Managing Market Mechanism Transitions: An RCT on Decentralized Pricing vs. Platform Control

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Sharing economy platforms have permeated several industry verticals

<table>
<thead>
<tr>
<th>Industry Vertical</th>
<th>Examples</th>
</tr>
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<tbody>
<tr>
<td>Banking</td>
<td>IVA, LendingClub, Funding Circle, PROSPER, Lufax</td>
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<tr>
<td>Food</td>
<td>instacart, LA RUCHE QUI DIT OUI!, COOK LOCAL, MUNCHERY, Josephine, EatWith</td>
</tr>
<tr>
<td>Hotels</td>
<td>airbnb, goneonbest, couchsurfing, tuia 途家, kozaza, BnB HERO, OYO</td>
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<tr>
<td>Real Estate</td>
<td>wework, Homesuite, common, THE YARD</td>
</tr>
<tr>
<td>Retailing</td>
<td>Etsy, mercari, threadUP, peerby, STYLELEND, REWEAR, RentHerVans</td>
</tr>
<tr>
<td>Healthcare</td>
<td>heal, Care.com, pager, COHEALO, fig. 1, Bla Bla Car, notteco, Bla Bla Car</td>
</tr>
<tr>
<td>Transportation</td>
<td>UBER, LYFT, 滴滴, Grab, HAIL, OLA, GOJEK, notteco, Bla Bla Car, TRADE SCHOOL</td>
</tr>
<tr>
<td>Diversified Labor</td>
<td>HANDY, taskrabbit, Upwork, Thumbtack, CrowdWorks, Lancers</td>
</tr>
<tr>
<td>Personal Services</td>
<td>shyp, POSTMATES, Alfred, LUXE, RINSE, SOOTHE, HopSkipDrive, eaze</td>
</tr>
<tr>
<td>Corporate Services</td>
<td>HourlyNerd, GIGSTER, MANAGED BY Q, upcounsel, UNIVERSAL AVENUE, workmarket</td>
</tr>
<tr>
<td>Rental Cars</td>
<td>GETAROUND, TURBO, drivy, SnappCar, socialcar, SOCAR, DriveNow</td>
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Sharing economy platforms are firm-market hybrids

<table>
<thead>
<tr>
<th>Sharing economy platforms/marketplaces</th>
</tr>
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<tbody>
<tr>
<td>• enable transactions between two (or more) types of users</td>
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<tr>
<td>• intermediaries: matching, search, reputation, payments, etc.</td>
</tr>
<tr>
<td>• typically don’t own assets</td>
</tr>
<tr>
<td>• use market mechanisms to sign up users</td>
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</table>

Decentralization

| • allows the platforms to scale very quickly |
| • BUT loss of control on the providers (of asset or labor) |

Challenge

| • price dispersion, hard to plan/schedule, inconsistent UX |

Solution

| • platforms becomes a firm-market hybrid |
| • takes on roles of a typical firm (e.g., pricing, service guarantees, etc.) |
Empirical Context: large P2P short-term car rental platform

Providers
- choose car availability
- choose hourly car rental prices
- rental times: ½ hour to 1 month
- cannot reject a transaction, can only later cancel

Platform
- search, reputation, matching process, curation, etc.
- proprietary mobile-phone based keyless locking

Renters
- compare listings and choose cars for rent
Descriptive statistics [1-Jan-2017 to 1-Aug-2017]: rental intensity aligned with population density

Intensity: red – high, green – low
Descriptive statistics [1-Jan-2017 to 1-Aug-2017]:
most of rental activity is for short-term (~65% rentals < 8 hrs)
Descriptive statistics [1-Jan-2017 to 1-Aug-2017]:

broad mix of “serious” and “casual” providers
Descriptive statistics [1-Jan-2017 to 1-Aug-2017]: varying degrees of provider success (low vehicle utilization)
Descriptive statistics [1-Jan-2017 to 1-Aug-2017]: most providers don’t change prices despite varying demand
DECENTRALIZED to CENTRALIZED pricing

Can the platform aggregate all of the relevant information?

What about heterogeneity of providers?

How will the providers react to the change?

What is the impact on market outcomes?
Move to centralized pricing in the San Francisco market

Platform objectives:

**Providers**
- increase vehicle utilization
- remove price inefficiencies

**Renters**
- increase chances of a match in low-demand periods
- provide consistent pricing experience

Platform capabilities:

- scale → large quantities of mkt data
- algos from 3rd party data analytics consulting firm

Challenges:

- heterogeneity of assets and provider costs
- lack of visibility into local info not captured by platform
- provider reaction to loss of pricing control
Field experiment in San Fran: 01-Aug-2017 to 05-Sep-2017 (peak summer month)

Provider sample for experiment
- 1218 providers [~12K rentals to ~7K renters]
- cover the entire SF bay area
- restricted to active users
  [car available > 24 hrs in the previous month]

Experimental design:
- Block random (BR) assignment to minimize spillover
- Unit of randomization: provider

Treatment groups
- Control (Trt 0)  Existing provider controlled pricing  73%
- Treatment 1 (Trt 1)  Centralized platform controlled pricing  13.5%
- Treatment 2 (Trt 2)  13.5%
Field experiment in San Fran: 01-Aug-2017 to 05-Sep-2017: Interface for provider-controlled pricing (Control/Treatment 0)

$20/hour
$200 / day
$1200 / week

Your rates include 200 miles per day. You’ll receive 30¢ for each additional mile. Commission (40%) covers renter insurance, driver screening, and payment processing.

How it works
Field experiment in San Fran: 01-Aug-2017 to 05-Sep-2017: Interface for centralized pricing (Treatment 1)

![Graph showing hourly rate fluctuations and rental prices from 01-Aug-2017 to 05-Sep-2017.]

Your rates include 200 miles per day. You’ll receive 30¢ for each additional mile. Commission (40%) covers renter insurance, driver screening, and payment processing.
Field experiment in San Fran: 01-Aug-2017 to 05-Sep-2017: Balanced experimental design (pre-exp attribute comparison)

<table>
<thead>
<tr>
<th>Provider attributes</th>
<th>T0 mean (s.e.)</th>
<th>T1 mean (se)</th>
<th>T0-T1 p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>33.65 (0.48)</td>
<td>34.13 (0.72)</td>
<td>0.58</td>
</tr>
<tr>
<td>Tenure</td>
<td>1.37 (0.05)</td>
<td>1.37 (0.08)</td>
<td>0.97</td>
</tr>
<tr>
<td>Cars</td>
<td>1.37 (0.04)</td>
<td>1.32 (0.06)</td>
<td>0.49</td>
</tr>
<tr>
<td>Price changes</td>
<td>1.79 (0.18)</td>
<td>1.8 (0.35)</td>
<td>0.98</td>
</tr>
<tr>
<td>Cancellations</td>
<td>1.43 (0.06)</td>
<td>1.39 (0.1)</td>
<td>0.73</td>
</tr>
<tr>
<td>Availability</td>
<td>0.65 (0.01)</td>
<td>0.64 (0.02)</td>
<td>0.49</td>
</tr>
<tr>
<td>Utilization</td>
<td>0.22 (0)</td>
<td>0.2 (0.01)</td>
<td>0.02</td>
</tr>
<tr>
<td>Earnings</td>
<td>1.01 (12.92)</td>
<td>-8.72 (30.22)</td>
<td>0.77</td>
</tr>
</tbody>
</table>
results from the field experiment: how and why of provider behavior

providers outcomes of interest

platform exit rate

Car availability

Ride cancellations
Provider behavior results from field experiment: providers in Trt1 exit from the platform

Exit rate from the platform

Control/Trt 0  8.8%  28.2% points increase in exit rates due to centralized pricing
Trt1  38.2%

Exit rate NOT correlated with earnings decrease!

≡

Both providers who increase and decrease their revenues to exit from the platform

The effect stays even after controlling for a host of factors
Provider behavior results from the field experiment: car availability is less in Trt1 when compared to Trt0/Control.

Fraction of time cars were made available on the platform:

- **Control/Trt 0**: 62%
- **Trt1**: 82%

20% points decrease in availability due to centralized pricing.
Provider behavior results from field experiment: providers in Trt1 cancel more rides than those in Trt0/Control

Fraction of rides cancelled by providers

Control/Trt 0 17%  
Trt1 37%  

20% points increase in ride cancellations due to centralized pricing
Results from the field experiment: how and why of provider behavior

Providers outcomes of interest

- Platform exit rate: increases
- Car availability: decreases
- Ride cancellations: increases

WHY? Explanation 1: Centralized pricing \(\rightarrow\) worse market outcomes
Market outcome results from field experiment: providers in Trt 1 earned more than those in Trt 0/Control

Control/Trt 0

Trt1

21.3% increase in revenues per available hr. due to centralized pricing
Results from the field experiment: how and why of provider behavior

Providers outcomes of interest

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Trt1 effect</th>
</tr>
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<tbody>
<tr>
<td>Platform exit rate</td>
<td>increases</td>
</tr>
<tr>
<td>Car availability</td>
<td>decreases</td>
</tr>
<tr>
<td>Ride cancellations</td>
<td>increases</td>
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WHY?
- Explanation 1: Centralized pricing → worse market outcomes
- Explanation 2: Platform objective ≠ provider objective
  Individual provider costs not observed by platform
Bring-to-Market (BTM) costs incurred by providers

[FHZ19] decompose BTM costs into:

– **Usage-based costs**: scale with usage; e.g., depreciation, regular wear-and-tear

– **Transaction-based costs**: fixed cost per transaction; e.g., screening the renter, answering questions, inspecting & cleaning

Costs are not observed, so we use proxy measures

**PROXY measure**

Usage-based cost  —  Revenue per mile
Transaction-based cost  —  Revenue per transaction

Bring-to-Market (BTM) costs from field experiment: providers in Trt 1 had less rev/mile than those in Trt 0/Control.

Control/Trt 0
Trt1 27.8% decrease in revenues per mile due to centralized pricing

Revenue per mile car was driven

Week

July Aug Sep
Bring-to-Market (BTM) costs from field experiment: providers in T1 had less rev/trans. than those in T0/Control

Control/T0
T1

14.7% decrease in revenues per trans. due to centralized pricing
Results from the field experiment: how and why of provider behavior

Providers outcomes of interest

- Platform exit rate: increases
- Car availability: decreases
- Ride cancellations: increases

BTM cost proxies

- Revenue / mile: decreases
- Revenue / trans.: decreases

WHY?

Explanation 1: Centralized pricing → worse market outcomes
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Experimental design:
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Treatment groups
- Control (Trt 0): Existing provider controlled pricing 73%
- Treatment 1 (Trt 1): Centralized platform controlled pricing 13.5%
- Treatment 2 (Trt 2): Partial control of pricing 13.5%
Field experiment in San Fran: 01-Aug-2017 to 05-Sep-2017: Interface for partial control of pricing (Treatment 2)

Minimum daily rate is $83.

Woohoo! Your car's more likely to be rented.

<table>
<thead>
<tr>
<th>Day</th>
<th>Price</th>
<th>Hourly Rate Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Today</td>
<td>$110</td>
<td>$6.95 to $14.00 per hour</td>
</tr>
<tr>
<td>Sat 8/19</td>
<td>$153</td>
<td>$10.75 to $20.27 per hour</td>
</tr>
<tr>
<td>Sun 8/20</td>
<td>$151</td>
<td>$9.87 to $19.38 per hour</td>
</tr>
<tr>
<td>Mon 8/21</td>
<td>$102</td>
<td>$6.86 to $12.88 per hour</td>
</tr>
<tr>
<td>Tue 8/22</td>
<td>$85</td>
<td>$6.08 to $11.29 per hour</td>
</tr>
<tr>
<td>Wed 8/23</td>
<td>$96</td>
<td>$5.79 to $11.50 per hour</td>
</tr>
<tr>
<td>Thu 8/24</td>
<td>$91</td>
<td>$8.04 to $11.96 per hour</td>
</tr>
</tbody>
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Your rates include 200 miles per day. You'll receive 30¢ for each additional mile. A commission (40%) covers renter insurance, driver screening, and payment processing.
Results from the field experiment: how and why of provider behavior

<table>
<thead>
<tr>
<th>Providers outcomes of interest</th>
<th>Trt1 effect</th>
<th>(Trt2 - Trt1)/Trt1 effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform exit rate</td>
<td>increases</td>
<td>– 58.2% significant</td>
</tr>
<tr>
<td>Car availability</td>
<td>decreases</td>
<td>40.2% significant*</td>
</tr>
<tr>
<td>Ride cancellations</td>
<td>increases</td>
<td>– 30.0% significant</td>
</tr>
<tr>
<td>BTM cost proxies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue / mile</td>
<td>decreases</td>
<td>9.2% significant</td>
</tr>
<tr>
<td>Revenue / trans.</td>
<td>decreases</td>
<td>11.2% significant</td>
</tr>
</tbody>
</table>

**WHY?**

Explanation 1: Centralized pricing → worse market outcomes

Explanation 2: Platform objective ≠ provider objective

Individual provider costs not observed by platform
Results from the field experiment: partial control increases provider satisfaction…
field expt. to evaluate impact of move from decentralized to centralized pricing in sharing economy platforms

KEY CONTRIBUTIONS

MAIN TAKEAWAYS

1. Decentralized → centralized pricing increases provider retaliation
2. DESPITE improved market outcomes (revenues and utilization)
3. Increase in BTM costs provides an plausible explanation

IMPLICATIONS FOR DYNAMIC PRICING

1. Provider objective ≠ platform objective in sharing economy platforms
2. Partial control — aligns objectives by providing idiosyncratic cost info
   — mitigates provider retaliation (psychological contract)

Update: platform launched Trt 2 (partial control) to all the providers after the experiment