Spillover Effects of the Gig Economy
How Uber Drives Employment & Earnings

Becca Daniels
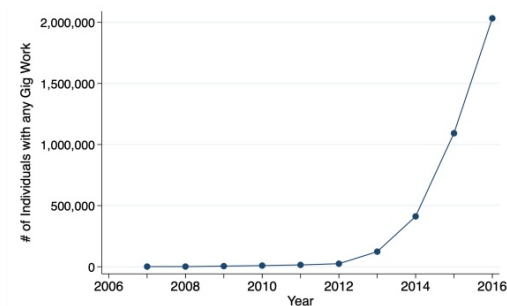
Sanford School of Public Policy

Duke University

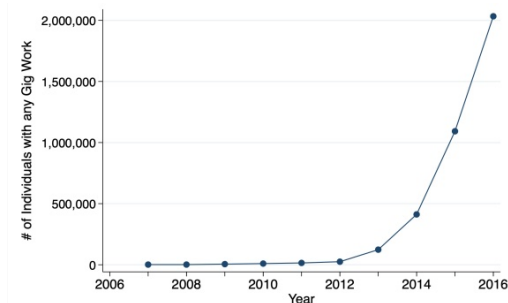December 14, 2022

A growing, yet small industry

Gig economy: firms that link workers to customers via online platforms

(Jackson 2020)

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Pallais 2017; Chen et al. 2019; Garin et al.
2020; Koustas 2018; Farrell, Greig, and
Hamoudi 2019; Jackson 2020)
– Media (Henderson 2020; Allsup,
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– Business community (Manyika
et al. 2016; Bayles 2019)

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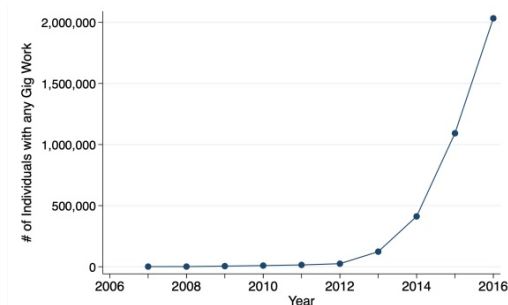(Jackson 2020)

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– Media (Henderson 2020; Allsup,
Mulvaney, and Cutler 2022)

– Business community (Manyika
et al. 2016; Bayles 2019)

– 1.6% of workforce participate in the gig work in a given year (Farrell, Greig, and
Hamoudi 2019)

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– Gig economy provides services that compete and complement existing industries

– Gig jobs are a unique outside option that could influence labor market outcomes for workers outside the gig economy

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Does the presence of gig work influence earnings and employment of workers in industries outside the gig economy?

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– **Identification strategy:** Exploit the staggered rollout of Uber across the U.S. to estimate the effect of the arrival of the gig economy on employment and earnings by industry.

In this paper...

Does the presence of gig work influence earnings and employment of workers in industries outside the gig economy?

- **Industries examined:**
    - Taxi industry
    - All industries
    - Potential mechanisms:
        - Product demand: bars & restaurants
        - Falsification: manufacturing, utilities, wholesale trade
    - Uber as outside option:
        - Concurrent v. nonconcurrent industries
        - Concurrent industries: retail, health care and social services, educational services, and professional, technical, and scientific services

Results: Uber $\rightarrow$ - effects in taxi industry, + on other industries

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  - Greater employment in the manufacturing, utilities, and wholesale trade industry suggest alternative mechanisms.

– Unable to determine if labor supply contributes to greater employment following Uber entry.

Findings build on growing literature and can inform gig work regulations

Existing evidence of the effects of the gig economy

- Focuses on gig worker outcomes (Mas and Pallais 2017; Chen et al. 2019, Garin et al. 2020; Koustas 2018; Farrell, Greig, and Hamoudi 2019; Jackson 2020)

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Informing policy
- Gig economy affects many workers beyond the 1.6% participating
- Massachusetts ballot question

Roadmap

1. Data and methods
2. Baseline estimates
3. Potential mechanisms
4. Robustness checks
5. Policy implications
6. Research agenda

Quarterly Workforce Indicators Series (QWI)

The QWI matches employers & employees to track earnings, hiring, and separations at the job level

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  - 20 2-digit NAICS sector
  - NAICS industry groups: "Taxi and limo services"; "Food services and drinking places"

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$\rightarrow$ Observations are at the CBSA-industry-education-quarter level

Outcomes of interest

	Full Sample
Employment	3,603
	(10,777)
Observations	1,248,351
Hires	504
	(1,567)
Observations	1,205,700
Separations	263
	(759)
Observations	1,181,107
Avg Monthly Earnings	3,610
	(4,619)
Observations	1,252,068

Source: Quarterly Workforce Indicator Series, 2008-2019.

Notes: Mean outcomes across industry, CBSA, and year-quarter.

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Provides measure of job churn

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Setting: UberX Entry

Following prior work*, I use the arrival of UberX to a CBSA to indicate the start of the gig economy.

- – UberX rollout determined by size of city.
  - Data matched to QWI for 338 CBSAs
- – Earliest entry was in New York City in August 2012.
- – Latest entry was in Sioux Falls, ND in June 2019.

*Prior research on public transit use (Hall, Palsson, and Price 2018), drunk driving (Greenwood and Wattal 2017), alcohol

consumption (Teltser, Lennon, and Burgdorf 2021), entrepreneurial activity (Burtch, Carnahan, and Greenwood 2018), and

economic activity (Gorback 2020)

UberX entry predicted by population, rather than outcomes of interest

– Regressing CBSA characteristics on timing of Uber entry, I find population to be the greatest determinant of entry timing.

– Average age, education, and income levels are also significant predictors of entry.

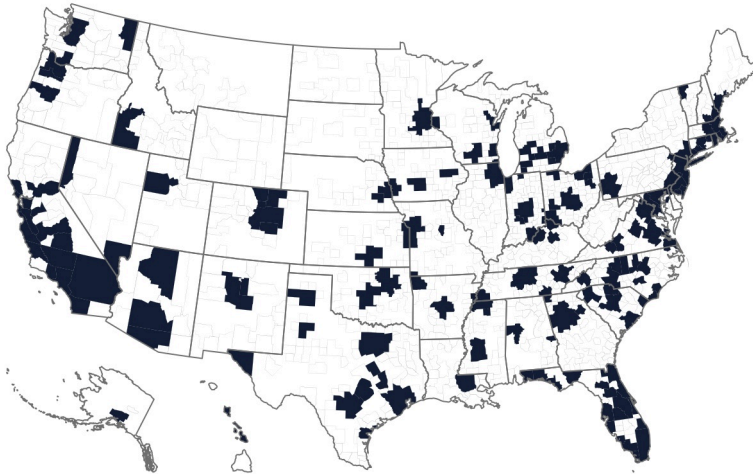– No outcomes of interest predict timing of entry.

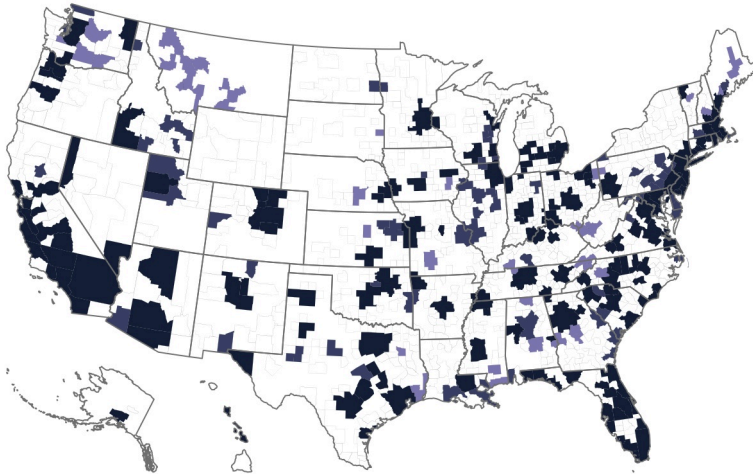Full regression results

UberX Entry

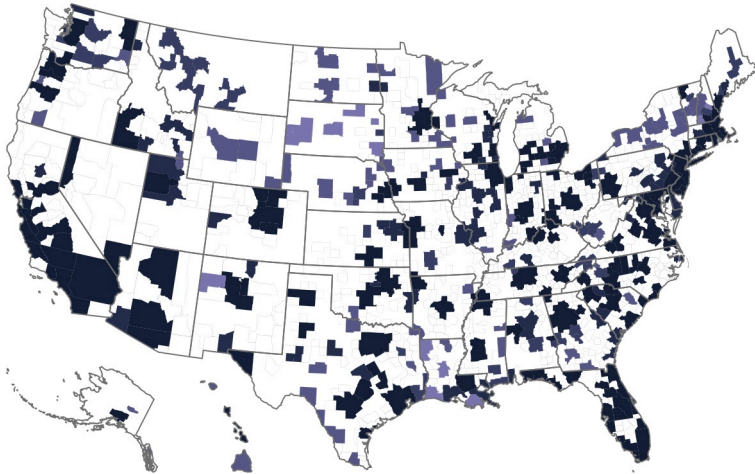UberX availability, 2013
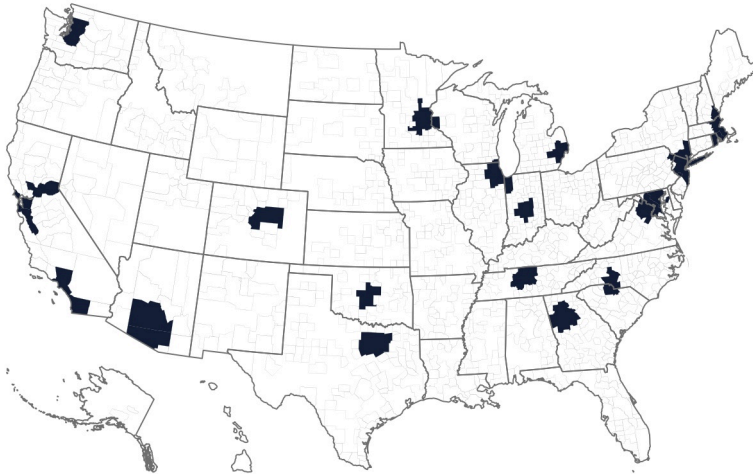
UberX Entry

UberX availability, 2014

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– Following Callaway and Sant'Anna (2020), I estimate average treatment effect (ATT) of Uber on outcomes by quarter of Uber entry.

Identification Strategy: How do I isolate the effect of Uber?

– Staggered roll-out lends itself to difference in difference identification strategy.

– Two way fixed effects model is subject to bias.

– Following Callaway and Sant'Anna (2020), I estimate average treatment effect (ATT) of Uber on outcomes by quarter of Uber entry.
  - E.g. group 3 = San Diego, Boston, Chicago, Seattle, & Atlanta
  - UberX entered all CBSAs in group 3 in Q2 of 2013

Empirical Model

For each group, I estimate

$$Y_{i,g,t} = \alpha_i + \gamma_t + \beta_{g,t} Uber_{g,t} + \epsilon_{i,g,t}$$

- $Y_{i,g,t}$ is log outcome for CBSA-industry-education level, i, at year-quarter t.

- $Uber_{g,t}$ is an indicator of UberX's entry in year-quarter t.

- α_i are CBSA, industry, education level group fixed effects.

- γ_t are time fixed effects.

- $\epsilon_{i,g,t}$ is the error term.

Empirical Model

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$$Y_{i,g,t} = \alpha_i + \gamma_t + \beta_{g,t} Uber_{g,t} + \epsilon_{i,g,t}$$

Coefficient of interest: $\beta_{g,t}$

- Difference in Y between groups treated by year-quarter t, $(g \leq t)$, and those untreated at year-quarter t, $(g > t)$.
- I aggregate $\beta_{g,t}$ by group to estimate ATT and by time relative to Uber entry for event studies.

★ Estimates are weighted by 2008q1 employment levels

DiD Assumptions

Key assumption for casual inference:

– Parallel trends

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– Additional assumptions

- Irreversibly of treatment
- Limited anticipation

Does the presence of gig work influence earnings and employment of formal workers?

1. **Validation check: taxis**
2. All industries
3. Potential mechanisms
    a. Product demand test:
        - Bars and restaurants
        - Falsification test
    b. Outside option channel:
        - Concurrent industries
        - Nonconcurrent industries

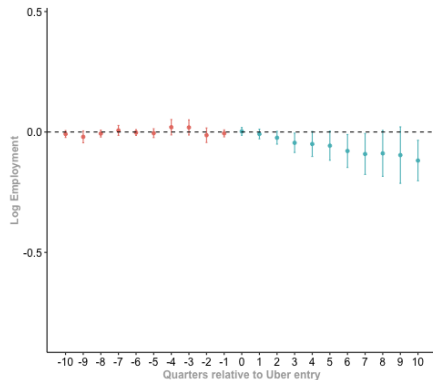# Employment in the taxi industry declines following Uber entry

Group-time ATT of Uber Entry

	Log total employment
Uber	-0.0865 **
	(0.0438)
Observations	25,056
CBSA*ed. level	522

Source: Uber Entry Data; Quarterly Workforce Indicator
Series, 2008-2019.
Notes: ***p<0.01, **p<0.05, *p<0; Standard errors
clustered by CBSA in parentheses.

Employment by Length of Exposure

Taxi hires decline a year after Uber entry

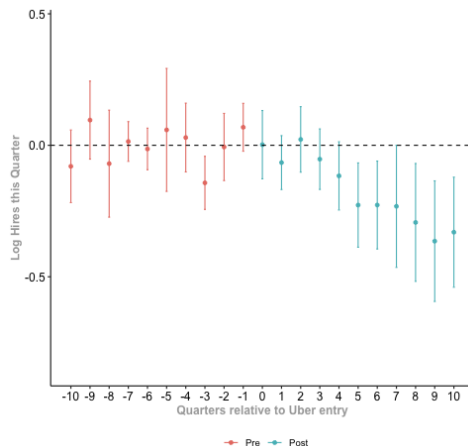## Group-time ATT of Uber Entry

	Log hires
Uber	-0.1365 ***
	(0.0506)
Observations	10,560
CBSA*ed. level	220

Source: Uber Entry Data; Quarterly Workforce
Indicator Series, 2008-2019.
Notes: ***p<0.01, **p<0.05, *p<0; Standard
errors clustered by CBSA in parentheses.

Hires by Length of Exposure

Declining separations following Uber entry

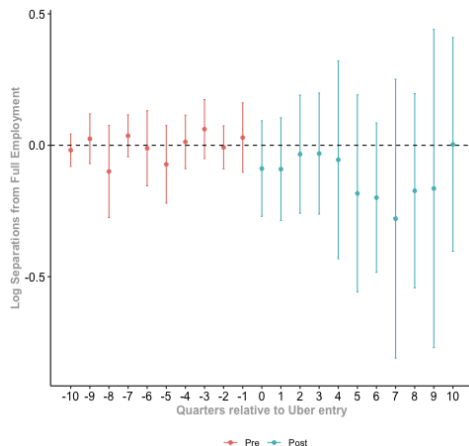Group-time ATT of Uber Entry

	Log separations
Uber	-0.1255
	(0.0771)
Observations	6,864
CBSA*ed. level	143

Source: Uber Entry Data; Quarterly Workforce Indicator

Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors

clustered by CBSA in parentheses.

Separations by Length of Exposure
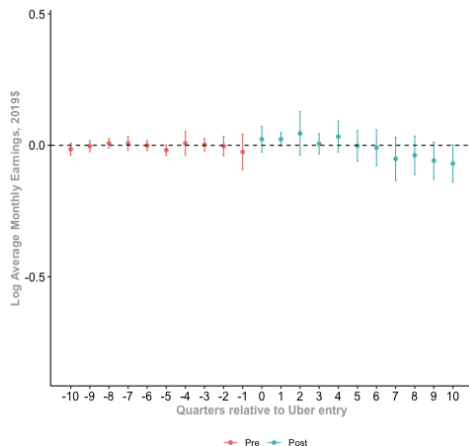
No effect detected on earnings in taxi industry

Group-time ATT of Uber Entry

	Log earnings
Uber	-0.0242
	(0.0219)
Observations	34,512
CBSA*ed. level	719

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Earnings by Length of Exposure

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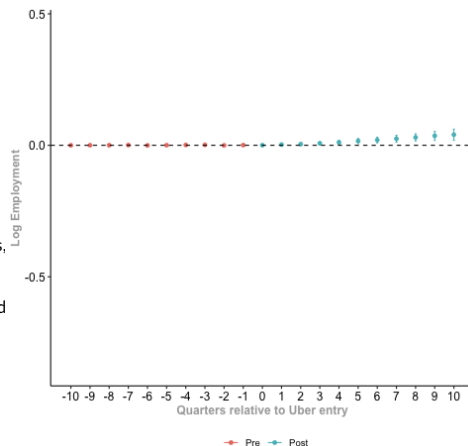
Employment increases across all industries

Group-time ATT of Uber Entry

	Log total employment
Uber	0.0552 ***
	(0.0209)
Observations	1,180,560
CBSA*industry*ed.	24,595

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Employment by Length of Exposure

Hires continue to rise over time across all industries

Group-time ATT of Uber Entry

	Log hires
Uber	0.0628 ***
	(0.0196)
Observations	1,055,184
CBSA*industry*ed. level	21,983

Source: Uber Entry Data; Quarterly Workforce Indicator
Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors
clustered by CBSA in parentheses.

Hires by Length of Exposure
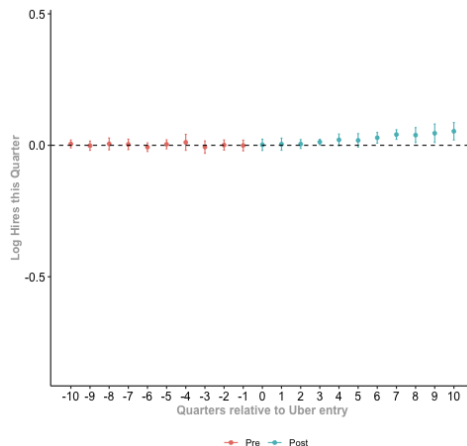
Similar rise in separations across all industries

Group-time ATT of Uber Entry

	Log separations
Uber	0.0624 ***
	(0.0177)
Observations	1,000,080
CBSA*industry*ed. level	20,835

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Separations by Length of Exposure
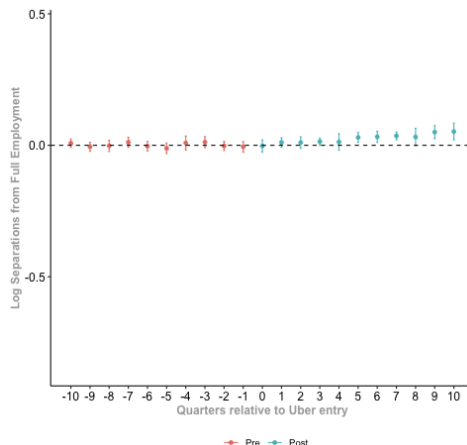
Treatment Effects of Uber Entry in All Industries

– 5.5% increase in employment translates to over 4.8 million additional jobs across the U.S.

  → Compared to 12 million additional jobs over study period (2008-2019)

– 6.2% increases in separations and hires translates to, nearly 690,000 more hires and 340,000 more separations

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Employment in bars & rest. increases with Uber

Group-time ATT of Uber Entry

	Log total employment
Uber	0.0155
	(0.0132)
Observations	189,312
CBSA*industry*ed.	3,944

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Employment by Length of Exposure
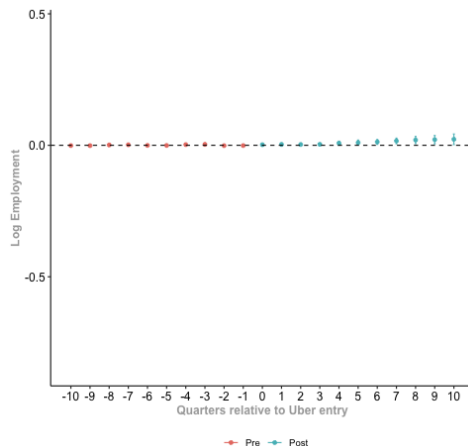
Hires continue to increase with Uber's presence

Group-time ATT of Uber Entry

	Log hires
Uber	0.0404 *
	(0.0221)
Observations	150,144
CBSA*industry*ed. level	3,128

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Hires by Length of Exposure
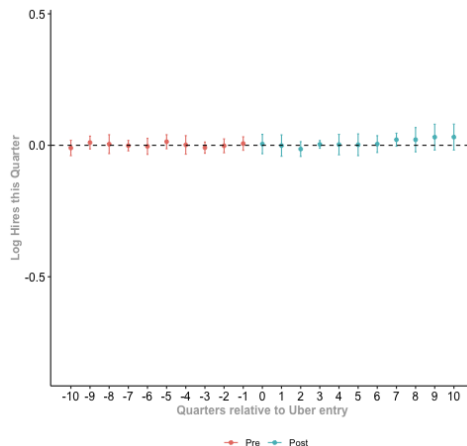
Bars & restaurant workers face greater separations

Group-time ATT of Uber Entry

	Log separations
Uber	0.0421 ***
	(0.0147)
Observations	129,792
CBSA*industry*ed. level	2,704

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Separations by Length of Exposure
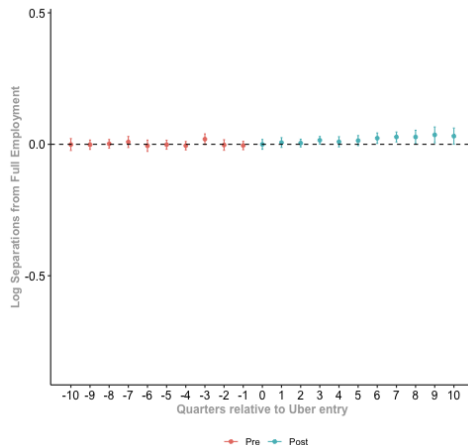
Monthly earnings increase in bars & rest. following Uber

Group-time ATT of Uber Entry

	Log earnings
Uber	0.0174 **
	(0.0074)
Observations	191,088
CBSA*industry*ed. level	3,981

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

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Earnings by Length of Exposure
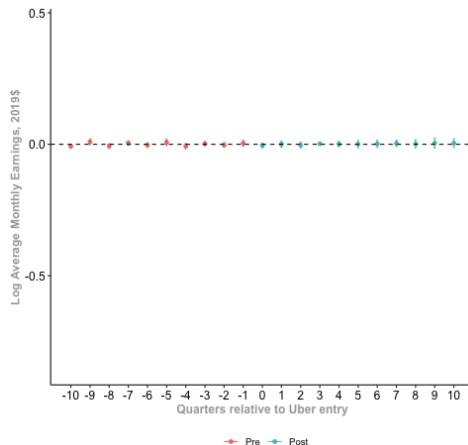
Is demand for goods and services sole driver of changes?

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- What about unrelated industries?

Is demand for goods and services sole driver of changes?

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– Unable to parse out every source of product demand driven by
   Uber entry

– What about unrelated industries?
   - Manufacturing
   - Utilities
   - Wholesale trade

Nontrivial changes to employment & earnings among unrelated industries

– Large, positive effects on hires and separations in the manufacturing industry.

– 4 percent increase in monthly earnings following arrival of Uber in the utilities industry.

– 3.3 percent increase in employment and increases in separations and hires among workers in the wholesale trade industry after Uber entry.

Does the presence of gig work influence earnings and employment of formal workers?

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2. All industries   → 5.5% increase employment
3. **Potential mechanisms**
    a. Product demand test:
        - Bars and restaurants   → Increased job churn & earnings
        - Falsification test   → **Greater employment, job churn, & earnings**
    b. Outside option channel:
        - Concurrent industries
        - Nonconcurrent industries

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Labor response to new outside option

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– Better outside options associated with higher wages (Caldwell and Danieli

   2021; Schubert, Stansbury, and Taska 2022; Beaudry, Green, and Sand 2012)

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$\rightarrow$ **Identify concurrent industries** (Survey of Household and Economic Data, 2016-2019)

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$\rightarrow$ **Identify concurrent industries** (Survey of Household and Economic Data, 2016-2019)
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        - Concurrent industries   ←
        - Nonconcurrent industries

Employment increases in concurrent industries after Uber

Group-time ATT of Uber Entry

	Log total employment
Uber	0.0407 ***
	(0.0089)
Observations	280,368
CBSA*industry*ed.	5,841

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses. Industries included: retail, health care and social services, educational

Employment by Length of Exposure
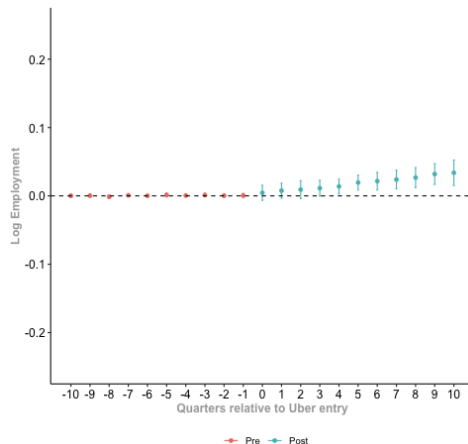
After Uber entry, hires increase in concurrent industries

Group-time ATT of Uber Entry

	Log hires
Uber	0.0396***
	(0.0148)
Observations	274,608
CBSA*industry*ed.	5,721

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses. Industries included: retail, health care and social services, educational services, and professional, technical, and scientific services.

Hires by Length of Exposure
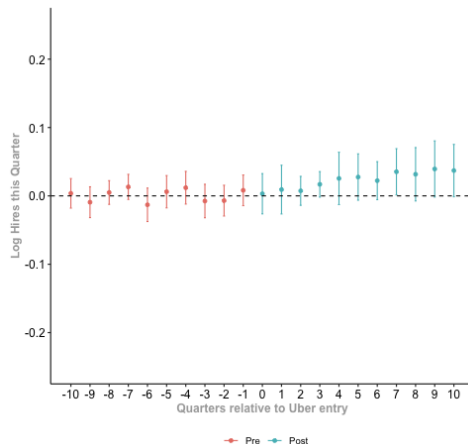
Separations increase similarly in concurrent industries

Group-time ATT of Uber Entry

	Log separations
Uber	0.0414 ***
	(0.0124)
Observations	265,536
CBSA*industry*ed. level	5,532

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses. Industries included: retail, health care and social services, educational services, and professional, technical, and scientific services.

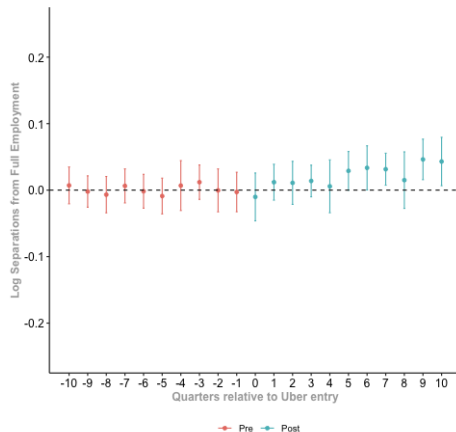Separations by Length of Exposure

Earnings in concurrent industries

Does the presence of gig work influence earnings and employment of formal workers?

1. Validation check: taxis   ✓ ↓ employment
2. All industries   → 5.5% increase employment
3. Potential mechanisms
   a. Product demand test:
      - Bars and restaurants   → Increased job churn & earnings
      - Falsification test   → Greater employment, job churn, & earnings
   b. **Outside option channel:**
      - Concurrent industries   **→ 4% increase in employment, hires, & separations**
      - Nonconcurrent industries

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      - Nonconcurrent industries   ←

Greater rise in employment in nonconcurrent industries

Employment by Length of Exposure

Group-time ATT of Uber Entry

	Log total employment
Uber	0.0784 *
	(0.0412)
Observations	947,184
CBSA*industry*ed.	19,733

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.
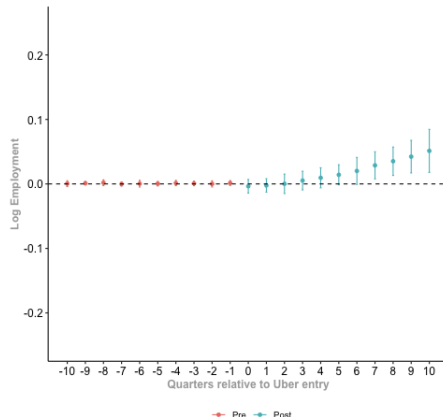
Hires increase in nonconcurrent industries follow Uber entry

Group-time ATT of Uber Entry

	Log hires
Uber	0.0911 ***
	(0.0275)
Observations	776,592
CBSA*industry*ed. level	16,179

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Hires by Length of Exposure
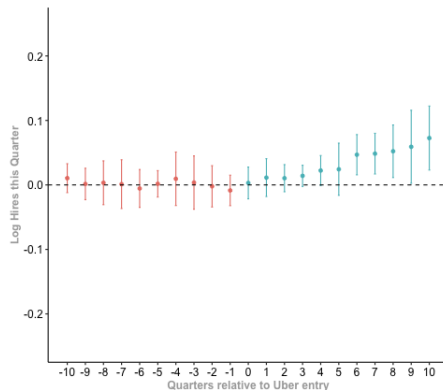
Greater separations in nonconcurrent industries

Group-time ATT of Uber Entry	
	Log separations
Uber	0.0887 ***
	(0.0326)
Observations	710,448
CBSA*industry*ed. level	14,801

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Separations by Length of Exposure

Earnings in Nonconcurrent Industries
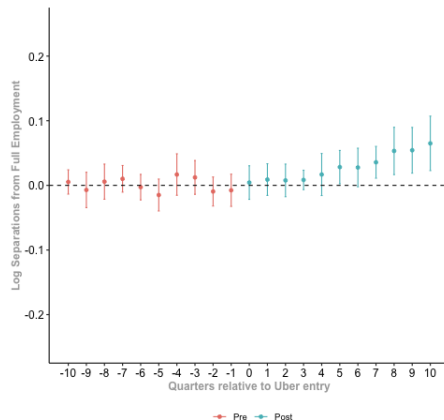
Robustness Checks

– Results consistent when accounting for anticipation   `Anticipation Results`

– Alternative data source: American Community Survey   `ACS Results`

– Multiple hypothesis testing
  - Findings on all industries robust to multiple hypothesis adjustments

Summary of Findings

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– Declines in employment in taxi industry consistent with hypotheses

– 5.5% increase in employment across all industries following Uber entry

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– Current analysis fails to determine if labor supply contributes to changes to employment following Uber entry

– Subgroup analyses provide little explanatory value Full results

Next Steps

- Alternative specifications to isolate likely gig workers

- Measures of job churn and wage posting: Glassdoor job board data

Gig work influences workers beyond the 1.9% engaged

While employment increases by over 4,873,500 jobs, on average, across the U.S. following the arrival of Uber, less than 93,000 workers engage in the gig economy per year

- – The arrival of Uber spurred greater employment and job churn

- – The changing landscape of work is broader than currently estimated

- – Policies formalizing gig work - Massachusetts ballot question

Research Agenda

Exploring how informal jobs and precarious work impact families and children

   – Evaluation of Fair Workweek Standard in Philadelphia

   – Relationship between labor policy and participation in informal labor

Thank you!

CONTACT ME

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Group-time Treatment Effects of Uber with Anticipation

Sample = All industries

	Log total employment		Log hires		Log separations		Log monthly earnings	
A. Anticipation = 1 quarter								
Uber	0.0584	***	0.0719	***	0.0577	***	0.0034	
	(0.0200)		(0.0194)		(0.0170)		(0.0055)	
Observations	1,367,952		1,187,088		1,107,696		1,192,800	
Industry*CBSA*education level	28,499		24,731		23,077		24,850	
B. Anticipation = 2 quarters								
Uber	0.0599	***	0.0716	***	0.0563	***	0.0099	*
	(0.0193)		(0.0194)		(0.0180)		(0.0059)	
Observations	1,367,952		1,187,088		1,107,696		1,192,800	
Industry*CBSA*ed. level	28,499		24,731		23,077		24,850	

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: This table presents aggregated group-time treatment effects by industry weighted by total industry employment in CBSA and education group in 2008. Earnings are in real 2019 dollars; standard errors clustered by CBSA in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Return

Findings from ACS

Group-time Treatment Effects of Uber Entry in All Industries

	Working		Worked last week		Log earned income	
A. All Industries						
Uber	0.017	***	0.015	***	0.183	***
	(0.004)		(0.005)		(0.040)	
Observations	2,304		2,304		2,304	
Industry*CBSA	192		192		192	

Source: Uber Entry Data; American Community Survey, 2008-2019.

Notes: This table presents aggregated group-time treatment effects by industry weighted by total industry employment in CBSA in 2008. Earned income is in real 2019 dollars; standard errors clustered by CBSA in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Back

Heterogeneous Group-time Treatment Effects of Uber Entry in All Industries

	Men		Women		<College education		College degree of more		Low public transit		High public transit	
A. Log total employment												
Uber	0.061	***	0.056	***	0.065	***	0.047	**	0.045	*	0.028	***
	(0.019)		(0.017)		(0.020)		(0.019)		(0.024)		(0.005)	
Observations	667,392		649,968		1,025,856		341,712		731,472		539,680	
Industry*CBSA*ed. level	13,904		13,541		21,372		7,119		15,239		13,492	
B. Log hires												
Uber	0.089	***	0.075	***	0.086	***	0.048	***	0.061	***	0.065	***
	(0.025)		(0.016)		(0.021)		(0.016)		(0.014)		(0.011)	
Observations	600,384		572,160		891,264		294,912		600,192		497,080	
Industry*CBSA*ed. level	12,508		11,920		18,568		6,144		12,504		12,427	
C. Log separations												
Uber	0.072	***	0.065	***	0.076	***	0.048	***	0.057	***	0.045	***
	(0.023)		(0.012)		(0.018)		(0.014)		(0.015)		(0.008)	
Observations	532,848		504,624		832,704		274,992		541,440		480,000	
Industry*CBSA*ed. level	11,101		10,513		17,348		5,729		11,280		12,000	
D. Log monthly earnings												
Uber	0.013		0.009	*	0.016	**	0.017	**	0.015	***	0.008	***
	(0.008)		(0.005)		(0.007)		(0.007)		(0.005)		(0.003)	
Observations	680,736		663,072		1,036,848		345,648		742,368		543,040	
Industry*CBSA*ed. level	14,182		13,814		21,601		7,201		15,466		13,576	

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019. Federal Transit Authority, 2008 Transit Operating Statistics.

Notes: This table presents aggregated group-time treatment effects weighted by total industry employment in CBSA and education group in 2008. Earnings are in real 2019 dollars; standard errors clustered by CBSA in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$ Back

Predicting UberX Entry

	(1) Date of Uber Entry	(2) Uber Entry (0/1)
LN population, 2010	-156.8***	0.00773
	(36.40)	(0.00692)
LN pop change 2000-2010	-60.58*	-0.00330
	(30.75)	(0.00307)
Pct Bachelor's degree	-86.72**	0.0197
	(35.96)	(0.0145)
Avg age	47.79**	0.00288
	(21.40)	(0.00298)
LN HH income	-95.32**	-0.0133
	(42.11)	(0.0103)
Unemployment rate	-73.62***	0.0108
	(27.17)	(0.00848)
log Average Monthly Earnings (2019 $)	29.07	-0.0159
	(39.05)	(0.0138)
log Beginning-of-Quarter Employment	-25.16	0.0141
	(259.7)	(0.0879)
log Hires (All Accessions)	55.02	0.0276
	(380.0)	(0.0371)
log Separations (All)	-95.02	-0.0290
	(440.6)	(0.0861)
Observations	215	217
R-squared	0.489	0.057

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0.1; Standard errors clustered by CBSA in parentheses. All covariates standardized to Z score. Back
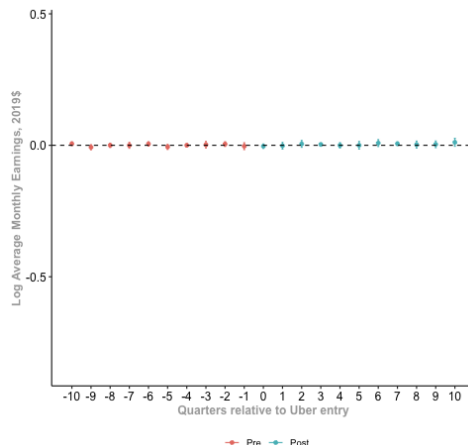
Treatment Effects of Uber Entry in All Industries

Group-time ATT of Uber Entry

	Log earnings
Uber	0.0064
	(0.0045)
Observations	1,024,080
CBSA*industry*ed. level	21,335

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Earnings by Length of Exposure

Back

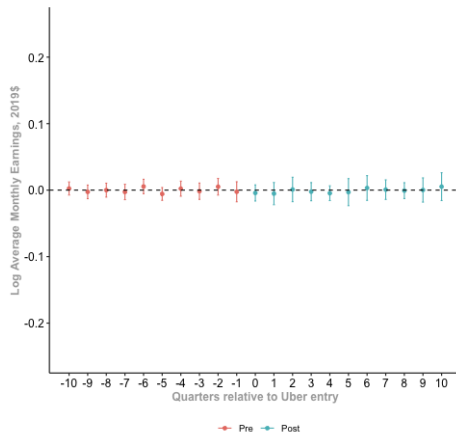# Treatment Effects of Uber Entry in Concurrent Industries

Group-time ATT of Uber Entry

	Log earnings
Uber	0.0032
	(0.0054)
Observations	242,592
CBSA*industry*ed. level	5,054

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses. Industries included: retail, health care and social services, educational services, and professional, technical, and scientific services.

Earnings by Length of Exposure

Back

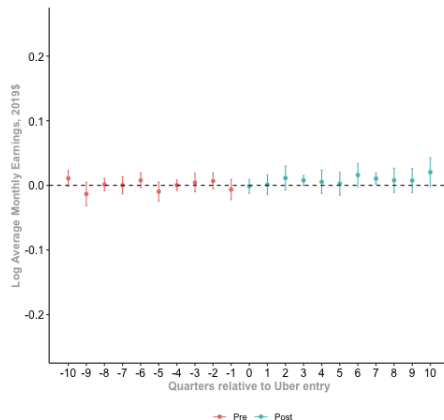# Treatment Effects of Uber in Nonconcurrent Industries

Group-time ATT of Uber Entry

	Log earnings
Uber	0.0111
	(0.0069)
Observations	828,864
CBSA*industry*ed. level	17,268

Source: Uber Entry Data; Quarterly Workforce Indicator Series, 2008-2019.

Notes: ***p<0.01, **p<0.05, *p<0; Standard errors clustered by CBSA in parentheses.

Earnings by Length of Exposure

Back

Group-time ATT Effects: Employment in all industries

Average effect by group on employment