Skewed Pricing in Two-Sided Markets

W. Bolt (DNB) and A.F. Tieman (IMF)

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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.

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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

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TWO-SIDED MARKETS: AN OVERVIEW

- **Examples of *two-sided markets*:**

buyers	platform	sellers
gamers	videogame platform	game developers
users	operating system	application developers
reader/viewer	portals, newspapers, TV	advertizers
cardholders	debit & credit cards	merchants
men	nightclubs	woman

- **Platform must get both sides on board/court each side while making money overall.**

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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?

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Payment Systems

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

- Antitrust controversy.

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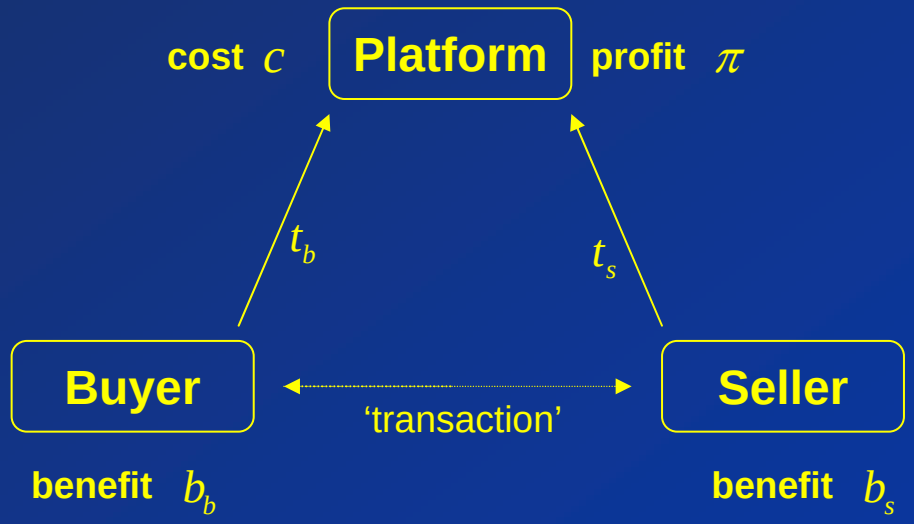
THE MODEL

The Monopoly platform



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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: $b_b \in \left[\underline{b}_b, \bar{b}_b\right]$

  Density: $h_b(.)$ Distribution: $H_b(.)$

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

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THE MODEL (3)

- **Sellers:**

  (relative) benefits b_s from using platform services

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

  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

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OPTIMAL PRICING (1)

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

$$\max_{t_b,\, t_s} \ \pi(t_b,t_s,c) = N(t_b+t_s-c)D(t_b,t_s) \qquad \text{(A1)}$$

subject to: $t_b \geq \underline{b}_b,\ t_s \geq \underline{b}_s$

- Important distinction between interior and corner solution!!!!

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OPTIMAL PRICING (2): Interior

- **RESULT 1: Interior Pricing (the interior solution)**

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

$$t_b^* = \frac{c\varepsilon_b^*}{\varepsilon^* - 1}, \quad t_s^* = \frac{c\varepsilon_s^*}{\varepsilon^* - 1},$$

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

- The optimal price structure is given by

$$\frac{t_b^*}{t_s^*} = \frac{\varepsilon_b^*}{\varepsilon_s^*}.$$

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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...

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OPTIMAL PRICING (4): Corner

- **RESULT 2: Skewed Pricing (the corner solution)**

  A corner solution (t_i^{co}, t_j^{co}) is characterized by

$$t_i^{co} = \underline{b}_i \quad \text{and} \quad t_j^{co} = m_j = \arg\max_{t_j} \pi(\underline{b}_i, t_j, c)$$

- **Under *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

$$t_b^{**} = \underline{b}_b \quad \text{and} \quad t_s^{**} = m_s \ .$$

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Constant Elasticity of Demand: Saddle Point

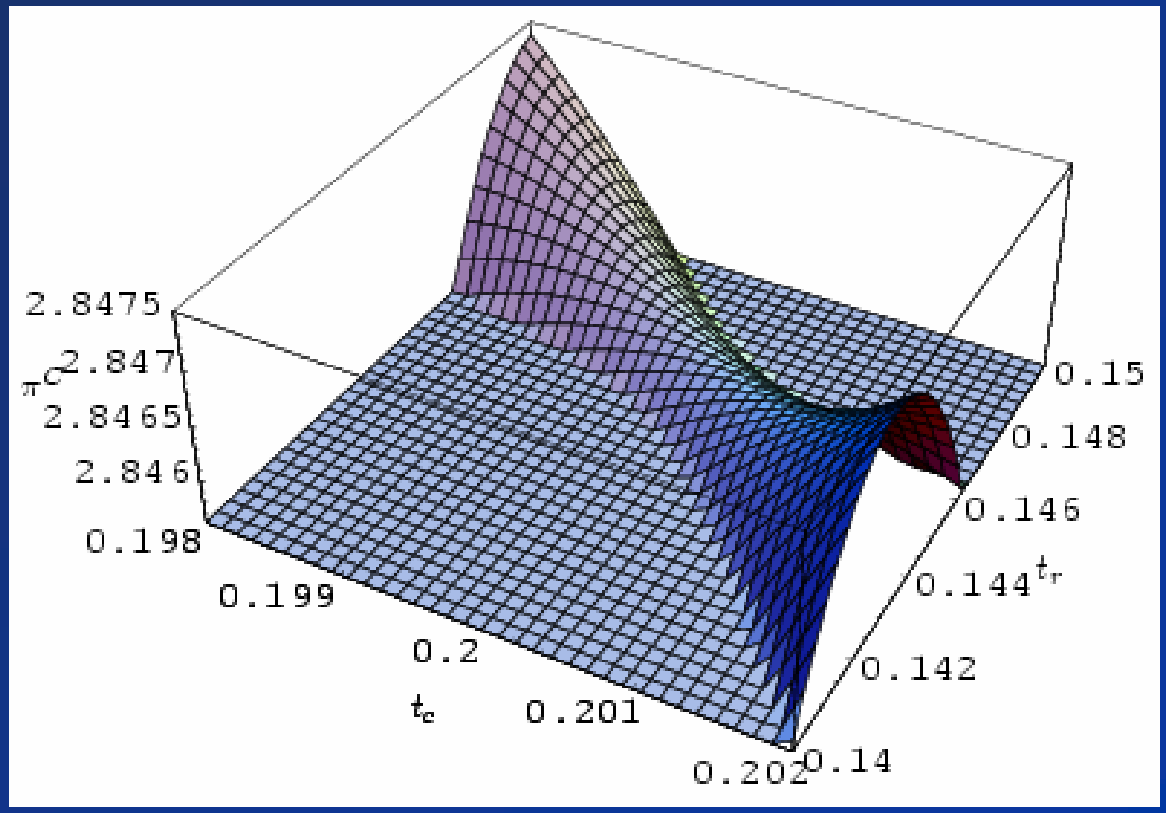

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TABLE II: Outcomes Monopoly

	Interior	Corner	
		buyer	seller
Price:			
Buyer	**0.046**	**0.020**	**0.069**
Seller	**0.034**	**0.081**	**0.018**
Total	**0.080**	**0.101**	**0.087**
Demand:			
Buyer	**8.4**	**100**	**2.4**
Seller	**25.5**	**3.7**	**100**
Total	**2.1**	**3.7**	**2.4**
Profit:			
Total	**0.32**	**1.35**	**0.56**
Per Transaction	**0.015**	**0.037**	**0.023**
Welfare:	**1.41**	**4.20**	**1.77**

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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. $D_b(\underline{b}_b)=1$)
  Inelastic sellers' side generates revenues

- In general, the sellers' fee is higher than the 'normal' one-sided monopoly fee.

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SOCIAL WELFARE (1)

- 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

$$W(t_b,t_s)=(\beta_b(t_b)+\beta_s(t_s)-c\,)D(t_b,t_s), \qquad \text{(A2)}$$

and

$\beta_i(t_i)$ denotes the conditional expected benefit of buyers and sellers.

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SOCIAL WELFARE (2)

- 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?

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SOCIAL WELFARE (3)

- **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,

  $t_s^{so} = \underline{b}_s$ **and** $t_s^{so} \leq m_s$ **(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, $t_b^{so} + t_s^{so} \leq c$

TABLE II: Outcomes Social Welfare

	Interior	Corner	
		buyer	seller
Price:			
Buyer	**0.030**	**0.020**	**0.031**
Seller	**0.018**	**0.034**	**0.018**
Total	**0.048**	**0.054**	**0.049**
Demand:			
Buyer	**28.3**	**100**	**26.9**
Seller	**96.6**	**24.7**	**100**
Total	**27.3**	**24.7**	**26.9**
Profit:			
Total	**-4.2**	**-2.5**	**-4.0**
Per Transaction	**-0.015**	**-0.010**	**-0.015**
Welfare:	**4.2**	**7.0**	**4.2**

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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

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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.

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(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

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