 - \beta)^n \cdot w < 0$

Then the interior solution satisfies

$$n^*(w, \beta, c_{con}, c_{app}) = \frac{\ln(\beta c_{con} + c_{app}) - \ln(-\ln(1 - \beta)) - \ln w}{\underbrace{\ln(1 - \beta)}_{<0}}$$

It is easy to show workers will optimally make

- Less applications when the probability of contact is higher $\frac{\partial n^*(\cdot)}{\partial \beta} < 0$, or the contact cost is higher $\frac{\partial n^*(\cdot)}{\partial c_{con}} < 0$, or the application cost is higher $\frac{\partial n^*(\cdot)}{\partial c_{app}} < 0$;
- More applications when the wage offered is higher $\frac{\partial n^*(\cdot)}{\partial w} > 0$.

Case 2: Consider there are two types of jobs, $\{N_i, w_i, \beta_i, c_{con}^i, c_{app}^i\}$, where $i \in \{1,2\}$.

w.l.o.g, let $w_1 > w_2$ and $f(1, w_1, \beta_1, c_{con}^1, c_{app}^1) > f(1, w_2, \beta_2, c_{con}^2, c_{app}^2)$

Then, the worker's problem is to choose the optimal number of applications in each types of jobs $\{n_1, n_2\}$ to maximize the expected payoff as follows,

$$\max_{n_1, n_2} g(n_1, w_1, \beta_1, c_{con}^1, c_{app}^1, n_2, w_2, \beta_2, c_{con}^2, c_{app}^2)$$

$$= f(n_1, w_1, \beta_1, c_{con}^1, c_{app}^1) + (1 - \beta_1)^{n_1} \cdot [1 - (1 - \beta_2)^{n_2}] \cdot w_2 - [\beta_2 c_{con}^2 + c_{app}^2] \cdot n_2$$

$$= \underbrace{f(n_1, w_1, \beta_1, c_{con}^1, c_{app}^1)}_{\text{exactly as when there are only type 1 jobs, except...}}$$

$$+ \underbrace{f(n_2, (1 - \beta_1)^{n_1} \cdot w_2, \beta_2, c_{con}^2, c_{app}^2)}_{\text{exactly as when there are only type 2 jobs, except...}}$$

When we have interior solution for both n_1 and n_2 , that is $n_1^*, n_2^* > 0$, then it is easy to show

- n_i^* will be smaller than the case where there is only job type i .

More generally, in terms of workers' **optimal application profile**

For those jobs that workers will optimally not to apply in case 1, they will still not apply in case 2;

For those jobs that workers will optimally apply in case 1, they might make no or less applications in each market in case 2, but not more.

Obvious this simple theoretical model of workers' **optimal application profile** suggests

- $n_i^*(\beta_1, \beta_2, \dots, \beta_I)$: The number of application made at each wage level depends on the expected probabilities of contact (offer) at all wage levels among other parameters;

Symmetrically, in this two-sided market, firms also need to decide on the optimal interview profiles. They interview decisions depend on their expected probability of success recruitment (like β in the worker case), the net revenue from the applicants (like the w in the worker case), etc. β_i^* (*application profiles of applicants*)

Therefore, even if workers with the highest ability would also bring the highest net revenue to the firm, firm might not send out the most number of interview contacts to them if the expected probability of success recruitment is considerably

5. Next steps