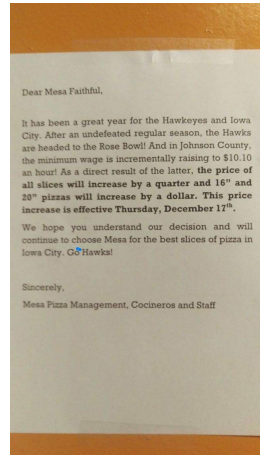## Effects of a Minimum Wage Increase on Restaurants: Price Pass Through and Beyond

Chelsea Crain
University of Iowa
May 31, 2017

Overview

- How do restaurant prices change in response to increases in the minimum wage?

- How is customer perceived quality of restaurants affected by a minimum wage increase?

- Do border effects have an impact on price pass through?

Minimum Wage Laws

	Regular Minimum Wage			Tipped Minimum Wage		
Area	'16	'17	%Δ	'16	'17	%Δ
NYC & FF	$10.50	$12.00	14.29%	-	-	-
NY Upstate & FF	$9.75	$10.75	10.26%	-	-	-
NYC & Lg	$9.00	$11.00	22.22%	$7.50	$7.50	0.00%
NYC & Sm	$9.00	$10.50	16.67 %	$7.50	$7.50	0.00%
NYC MSA	$9.00	$10.00	11.11%	$7.50	$7.50	0.00%
NY Upstate	$9.00	$9.70	7.78%	$7.50	$7.50	0.00%
Connecticut	$9.60	$10.10	5.21%	$6.07	$6.38	5.11%
New Jersey	$8.38	$8.44	0.72%	$2.13	$2.3	0.00%
Massachusetts	$10.00	$11.00	10.00%	$3.00	$3.75	25.00%
Pennsylvania	$7.25	$7.25	0.00%	$2.83	$2.83	0.00%
Vermont	$9.60	$10.00	4.2%	$4.80	$5.00	4.2%

NY Schedule

Minimum Wage Laws

	Regular Minimum Wage			Tipped Minimum Wage		
Area	'16	'17	%Δ	'16	'17	%Δ
NYC & FF	$10.50	$12.00	14.29%	-	-	-
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NY Schedule

Data

Yelp

- Basic restaurant info, item and price info
- Star rating
- Quarterly data: Apr '16, Jul '16, Oct '16, Jan '17, Apr '17

Grubhub

- Basic restaurant info, item and price info
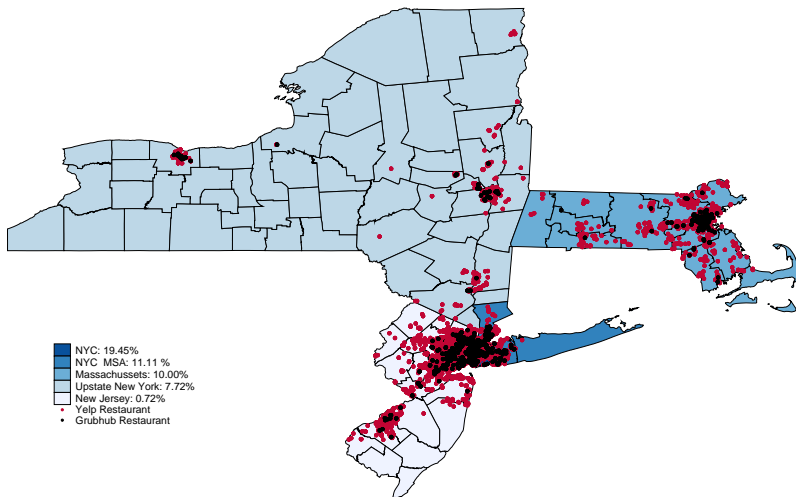- Monthly data: Dec '16, Jan '17, Feb '17, Mar '17, Apr '17

ReferenceUSA

- Business data
- Sales, employees, restaurant type, franchise status

Sample of Restaurants

Source	N	%Limited Service	% Chain	% Small	Price
RUSA	89,114	19.94	14.06	75.72	-
Yelp (All)	35,502	17.01	11.82	75.13	-
Yelp (Prices)	7,901	5.49	1.77	78.40	9.37
Grubhub	5,351	6.48	2.01	86.19	8.66

Sample of Yelp and Grubhub Restaurants

NYC: 19.45%
NYC MSA: 11.11 %
Massachussets: 10.00%
Upstate New York: 7.72%
New Jersey: 0.72%
• Yelp Restaurant
• Grubhub Restaurant

Model of Price Pass Through

$$\Delta \ln p_{jkt} = \sum_{h=l}^{L} \beta_h \Delta \ln mw_{kt-h} + \gamma P\_START_j \qquad (1)$$
$$+ \zeta T\_BTWN_{jkt} + \lambda \boldsymbol{X}_j + \epsilon_m + \epsilon_k + \epsilon_{jkt}$$

j = restaurant

k = minimum wage group

t = observation period

m = month

P_START_j = average price April 2016

T_BTWN_{jkt} = days between observations

$\boldsymbol{X}_j$= vector of covariates: chain, LS, employees, sales, total items

Price Pass Through of a 10% Increase in MW

	All	Cntrls	Yelp Change	Eat24	Eat24+GH	All	Grubhub Cntrls	Eat24
Jul − Oct	0.084	0.023	0.378	0.313	-0.236			
	(0.040)	(0.067)	(0.178)	(0.212)	(0.418)			
Oct − Jan	0.171***	0.185**	0.668**	0.326**	-0.235			
	(0.034)	(0.064)	(0.198)	(0.114)	(0.334)			
Jan − Apr	0.162***	0.148*	0.556*	0.272	0.625			
	(0.034)	(0.059)	(0.202)	(0.183)	(0.339)			
Dec − Jan						0.260***	0.271***	0.206***
						(0.010)	(0.007)	(0.022)
Jan − Feb						0.245***	0.293***	0.149**
						(0.042)	(0.028)	(0.044)
Feb − Mar						0.244***	0.295***	0.209***
						(0.022)	(0.015)	(0.044)
Mar − Apr						0.162***	0.161***	0.032
						(0.013)	(0.023)	(0.087)
Total Pass Through	0.333***	0.333***	1.224***	0.598**	0.39	0.911***	1.019***	0.596***
	(0.066)	(0.114)	(0.394)	(0.281)	(0.434)	(0.053)	(0.069)	(0.166)
N	8805	5257	2099	2269	432	3653	2760	432
NxT	35220	21028	8396	9076	1728	14612	11040	1728

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

Price Pass Through By Restaurant Characteristics

Highest and Lowest Quartiles, Yelp

	Low Sales	High Sales	Low Emps	High Emps	Low Stars	High Stars
Jul − Oct	-0.085	-0.145	0.466	-0.077	-0.073	0.064
	(0.078)	(0.146)	(0.316)	(0.158)	(0.061)	(0.041)
Oct − Jan	0.069	-0.013	0.492*	-0.013	0.204***	0.060
	(0.065)	(0.100)	(0.209)	(0.107)	(0.025)	(0.034)
Jan − Apr	0.121**	0.344**	0.514*	0.330**	0.143**	0.105
	(0.039)	(0.112)	(0.239)	(0.117)	(0.047)	(0.065)
Total Pass Through	0.191**	0.331*	1.006**+	0.318*+	0.346***+	0.165**+
	(0.102)	(0.207)	(0.447)	(0.222)	(0.05)	(0.098)
N	1333	1490	1485	1842	2022	4973
NxT	5332	5960	5940	7368	8088	19892

$* \ p < 0.1; ** \ p < 0.05; *** \ p < 0.01$

Price Pass Through By Item Type

Grubhub

	All	Popular	Side	Sandwich	Soup/Salad	Entre	Dessert	Drink
$Dec - Jan$	0.156***	0.179***	0.165***	0.210***	0.144***	0.147***	0.126***	0.166***
	(0.008)	(0.004)	(0.013)	(0.004)	(0.003)	(0.002)	(0.016)	(0.003)
$Jan - Feb$	0.160***	0.231***	0.200**	0.220***	0.067**	0.155***	0.114***	0.211***
	(0.020)	(0.003)	(0.053)	(0.005)	(0.017)	(0.013)	(0.022)	(0.029)
$Feb - Mar$	0.146***	0.143***	0.259***	0.231***	0.124***	0.050***	0.102**	0.036
	(0.011)	(0.014)	(0.019)	(0.014)	(0.005)	(0.006)	(0.023)	(0.041)
$Mar - Apr$	0.014	0.065**	0.067**	0.024	-0.003	0.013	0.014	-0.002
	(0.010)	(0.015)	(0.017)	(0.037)	(0.008)	(0.007)	(0.024)	(0.018)
Total	0.477***	0.617***+	0.691***+	0.684***+	0.331***+	0.365***+	0.356***	0.412***
	(0.034)	(0.027)	(0.064)	(0.026)	(0.021)	(0.01)	(0.081)	(0.041)
N	435676	23845	53227	56750	23447	81176	9963	31757
NxT	1742704	95380	212908	227000	93788	324704	39852	127028

$^* \, p < 0.1$; $^{**} \, p < 0.05$; $^{***} \, p < 0.01$

Price Pass Through Comparisons

Paper	Pass Through of 10% MW Increase
This paper	0.3-1.0%
Allegretto and Reich (2015)	0.58%
Aaronsen, French and MacDonald (2008) (FS)	0.32%
Aaronsen, French and MacDonald (2008) (LS)	1.55%
Basker and Khan (2013)	0.90%
Aaronson (2001)	1.50%

Yelp Stars as Quality Measure

- Main star rating: rounded average (to the .5 star) of consumer reviews
- Actual start rating to the .1 (used to be) available online
- Yelp has a proprietary algorithm to sort out fake reviews
- One star increase in Yelp rating leads to a 5-9% increase in revenue (Luca, 2016)
- Yelp ratings of hospitals had significant correlations with industry standard measure of hospital quality as well as helath outcomes (Bardach et. al, 2013)

Change in Star Rating and Minimum Wage Increase
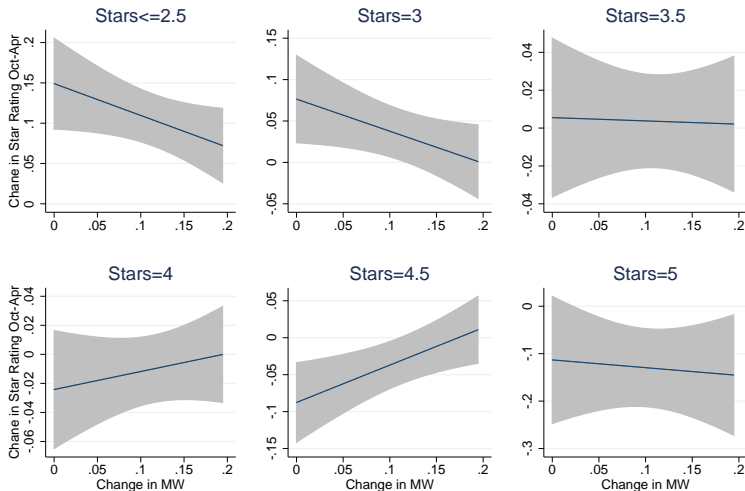
Min Wage Impact on Yelp Star Ratings

$$\Delta \ln(stars_{jkt}) = \alpha + \sum_{h=l}^{L} \beta_h \Delta \ln mw_{kt-h} + \gamma P\_START_j + \epsilon_k + \epsilon_t + \epsilon_{ijkt}$$

(2)

$stars_{jkt}$: average star rating to the half

$stars\_april_{jkt}$: average star rating to the half

Impact of a 10% Increase in MW on Yelp Star Ratings

	All	<= 2.5	3	3.5	4	>= 4.5
Jul − Oct	-0.083	-3.221*	-0.930	0.041	1.304	0.089
	(0.198)	(1.276)	(0.743)	(0.242)	(0.793)	(0.812)
Oct − Jan	-0.110	-3.329*	-1.966*	-0.335	1.479*	1.324
	(0.166)	(1.379)	(0.867)	(0.207)	(0.539)	(0.623)
Jan − Apr	-0.415	-3.445**	-1.171	-0.796*	0.912	0.352
	(0.354)	(1.132)	(1.201)	(0.327)	(0.686)	(0.545)
Total % Change Stars	-.526	-6.774***	-3.136*	-1.131***	2.391**	1.676*
	(0.451)	(2.509)	(2.021)	(0.486)	(1.185)	(1.125)
N	6817	940	1080	1801	1904	1092
NxT	27268	3760	4320	7204	7616	4368

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

Impact of a 10% Increase in MW on Yelp Star Ratings: Controlling for price increase

	All	$<= 2.5$	3	3.5	4	$>= 4.5$
Jul − Oct	-0.082	-3.232*	-0.940	0.041	1.296	0.938
	(0.196)	(1.287)	(0.743)	(0.234)	(0.790)	(0.693)
Oct − Jan	-0.102	-3.329*	-1.983*	-0.326	1.489*	1.515***
	(0.160)	(1.374)	(0.868)	(0.214)	(0.539)	(0.281)
Jan − Apr	-0.407	-3.443**	-1.183	-0.785*	0.922	0.782
	(0.359)	(1.128)	(1.204)	(0.348)	(0.679)	(0.494)
Change Price	-0.028	-0.059	0.037	-0.032	-0.003	-0.018
	(0.025)	(0.080)	(0.024)	(0.031)	(0.056)	(0.047)
Total % Change Stars	-.509	-6.772***	-3.166*	-1.111**	2.411**	2.297***
	(.453)	(2.499)	(2.028)	(0.518)	(1.178)	(.731)
N	6815	940	1080	1800	1903	2995
NxT	27260	3760	4320	7200	7612	11980

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

Border Effects
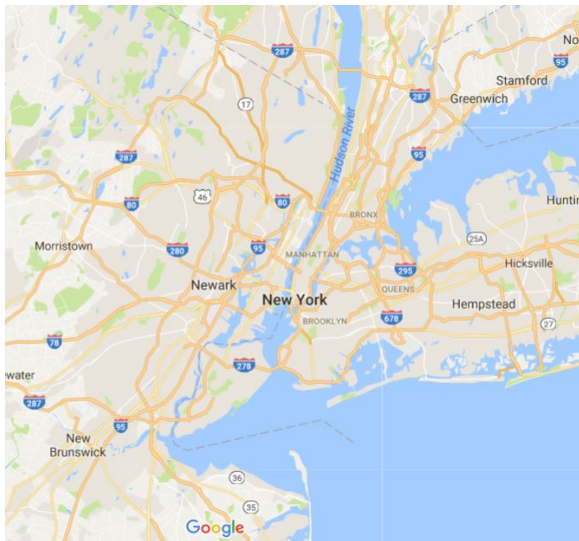
Border Effects

$$\Delta \ln(p_{j,Oct16-Apr17}) = \alpha_0 + \alpha_1 \mathbb{1}(NY = 1)$$
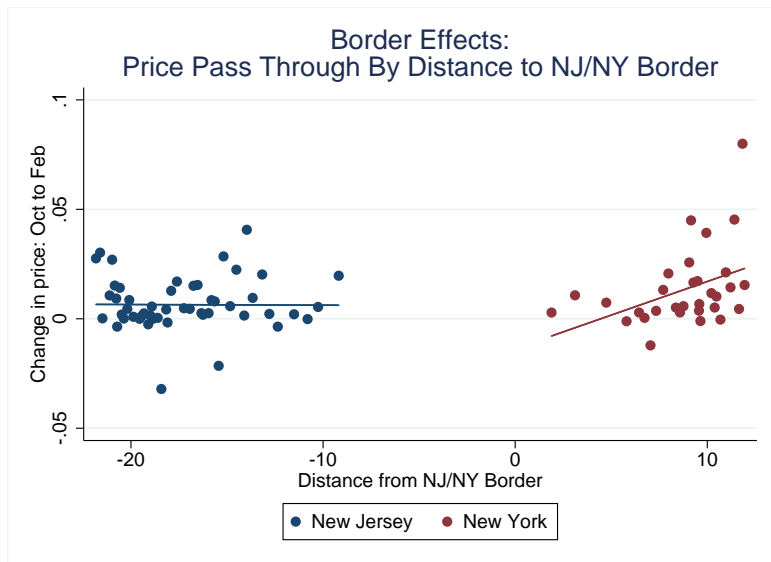$$+ \alpha_2 D_j + \alpha_3 [D_j * \mathbb{1}(NY = 1)] + \epsilon_j$$

D_j: minutes to a competitor across the border

$\mathbb{1}(NY = 1)$: indicator function for state

NY: $\Delta \ln(p_{j,Oct16-Apr17}) = (\alpha_0 + \alpha_1) + (\alpha_2 + \alpha_3)D_j + \gamma X_j + \epsilon_j$

NJ: $\Delta \ln(p_{j,Oct16-Apr17}) = (\alpha_0) + (\alpha_2)D_j + \gamma X_j + \epsilon_j$

Border Effects (Grubhub)

Border Effects:
Price Pass Through By Distance to NJ/NY Border

Border Effects: Results

Source		Yelp		Grubhub	
Comparison Area	NJ	NJ	NYC MSA	NJ	NYC MSA
Time Frame	Oct16-Apr17	Apr16-Oct16	Oct16-Apr17	Dec16-Apr17	Dec16-Apr17
$\mathbb{1}(NY)$ (α_1)	0.0166	-0.0043	-0.0071	-0.0102	-0.0134
	(0.0188)	(0.0140)	(0.0198)	(0.0124)	(0.0128)
Distance (α_2)	-0.0016	-0.0001	-0.0001	-0.0000	0.0003
	(0.0011)	(0.0008)	(0.0006)	(0.0006)	(0.0004)
Distance * $\mathbb{1}(NY)$ (α_3)	0.0027*	0.0008	0.0007	0.0019**	0.0011
	(0.0014)	(0.0010)	(0.0020)	(0.0009)	(0.0012)
Constant (α_0)	-0.0171	0.0020	0.0064	0.0059	0.0137**
	(0.0172)	(0.0128)	(0.0085)	(0.0101)	(0.0059)
	896	896	439	694	231

$* \ p < 0.1; ** \ p < 0.05; *** \ p < 0.01$

Conclusion

How do restaurant prices change in response to increases in the minimum wage?

- Significant price pass through consistent with literature
- Heterogeneity across restaurant characteristics
- Heterogeneity across item type

How is customer perceived quality of restaurants affected by a minimum wage increase?

- Good restaurants get better
- Bad restaurants get worse

Do border effects have an impact on price pass through?

- Yes, in areas with a higher minimum wage increase

Minimum Wage Laws: Fight for 15 Schedule

Area	2017	2018	2019	2020	2021	2022
NYC & FF	$12.00	$13.50	$15.00			
NY Upstate & FF	$10.75	$11.75	$12.75	$13.75	$15.00	
NYC & Lg	$11.00	$13.00	$15.00			
NYC & Sm	$10.50	$12.00	$13.50	$15.00		
NYC MSA	$10.00	$11.00	$12.00	$13.00	$14.00	$15.00
NY Upstate	$9.70	$10.40	$11.10	$11.80	$12.50	...

Back