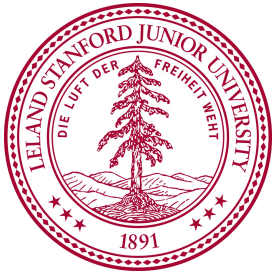

The Impact of Online Food Delivery Services on Restaurant Sales

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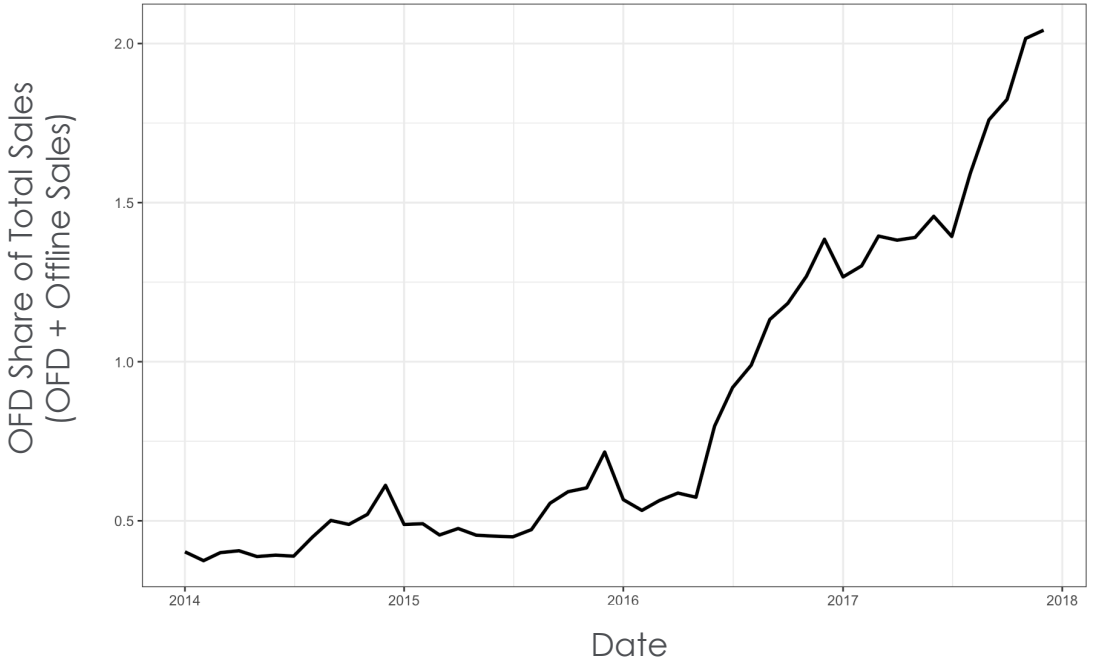
Motivation

- E-commerce is becoming increasingly important to study
- New revenue channels create the risk of sales cannibalization
- The rapid growth of online food delivery services (Doordash, Postmates, Uber Eats) has disrupted the traditional restaurant industry



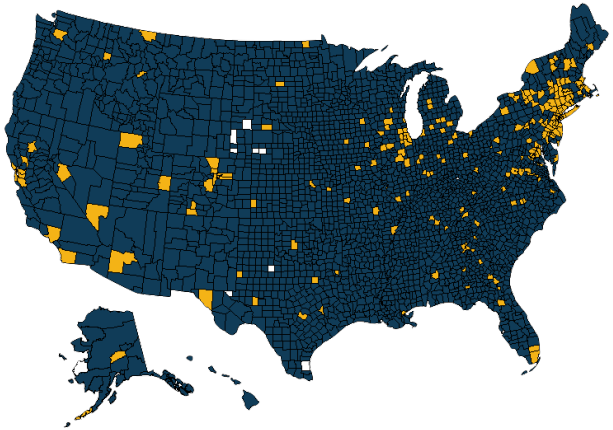
Meal-delivery companies are a symbol of what might be the most powerful force in business today: convenience maximalism.

Derek Thompson, *The Atlantic* (2019)

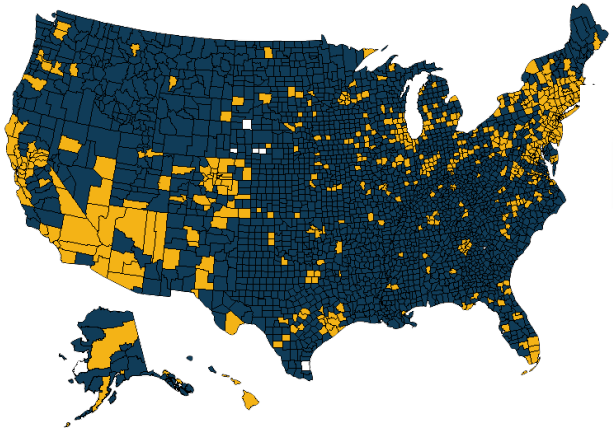
Data

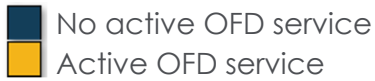
- Universe of credit and debit transactions on the Visa network
- Each observation is a transaction between a business and a cardholder
  - Business name and category, date and time of purchase, "card presence", zip code, and dollar amount are observed

2014



2017





Empirical Strategy

$$TotalRestaurantSales_{zt} = \phi_z + \beta \cdot OFDSales_{zt} + \tau_t$$

Total restaurant sales (OFD + offline, dollars per card)

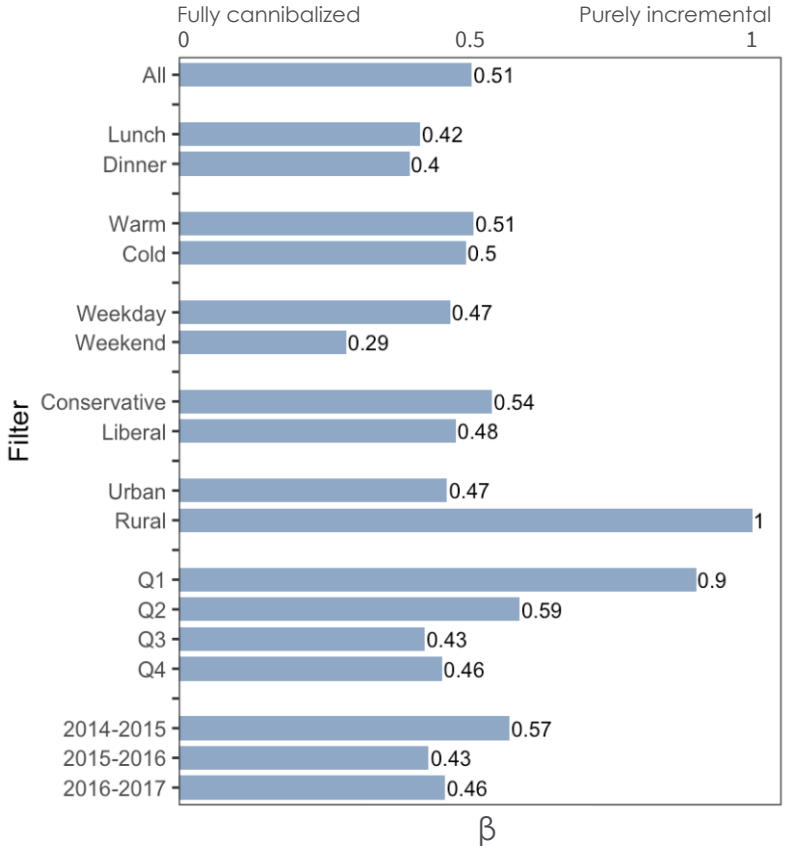
Zip code **z** fixed effects

Online food delivery sales (dollars per card)

Month **t** fixed effects

- Standard difference-in-differences strategy, taking advantage of the staggered and gradual entry of platform to different locations
- (a) β = 0 means every dollar is cannibalized
- (b) β = 1 means every dollar is incremental
- (c) β = 0.3 means that 30 cents of each dollar are incremental, and 70 cents are cannibalized

Findings


Fully cannibalized
Purely incremental
0
0.5
1
Filter
All
0.51
Lunch
0.42
Dinner
0.4
Warm
0.51
Cold
0.5
Weekday
0.47
Weekend
0.29
Conservative
0.54
Liberal
0.48
Urban
0.47
Rural
1
Q1
0.9
Q2
0.59
Q3
0.43
Q4
0.46
2014-2015
0.57
2015-2016
0.43
2016-2017
0.46
β

Conclusion

- Online food delivery services are providing incremental sales to restaurants, but they are also cannibalizing in-person sales
- Convenience drives consumer choice and is becoming more important over time
- Restaurant revenues are increasing, but their profitability is being hurt
- COVID-19 may play an important role in driving online food delivery service sales post-pandemic

Thank you

Supplemental Material

Variables of Interest

- Unique and anonymized card identifier (credit or debit card number)
- Business name
- Business category (as determined by Visa)
- Business location (zip code)
- Dollar amount of transaction
- Date and time of transaction (recorded down to the second)
- Card type (credit or debit)
- Card presence indicator (physical swipe)
- Non-physical transaction type (online, mail order, phone order, or recurring transaction)

Analysis Sample

- Include
  - Restaurant purchases that occurred between 2014 and 2017, inclusive
  - Completed and processed transactions
  - Only cards that transacted on online food delivery services at some point
- Omit
  - Debit-PIN transactions (due to a change in legislation)
  - Cardholders that made fewer than 5 transactions at restaurants
  - Cardholders that spend more than $3,000 per month (on average)

Variable Construction

- Cardholder's "preferred shopping location" is proxied as modal zip code
- Online food delivery purchases are transactions that occurred at restaurants without a physical card swipe that have a business name matching one of the top nine online food delivery service companies (Doordash, Grubhub, Uber Eats, etc.)
- Cardholders that purchased goods at children's clothing and toy stores are classified as those who have young children
- Transactions that occurred before 5:00pm are classified as lunch; those that occurred after are classified as dinner
- Urban-rural indictor is determined using ACS data
- Liberal-conservative indicator is determined using the results of the 2016 Presidential election

Empirical Strategy

$$TotalRestaurantSales_{zt} = \phi_z + \beta \cdot OFDSales_{zt} + \tau_t$$

$$OfflineSales_{zt} + OFDSales_{zt} = \phi_z + \beta \cdot OFDSales_{zt} + \tau_t$$

$$OfflineSales_{zt} = \phi_z + \beta \cdot OFDSales_{zt} - OFDSales_{zt} + \tau_t$$

$$OfflineSales_{zt} = \phi_z + (\beta - 1) \cdot OFDSales_{zt} + \tau_t$$

- When β = 1, there is no correlation between online and offline sales; this indicates that online food delivery services are purely incremental
- When β = 0, there is perfect correlation between online and offline sales; this indicates that online food delivery services are not providing incremental sales at all and are just drawing away from brick-and-mortar sales

Regression Tables

	Dependent variable:						
	Total Restaurant Sales (per card)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	All	Lunch	Dinner	Weekday	Weekend	Warm	Cold
OFD Sales (per card)	0.509***	0.419***	0.401***	0.471***	0.290***	0.512***	0.499***
	(0.016)	(0.016)	(0.014)	(0.016)	(0.010)	(0.026)	(0.016)
Observations	478,910	453,462	460,802	469,238	439,662	239,057	239,853
Fixed Effects?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.352	0.311	0.286	0.319	0.206	0.371	0.439

*p<0.1; **p<0.05; ***p<0.01

Note: Errors are clustered at the zipcode-level. The columns refer to the type of transaction and type of consumer. For example, "lunch" refers to transactions that occurred prior to 5:00pm, "weekday" refers to transactions that happened during the work week, and "warm" refers to purchases that occurred during the summer months.

Regression Tables

	Dependent variable:			
	Total Restaurant Sales (per card)			
	(1)	(2)	(3)	(4)
	Urban	Rural	North	South
OFD Sales (per card)	0.466***	0.997***	0.509***	0.512***
	(0.018)	(0.069)	(0.020)	(0.028)
Observations	400,647	42,041	334,866	144,044
Fixed Effects?	Yes	Yes	Yes	Yes
Adjusted R^2	0.363	0.304	0.357	0.339

*p<0.1; **p<0.05; ***p<0.01

Note: Errors are clustered at the zipcode-level. The columns refer to different regions in the United States. The first two columns refer to zipcodes that are designated as urban and rural, respectively; and the last two columns refer to zipcodes that are in the northern and southern regresions of the United States, respectively.

Regression Tables

	Dependent variable:			
	Total Restaurant Sales (per card)			
	(1)	(2)	(3)	(4)
	Children	No Children	Conservative	Liberal
OFD Sales (per card)	0.530***	0.503***	0.544***	0.481***
	(0.026)	(0.016)	(0.020)	(0.025)
Observations	233,043	477,536	247,769	230,031
Fixed Effects?	Yes	Yes	Yes	Yes
Adjusted R^2	0.150	0.347	0.327	0.372

*p<0.1; **p<0.05; ***p<0.01

Note: Errors are clustered at the zipcode-level. The columns refer to consumers who (i) have children, (ii) do not have children, (iii) live in states that voted Republican in the 2016 presidential election, and (iv) those who live in states that voted Democrat in the 2016 presidential election.

Regression Tables

	Dependent variable:			
	Total Restaurant Sales (per card)			
	(1)	(2)	(3)	(4)
	Q1	Q2	Q3	Q4
OFD Sales	0.899***	0.592***	0.427***	0.457***
(per card)	(0.044)	(0.022)	(0.019)	(0.036)
Observations	75,669	128,894	142,060	132,287
Fixed Effects?	Yes	Yes	Yes	Yes
Adjusted R^2	0.120	0.091	0.097	0.274

*p<0.1; **p<0.05; ***p<0.01

Note: Errors are clustered at the zipcode-level. The columns refer to zipcodes that fall within the first, second, third, and fourth quartiles of average monthly expenditure at restaurants.

Regression Tables

	Dependent variable:		
	Total Restaurant Sales (per card)		
	(1)	(2)	(3)
	2014-2015	2015-2016	2016-2017
OFD Sales (per card)	0.574***	0.434***	0.462***
	(0.033)	(0.017)	(0.016)
Observations	204,569	265,445	274,341
Fixed Effects?	Yes	Yes	Yes
Adjusted R^2	0.451	0.422	0.397

*p<0.1; **p<0.05; ***p<0.01

Note: Errors are clustered at the zipcode-level. The years refer to the sample restrictions imposed on the analysis in these three regressions, which show incremental cannibalization with increased exposure to online food delivery services. Two year periods are included in order to smooth the effects, as the estimates were otherwise too noisy.