Application Flows

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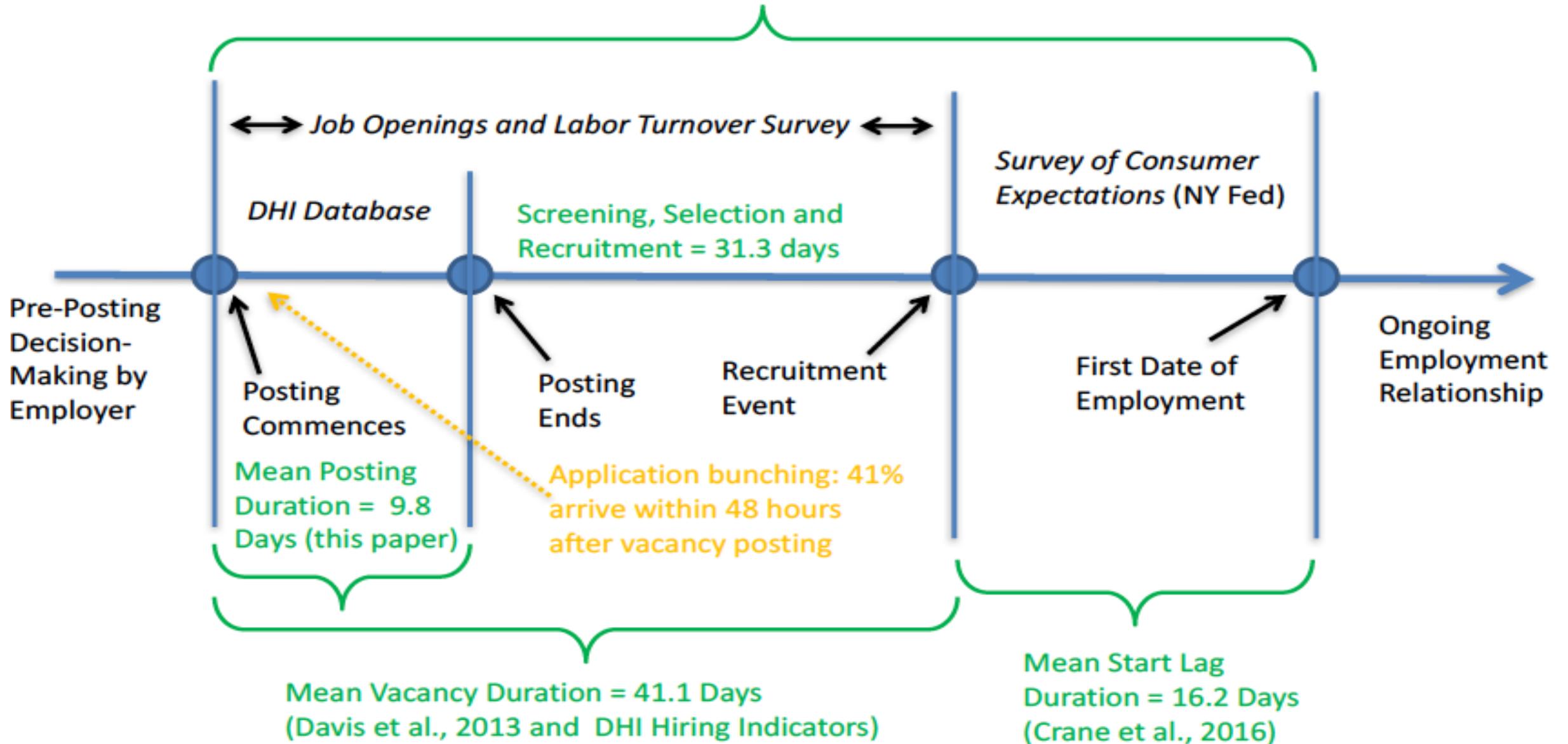27 November 2017

Outline of the Talk

I.   Rich new database that links employers, vacancy postings, applications & applicants

II. Eight (mostly) new facts about search & hiring behavior

III. Implications for theoretical modeling

(1) Employer search is non-sequential. (2) Intermediaries play a huge role in the matching process. Plus more.

IV. New way to quantify labor market tightness:

Our new method and database yield highly granular tightness measures at a monthly frequency in near real-time.

Stages of the Hiring Process: A Quantitative Sketch

Mean Duration from Date of First Posting to Start of Employment = 57.3 Calendar Days

Job Openings and Labor Turnover Survey

DHI Database

Screening, Selection and Recruitment = 31.3 days

Survey of Consumer Expectations (NY Fed)

Pre-Posting Decision-Making by Employer

Posting Commences

Posting Ends

Recruitment Event

First Date of Employment

Ongoing Employment Relationship

Mean Posting Duration = 9.8 Days (this paper)

Application bunching: 41% arrive within 48 hours after vacancy posting

Mean Vacancy Duration = 41.1 Days (Davis et al., 2013 and DHI Hiring Indicators)

Mean Start Lag Duration = 16.2 Days (Crane et al., 2016)

The DHI Vacancy and Application Flow Database

Raw data from DHI Group, Inc., which owns and operates several online platforms for posting vacancies and attracting applications. Our data derive from the Dice.com online job board.

Employer-side clients: (a) organizations that directly hire their own workers, (b) recruitment firms that solicit applicants for third parties, and (c) staffing firms that hire workers for lease to others.

Vacancy postings: Mainly in technology sectors, software development, other computer-related occupations, engineering, financial services, business and management consulting, and a variety of other jobs that require technical skills.

High volume, granularity & frequency:

- 77 million applications to 7 million postings from 5 million applicants since January 2012. 56,000 employer-side clients
- Second-by-second tracking of postings and applications, with identifiers for employer-side clients and applicants
- Employer side: Name, industry, size, vacancy ID, job description, city of job, compensation (if posted) and more
- Applicant side: Applicant ID, location, current job title, date-time stamp of applications and more
- 3,600 job titles with ≥ 100 distinct postings
- Broader functional categories (software developer, project manager, business analyst, etc.) and skill categories (Javascript, Oracle, Linux, etc.) that we construct from job descriptions.

Two Application Modes: Email and URL

- For each posting, the employer-side client decides whether job seekers submit applications via email on the Dice platform or via an external URL operated by the client or a third party.

- For email applications, we see the number of completed applications. For URL applications, we see how often job seekers click through to the external URL.

- We pool these two application modes in our analysis.

<u>Timeliness:</u> Near real-time updates every 2-3 months, with potential for adopting a monthly production cycle.

More about the Dice.com Platform, 1

The Pricing of Vacancy Postings

- Clients typically face a positive (shadow) price to keep a posting in active status and visible to job seekers.

- Pricing on other platforms can yield many "stale" postings.

The Job-Seeker Experience

- Can browse postings by job title, job location, company name, skill requirements and other job characteristics.

- Browsing does not require registration, but job seekers must register before applying for a job via the Dice.com platform.

- Job seekers submit applications at no charge.

- By supplying enough information, job seekers can include their profiles in a database searchable to employer-side clients.

More about the Dice.com Platform, 2

Applicant Quality Control

- High-quality applicant pools are an important part of the Dice.com value proposition to employer-side clients.

- DHI uses client complaints and other information to identify bad actors who engage in bad behaviors.
  - Example: A third party misrepresents itself to submit an application for a posting that accepts only first-party applicants.

- DHI uses machine-learning methods to develop rules for screening bad actors and bad behaviors. After verifying a rule does not generate false positives, DHI implements the rule to block "bad" applications.

- To prevent gaming of rules, "bad" actors are not informed when their applications are blocked.

- Our dataset excludes blocked applications.

Standard versus "Long-Duration" Postings, 1

80% of postings at the level of a Job ID exhibit the following pattern:

a) Client posts a vacancy on the DHI site

b) Most applications arrive within a week after posting

c) Client permanently removes the vacancy posting within one month after first posting.

For Job IDs that fit the standard pattern, we interpret each one as a unique posting for a single opening.

Standard versus "Long-Duration" Postings, 2

- Other Job IDs do not conform to this pattern; instead, they remain online for many weeks or months, and applications flow in over time.

- Based on our examination of the data and our conversations with DHI staff, the vast majority of these "long-duration" postings reflect direct hire clients with ongoing hiring needs for certain jobs and recruiting and staffing firms that more or less continuously seek applicants for certain types of jobs

Standard versus "Long-Duration" Postings, 3

How We Proceed

- If gap between a posting's first active date-time and its last active date-time is > 31 days, we regard it as a "long-duration" posting.
- We "slice" each long-duration posting into multiple postings, one for each calendar month it's active.
- We consider standard postings only in much of our analysis, so as to focus on single-position openings.

Table 1. Vacancy Postings and Applications in the DHI Database, January 2012 to July 2017

	Millions	Direct Hire Share	Recruitment and Staffing Firm Share
(1) Number of Raw Postings	7.1	24.3%	75.7%
(2) Number of Vacancies, After Slicing Long-Duration Postings	10.9	36.9%	63.1%
(3) Volume of Applications	77.3	39.7%	60.3%
(3.a) Email Applications	56.9	36.4%	63.6%
(3.b) URL Applications	20.9	48.9%	51.1%

Distributions by Full/Part Time Schedule

	Raw Postings	Applications
Full-Time	44.9%	45.7%
Part-Time	4.1%	4.9%
No Time Schedule Specified	53.9%	53.3%

Columns sum to more than 100% because some postings are for a job that can be full-time or part-time.

Percent Distributions by Firm Type, Direct Hires Only

Jan. 2012 to July 2017	Privately Held	Publicly Listed	Govt.	Other
Employer-Side Clients	93.5	3.5	2.9	0.1
Raw Job Postings	91.6	7.7	0.6	0.0
Applications	92.1	7.2	0.7	0.0

Percent Distributions by Firm Size, Direct Hires Only

Employer Size	Clients	Raw Job Postings	Applications
0 Employees	11.8	16.7	14.5
1-9	20.3	19.2	21.7
10-11	8.1	6.4	6.7
20-99	22.9	21.7	20.3
100-249	12.3	7.6	8.0
250-499	7.3	6.0	6.3
500-999	5.7	2.3	2.9
1,000-2,499	4.9	3.2	4.2
2,500-4,999	2.6	2.5	3.4
5000-9,999	1.6	2.9	3.1
10,000+	2.4	11.6	8.8

Eight Facts about Search & Hiring Behavior

1. Large, growing role for labor market intermediaries

2. *Posting* durations are short, much shorter than *vacancy* durations.

3. Most vacancy postings attract zero or few applicants.

4. The typical applicant competes with many other applicants.

5. Job seekers target new postings for applications, strikingly so.

6. Most job seekers concentrate their applications on Day 1, i.e., their first day with positive applications on Dice.com.

7. Platform functionality greatly affects the volume and distribution of application flows to postings.

8. Seasonals (daily, weekly, monthly) are *much* stronger for application flows than for vacancy postings. (Later in talk, time permitting)

1(a). Large, Growing Role of Recruitment & Staffing Firms

Excluding Postings with No Applications

Raw Vacancy Postings

Vacancy Postings After "Slicing" Operation

Applications

Percentage of Postings or Applications

85%
80%
75%
70%
65%
60%
55%
50%

2012   2013   2014   2015   2016   2017
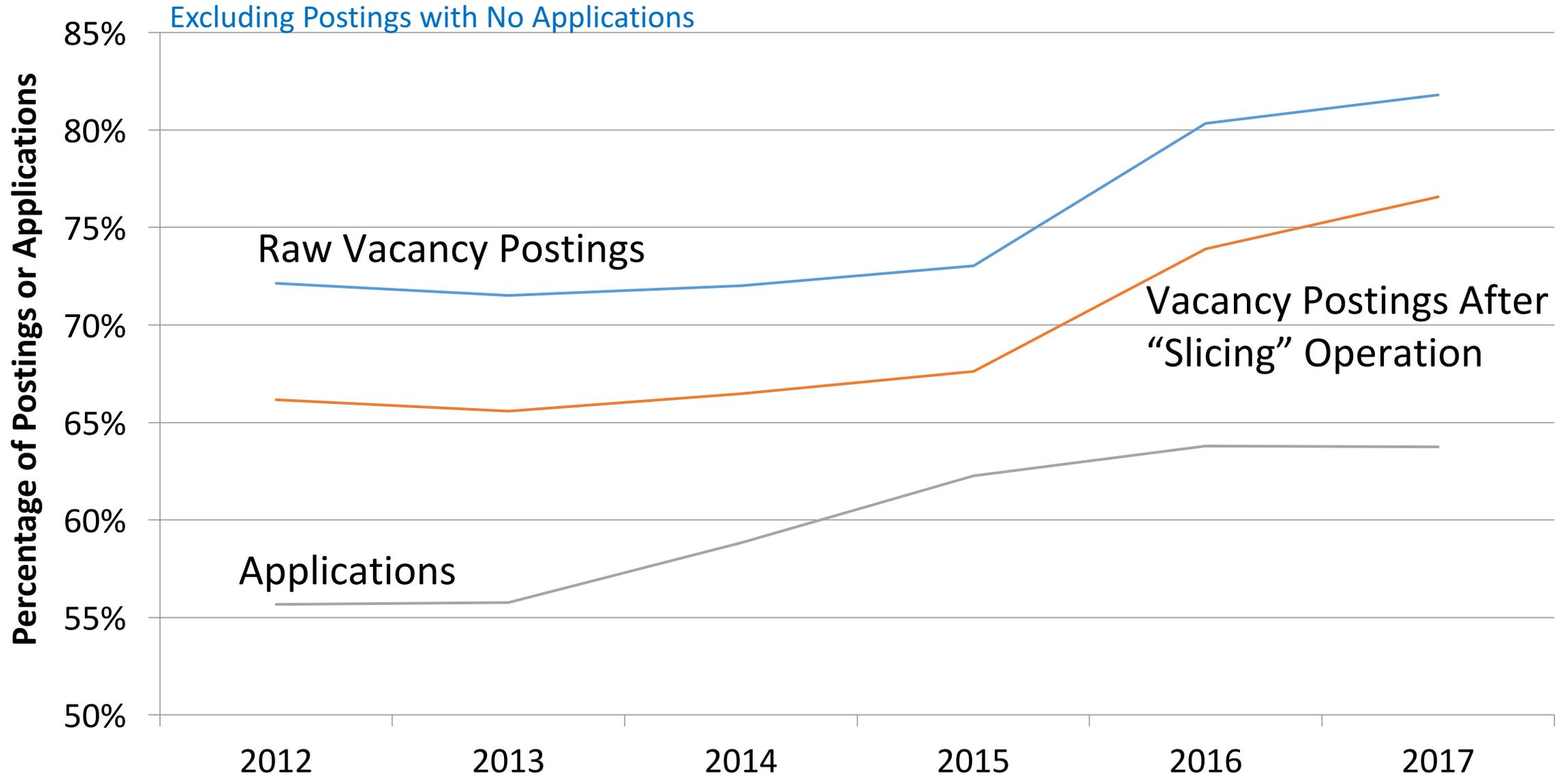
1(b). Large Role for Worker-Side Intermediaries, Too

Joint Distribution of Applications over Employer-Side and Worker-Side Types, January 2015 to July 2017

	1st Party Applications	3rd Party Applications	Not Classified
Direct Hire	12%	22%	3%
Recruitment & Staffing Firms	20%	39%	4%

88% of applications involve an intermediary on one or both sides of the matching process (in addition to platform role of Dice.com).

Who Generates 3rd-Party Applications?

We don't yet have a quantitative answer to this question, but we think 3rd-party applications arise in at least two ways:

1. Staffing firms that lease their employees to other firms submit applications in response to Dice.com postings.

   - Even when staffing firms pay hourly, they have incentives to market their employees. That's how they generate (a) fees charged to employers and (b) markups on what they pay their employees.

   - Employer-side clients on Dice.com can explicitly allow or disallow such "corporation-to-corporation" applications in their postings.

2. Placement firms that respond on behalf of individuals seeking jobs that meet particular criteria.

2. Postings for single-position openings are short-lived

- The mean ***posting*** duration for single-position openings is only 9.8 days.
- In contrast, the mean ***vacancy*** duration for comparable jobs in the Job Openings and Labor Turnover Survey (JOLTS) is more than four times as long.
- Thus, the "meeting" phase of the hiring process, during which employers solicit and accept applications, is far shorter than the "selection" phase, which entails screening and interviewing applicants, selecting one for a job offer, extending an offer, negotiating terms, and waiting for an accept/reject decision.

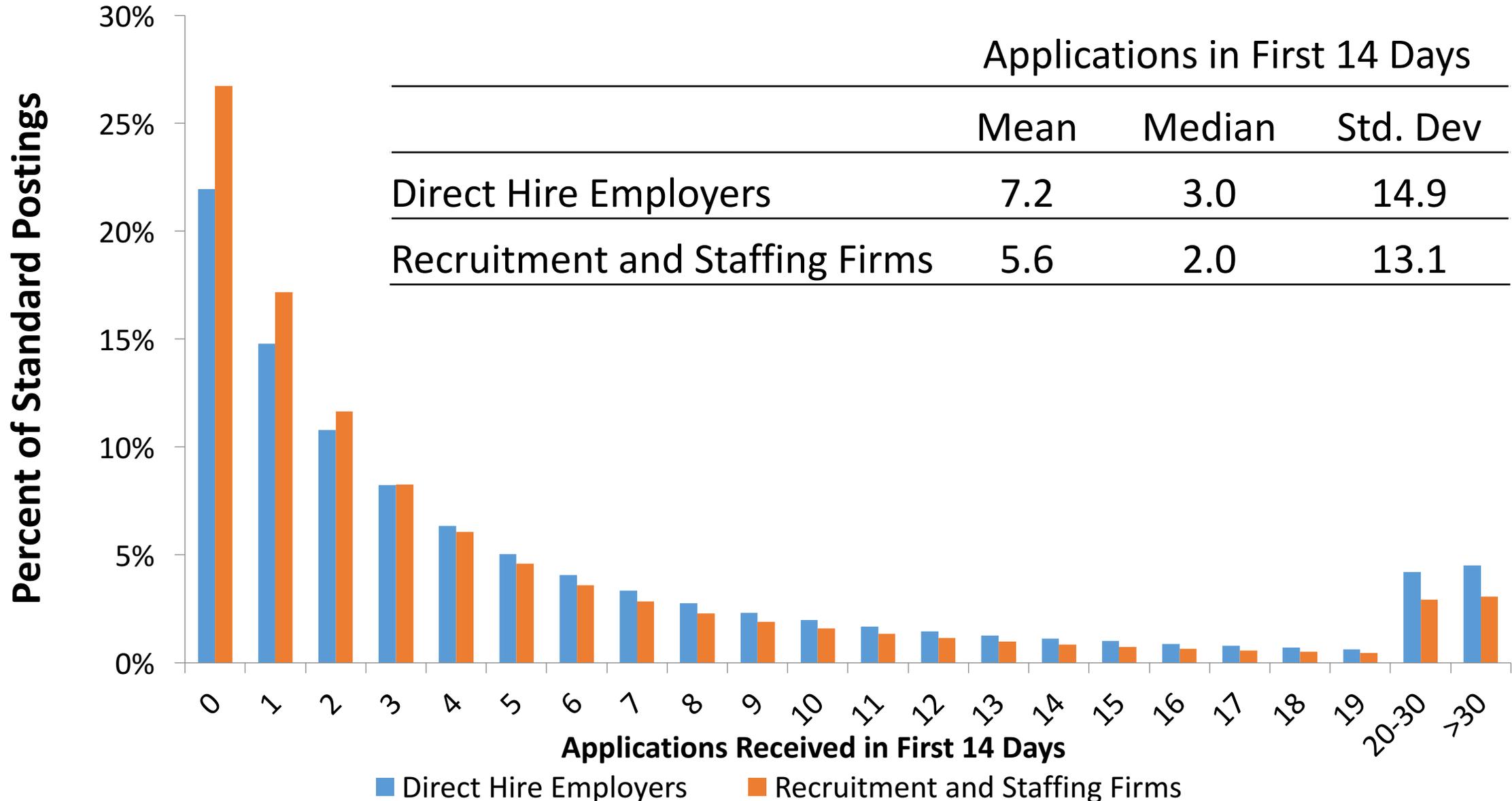# The Distribution of Completed Spell Durations

Standard Postings, Jan. 2012- Jul.2017*

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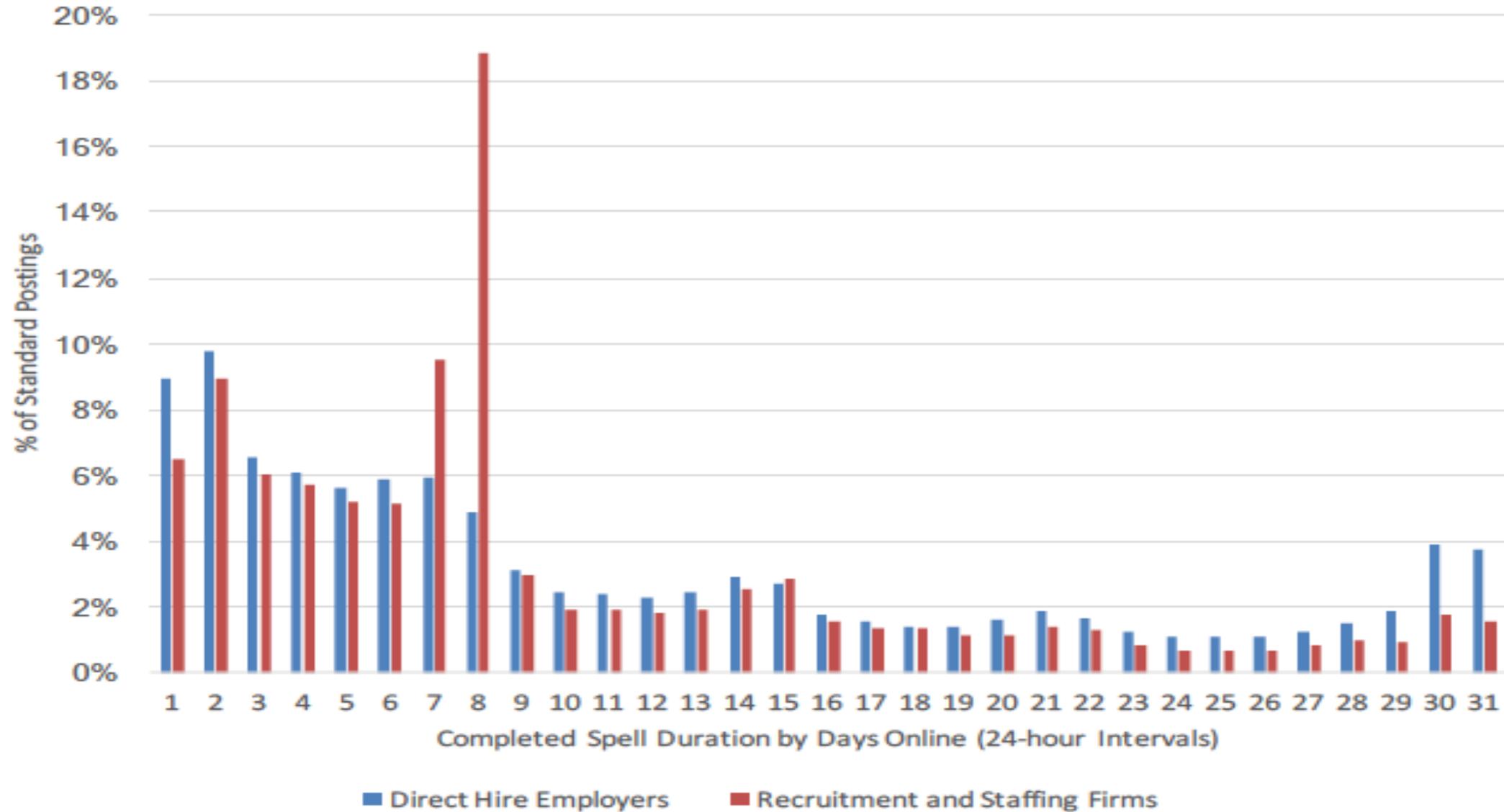
Summary Stats for Completed Posting Durations, in Days

January 2012 to June 2017		Percentile				
	Mean	10	25	50	75	90
All Standard Postings	9.80	0.91	2.66	6.78	14.70	25.12
All Job Titles with at Least 100 Standard Postings	9.80	0.91	2.67	6.79	14.71	25.13
Selected Job Types						
Developer	8.80	0.84	2.16	6.25	13.38	22.29
Project Manager	9.51	1.00	2.96	6.80	13.93	23.62
Business Analyst	9.30	0.91	2.57	6.66	13.80	23.61
Help / Support Desk	10.35	1.00	3.25	7.00	15.64	25.80
Software Engineer	12.96	1.31	4.72	10.63	20.90	29.08
Systems Administrator	11.36	1.05	3.63	8.00	17.59	27.54
Technician	9.35	0.89	2.69	6.60	13.75	24.62
Data Analyst	10.12	1.00	3.02	7.00	15.05	25.08
Database Administrator	9.81	0.94	2.77	6.77	14.58	25.41
Programmer	11.45	1.03	3.64	7.92	18.02	28.10
Quality Assurance Tester	7.83	0.83	1.79	5.45	11.01	20.58
Sales	11.89	0.81	3.23	9.66	18.70	28.16
Electrical Engineer	12.69	1.68	4.96	10.78	19.85	28.87
Mechanical Engineer	12.01	1.20	4.39	9.62	18.90	28.41
Finance Consultant	7.91	0.59	2.12	5.31	10.46	21.64

3. Most Postings Attract Few Applicants

Applications in First 14 Days			
	Mean	Median	Std. Dev
Direct Hire Employers	7.2	3.0	14.9
Recruitment and Staffing Firms	5.6	2.0	13.1

Percent of Standard Postings (y-axis)

Applications Received in First 14 Days (x-axis)

Legend: Direct Hire Employers · Recruitment and Staffing Firms

Why Not More Applicants Per Posting?

1. Most postings on Dice.com have demanding technical qualifications such as Java developer, software engineer, systems administrator, SAP consultant, LINUX administrator, data scientist and electrical engineer.

2. Dice.com job listings are also concentrated in occupations with relatively rapid demand growth in recent years, potentially outstripping the pace of skill adjustment on the supply side of the labor market.

Points 1 and 2 suggest that skill scarcities are more prevalent for the jobs covered by the DHI database than for the economy as a whole.

3. DHI blocks certain IP addresses and User IDs with "bad" behaviors or a history of excessive application volumes, and from certain foreign sources. These blocking actions are part of DHI's efforts to provide high-quality applicant pools to its employer-side clients.

4. The Typical Applicant Competes Against Many Others

	Mean Applications Per Vacancy Posting	
How it looks to employers and recruiters →	Equal Weights	Flow Weighted ← How it looks to job seekers
To sort by applications volume, we first compute mean applications per posting at the job title level and then sort job titles into quintiles.		
All Standard Vacancy Postings	5.1	38.2
Job titles with ≥ 100 St. Postings	5.7	42.0
Sorted by Applications Volume		
Bottom Quintile	0.6	10.5
Fourth Quintile	1.9	16.6
Third Quintile	3.4	23.4
Second Quintile	5.5	37.5
Top Quintile	10.2	49.6

This table based on data from January 2012 to July 2017

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	Mean Number of Applications Per Vacancy	
Selected Job Categories	Equal Weights	Flow Weighted
Software Engineers & Developers	4.7	54.3
Electrical Engineers	1.2	12.9
Mechanical Engineers	1.6	12.8
Business Analysts	11.3	40.4
Financial & Securities Analysts	5.0	13.9
Data Analysts	7.3	26.8
Sales & Business Development	1.1	8.2

On Application Flows Per Vacancy Posting

- The typical applicant faces many rivals for each sought-after job, even as employers face small applicant pools for most openings.

- Mechanically, this pattern reflects a highly uneven distribution of applications over postings.

- In terms of economics, this pattern fits two somewhat different interpretations:
  - A modest share of vacancies is highly attractive to many job seekers because of high compensation, good working conditions, high job security or other desirable attributes.
  - Skill mismatch is an important phenomenon that curtails the size of applicant pools for a large share of vacancies.

5. Job Seekers Target New Vacancy Postings

- 41% of applications flow to postings < 48 hours old

- 56% flow to postings < 96 hours old.

- Daily applications fall as postings age, sharply so over the first days.

- These patterns are pervasive across job functions and skill types.

- Third-party applications show a greater propensity to target young postings.

Distribution of Applications by Posting Age

Standard Postings, Jan. 2012- Jul.2017

Direct Hire Employers · Recruitment and Staffing Firms
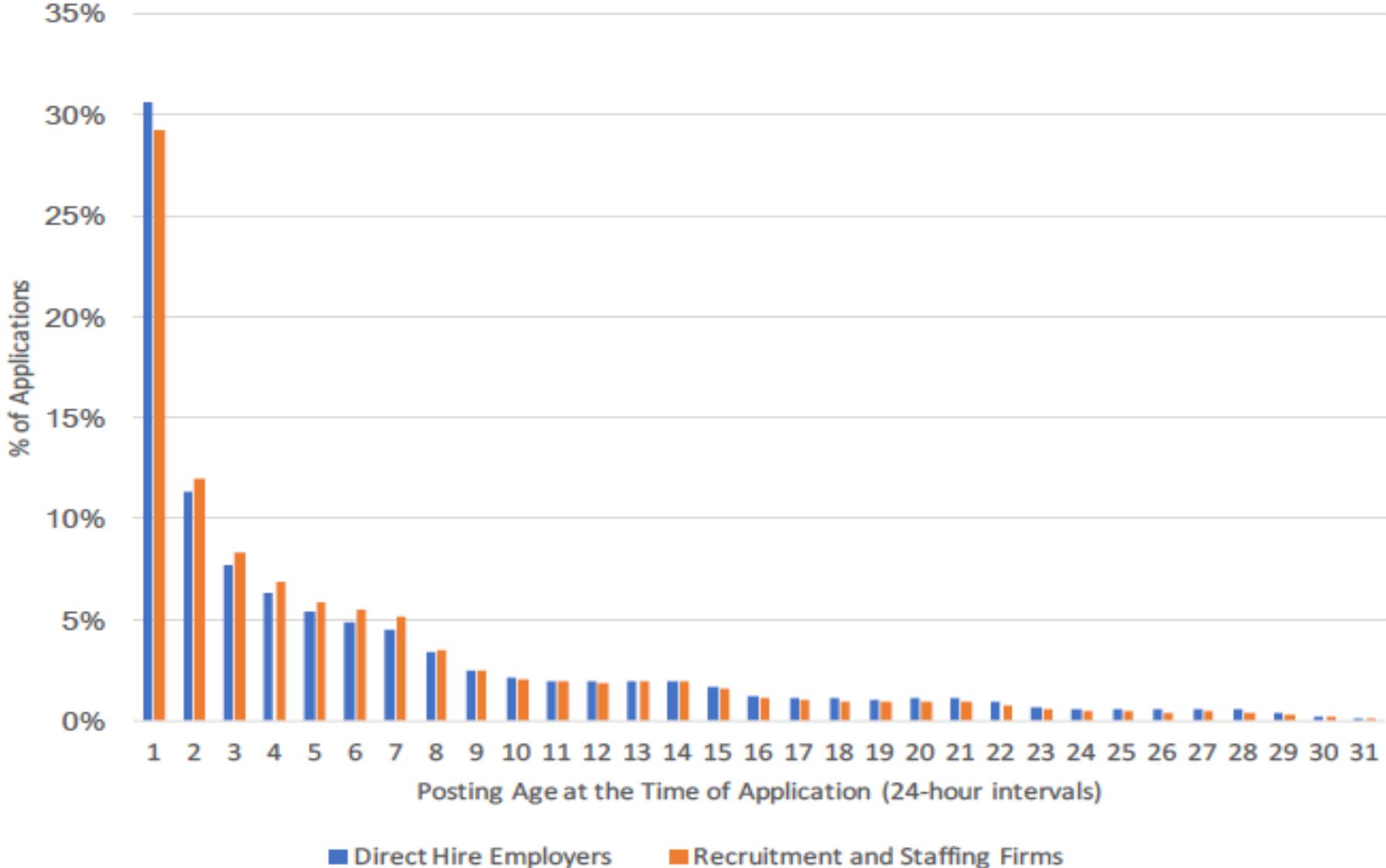
Mean Daily Applications Per Active Posting

Standard Postings, Jan. 2012- Jul.2017

Direct Hire Employers   Recruitment and Staffing Firms
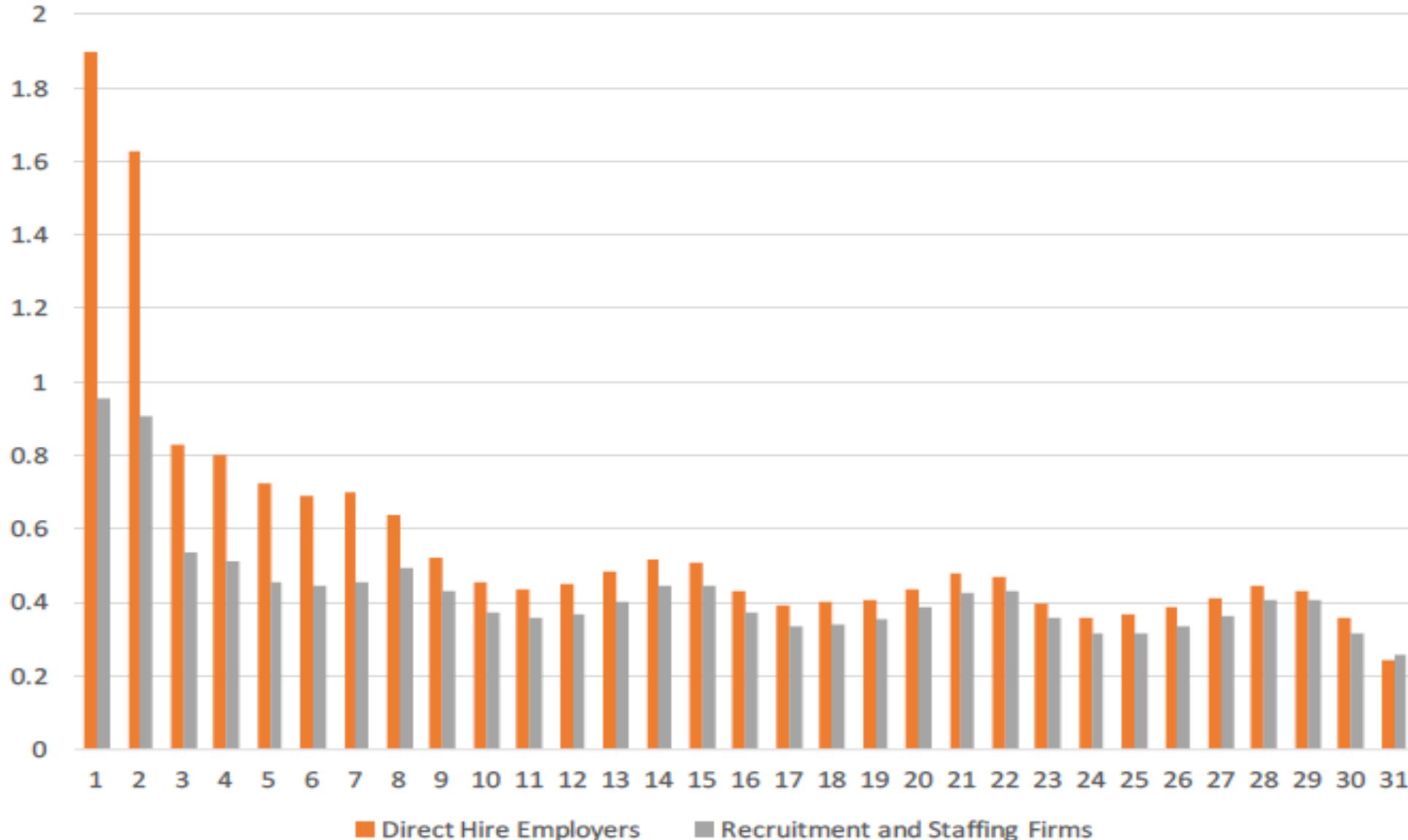
January 2012 to July 2017	Mean Applications per Vacancy	Share of Total Applications Received Within:	
		First 48 hours	First 96 hours
Standard Postings[1]	7.1	41	56
Standard Postings with Frequently Used Job Functions[2]	7.3	41	55
Selected Job Functions			
Quality Assurance Tester	23.3	42	58
Scrummaster	11.8	49	63
Developer	9.1	47	62
Administrator	6.9	43	57
Electrical Engineer	3.4	29	47
Mechanical Engineer	3.7	31	48
Business Analyst	12.8	42	57
Consultant	5.4	49	63
Sales & Business Development	2.6	31	47
Modeler	6.9	48	62
Administrative Assistant	8.4	29	49

6. Most Job Seekers Concentrate Their Applications on Day 1

- 45% of 1st party job seekers submit no applications after Day 1, where "Day 1" = job seeker's first day with one or more applications on Dice.com.

- For persons who continue to search on Dice.com (as indicated by at least one later application):
    - The average job seeker applies to multiple jobs on Day 1.
    - The average daily application rate for job seekers drops off very sharply after Day 1.

- Nevertheless, Day-1 applications account for a minority of all applications.

Distribution of Job Seekers by Search Duration on Dice.com
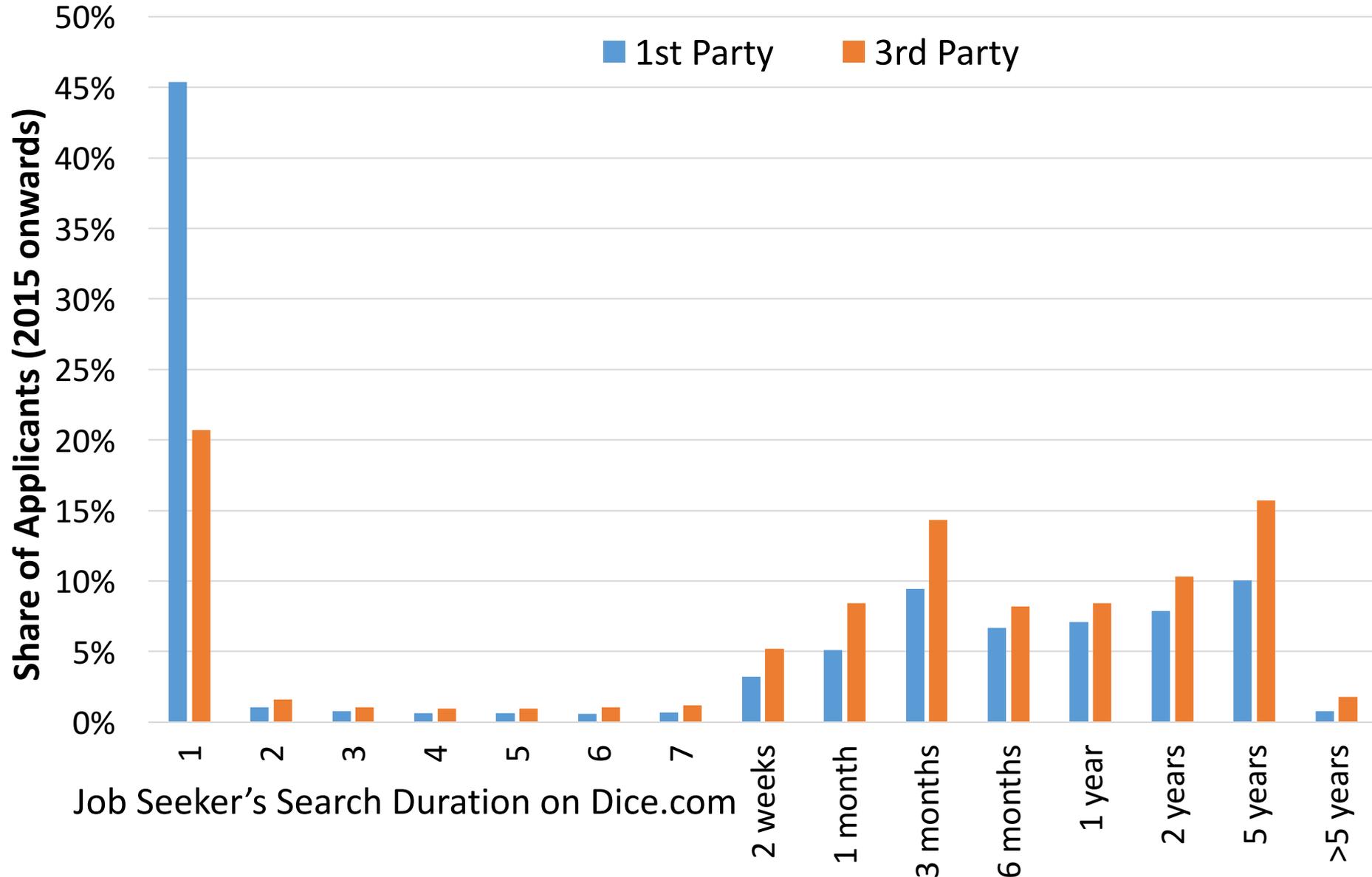
"Search Duration" measured by time elapsed between the job seeker's first and last application to a Dice.com posting. The 1 Day duration bin includes persons who apply to only 1 posting on Dice.com.

The current version of this chart makes no adjustment for person who have long spells (months or years) in between applications.

Mean Daily Applications Per Applicant by Days Since First Application, Jan 2012 to July 2017,
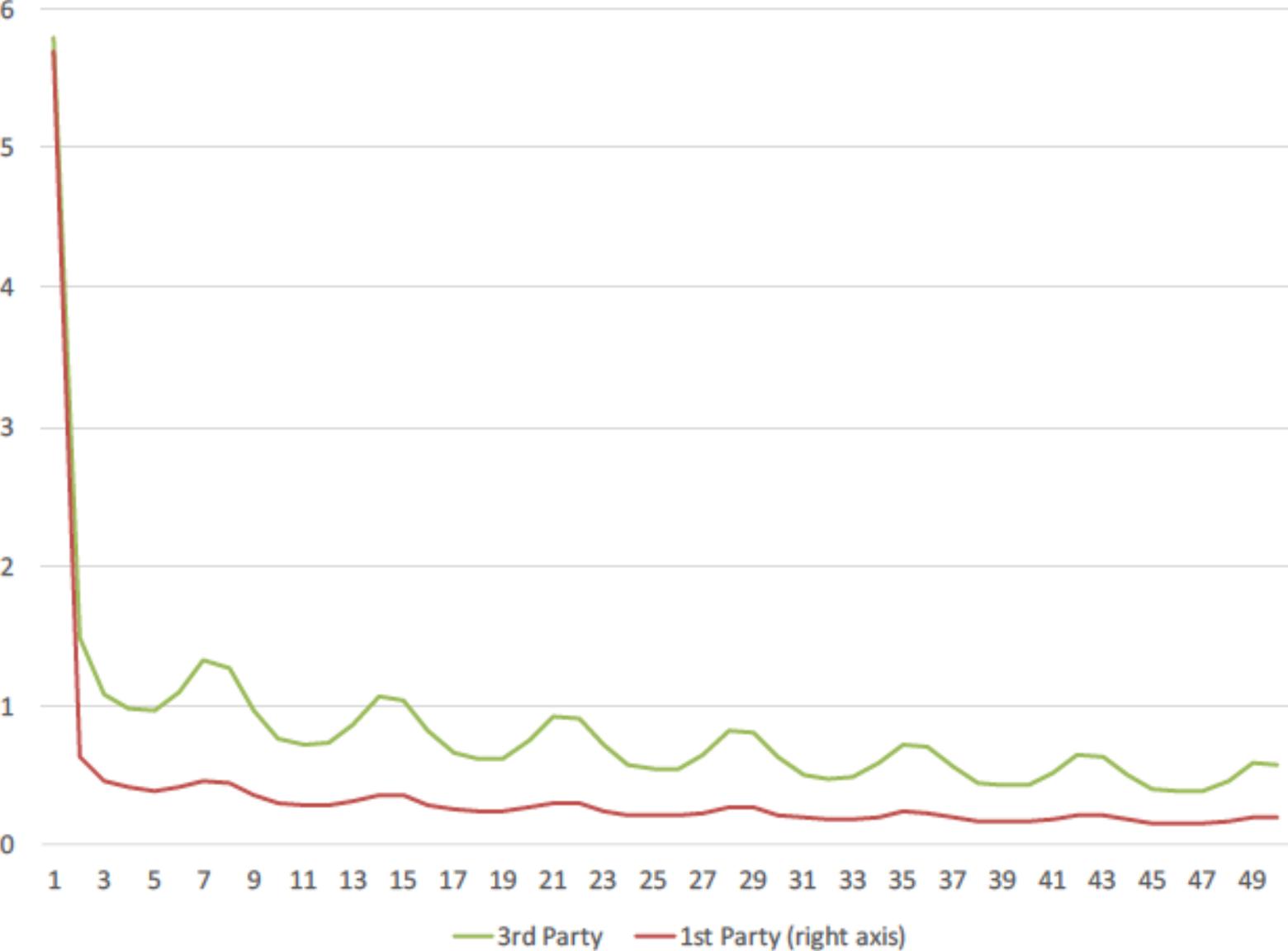
For each "Day," (24-hour period), we restrict the sample to persons who apply to at least one job on Dice.com on a later day. In this way, we condition on persons who continue as active searchers.

3rd Party — 1st Party (right axis)

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Distribution of Applications by Applicant's Search Duration
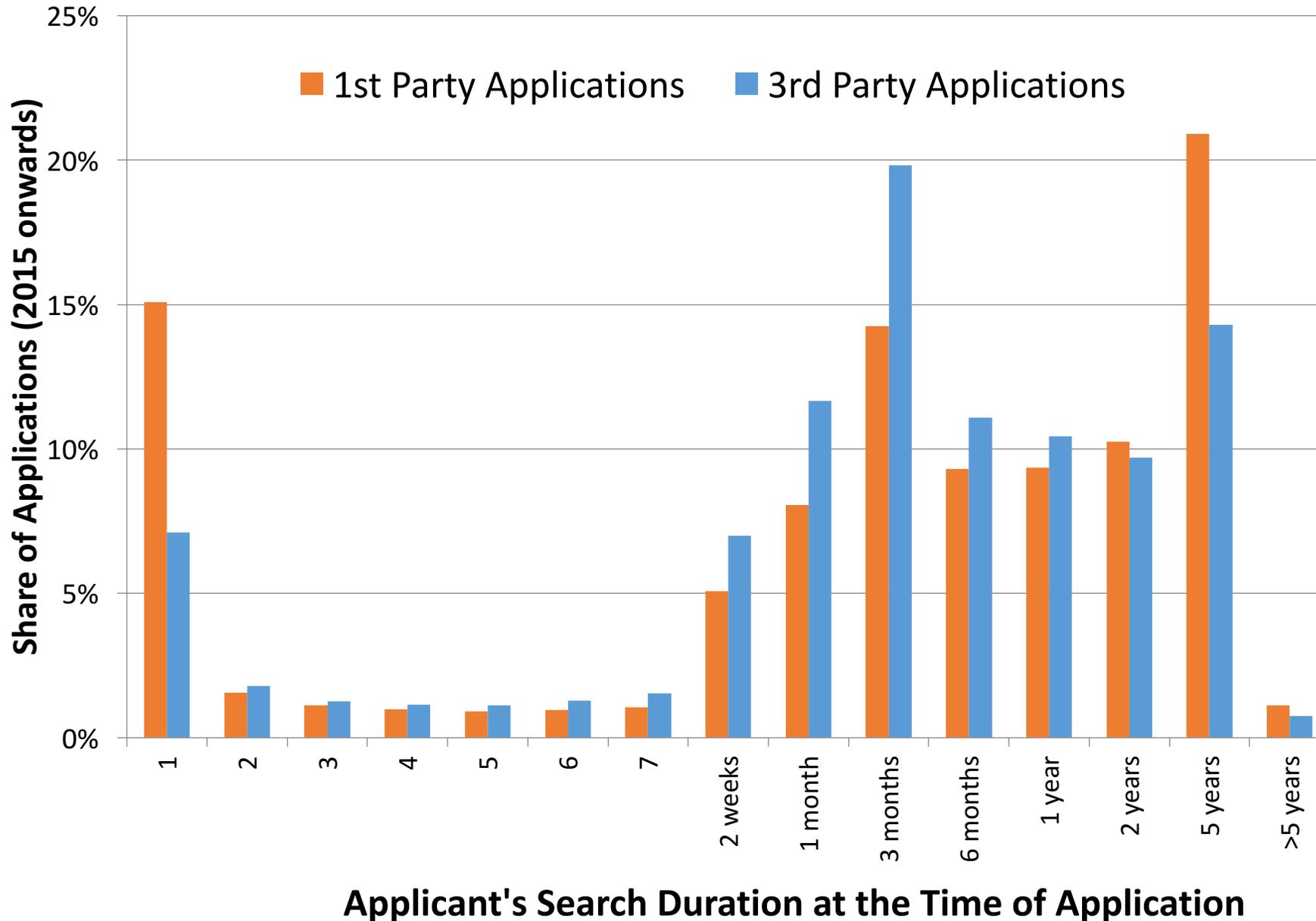
Share of Applications (2015 onwards) (y-axis)

Legend: ■ 1st Party Applications ■ 3rd Party Applications

x-axis categories: 1, 2, 3, 4, 5, 6, 7, 2 weeks, 1 month, 3 months, 6 months, 1 year, 2 years, 5 years, >5 years

Applicant's Search Duration at the Time of Application

The current version of this chart makes no adjustment for person who have long spells (months or years) in between applications. Thus, it overstates the mass in the right tail of the search duration distribution, probably to a large degree.

We will address that issue.

7. Platform Functionality Greatly Affects the Volume And Distribution of Applications to Postings

Key changes to the Dice.com platform in December 2014:

1. DHI streamlined the registration and application process for job seekers.

2. It improved the search engine available to job seekers.

3. It enabled employer-side clients to solicit applications from particular individuals among Dice.com registrants.

4. It removed information from Dice.com postings that, in some cases, had facilitated applications off platform.

Applications per Vacancy-Day by Firm Size, Annual Averages, Standard Postings by Direct-Hire Employers
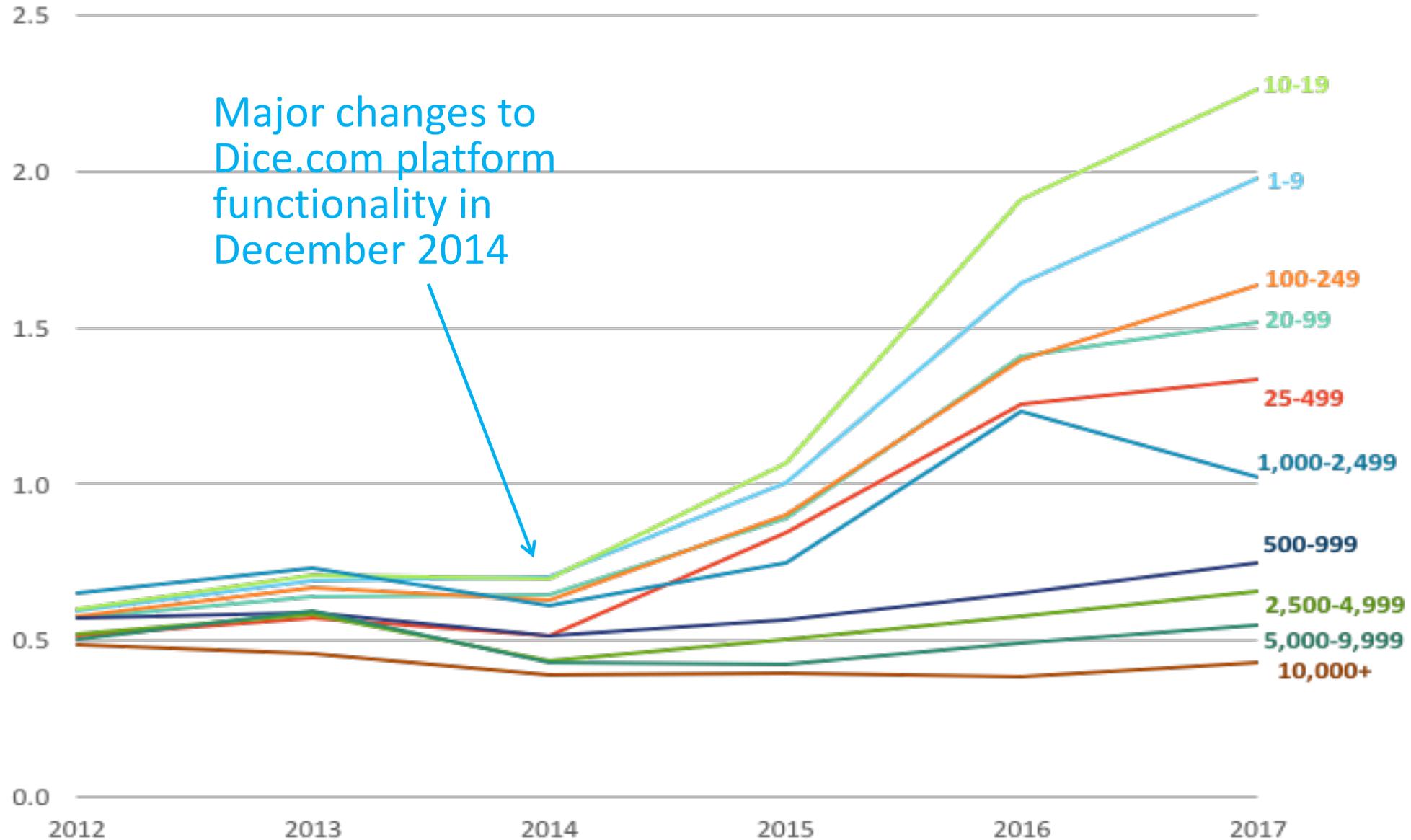
Taking Stock

- Quantitative Sketch of the Hiring Process
- Alternative Employer Search Strategies
- Five Implications for Theoretical Modeling
- Additional Remarks on Sequential vs. Non-Sequential Search Strategies

Stages of the Hiring Process: A Quantitative Sketch

Mean Duration from Date of First Posting to Start of Employment = 57.3 Calendar Days

Job Openings and Labor Turnover Survey

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Survey of Consumer Expectations (NY Fed)

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Mean Posting Duration = 9.8 Days (this paper)

Application bunching: 41% arrive within 48 hours after vacancy posting

Mean Vacancy Duration = 41.1 Days (Davis et al., 2013 and DHI Hiring Indicators)

Mean Start Lag Duration = 16.2 Days (Crane et al., 2016)

Alternative Employer Search Strategies

Sequential Search Strategy: Employer screens each applicant on arrival and immediately offers a job if expected match surplus > 0. Factors that favor a sequential strategy include**:**
- Low applicant arrival rate
- High cost of screening another applicant
- Absence of scale economies in screening

Non-Sequential Search Strategy: Employer gathers a pool of applicants, screens the pool, selects one or more, then extends job offer(s). Factors that favor a non-sequential strategy include:
- High applicant arrival rate
- Bunching of applications shortly after posting
- Scale economies in screening applicants
- Vacancy posting costs are largely sunk

Five Implications for Theory

1. **Labor market intermediaries play a huge role**: 88% of all applications on Dice.com involve an employer-side or worker-side intermediary, or both. Of course, all of our applications flow through Dice.com, another type of intermediary.

   - Few theoretical models of hiring activity consider intermediaries. Bull et al. (1987) – an early exception – stress that recruitment firms can screen in advance and thereby enable firms with stochastic hiring needs to fill vacancies more quickly. Gautier (2002) stresses that intermediaries reduce duplicative screenings, thereby lowering aggregate screening costs and mitigating congestion externalities under non-sequential worker search.

2. **Employer search is non-sequential:** Employers/recruiters collect multiple applications w/ short-lived postings (mean duration of 10 days). They take much longer (31 days) to screen, select and recruit.

   - In contrast, the dominant models of labor market matching and hiring presume sequential search behavior.

- We are not the first to argue that much hiring behavior is inconsistent with sequential search. In a small sample of 1900 Dutch establishments with 670 vacancies, Van Ours and Ridder (1992) find that almost all hires take place from a pool of applicants formed shortly after vacancy posting.

- Van Ommeren and Russo (2008) reject the hypothesis of sequential search by Dutch employers who rely on advertising or employment agencies to recruit workers, which constitute nearly half the hires in their sample. When they consider vacancies filled through social networks (e.g., employee referrals), they cannot reject the hypothesis of sequential search by employers.

3. **Application bunching shortly after posting favors a non-sequential search strategy, whereby an employer first collects a batch of applications, then screens them and potentially selects one (or more) for an offer**.

- See Gal, Landsberger and Levykson (1981), Morgan (1983) and Morgan and Manning (1985)

- Application bunching is prominent in our data: 41% of applications arrive within 48 hours of posting, and 56% arrive within 96 hours.

- Thus, observed applicant behavior favors non-sequential employer search, according to theory. And we find evidence of non-sequential employer search.

4. **Non-sequential employer search creates incentives for job seekers to also adopt a non-sequential strategy, applying to many job openings at the same time.**

- Non-sequential employer search creates a delay between the submission of an application and the employer's selection of a recruit. Thus, it makes sense for job seekers to apply for multiple job openings simultaneously while awaiting call-backs and offers, unless applications themselves are very costly to submit.
- See Morgan and Manning (1985) and Gautier (2002).
- We find evidence that many or most job seekers engage in this form of non-sequential search. See, also, Abbring and Van Ours (1994).

5. Stock-flow matching?

- Our evidence that job seekers favor newly posted vacancies lends support to the empirical relevance of stock-flow matching.

- But our results do not paint a picture of sequential search by employers within a stock-flow matching framework. Recall:
  - The typical posting attracts multiple applications.
  - Mean posting duration < one-fourth of mean vacancy duration.
  - One quarter of our postings have completed spells < 2.2 days!

- In this respect, our findings are at odds with models that feature sequential search in a stock-flowing matching framework, e.g., Coles and Smith (1998) and Gregg and Petrongolo (2005).

More on Sequential vs. Non-Sequential Search

- The non-sequential perspective has been overshadowed by theories in the mold of Diamond (1982), Mortensen (1982), Pissarides (1985) and Mortensen and Pissarides (1994), which postulate sequential search by employers and workers.

- Prevailing treatments of frictional unemployment, job-finding rates, vacancy dynamics, wage dispersion with search frictions, and job creation incentives in settings with search frictions have been dominated by the sequential search perspective.

- Leading examples include Burdett & Mortensen (1998), Pissarides (2000), Postel-Vinay & Robin (2002), Mortensen (2003), Hall (2005), Shimer (2005), Hornstein, Krusell and Violante (2011) and Davis, Faberman & Haltiwanger (2013).

- It strikes us as problematic to rely on sequential search models for quantitative assessments of market outcomes and policy interventions, when the hiring process in these models is so sharply at odds with actual hiring behavior.

- Example: The duration of the "meeting" phase in the hiring process is unlikely to vary with tightness in the same way as the duration of the "screening & selection" phase or the "recruitment & bargaining" phase. Hence, quantitative non-sequential search models have the potential to improve our ability to explain job-finding and vacancy-filling rates.

  - On a related note, Crane et al. (2016) find: (a) The mean "start lag" is 40% of the mean vacancy duration. (b) Start lags are mildly countercyclical, but vacancy durations are strongly pro-cyclical.

- Theories of non-sequential search date to Stigler (1961). Gal et al. (1981), Morgan (1983) and Morgan and Manning (1985) theoretically analyze the choice between sequential and non-sequential search strategies.

- Labor market environments with non-sequential search involve a different set of externalities than environments characterized by sequential search. See Gautier (2002), Albrecht, Gautier and Vroman (2006) and Wolthoff (2014).

- We see our evidence as strong motivation for greater attention to non-sequential search models in which both job seekers and employers simultaneously contact multiple potential partners with whom to initiate an employment relationship.

Quantifying Labor Market Slack: A New Approach

- We show how to extract information about slack from micro data on vacancy postings and application flows.

- Our measurement methods have clear parallels in the application of hedonic regressions to price indices and in the use of repeat home sales to study price changes in housing markets.

- To our knowledge, we are the first to apply these methods to vacancy postings and application flows to quantify labor market slack.

Measuring Slack Using Application Flows

1 A simple measure of slack:

$$S_{o,t} = \frac{A_{o,t}}{V_{o,t}}$$

where $V_{o,t}$ is the number of vacancy days in job category o in month t and $A_{o,t}$ is the number of applications received by postings of type o during t.

This approach to quantifying slack is simple, straightforward to implement, and easy to understand. It is suitable for categories with "dense" observations in the DHI Database.

Regression Approach

Fit the following regression model by weighted least squares (WLS) using data from months *1* to *T*:

$$S_{kt} = \sum_{k=1}^{K} I_k \alpha_k + \sum_{t=1}^{T} I_t \gamma_t + u_{jt},$$

where $I_t = 1$ in month t and 0 otherwise, γ_t is a vector of monthly time effects, α_k is the conditional mean daily application flow for type-k vacancies, and u is an error term. We use the vacancy-day shares v_{kt} to weight observation k in month t in the regression (3), which has at most $K \times T$ observations and fewer if certain vacancy types are not present in every

Slack Measures: Simple and Regression- Adjusted

Daily Application Flows per Vacancy Posting, Feb. 2012 - Jul. 2017
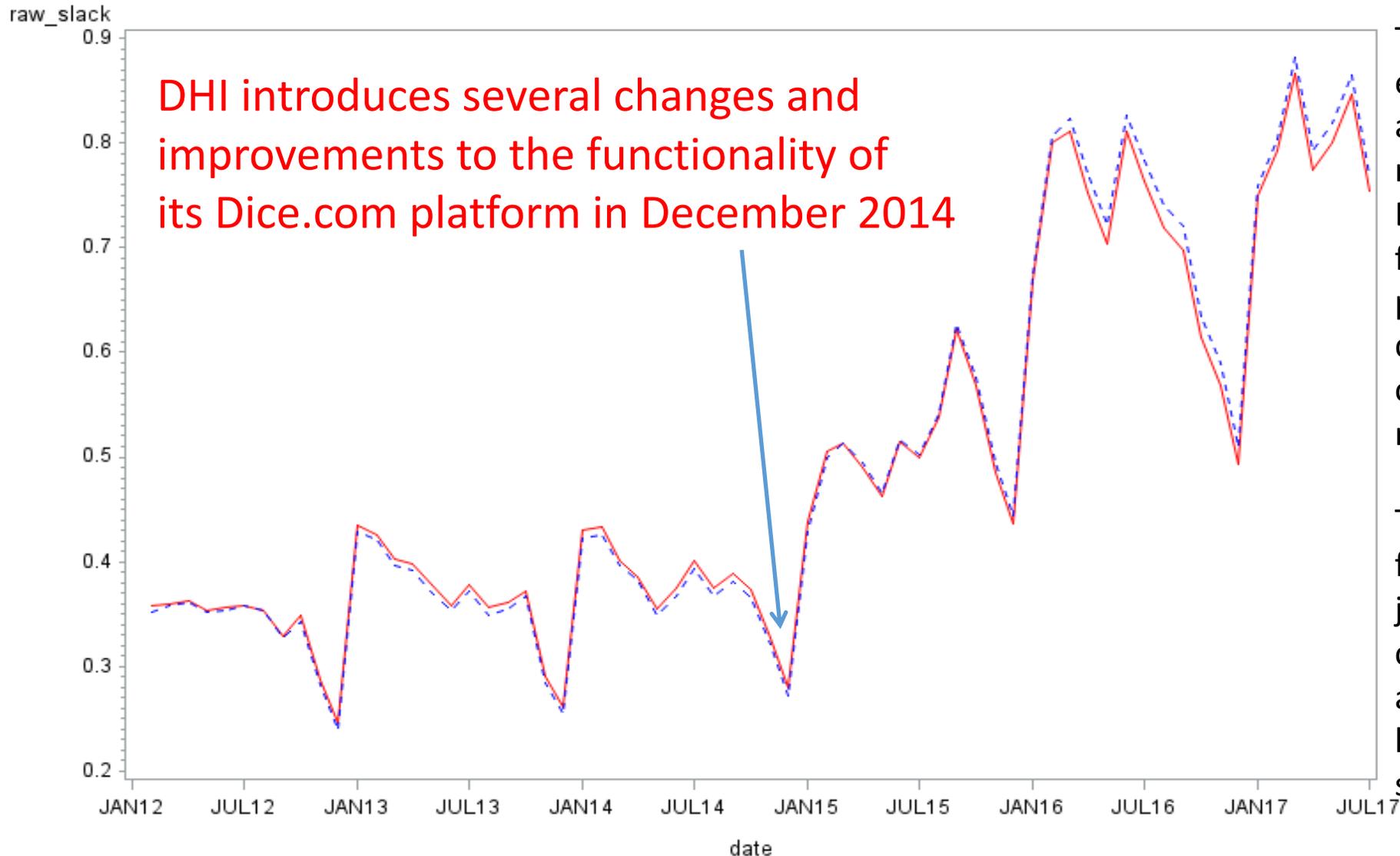
DHI introduces several changes and improvements to the functionality of its Dice.com platform in December 2014

This chart highlights a key execution challenge: Daily applications per posting began rising sharply in the wake of the December 2014 changes to the functionality of the Dice.com platform. It is a challenge to disentangle platform functionality changes and changes in labor market tightness.

To address this issue, we shift our focus to relative tightness (among jobs covered by Dice.com). We currently operationalize this approach by scaling each category-level slack measure by the overall slack measure in this chart.

PLOT — Raw Daily Applications Flow - - - - Job Title Composition Adjusted Flow

52

Skills with Decreasing Relative Tightness

53
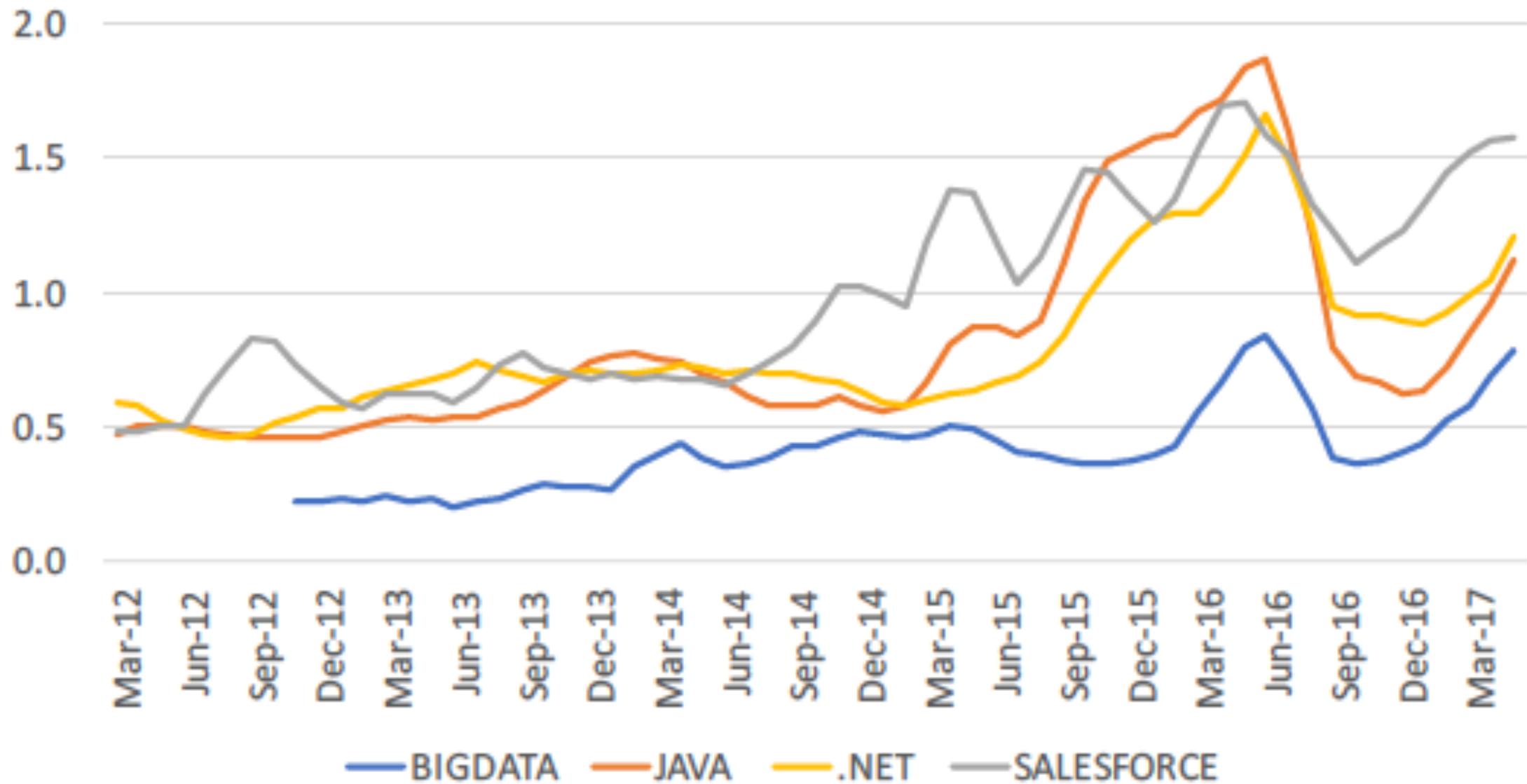
Skills with Constant Relative Tightness

IBM — SAS — MOBILE — INFORMATICA (right axis)
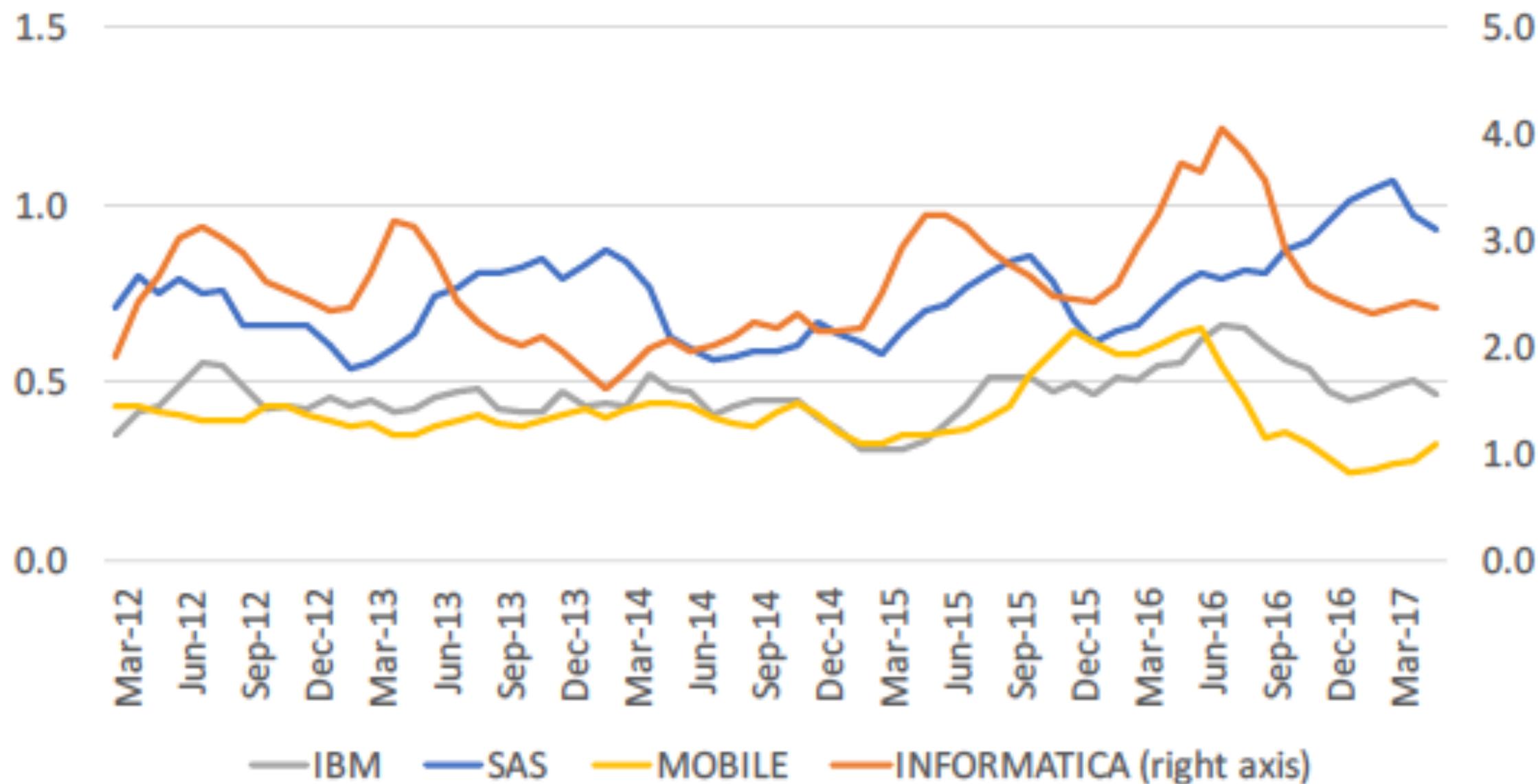
Skills with Increasing Relative Tightness
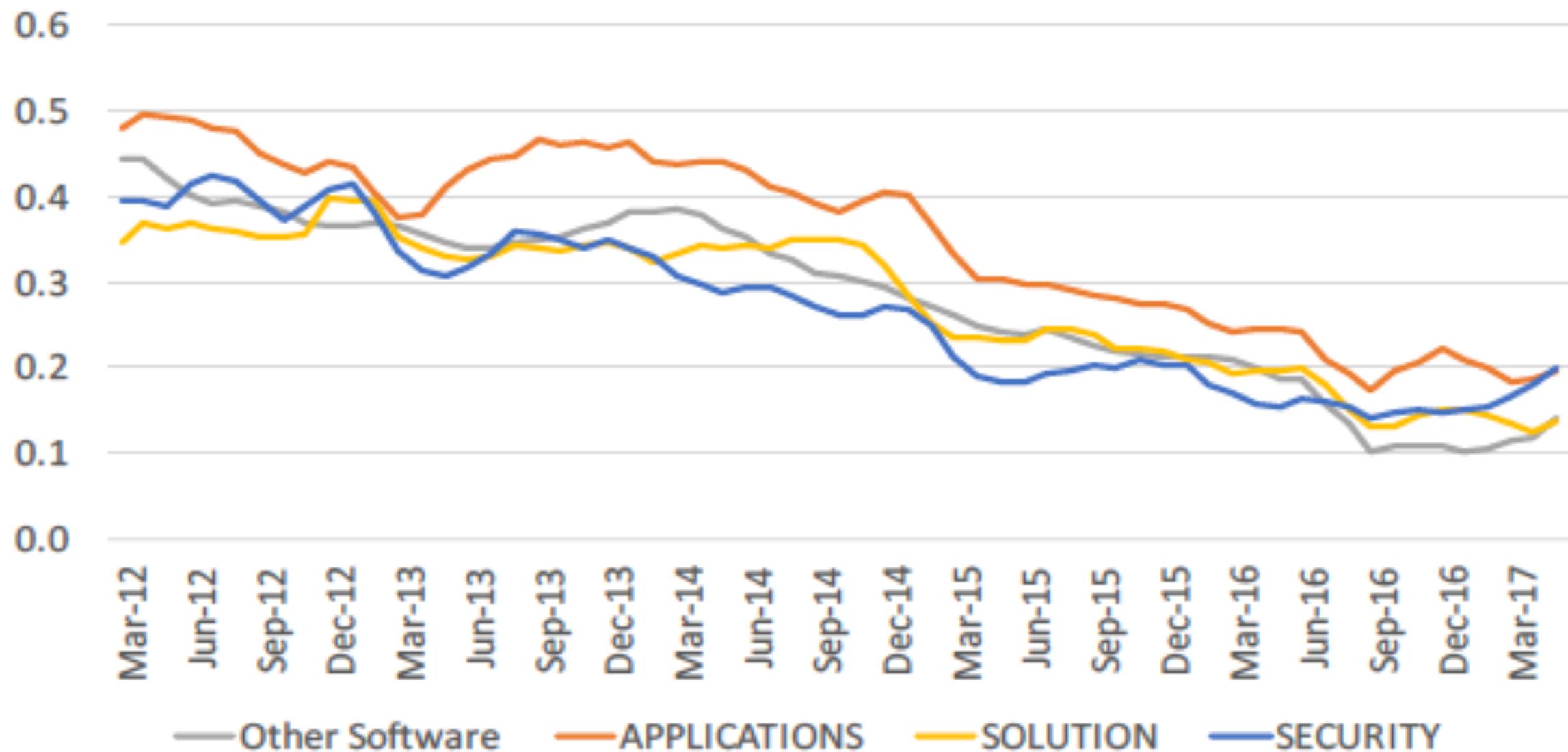
8. Strong seasonals in application flows but not in postings

Application Flows in December and January Relative to the Preceding October

	2012	2013	2014	2015	Mean
Ratio of December-to-October	0.67	0.65	0.71	0.74	0.69
Ratio of January-to-October	1.16	1.04	1.10	1.07	1.09
Ratio of January-to-December	1.73	1.59	1.54	1.45	1.58

Daily Applications Per Vacancy Posting Relative to the Preceding October

	2012	2013	2014	2015	Mean
Ratio of December-to-October	0.64	0.68	0.69	0.76	0.69
Ratio of January-to-October	1.23	1.14	1.02	1.12	1.13
Ratio of January-to-December	1.91	1.68	1.47	1.45	1.63

Distribution of Posting Days by Day of the Month
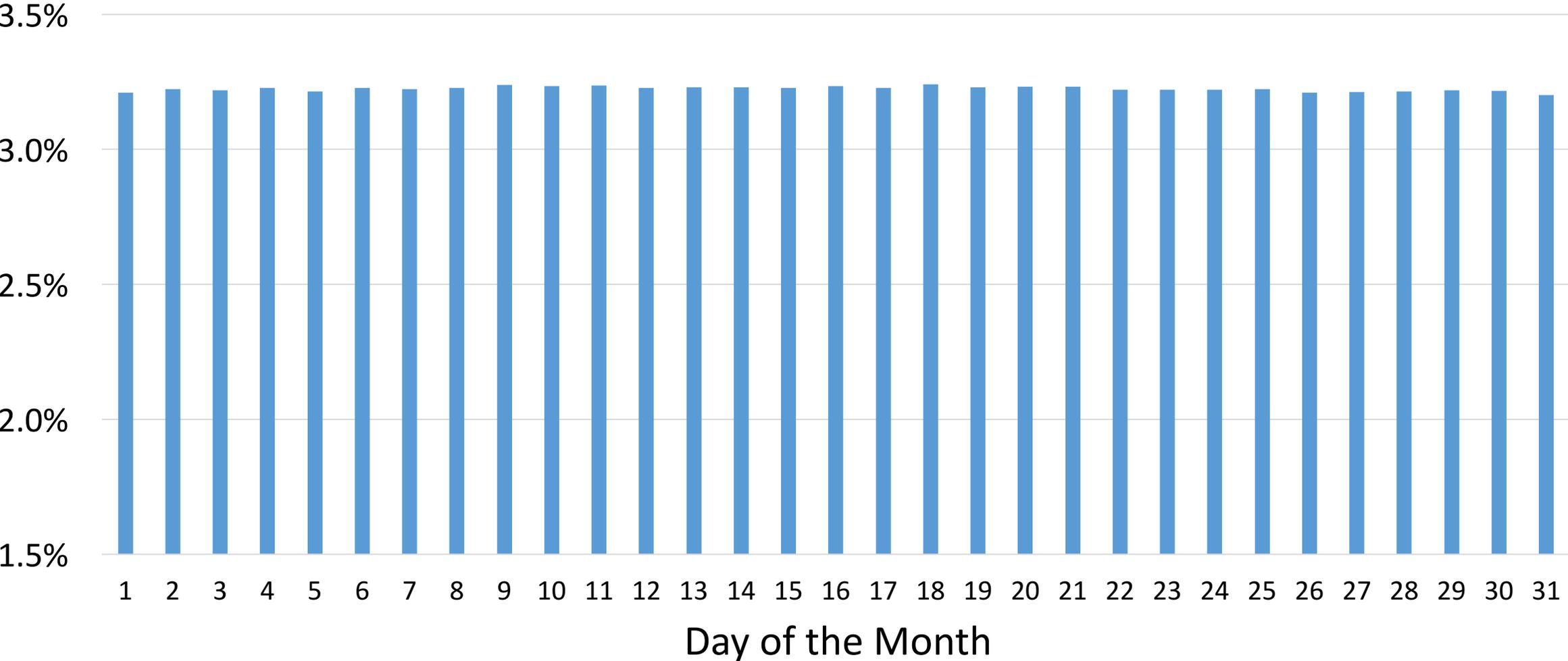
Using data from January 2012 to November 2016

Figure 7. Average Daily Applications Per Vacancy by Day of the Month, January 2012 to November 2016
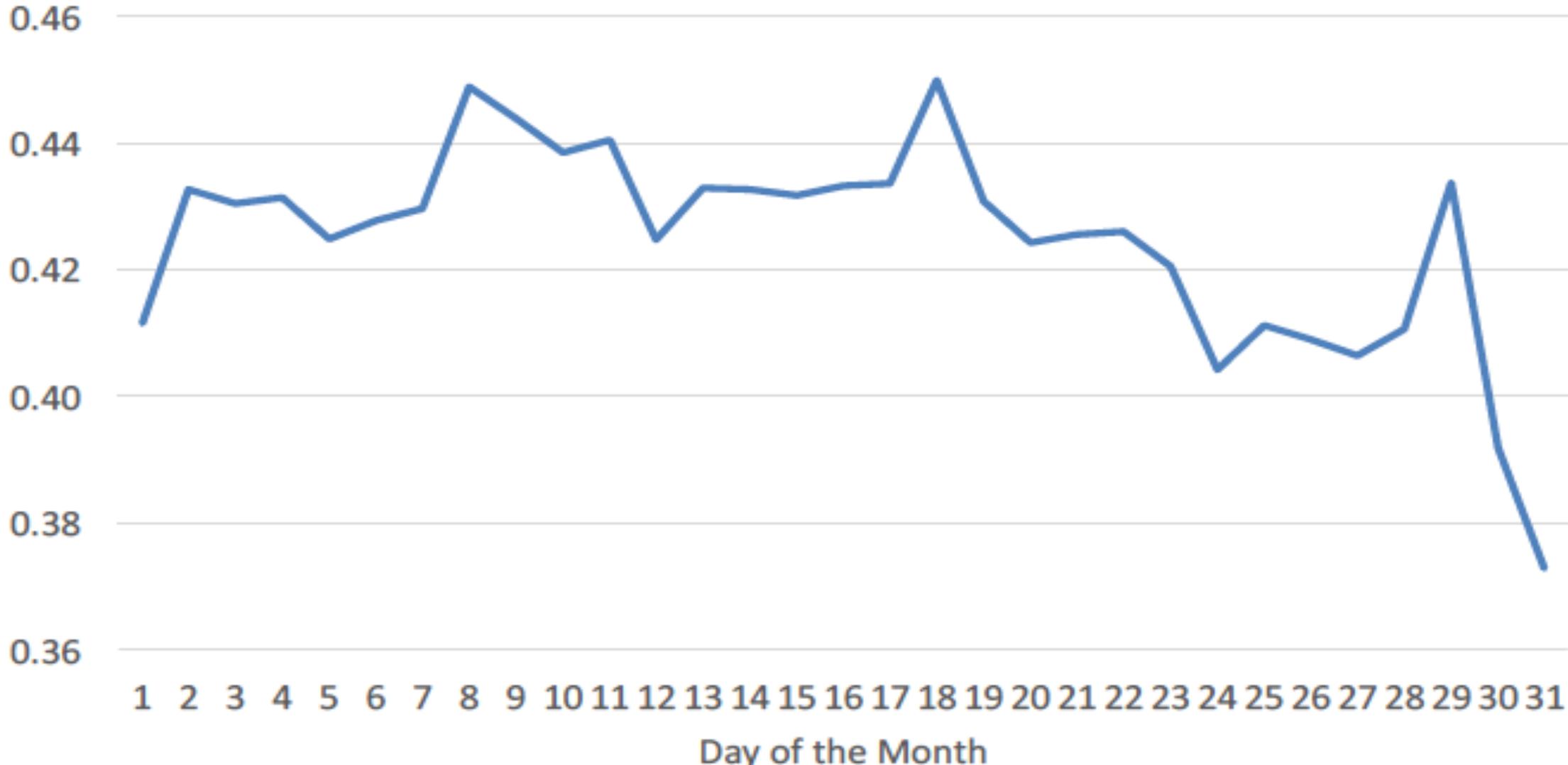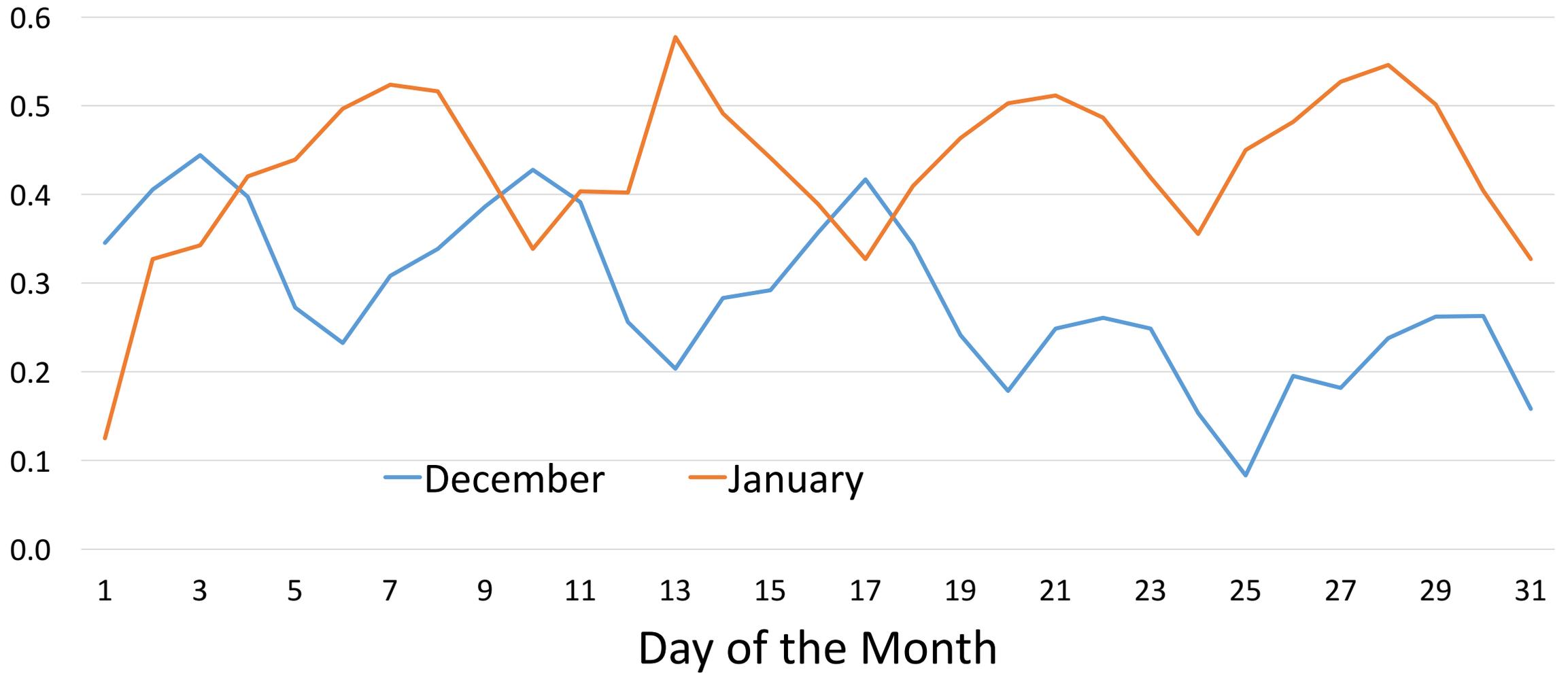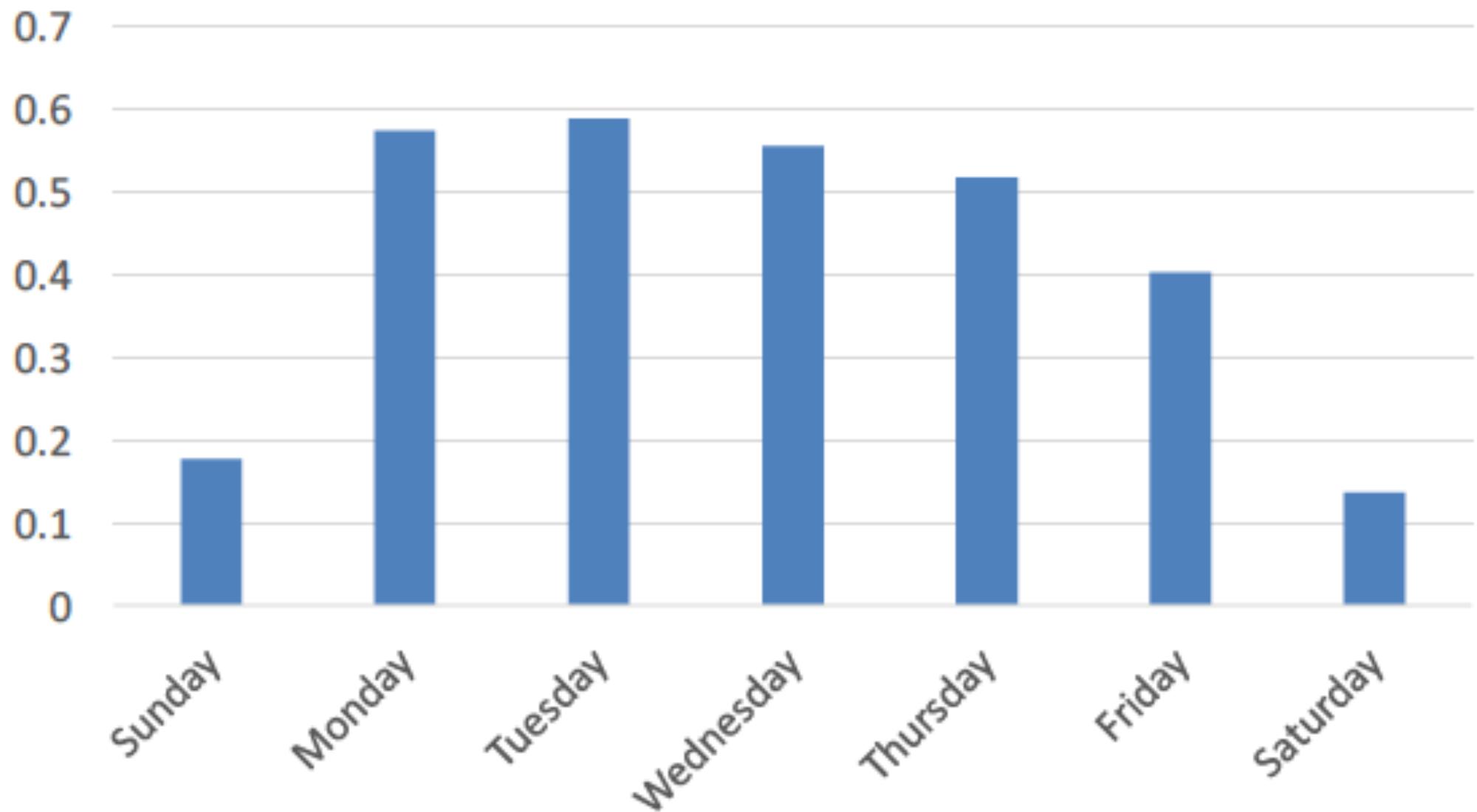
Daily Applications per Vacancy by Day of the Month

Figure 8. Average Daily Applications Per Vacancy by Day of the Week, January 2012 to October 2016

Extra Slides

Table 4. Summary Statistics for Frequently Posted Job Titles in the DHI Database

January 2012 to November 2016

(1) Minimum Posting Frequency	(2) Number of Job Titles	(3) Share of Job IDs	(4) Share of Vacancy IDs	(5) Share of Applications
250 Job IDs	1,580	66.6%	66.3%	73.6%
100 Job IDs	3,680	70.7%	70.2%	76.9%
50 Job IDs	7,122	73.8%	73.1%	76.9%

Figure 3. Mean Applications per Vacancy by Employer Size

Panel A. Direct Hire, All Standard Postings, Equal Weights
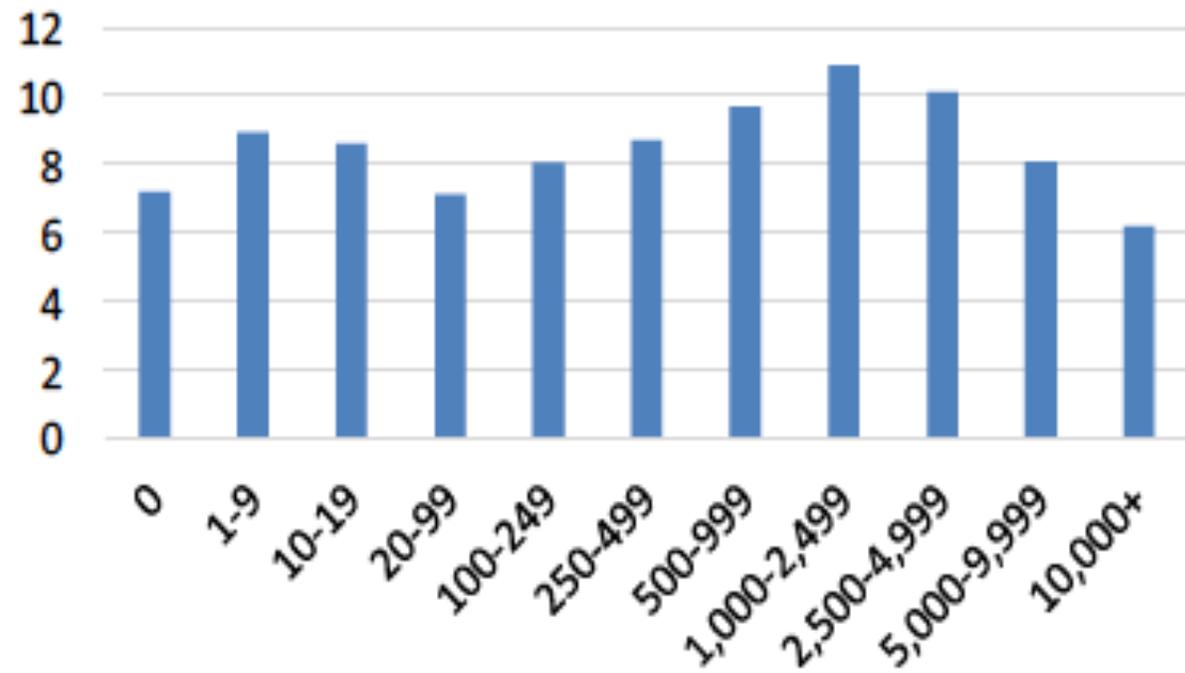
Panel B. Direct Hire, All Standard Postings, Weighted by Application Flows
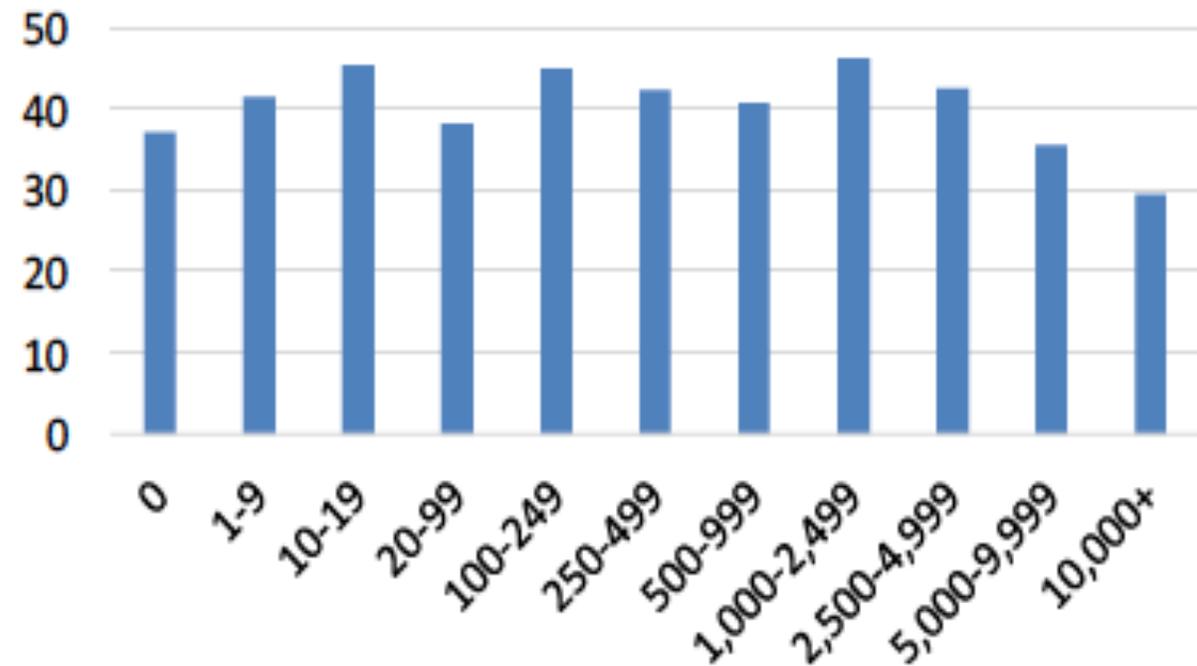
More on Posting Durations

- Spell durations tend to rise with application numbers, a surprise to us.

- We expected employers to extend posting durations in response to low applicant numbers.

  - Mechanically, of course, longer spells mean more time for application arrivals.
  - We have tried, thus far without success, to uncover evidence that employers react to low applicant numbers by lengthening posting durations. More to do here.