"The Effect of Ambiguity on Price Dispersion in Duopoly Markets"

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Research Question

Research Question:

How does ambiguity about market share effect price dispersion in duopoly markets?

Experimental Prediction

If sellers are averse to ambiguity we would expect sellers to decrease dispersion with the introduction of ambiguity.

Baseline Model / Literature

Doupoly Pricing Model:

- Informed (ψ_0) and Captive (ψ_1, ψ_2)
- Unit demand of one homogeneous product with MC=0
- Reservation price set to 1
- Constraint: $\psi_0 + \psi_1 + \psi_2 = 1$
- If $\psi_1 > \psi_2$, then Firm 1 uses the mixed strategy H(p) and Firm 2 uses the mixed strategy G(p)

Literature:

Symmetric: Salop and Stiglitz (1977), Shilony (1977), Rosenthal (1980), Varian (1980)
Asymmetric: Baye and Morgan (2001), Morgan et al. (2006), Chioveanu (2008)

Background/ Motivation

Risk v. Ambiguity

How pricing markets in practice deviate from the literature.

Tversky and Fox (1995) stated that ambiguity has recently attracted much attention because many agents and firms make decisions without precise knowledge of how probabilistic those decisions outcomes will be. They note that decisions like going into business, going to court, or going into medical surgery are all decided in the absence of precise probabilities.

Increased price competition.

Model/ Preferences

Ambiguity Preferences

The α-maximin preferences can be written as:

$$V_i(p;\psi_i,\alpha_i,A_i) = \alpha_i[\underset{\psi_i \in A_i}{Max}\ E\pi_i(H(p),G(p),\psi_i)] + (1-\alpha_i)[\underset{\psi_i \in A_i}{Min}\ E\pi_i(H(p),G(p),\psi_i)] \tag{1}$$

Comparative Statics

$$\frac{\partial E(p_1)}{\partial \alpha_1} > 0 \qquad \frac{\partial E(p_2)}{\partial \alpha_2} < 0 \tag{2}$$

Experimental Design

- Experiment uses a 2x2 between-subjects design
  1) Change in informed consumer shares (ψ_0)
  2) Ambiguity on the captive consumer shares

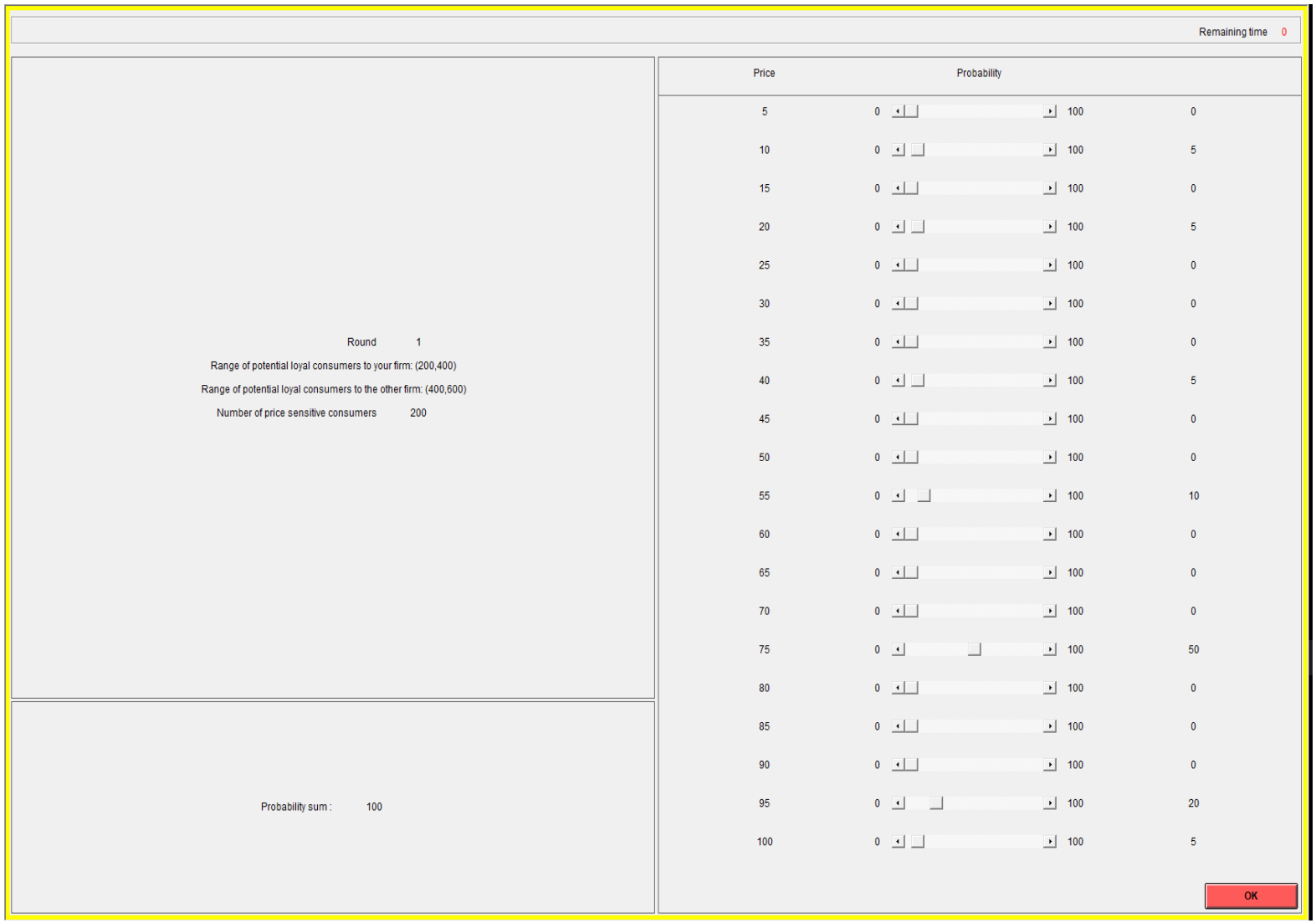
- ψ_0 varied at 20% (Low) and 60% (High) of the total consumer continuum. If ambiguity was not present within the captive consumer shares (No), if so (Yes). Ambiguity was presented to subjects as a range (A%, B%). Two-letter combination: LN, LY, HN, HY.

- The experiment consists of 24 sessions at the University of Alabama, TIDE Lab, in the Spring of 2021. All choices and information are entered into the z-Tree program, Fischbacher, U (2007).

Procedures

- 24 Sessions / 6 Subjects / 25 Pricing markets (35 period realizations)
- Random re-matching after each market
- Each subject entered a distribution instead of a single price
- 60-minute session
- Average earnings in study was $20.39

Decision z-Tree Page



Result z-Tree Page

"The Effect of Ambiguity on Price Dispersion in Duopoly Markets"

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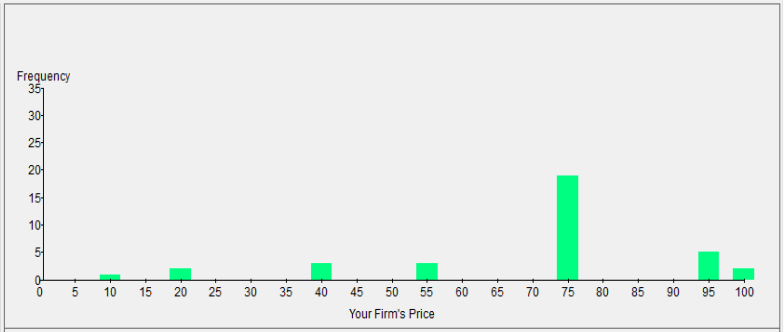
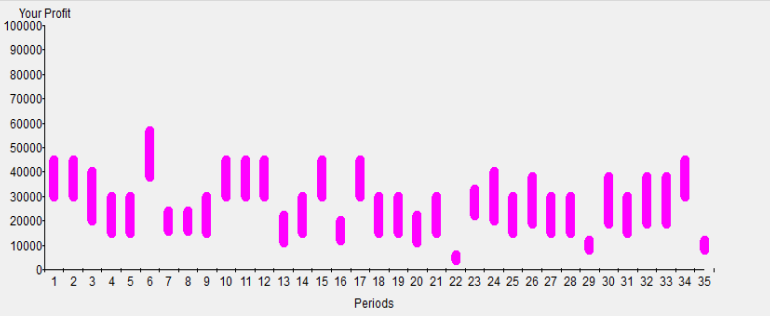
Remaining time 52

Period	Your firm's price	Other firm's price	Price sensitive buyers purchased from	Your firm's profit range
1	75	90	Your Firm	(45000,30000)
2	75	90	Your Firm	(45000,30000)
3	100	75	Other Firm	(40000,20000)
4	75	35	Other Firm	(30000,15000)
5	75	20	Other Firm	(30000,15000)
6	95	100	Your Firm	(57000,38000)
7	40	90	Your Firm	(24000,16000)
8	40	90	Your Firm	(24000,16000)
9	75	45	Other Firm	(30000,15000)
10	75	85	Your Firm	(45000,30000)
11	75	90	Your Firm	(45000,30000)
12	75	100	Your Firm	(45000,30000)
13	55	10	Other Firm	(22000,11000)
14	75	10	Other Firm	(30000,15000)
15	75	90	Your Firm	(45000,30000)
16	40	40	Even Split	(20000,12000)
17	75	85	Your Firm	(45000,30000)
18	75	20	Other Firm	(30000,15000)
19	75	60	Other Firm	(30000,15000)
20	55	50	Other Firm	(22000,11000)
21	75	15	Other Firm	(30000,15000)
22	10	80	Your Firm	(6000,4000)
23	55	75	Your Firm	(33000,22000)
24	100	50	Other Firm	(40000,20000)
25	75	5	Other Firm	(30000,15000)
26	95	40	Other Firm	(38000,19000)
27	75	45	Other Firm	(30000,15000)
28	75	70	Other Firm	(30000,15000)
29	20	70	Your Firm	(12000,8000)
30	95	75	Other Firm	(38000,19000)
31	75	70	Other Firm	(30000,15000)
32	95	55	Other Firm	(38000,19000)
33	95	80	Other Firm	(38000,19000)
34	75	80	Your Firm	(45000,30000)
35	20	30	Your Firm	(12000,8000)





OK

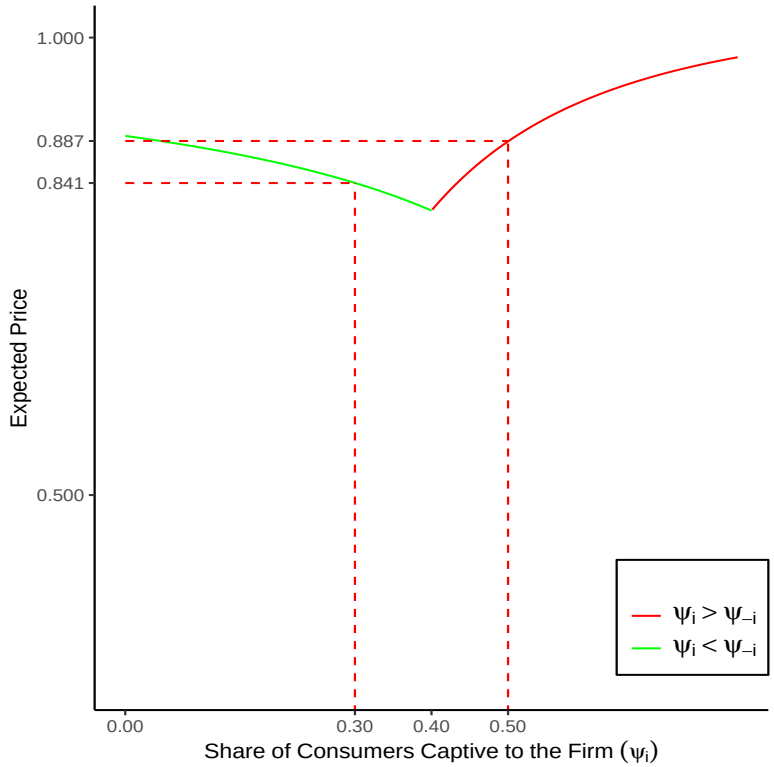
Design Predictions: Unambiguous Captive Consumers

LN Treatment

$\psi_0 = 20\%$

$\psi_1 = 50\%$

$\psi_2 = 30\%$



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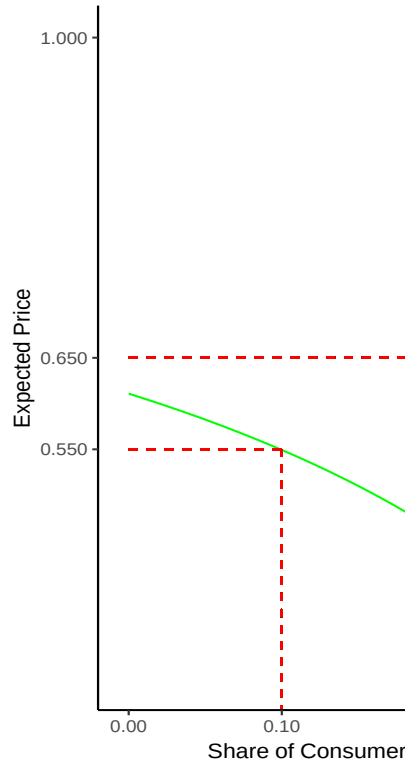
HN Treatme

$\psi_0 = 60\%$

$\psi_1 = 30\%$

$\psi_2 = 10\%$



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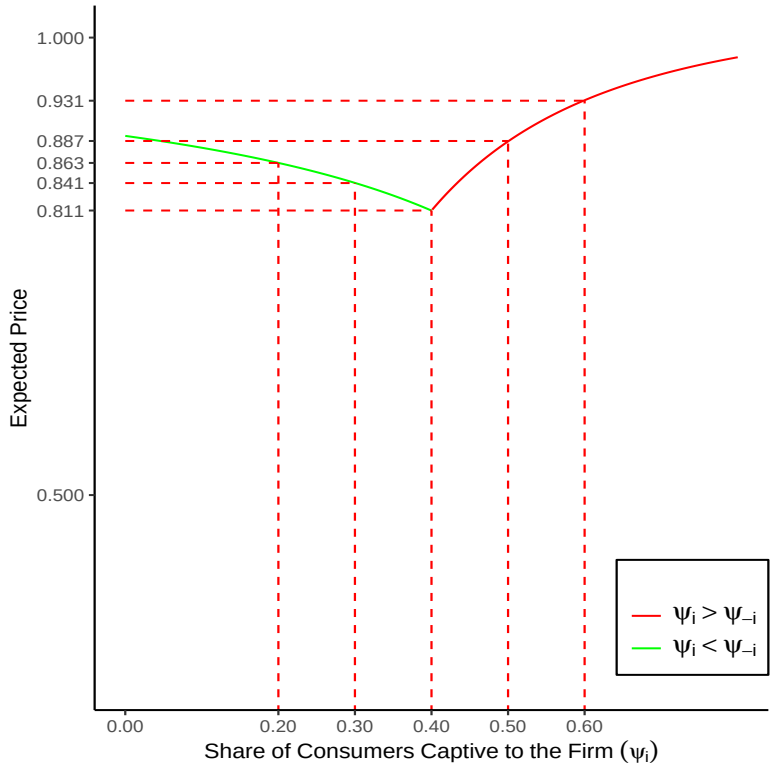
Design Predictions:Ambiguous Captive Consumers

LY Treatment

$\psi_0 = 20\%$

$\psi_1 \in [40\%, 60\%]$

$\psi_2 \in [20\%, 40\%]$



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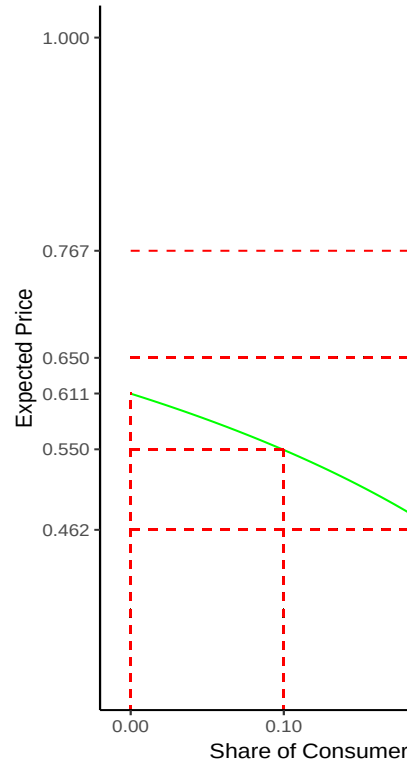
HY Treatme

$\psi_0 = 60\%$

$\psi_1 \in [20\%, 4$

$\psi_2 \in [0\%, 20$



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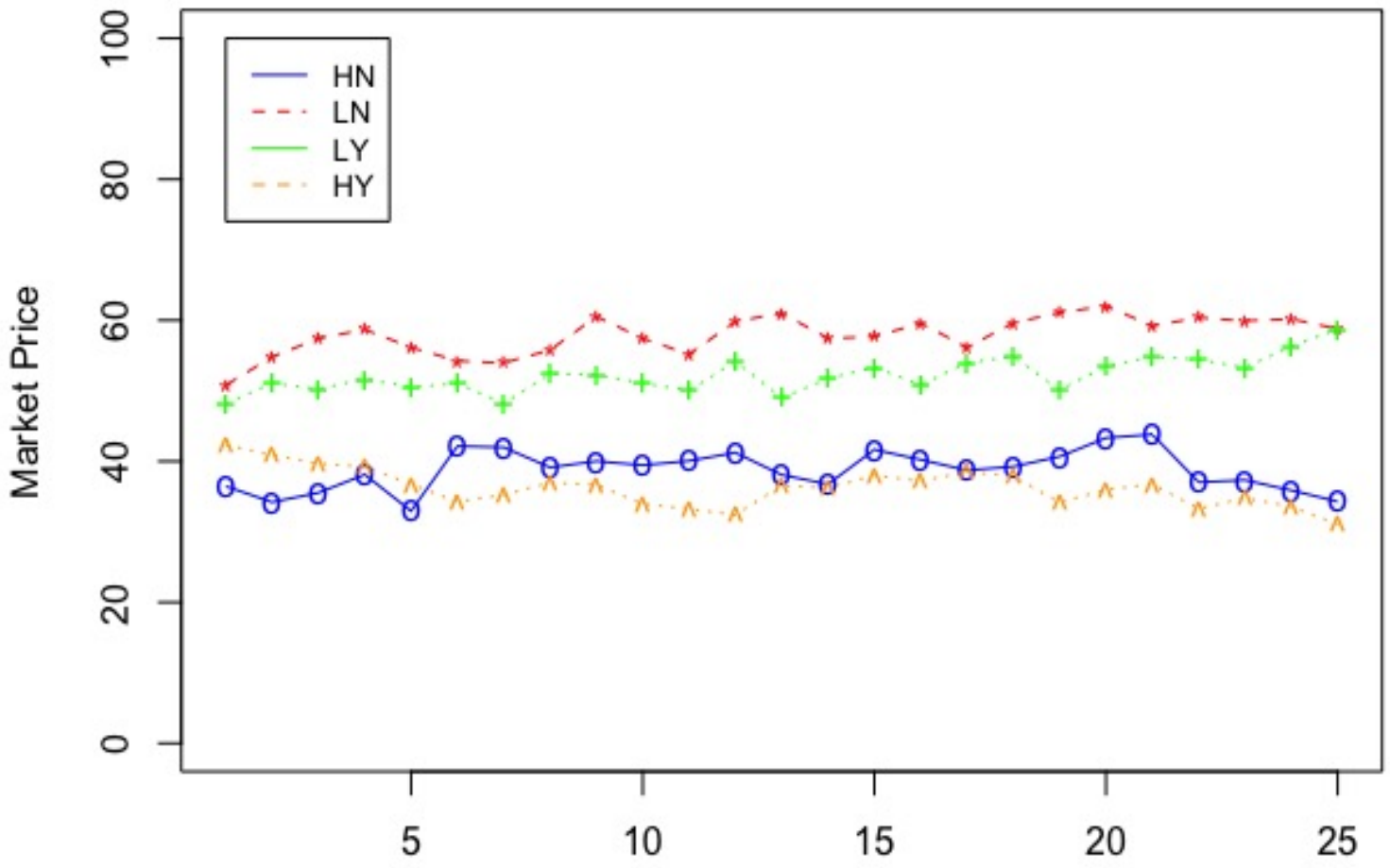
Treatment Market Price by Period

by TREATMENT (1).jpeg



Increasing Informed Consumer Share

Market Price	(1)
Period	0.09
	(0.10)
HighInformed	-19.19***
	(5.76)
Ambiguity	-5.69
	(7.10)
HighInformed × Ambiguity	3.18
	(9.07)
Constant	56.76***
	(4.85)
R^2	0.19
Observations	3600

Null Hypothesis	Two-sided p-value
Ambiguity + HighInformed × Ambiguity = 0	0.66

Note: Standard errors are in parenthesis and are clustered at the session level.

Significance levels: * p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01.

Dispersion by Treatment

Dispersion	(1)
Period	0.29***
	(0.11)
HighInformed	0.35
	(4.66)
Ambiguity	.79
	(3.81)
HighInformed × Ambiguity	-11.34*
	(6.59)
Constant	25.34***
	(2.86)
R^2	0.05
Observations	3600

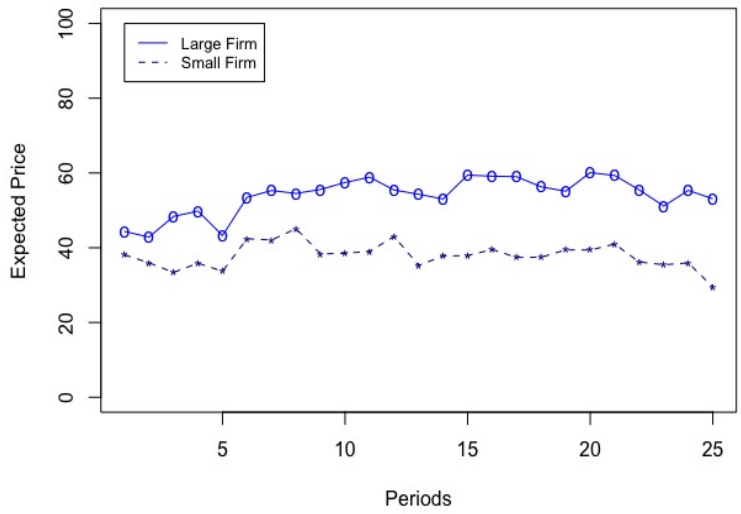
Null Hypothesis	Two-sided p-value
Ambiguity + HighInformed × Ambiguity = 0	0.05

Note: Standard errors are in parenthesis and are clustered at the session level.

Significance levels: * p $<$ 0.10, ** p $<$ 0.05, *** p $<$ 0.01.

HN / HY

HN



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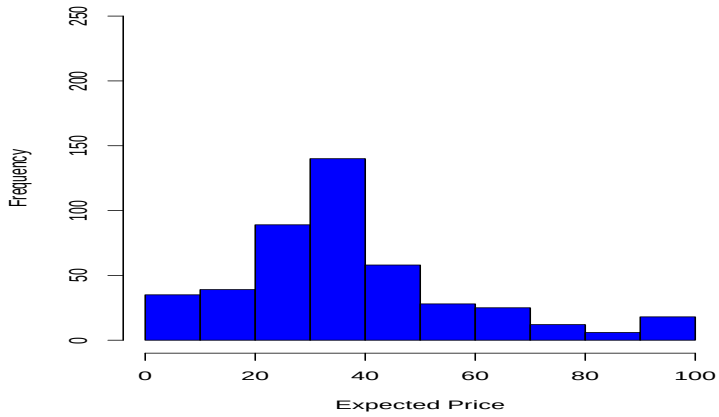
	HN: Small	HY: Small	HN: Large	HY: Large
Avg. Price	36	31.5	54	41

HN / HY

HN: Small



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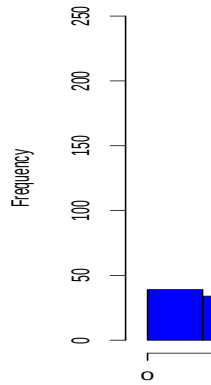
HN:



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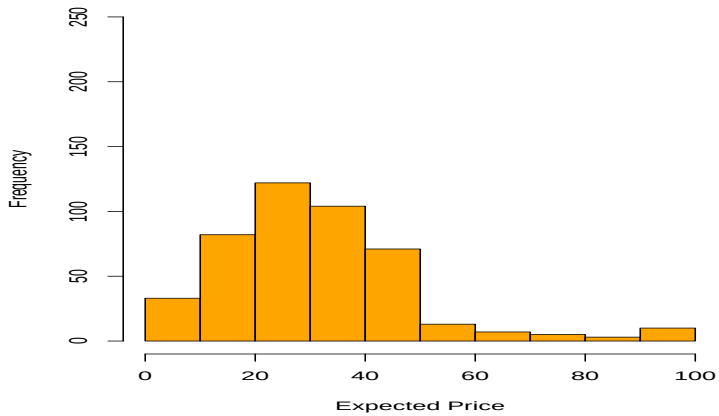
HY: Small



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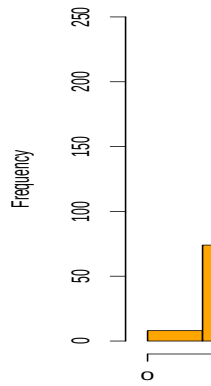
HY:



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Summary

Findings:

1) The effect of ambiguity on average price

2) The effect of ambiguity on Low and High markets

3) The effect of ambiguity on Large and Small firms

Thank You and Roll Tide!