

Information Disclosure as a Matching Mechanism: Theory and Evidence from a Field Experiment

Steve Tadelis, UC Berkeley

Florian Zettelmeyer, Northwestern University and NBER

Information As a Matching Mechanism

- The amount of information in markets influences their outcomes
- **This project** is designed to test the effect of information disclosure in a common large business auction setting:
 1. We create and manipulate the availability of information about quality to buyers
 2. We measure how auction outcomes vary with information disclosure
- **Results: Surprise! Information as a Matching Mechanism**
 1. Expected revenues increase at **all quality levels**
 2. Most pronounced at the **extremes** (high *and* low)
 3. Consistent with a **matching/sorting effect** that we propose
 4. Further implications of matching/sorting **are verified**
- **General implications** of matching/sorting:
 - Other platforms with simultaneous auctions (e.g., eBay)
 - Procurement auctions with endogenous entry
 - Labor markets

First understand the auction process

AUCTION PROCESS

- Auction on Wednesday (≈1500 dealer cars)
- Cars checked in Thursday through Tuesday
- At check-in the car is assigned
 - a work order number
 - a lane (1-12) and "run number"



The study was designed as a randomized experiment

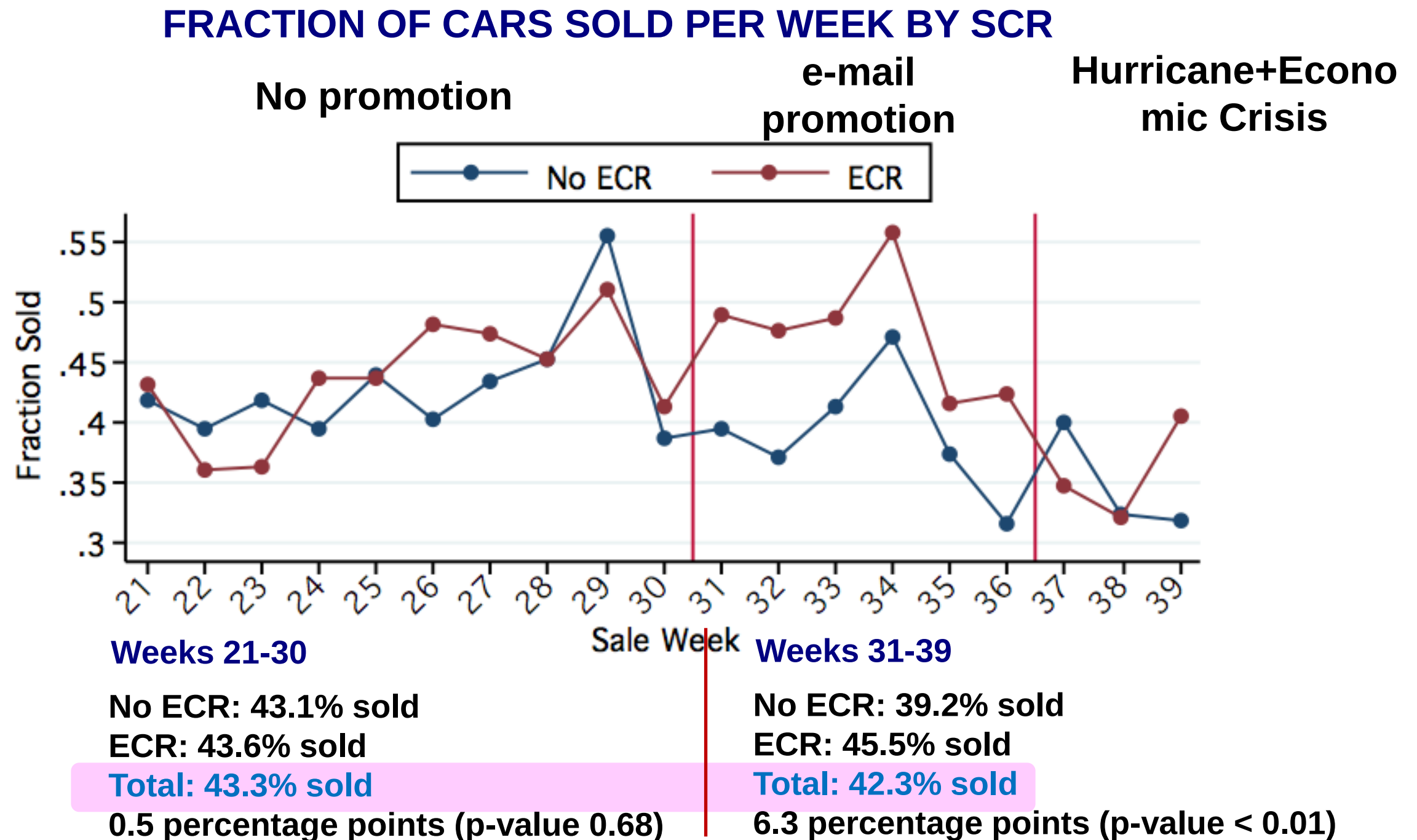
EXPERIMENT DESIGN

- Inspect cars: SCR
 - Scores 1.0 – 5.0 (and estimated costs)
 - **even** last digit of VIN: SCR is published
 - **odd** last digit of VIN: SCR is **NOT** published
 - Researchers see SCRS **for all cars**
- Compare cars with published and unpublished SCRs
- Several tests confirm the randomization is valid

INSPECTIONS PER WEEK

Sale Week	NO ECR	ECR	Total
21	237	223	460
22	195	186	381
23	324	330	654
24	281	365	646
25	303	344	647
26	229	250	479
27	290	305	595
28	245	245	490
29	267	281	548
30	231	269	500
31	233	247	480
32	214	215	429
33	237	154	391
34	225	185	410
35	150	140	290
36	73	85	158
37	90	107	197
38	71	84	155
39	82	104	186
Total	3,977	4,119	8,096
%	49.1%	50.9%	100%

Effect of SCRs on the PROBABILITY OF SALE is Large



- The effect of SCRs is mostly on proportion sold, not prices!
- There may be a problem: salience/substitution...

Information should matter where it is a surprise

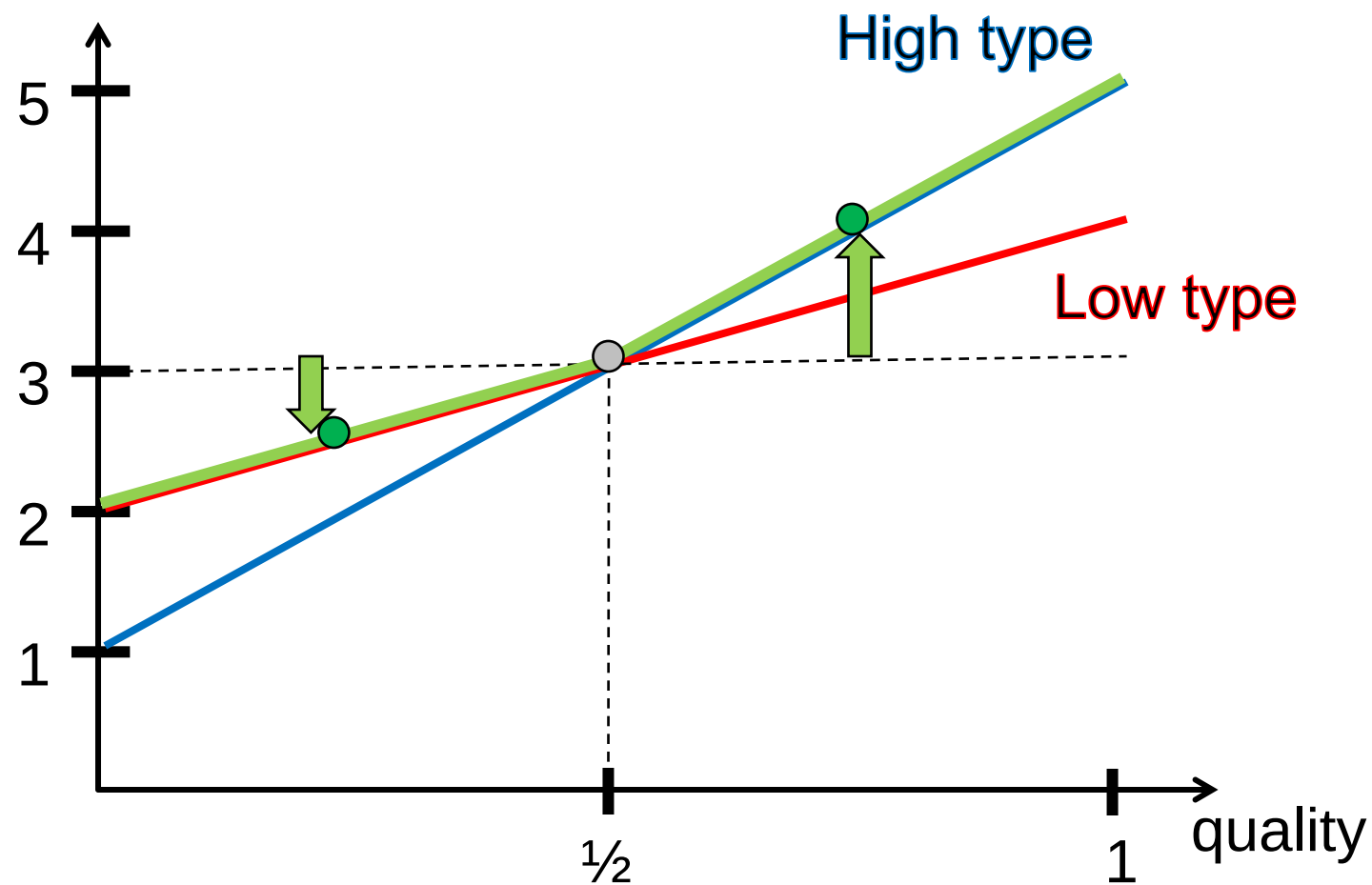
- Bidders have lots of information without SCRs (mileage, year...) which can be a noisy signal of SCR (Table 11).
- Effect of information should be on “surprises”

Table 12: Sales probability by difference of expected condition grade (CG), weeks 31-39

Tercile of Difference from Expected CG	# of Cars	No posted SCR	Posted SCR	Difference	% Difference	z-statistic	p-value
Worse than expected	901	0.338	0.403	0.065	19.2%	2.00	0.045
Close to expected	897	0.416	0.425	0.009	2.2%	0.28	0.78
Better than expected	898	0.421	0.53	0.122	29.0%	3.27	0.001

- bad news is good! Inconsistent with information disclosure models
- **Note:** no-news does not cause a shift → there is no “salience” effect
- The constant probability across periods may be due to a time trend
- Small effect on prices (marginally positive for bad news!)

Information in Markets: Existing Theory

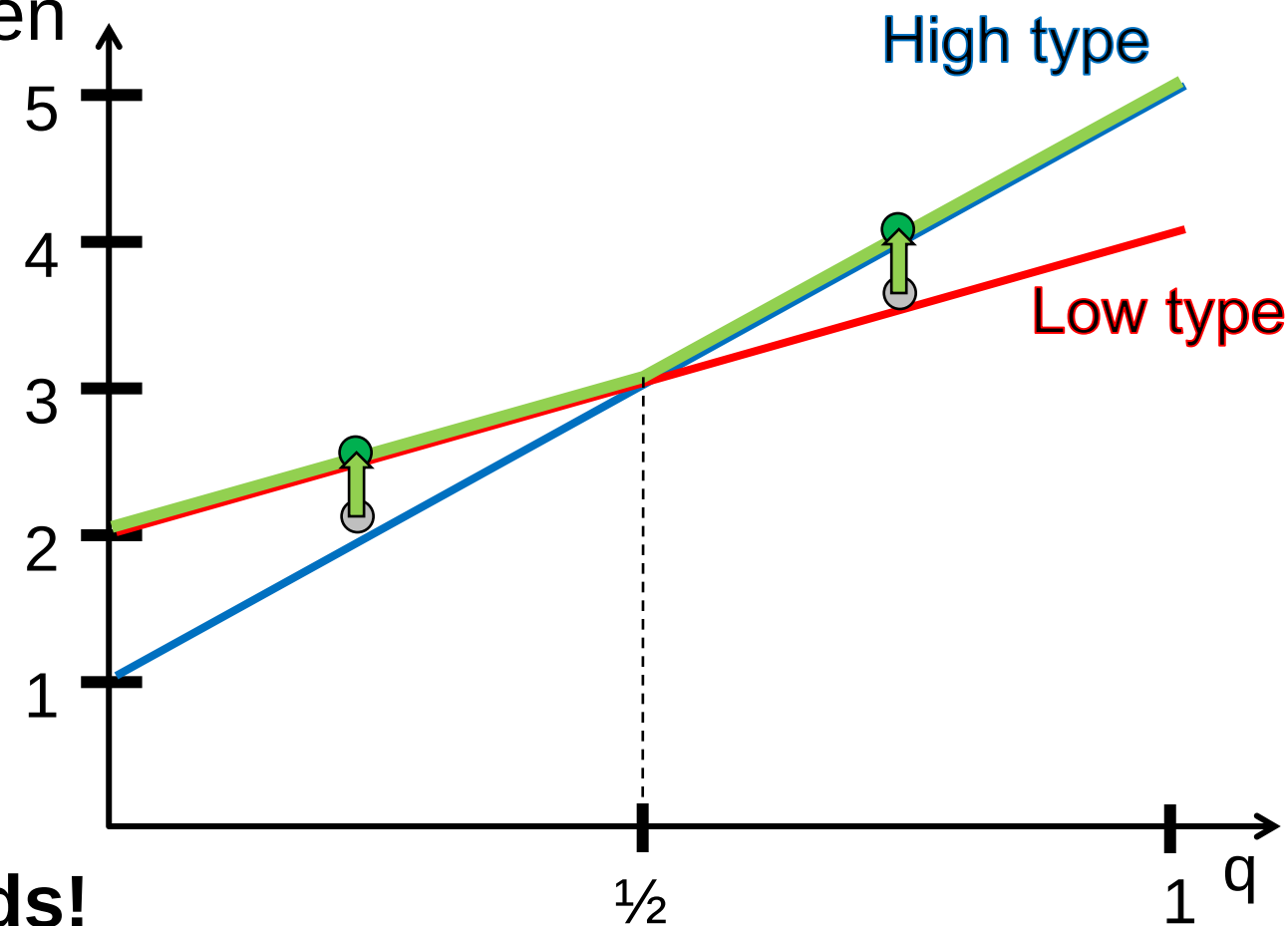


- quality $q \sim U[0,1]$
- $v_i = \alpha_i + \theta_i q$
- **Two types: *Low* and *High* (A1)**
 - *Low*: $\alpha = 2, \theta = 2$ ($E[v] = 3$)
 - *High*: $\alpha = 1, \theta = 4$ ($E[v] = 3$)
- Possible Information:
 - Bad: $q < \frac{1}{2}$ or Good: $q \geq \frac{1}{2}$

- Consider a 2nd price auction with $(\geq) 4$ bidders, $(\geq) 2$ of each type
- $E[\text{Revenue} \mid \text{no info}] = 3$
- $E[\text{Revenue} \mid \text{info}] = 3.25$!!
 - Idea: information changes the expected 2nd order statistic
 - (“Linkage Principle” or “Allocation Effect”.)
- Information prices “diverge” from the no-information price (true for any standard information disclosure model)

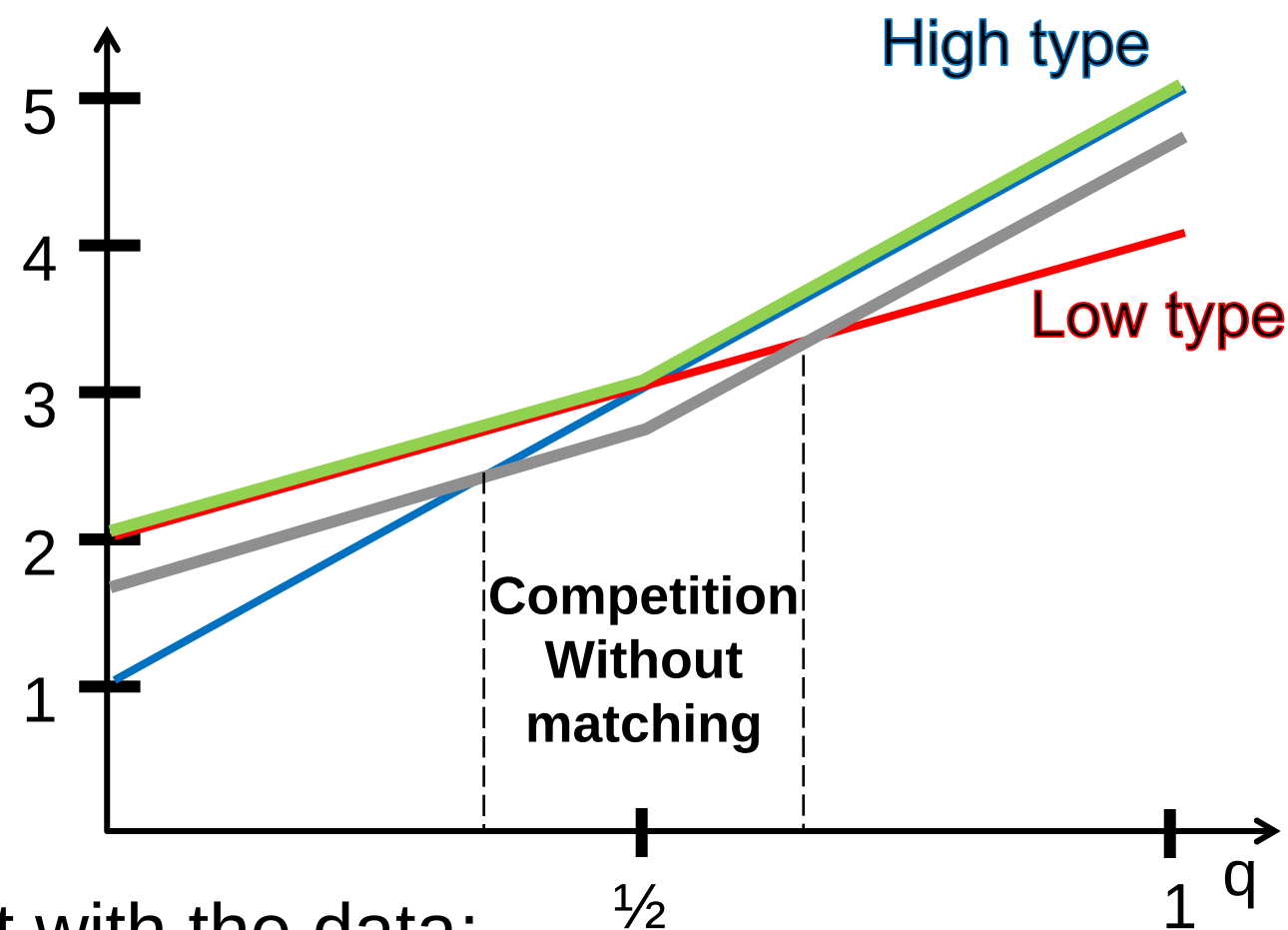
Information in Markets: A “Matching/Sorting” Model

- **A2:** Good and bad cars sell simultaneously on two separate platforms
- **A3:** Bidders know the value when they see the car, but they don't know where each car is (*no ex-post uncertainty about value*)
- **Without information:** each bidder randomly chooses a platform
 - Expected 2nd value is below the green line because won't always have two “strong” types
- **With information:** types will sort according to their strength
 - If not, someone wants to move
 - Expected 2nd value is on green line
 - All news is good news!
- **Information matches buyers to goods!**
 - Release of information is good for the seller (like Linkage)
 - Information increases prices for **all quality** levels (unlike Linkage)



Sorting with Reserve Prices: Implications

- Sellers have outside options:
 - They can sell to wholesalers
 - They can run the car through the auction again and again...
- Setting reserve prices:
 - With low opportunity costs of time, **reserve price** should be close to the **upper envelope**
- Effect of more information is consistent with the data:
 - Likelihood of meeting the reserve goes up
 - Effect is larger as you move away from the “middle” (Table 9)
 - Conditional on selling, not much of a (positive) price effect (Table 10)
- Need to verify what we can to support matching/sorting theory:
 - Heterogeneous bidders
 - Test other empirical implications (when info matters; better matching)



Buyer's are Heterogeneous (Horizontally)

- Heterogeneous buyers → the grade of “early” purchases should predict “late” purchases. Consider sample halves for each bidder:
 - average CGs correlation = 0.45 (p-value <0.01, 350 dealers.)
 - Transition Matrix per buyer by quintile of buyer average grades

Condition Grade Quintile		“Late” purchases					Total
		1	2	3	4	5	
“Early” purchases	1	34	14	9	7	2	66
		51.52%	21.21%	13.64%	10.61%	3.03%	100%
	2	28	21	17	10	10	86
		32.56%	24.42%	19.77%	11.63%	11.63%	100%
	3	13	21	24	15	12	85
		15.29%	24.71%	28.24%	17.65%	14.12%	100%
	4	19	7	15	21	30	92
		20.65%	7.61%	16.30%	22.83%	32.61%	100%
	5	8	9	17	15	29	78
		10.26%	11.54%	21.79%	19.23%	37.18%	100%
Total		102	72	82	68	83	407
		25.06%	17.69%	20.15%	16.71%	20.39%	100%

Information should help where it is a surprise

- Recall: Bidders have lots of information without SCRs (mileage, year...) which can be a noisy signal of SCR
- Effect of information should be on “surprises” in only for weeks 31-39

Table 12: Sales probability by difference of expected condition grade (CG), weeks 31-39

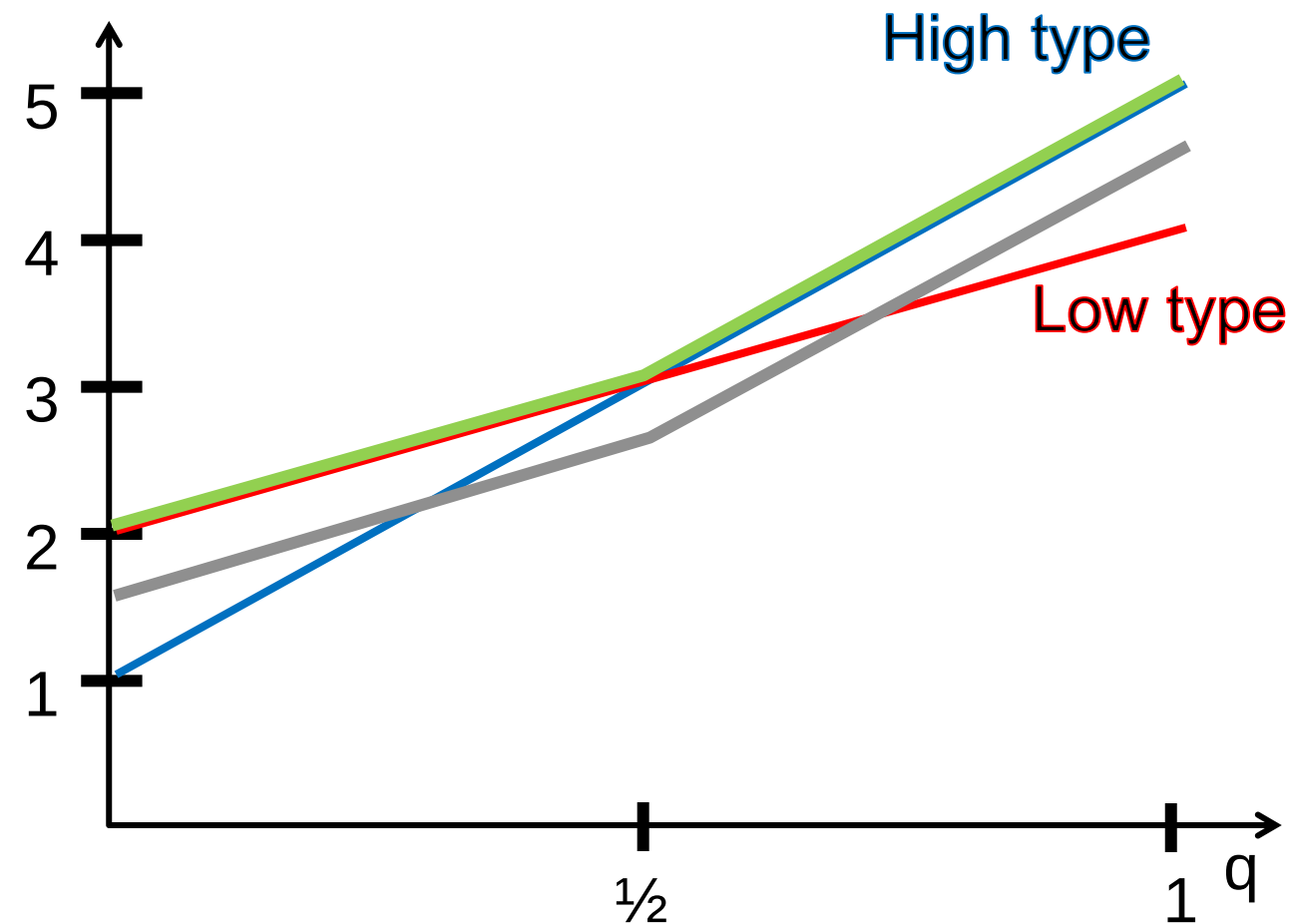
Tercile of Difference from Expected CG	# of Cars	No posted SCR	Posted SCR	Difference	% Difference	z-statistic	p-value
Worse than expected	901	0.338	0.403	0.065	19.2%	2.00	0.045
Close to expected	897	0.416	0.425	0.009	2.2%	0.28	0.78
Better than expected	898	0.421	0.53	0.122	29.0%	3.27	0.001

Table 13: Sales probability by difference of expected condition grade (CG), weeks 21-30

Tercile of Difference from Expected CG	# of Cars	No posted SCR	Posted SCR	Difference	% Difference	z-statistic	p-value
Worse than expected	1802	0.383	0.375	-0.08	-0.2%	-0.36	0.72
Close to expected	1800	0.429	0.452	0.02	4.6%	0.99	0.32
Better than expected	1800	0.477	0.483	0.005	1.3%	0.23	0.82

Is More Information Creating Better Matches?

- If seller's are using information:
 1. They should focus more
 2. Less variance in purchases
- Data limitations:
 1. Can't see where they are
 2. Can see what they buy, but variance maybe the same due to the **reserve price** (it is...)
- Indirect effect of more information?
 - random assignment of vehicles to lanes prior to SCRs being performed
 - weeks 21-30: bidders have less information so the benefit of switching lanes in search of better matched vehicles is not large.
 - After week 30, more information about the vehicles with SCRs increases the benefit of switching lanes
 - → given # of vehicles a bidder buys, he should visit more lanes after week 30 to buy the “right” cars with SCRs



Indirect Evidence of Better Matching

Table 16: Number of lanes used by dealers per week†

	All Cars	ECR Cars	Non-ECR Cars
Week 31-39	-.21** (.067)	-.31* (.12)	-.17+ (.1)
Number of cars	.47** (.05)	.42** (.075)	.49** (.076)
Week 31-39 * Number of cars	.17** (.055)	.25* (.098)	.13 (.082)
Buyer Fixed Effects (837)	yes	yes	yes
Constant	.58** (.062)	.64** (.097)	.55** (.096)
Observations	2690	1401	1289
R-squared	0.779	0.796	0.843

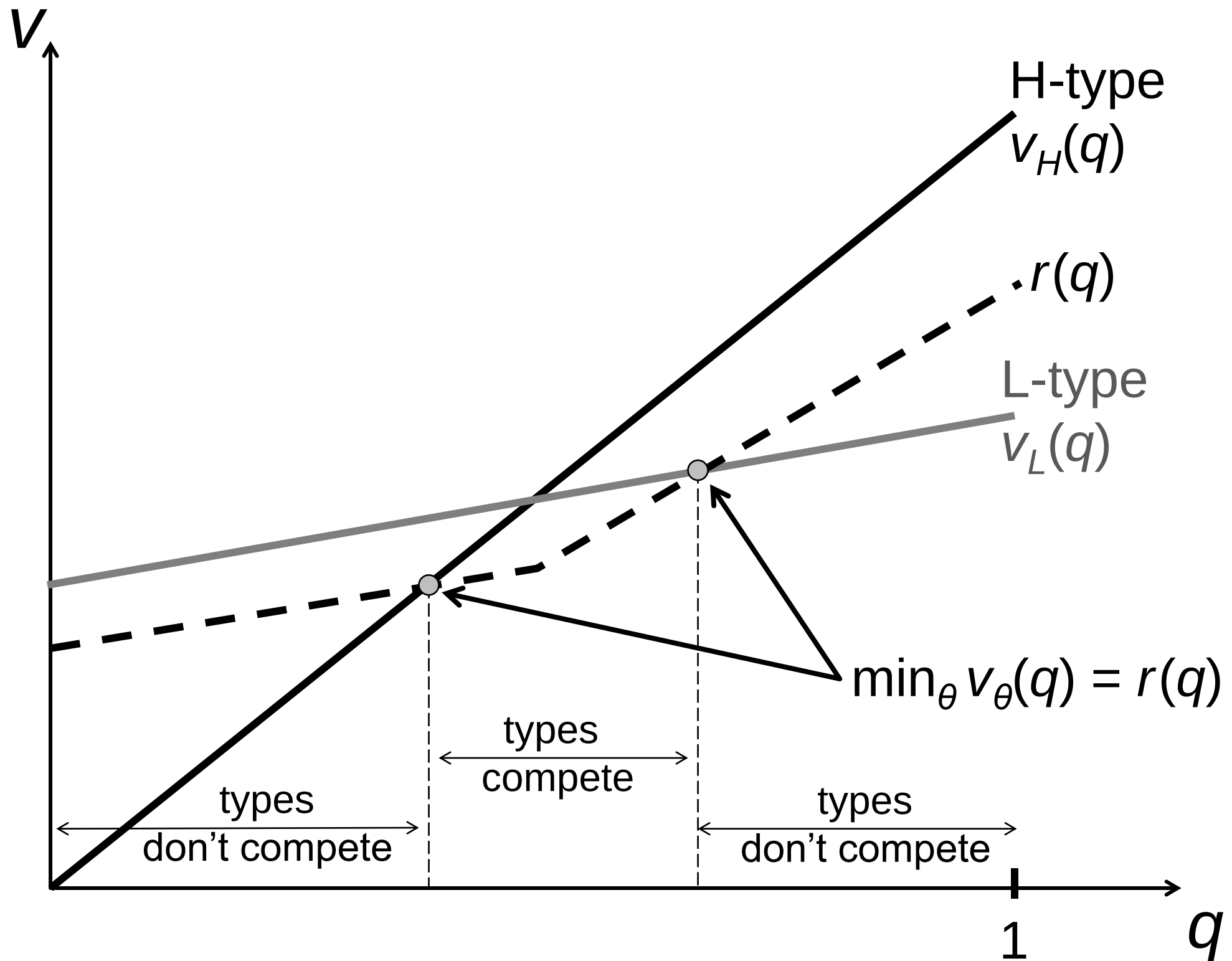
Take Away

- Information as a “matching mechanism”:

- In Markets with heterogeneous bidders and multiple (exclusive) auctions, information makes competition more “effective” by matching buyers to goods
 - This is even when conditional on seeing the item, information adds no value (which is not the case for the standard auction approach)
- Information as a “matching mechanism” **may be** more important than information-rent effects (Linkage Principle)

- More generally:

- Other simultaneously exclusive platforms (online auctions);
- Sequential procurement;
- Labor markets;
- Mergers and acquisitions



Controlling for Trends: Diff-in-Diff Using Fleet Sales

Table 5: Linear probability model: diff-in-diff specification[†]

Dependent Variable: Sold	(1)	(2)	
Dealer-consigned car, no posted SCR	-.24** (.012)	-.27** (.015)	← Dealer sales Weeks 21-30
Dealer-consigned car, posted SCR	-.23** (.012)	-.27** (.015)	←
Week 31-39	-.07** (.0066)	-.14** (.015)	← Secular trend
Week 31-39 * Dealer-consigned car, no posted SCR	.031 (.019)	.029 (.02)	← No significant change for no SCR
Week 31-39 * Dealer-consigned car, posted SCR	.089** (.02)	.087** (.019)	← Significant change for cars with SCR
Mileage on Car		1.6e-07 (1.0e-07)	
Green light		.14** (.0081)	
Yellow light		-.011 (.01)	
Blue light		-.11** (.0096)	
Model Year Fixed Effects	no	yes	
Vehicle Segment Fixed Effects	no	yes	
Nameplate Fixed Effects	no	yes	
Sale Week Fixed Effects	no	yes	
Constant	.67** (.0049)	.66** (.2)	← Fleet sales
Observations	35287	35287	
R-squared	0.034	0.119	

SCRs were effective at increasing **webcast bidding** even without e-mail promotions (reality check...)

Table 6: Percentage of dealer-consigned cars which received an online bid

	No posted SCR	Posted SCR	Difference	% Difference	z-statistic	p-value
All weeks	2.54% 3,980 cars	3.45 % 4,118 cars	0.91%	35.8%	2.40	0.016
Weeks 21-30	2.69% 2,605 cars	3.50% 2,797 cars	0.81%	30.2%	1.73	0.084
Weeks 31-39	2.25% 1,375 cars	3.33% 1,321 cars	1.08%	47.7%	1.70	0.089

Table 7: Percentage of sold dealer-consigned car with where winning bid was placed online

	No posted SCR	Posted SCR	Difference	% Difference	z-statistic	p-value
All weeks	3.07% 1,660 cars	4.72 % 1,821 cars	1.65%	53.6%	2.50	0.01
Weeks 21-30	3.21% 1,121 cars	4.51% 1,220 cars	1.29%	40.3%	1.62	0.10
Weeks 31-39	2.78% 539 cars	5.15% 601 cars	2.37%	85.3%	2.03	0.04

- $E[\# \text{ of bidders per 100 auctions}]$ goes up from 3.6 to 4.7 (Table 8)