Skewed Pricing in Two-Sided Markets

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Of course ....

- The views expressed in this presentation and paper are those of the authors and do not necessarily represent those of the IMF, IMF policy, De Nederlandsche Bank, or the European System of Central Banks.
OUTLINE

- Two-sided markets: an overview

- Simple IO model of two-sided markets:

  - Main Results:
    - rationalization of skewed pricing (only one side of the market gets charged, while the other side has complete participation at minimal prices)
    - monopoly profits and social welfare

- Other issues and policy conclusions
TWO-SIDED MARKETS: AN OVERVIEW

• Examples of two-sided markets:

Platform

buyers
- gamers
- users
- reader/viewer
- cardholders
- men

platform
- videogame platform
- operating system
- portals, newspapers, TV
- debit & credit cards
- nightclubs

sellers
- game developers
- application developers
- advertizers
- merchants
- woman

• Platform must get both sides on board/court each side while making money overall.
Two-sided markets raise new issues:

• Main point: cross-group externalities
  Not only the total price but also the pricing structure matters for total demand!!!

• Completely skewed pricing structure: In the Netherlands we observe skewed pricing on the market for debit card transactions:
  Consumer pays zero transaction price, retailer pays 7 eurocents.

• Explanation for such pricing structure?
Payment Systems

• No free lunch! Payment systems impose resource costs; Tentative estimations: 1-3% of GDP.

• Antitrust controversy.
THE MODEL

The Monopoly platform

- Cost: $c$
- Profit: $\pi$
- Benefit buyer: $b_b$
- Benefit seller: $b_s$
- Transaction: $t_b$, $t_s$

The model represents the relationship between the platform, seller, and buyer in terms of cost, profit, and benefit.
THE MODEL (2)

- **Platform:**
  - cost: $C$ per transaction
  - prices: $t_b, t_s$ per transaction
  - profit: $\pi(t_b, t_s, C) = (t_b + t_s - C)q$

- **Buyers:**
  - (relative) benefits $b_b$ from platform services
  - Heterogeneous: $b_b \in [\underline{b}_b, \bar{b}_b]$
  - Density: $h_b(.)$ Distribution: $H_b(.)$

  Demand: $q_b = D_b(t_b) = \Pr(b_b \geq t_b) = 1 - H_b(t_b)$. 
THE MODEL (3)

- **Sellers:**
  (relative) benefits $b_s$ from using platform services

  Heterogeneous: $b_s \in [b_s, \bar{b}_s]$

  Density: $h_s(.)$ Distribution: $H_s(.)$

  Demand: $q_s = D_s(t_s) = \Pr(b_s \geq t_s) = 1 - H_s(t_s)$.

- **Total demand:** $q = D(t_b,t_s) = D_b(t_b)D_s(t_s)$.

  Note the externality!

- **Assumption:** Fixed number $N$ of transactions
OPTIMAL PRICING (1)

- In setting prices, platform make sure that both sides ‘get on board’.
- Maximization problem of monopolistic platform

\[
\max_{t_b, t_s} \pi(t_b, t_s, c) = N(t_b + t_s - c)D(t_b, t_s) \quad (A1)
\]

subject to: \( t_b \geq b_b, \ t_s \geq b_s \)

- Important distinction between interior and corner solution!!!!
RESULT 1: Interior Pricing (the interior solution)

- The interior solution \((t_b^*, t_s^*)\) is characterized by

\[
\begin{align*}
t_b^* &= \frac{c \varepsilon_b^*}{\varepsilon^*-1}, \\
t_s^* &= \frac{c \varepsilon_s^*}{\varepsilon^*-1},
\end{align*}
\]

where \(\varepsilon_i^* = \varepsilon_i(t_i^*), \ i = b, s\) and \(\varepsilon^* = \varepsilon_b^* + \varepsilon_s^*\).

- The optimal price structure is given by

\[
\begin{align*}
t_b^* &= \frac{\varepsilon_b^*}{\varepsilon_b^*}, \\
t_s^* &= \frac{\varepsilon_s^*}{\varepsilon_s^*}.
\end{align*}
\]
OPTIMAL PRICING (3): Interior

- Under *log-concavity* of demand functions, the interior solution yields the global maximum.

- Elegant, but counterintuitive results!
  And not seen in practice...
OPTIMAL PRICING (4): Corner

• RESULT 2: Skewed Pricing (the corner solution)

A corner solution \((t^c_i, t^c_j)\) is characterized by

\[
t^c_i = b_i \quad \text{and} \quad t^c_j = m_j = \arg\max_{t_j} \pi(b_i, t_j, c)
\]

• Under \textit{constant elasticity of demand}, it is optimal to charge the most elastic side of the market its minimal price.

That is, w.l.o.g. there exists an \(\bar{\varepsilon} \geq \varepsilon_s\) such that if \(\varepsilon_b > \bar{\varepsilon}\) then

\[
t^*_b = b_b \quad \text{and} \quad t^*_s = m_s .
\]
Constant Elasticity of Demand: Saddle Point
TABLE II: Outcomes Monopoly

<table>
<thead>
<tr>
<th></th>
<th>Interior</th>
<th></th>
<th>Corner</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>buyer</td>
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<td>seller</td>
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</tr>
<tr>
<td><strong>Price:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buyer</td>
<td>0.046</td>
<td></td>
<td>0.020</td>
<td>0.069</td>
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<tr>
<td>Seller</td>
<td>0.034</td>
<td></td>
<td>0.081</td>
<td>0.018</td>
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<tr>
<td>Total</td>
<td>0.080</td>
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<td>0.101</td>
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<td><strong>Demand:</strong></td>
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<tr>
<td>Buyer</td>
<td>8.4</td>
<td></td>
<td>100</td>
<td>2.4</td>
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<tr>
<td>Seller</td>
<td>25.5</td>
<td></td>
<td>3.7</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>2.1</td>
<td></td>
<td>3.7</td>
<td>2.4</td>
</tr>
<tr>
<td><strong>Profit:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>0.32</td>
<td></td>
<td>1.35</td>
<td>0.56</td>
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<tr>
<td>Per Transaction</td>
<td>0.015</td>
<td></td>
<td>0.037</td>
<td>0.023</td>
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<tr>
<td><strong>Welfare:</strong></td>
<td>1.41</td>
<td></td>
<td>4.20</td>
<td>1.77</td>
</tr>
</tbody>
</table>
OPTIMAL PRICING (5): Corner

- Resembles Dutch debit card practice:
  consumers pay nothing, retailers pay ‘high’ fee per transaction

- Skewed pricing result:
  Elastic buyers’ side is used to boost demand \( (i.e. D_b(b_b)=1) \)
  Inelastic sellers’ side generates revenues

- In general, the sellers’ fee is higher than the 'normal' one-sided monopoly fee.
Total (expected) social welfare that is generated from platform services is equal to buyer plus seller (expected) benefits, conditional upon their participation in the platform network, minus (marginal) costs.

\[ W(t_b, t_s) = (\beta_b(t_b) + \beta_s(t_s) - c)D(t_b, t_s), \]  

(A2)

and \( \beta_i(t_i) \) denotes the conditional expected benefit of buyers and sellers.
2 Questions:

1. How do fees compare to monopoly prices and price structure?

2. Is the platform still profitable when implementing the socially optimal fees?
RESULT 3: (social welfare)

Under general conditions, the socially optimal prices \((t_{c}^{so}, t_{r}^{so})\) that maximize the social welfare function (A2) are also skewed towards the sellers' side of the market, but lower than the price set by the monopolistic platform. More precisely,

\[ t_{s}^{so} = b_{s} \quad \text{and} \quad t_{s}^{so} \leq m_{s} \quad \text{(corner solution)} \]

Hence, the platform induces *underprovision* of platform services.

Under general conditions, the socially optimal prices \((t_{b}^{so}, t_{s}^{so})\) induce an operational loss for the platform (cost recovery problem).

That is,

\[ t_{b}^{so} + t_{s}^{so} \leq c \]

SOCIAL WELFARE (3)
## TABLE II: Outcomes Social Welfare

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<tr>
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<tr>
<td><strong>Price:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buyer</td>
<td>0.030</td>
<td>0.020</td>
<td>0.031</td>
</tr>
<tr>
<td>Seller</td>
<td>0.018</td>
<td>0.034</td>
<td>0.018</td>
</tr>
<tr>
<td>Total</td>
<td>0.048</td>
<td>0.054</td>
<td>0.049</td>
</tr>
<tr>
<td><strong>Demand:</strong></td>
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<td></td>
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</tr>
<tr>
<td>Buyer</td>
<td>28.3</td>
<td>100</td>
<td>26.9</td>
</tr>
<tr>
<td>Seller</td>
<td>96.6</td>
<td>24.7</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>27.3</td>
<td>24.7</td>
<td>26.9</td>
</tr>
<tr>
<td><strong>Profit:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>-4.2</td>
<td>-2.5</td>
<td>-4.0</td>
</tr>
<tr>
<td>Per Transaction</td>
<td>-0.015</td>
<td>-0.010</td>
<td>-0.015</td>
</tr>
<tr>
<td><strong>Welfare:</strong></td>
<td>4.2</td>
<td>7.0</td>
<td>4.2</td>
</tr>
</tbody>
</table>
SOCIAL WELFARE (4)

- Loss-making business: how to resolve?
  - (government) subsidies
  - cross-selling and tying
  - interchange fees in payment systems
  - second-best under balanced-budget (Ramsey pricing)
  - introduction of fixed fees
ANTITRUST ISSUES

- Is skewed pricing a signal for abuse of market power?
  When are prices on one side of the market excessive?
  Large price mark-ups on one side of the market.

- In antitrust matters, no examination of prices possible on either side
  *in isolation* because of feedback effects on total demand.

- Skewed pricing may also be socially optimal.

- Development of economically sensible test to check
  for abuse of market power and excessive pricing.
(POLICY) CONCLUSIONS

- Skewed pricing can be explained, and may also hold in social optimum!

- Socially optimal prices are at odds with cost recovery

- Some other issues still to be studied:
  - network/system competition
  - impact of single/multihoming
  - antitrust implications
  - impact of fixed cost