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Abstract

Summer Youth Employment Programs have been shown to have significant impacts on youth outcomes such as reducing violent crime, increasing high school graduation, and boosting employment and wages. Much of this research is based on lotteries from oversubscribed programs. But what happens when jobs cannot be allocated using simple random assignment due to heterogeneous preferences of employers and youth participants? During the summer 2022, we obtained data snapshots from the hiring platform used by the City of Boston to match youth to summer jobs. Using this novel data set, we explore both youth application and employer selection behavior to better understand youth labor market dynamics and document how the job matching process unfolds within a workforce development program. We find that one-third of youth fail to complete the application process, suggesting significant barriers to accessing the program. Among youth completing at least one valid job application, there was a high degree of mismatch between the distribution of applicants versus openings, leaving upwards of 25 percent (830) of positions unfilled as of 2021. Finally, employers were nearly twice as likely to select white youth relative to the percentage of whites in the overall pool of applicants and significantly less likely to select Black and Hispanic applicants. This racial disparity persisted even when controlling for other demographics, number and timing of applications submitted, and previous participation in the program. Implementing a job matching algorithm that was stratified by race improved both the equity and efficiency of the program. Our findings demonstrate that despite having stated goals of reducing inequality, workforce development programs that face heterogeneity on both sides of the job matching process are likely to result in job placements that perpetuate inequities found in the broader labor market.

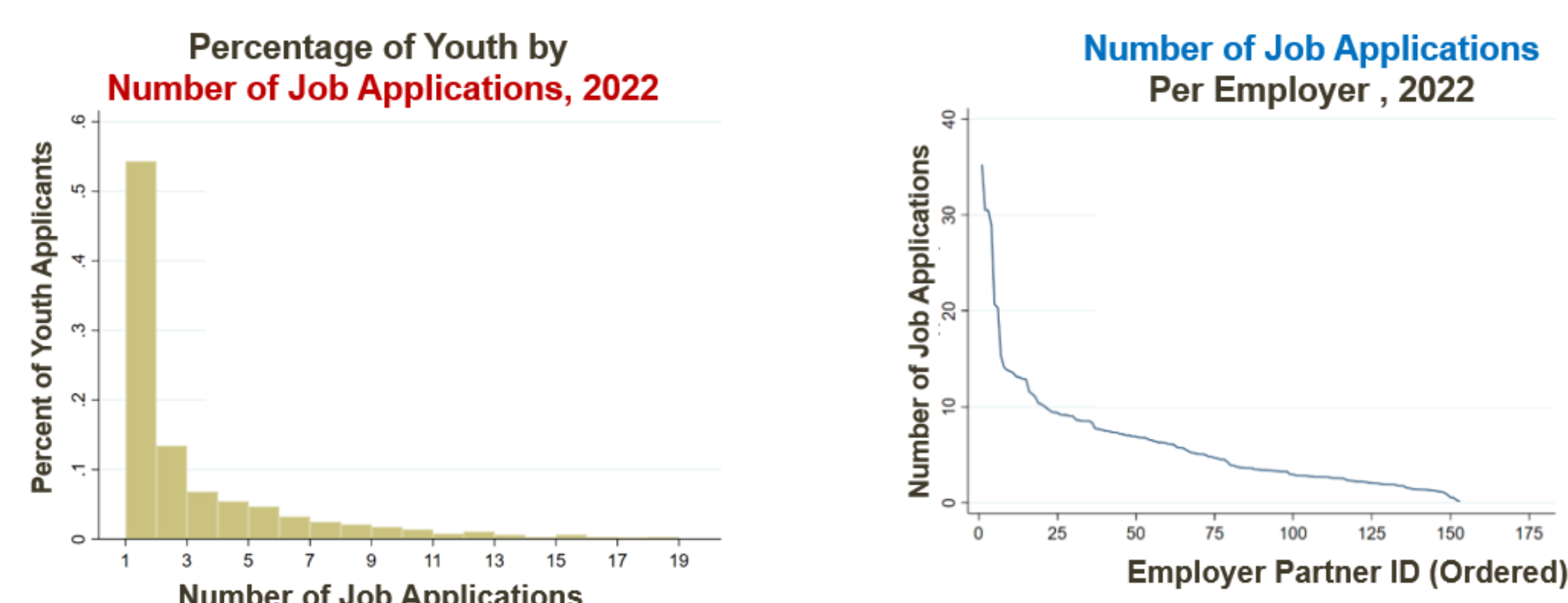
Background and Motivation

The **Boston Summer Youth Employment Program (SYEP)** supports up to 10,000 youth in jobs at nearly 1,000 local employers every summer with the goal of improving equity by providing access to early employment experiences. Participants may be placed in a job with a city, non-profit or a private sector employer, are paid the minimum wage, and work a maximum of 25 hours per week for a six-week period from July to mid-August.

Prior research based on lottery designs in Boston, Chicago, and New York City demonstrates SYEPs improve a range of behavioral, academic, and economic youth outcomes. Yet most cities do not assign youth to jobs by lottery due to **substantial heterogeneity and viable outside options** on both sides of the youth labor market. This creates a complex matching problem that reduces both efficiency and equity:

- **Efficiency:** More than half (53 percent) of all youth apply to only one job, and many apply to the same job, creating a severe mismatch leaving hundreds of youth unemployed and jobs unfilled in a given summer.

Figure 1. Mismatch between Distribution of Job Applications per Youth versus Employer, Summer 2022.



Source: Authors' calculations based on data from the City of Boston's Office of Youth Employment and Opportunity

- **Equity:** After abandoning random assignment in 2017, employers were more likely to select White youth and less likely to select Black and Hispanic youth relative to their representation in the application pool.

Table 1. Difference in the Racial and Ethnic Distribution of Youth Applicants versus Hires for Boston SYEP Jobs.

	Percentage Point Difference: Share of hiring pool minus share of applicant pool				
	2017	2018	2019	2020	2021
White (Not Hispanic or Latino)	5.47	4.01	3.75	2.56	5.50
Asian (Not Hispanic or Latino)	-1.51	-1.77	-0.61	1.99	0.20
Black or African American (Not Hispanic or Latino)	0.15	1.40	-0.85	-1.77	-2.01
Hispanic or Latino	-3.53	-3.26	-1.71	-2.46	-4.56
Two or More Races (Not Hispanic or Latino)	0.13	-0.06	-0.27	0.00	0.04

Source: Authors' calculations based on data from the City of Boston's Office of Youth Employment and Opportunity

Data and Methods

We use **snapshots of recruiting reports** provided from the City of Boston's online job matching portal during the summer of 2022. This includes information from each youth's application profile (basic demographics, prior program participation, resume and work statement) as well as each job that the youth applied for, the status of each application, and timestamps documenting the submission, selection, onboarding, and hiring process.

We explore **three design challenges** facing workforce development programs, and SYEPs in particular, that can create inefficiencies and inequities in the **job matching process**:

1. **Youth application behavior:** How can programs create a "think" labor market? How many jobs do youth typically apply to? Are youth applications skewed towards certain jobs? How does application behavior differ by age, gender, race, ethnicity, and school type?
2. **Employer selection behavior:** How can programs limit disproportionate selections? Which youth characteristics appear to drive employer selections? Can these disparities be explained by differences in youth application behaviors across groups?
3. **Hiring over multiple waves:** How can programs back-fill positions equitably and efficiently? What are the characteristics of youth who apply to the program "late"? What are the characteristics of youth who fail to complete the hiring process?

We implement a simple **job matching algorithm** in real-time to address these inefficiencies and inequities and compare the assignments to those of the Ford-Fulkerson algorithm to evaluate the maximum number of "matches" between youths and job slots.

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Key Findings

Since abandoning the lottery system, the selection and hiring process across became inefficient and inequitable, serving to slow down or even derail the hiring process for certain groups of youth.

1. **Youth application behavior:** Black, Hispanic, Asian and female applicants are more likely to apply to multiple jobs than white males, despite controlling for our rich set of applicant characteristics as well as timing and competitiveness of jobs applied to, quality of work question response, and resume submission.
2. **Employer selection behavior:** Black, Hispanic and Asian youth were significantly less likely to be selected by an employer compared to white youth even when controlling for applicant characteristics and behaviors.
3. **Hiring over multiple waves:** Upwards of 25% of youth who are selected for a job do not make it through the hiring process even after the program has started. Black and Hispanic youth were less likely to complete the hiring process, suggesting that documentation requirements may present a greater barrier to youth of color.

Table 2. Relationship between Youth Characteristics and Likelihood of being Selected by an Employer

	(1)	(2)	(3)	(4)	(5)	(6)
Age	0.02*** (4.58)	0.01*** (3.89)	0.00 (1.26)	0.01** (2.15)	0.01** (2.07)	0.01** (2.13)
African American	-0.16*** (-7.20)	-0.15*** (-6.21)	-0.14*** (-5.85)	-0.13*** (-5.67)	-0.12*** (-5.15)	-0.11*** (-4.23)
Hispanic or Latino	-0.19*** (-6.95)	-0.18*** (-6.35)	-0.16*** (-5.81)	-0.14*** (-5.39)	-0.13*** (-4.77)	-0.12*** (-4.18)
Asian	-0.16*** (-4.73)	-0.18*** (-5.19)	-0.17*** (-5.05)	-0.16*** (-4.85)	-0.16*** (-5.05)	-0.19*** (-5.46)
Other Race	-0.07** (-2.32)	-0.06* (-1.77)	-0.10*** (-3.09)	-0.10*** (-3.28)	-0.09*** (-3.12)	-0.08*** (-2.69)
Female	-0.00 (-0.10)	-0.00 (-0.12)	-0.01 (-0.82)	-0.01 (-0.56)	-0.01 (-0.73)	-0.01 (-0.94)
Fluent in Another Language	-0.02 (-0.96)	0.00 (0.03)	-0.01 (-0.27)	-0.01 (-0.59)	-0.01 (-0.55)	-0.01 (-0.51)
First Language English	-0.05** (-2.15)	-0.01 (-0.48)	-0.01 (-0.63)	-0.02 (-1.13)	-0.03 (-1.17)	-0.02 (-0.95)
R ²	0.110	0.119	0.151	0.221	0.227	0.245
Observations	3762	3762	3762	3762	3762	3762
Date of earliest application	X					
School characteristics	X	X				
Prior participation	X	X	X			
Number of applications per opening	X	X	X	X		
Resume and work question	X	X	X	X	X	
Zip code	X	X	X	X	X	X

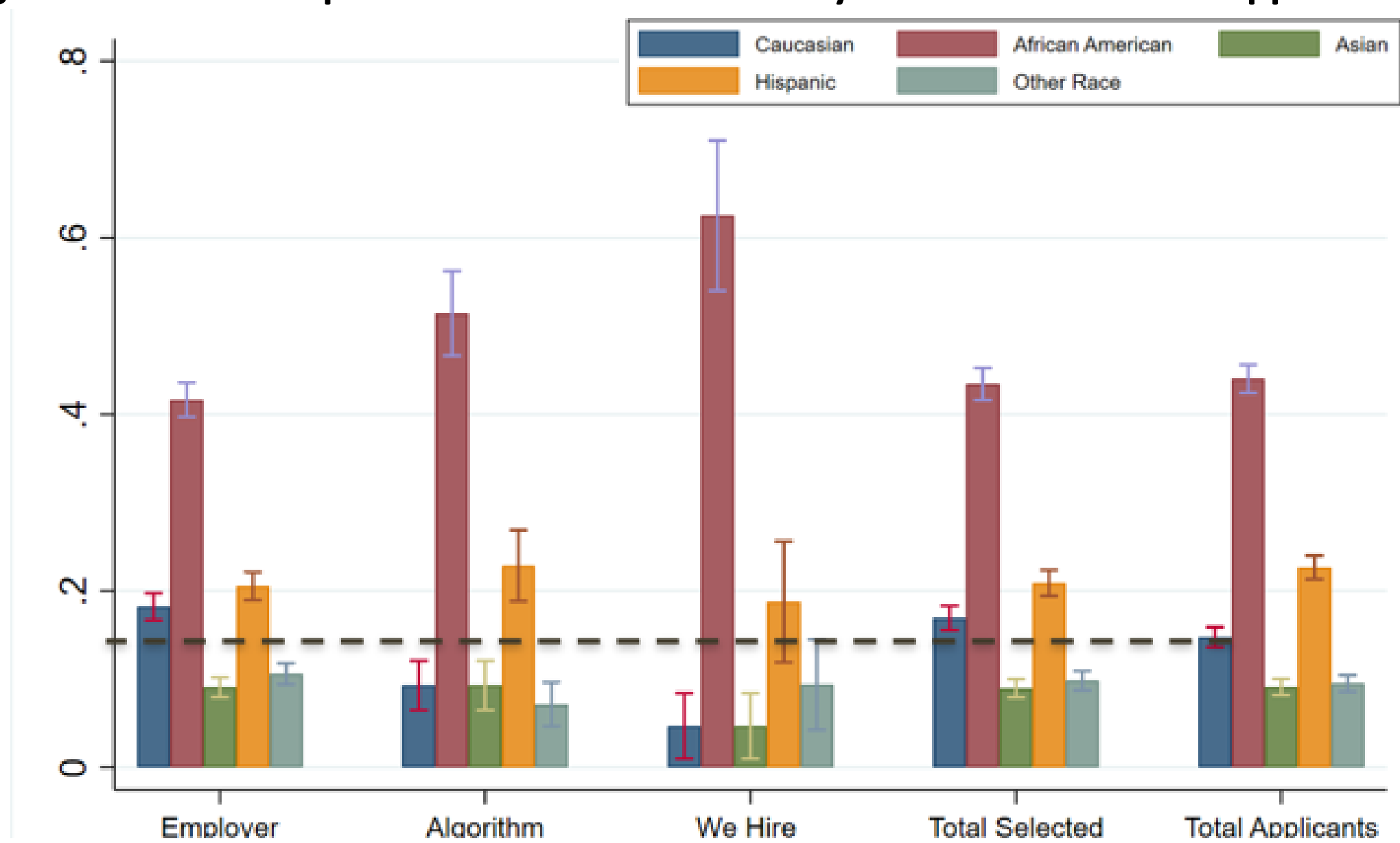
Source: Authors' calculations based on data from the Boston Office of Youth Employment and Opportunity.

Note: The sample includes youth who submitted at least one complete and valid job application prior to the employer selection deadline. The dependent variable is equal to one if the youth was selected for employment by at least one employer and is equal to zero otherwise. Standard errors are reported in parentheses. Statistical significance is indicated at the following levels: * p<0.1, ** p<0.05, *** p<0.01.

Discussion

The automated allocations produced by our simple **job matching algorithm** were **10 percentage points more likely to select Black and Hispanic youth**, large enough to nudge the racial composition of total selections towards a more equitable distribution that was more representative of the applicant pool. The youth selected by the algorithm were also more likely to have applied later in the hiring cycle and to have applied to more competitive jobs, which perhaps had put them at a disadvantage compared to earlier applicants and those who had applied earlier or to under-subscribed jobs. However, the youth selected by the algorithm were also more likely to have uploaded a longer resume and completed the "Why Work" question—actions that would typically get an applicant noticed by an employer—which again makes the racial gaps among the employer selections more eye-opening. Finally, we retroactively applied the Ford-Fulkerson algorithm and found that our simple job matching pilot was slightly more efficient while also producing greater equity across racial groups.

Figure 1. Racial Composition of Youth Selected by Source versus Total Applicant Pool



Source: Authors' calculations based on data from the City of Boston's Office of Youth Employment and Opportunity

Conclusions

Our results indicate that despite having honorable goals of reducing inequality, workforce development programs that face heterogeneity on both sides of the job matching process can result in job placements that perpetuate the inequities found in the labor market.

- Programs need to **actively create a thick market** since youth apply to few jobs and many of the same jobs and barriers to the application process necessitates hiring over multiple waves.
- However, without some **guardrails for employers**, programs will replicate bias found in the labor market such that cities can be more intentional about matching to maximize both employer and youth participation.
- In the absence of a simple random selection mechanism, **instituting some kind of 50-50 rule** with half of the program slots filled by employer selection and the remaining half filled by a lottery run by the City could be a feasible solution to improve both equity and efficiency.

References

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