# Session 9: Merchants vs. TSPs II

Andrei Hagiu

HBS

June 23rd 2009

# Agenda

- Today:

# Agenda

- Today:
  - Merchants vs. two-sided platforms II

# Merchants vs. TSPs (Hagiu 2007)

- When selling through a merchant offering to buy products for $B^S$, each seller makes:

$$\pi^M = B^S - f$$

# Merchants vs. TSPs (Hagiu 2007)

- When selling through a merchant offering to buy products for $B^S$, each seller makes:

$$\pi^M = B^S - f$$

- When selling through a TSP:

$$\begin{aligned} \pi^P(n) &= p^P(n) N^C - P^S - f \\ &= p^P(n) F\left(V(n) - np^P(n) - P^C\right) - P^S - f \end{aligned}$$

# Basic Model

- Timing:
  1. Intermediary announces seller access fee $P^S$ (TSP) or buyout offer $B^S$ (merchant); it credibly commits to $P^C$ (consumer access fee)

# Basic Model

- Timing:
  1. Intermediary announces seller access fee $P^S$ (TSP) or buyout offer $B^S$ (merchant); it credibly commits to $P^C$ (consumer access fee)
  2. Sellers accept or not intermediary's offer and those who do incur fixed cost $f$

# Basic Model

- Timing:
  1. Intermediary announces seller access fee $P^S$ (TSP) or buyout offer $B^S$ (merchant); it credibly commits to $P^C$ (consumer access fee)
  2. Sellers accept or not intermediary's offer and those who do incur fixed cost $f$
  3. Consumers decide to affiliate with intermediary or not

# Basic Model

- Timing:
  1. Intermediary announces seller access fee $P^S$ (TSP) or buyout offer $B^S$ (merchant); it credibly commits to $P^C$ (consumer access fee)
  2. Sellers accept or not intermediary's offer and those who do incur fixed cost $f$
  3. Consumers decide to affiliate with intermediary or not
  4. If merchant, then intermediary sets price per product $p^M(n)$; if TSP, then each affiliated seller sets price $p^P(n)$; in both cases, affiliated consumers decide whether or not to buy seller products.

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$
- Assume all sellers charge an *exogenously* fixed price $p < v$

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$
- Assume all sellers charge an *exogenously* fixed price $p < v$
- Seller profits under two-sided platform mode:

$$\pi(n) = pF\left(v_0 + n(v - p) - P^C\right) - P^S - f$$

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$
- Assume all sellers charge an *exogenously* fixed price $p < v$
- Seller profits under two-sided platform mode:

$$\pi(n) = pF\left(v_0 + n(v - p) - P^C\right) - P^S - f$$

- Two possible equilibria:

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$
- Assume all sellers charge an *exogenously* fixed price $p < v$
- Seller profits under two-sided platform mode:

$$\pi(n) = pF\left(v_0 + n(v-p) - P^C\right) - P^S - f$$

- Two possible equilibria:
  1. With *favorable* seller expectations:
     $P^S = pF\left(v_0 + n(v-p) - P^C\right) - f$, so that:

$$\Pi_F^P = \max_{P^C}\left\{\left(P^C + np\right) F\left(v_0 + nv - np - P^C\right)\right\} - nf$$

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$
- Assume all sellers charge an *exogenously* fixed price $p < v$
- Seller profits under two-sided platform mode:

$$\pi(n) = pF\left(v_0 + n(v-p) - P^C\right) - P^S - f$$

- Two possible equilibria:
  1. With *favorable* seller expectations:
     $P^S = pF\left(v_0 + n(v-p) - P^C\right) - f$, so that:
     $$\Pi_F^P = \max_{P^C}\left\{\left(P^C + np\right)F\left(v_0 + nv - np - P^C\right)\right\} - nf$$
  2. With *unfavorable* seller expectations: $P^S = pF\left(v_0 - P^C\right) - f$, so that:
     $$\Pi_{NF}^P = \max_{P^C}\left\{P^C F\left(v_0 + vn - np - P^C\right) + npF\left(v_0 - P^C\right)\right\} - nf$$

# Indirect network effects

- Consumer *net* utility from $n$ products/sellers: $V(n) = v_0 + n(v - p)$
- Assume all sellers charge an *exogenously* fixed price $p < v$
- Seller profits under two-sided platform mode:

$$\pi(n) = pF\left(v_0 + n(v-p) - P^C\right) - P^S - f$$

- Two possible equilibria:
  1. With *favorable* seller expectations: $P^S = pF\left(v_0 + n(v-p) - P^C\right) - f$, so that:
  $$\Pi_F^P = \max_{P^C}\left\{\left(P^C + np\right)F\left(v_0 + nv - np - P^C\right)\right\} - nf$$
  2. With *unfavorable* seller expectations: $P^S = pF\left(v_0 - P^C\right) - f$, so that:
  $$\Pi_{NF}^P = \max_{P^C}\left\{P^C F\left(v_0 + vn - np - P^C\right) + npF\left(v_0 - P^C\right)\right\} - nf$$

- Clearly: $\Pi_{NF}^P < \Pi_F^P$.

# Indirect network effects

- Under merchant mode: $B^S = f$ and no network effects, therefore total merchant profits are:

$$\Pi^M = \max_{P^C} \left\{ \left( P^C + np \right) F \left( v_0 + nv - np - P^C \right) \right\} - nf = \Pi_F^P$$

# Indirect network effects

- Under merchant mode: $B^S = f$ and no network effects, therefore total merchant profits are:

$$\Pi^M = \max_{P^C} \left\{ \left( P^C + np \right) F \left( v_0 + nv - np - P^C \right) \right\} - nf = \Pi^P_F$$

- $\Pi^M = \Pi^P_F > \Pi^P_{NF}$: merchant mode dominates when seller coordination problems severe

# Indirect network effects

- Under merchant mode: $B^S = f$ and no network effects, therefore total merchant profits are:

$$\Pi^M = \max_{P^C} \left\{ \left( P^C + np \right) F \left( v_0 + nv - np - P^C \right) \right\} - nf = \Pi^P_F$$

- $\Pi^M = \Pi^P_F > \Pi^P_{NF}$: merchant mode dominates when seller coordination problems severe
  - e.g. launch of new platform (videogame consoles; Palm)

# Complementarities, substitutability and price distortions

- Consumer access fee $P^C$ exogenously fixed under both modes, equal to $\overline{P}$.

# Complementarities, substitutability and price distortions

- Consumer access fee $P^C$ exogenously fixed under both modes, equal to $\overline{P}$.
- Two-sided platform mode:

$$\Pi^P = \left[\overline{P} + np^P(n)\right] F\left(V(n) - np^P(n) - \overline{P}\right) - nf$$

- Consumer access fee $P^C$ exogenously fixed under both modes, equal to $\overline{P}$.
- Two-sided platform mode:

$$\Pi^P = \left[\overline{P} + np^P(n)\right] F\left(V(n) - np^P(n) - \overline{P}\right) - nf$$

- Merchant mode:

$$\Pi^M = \max_p \left\{ \left[\overline{P} + np\right] F\left(V(n) - np - \overline{P}\right) \right\} - nf \Longrightarrow p^M(n)$$

# Complementarities, substitutability and price distortions

- Consumer access fee $P^C$ exogenously fixed under both modes, equal to $\overline{P}$.
- Two-sided platform mode:

$$\Pi^P = \left[\overline{P} + np^P(n)\right] F\left(V(n) - np^P(n) - \overline{P}\right) - nf$$

- Merchant mode:

$$\Pi^M = \max_p \left\{ \left[\overline{P} + np\right] F\left(V(n) - np - \overline{P}\right) \right\} - nf \Longrightarrow p^M(n)$$

- $\Pi^M > \Pi^P$ (if products are complements then $p^P(n) > p^M(n)$; if substitutes (business-stealing) then $p^P(n) < p^M(n)$).

# Hold-up vs. innovation incentives

- For TSP, "hold-up"-type problem arises if it cannot credibly commit to $P^C$ when it contracts with sellers (before consumers arrive) - cf. session 4

# Hold-up vs. innovation incentives

- For TSP, "hold-up"-type problem arises if it cannot credibly commit to $P^C$ when it contracts with sellers (before consumers arrive) - cf. session 4
- By contrast, merchant fully internalizes seller profits $\Longrightarrow$ no hold-up problem

# Hold-up vs. innovation incentives

- For TSP, "hold-up"-type problem arises if it cannot credibly commit to $P^C$ when it contracts with sellers (before consumers arrive) - cf. session 4
- By contrast, merchant fully internalizes seller profits $\Longrightarrow$ no hold-up problem

- BUT seller investment incentives under merchant model?

# Hold-up vs. innovation incentives

- For TSP, "hold-up"-type problem arises if it cannot credibly commit to $P^C$ when it contracts with sellers (before consumers arrive) - cf. session 4
- By contrast, merchant fully internalizes seller profits $\Longrightarrow$ no hold-up problem

- BUT seller investment incentives under merchant model?

- Example: why don't videogame console manufacturers simply buy all the games they need from third-party developers?

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards
- Monopoly platform model:

$$
\begin{aligned}
U_1(p_1, n_2) &= (b_1 - p_1)\, n_2 \\
U_2(p_2, n_1) &= (b_2 - p_2)\, n_1
\end{aligned}
$$

where:

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards
- Monopoly platform model:

$$\begin{aligned} U_1(p_1, n_2) &= (b_1 - p_1)\, n_2 \\ U_2(p_2, n_1) &= (b_2 - p_2)\, n_1 \end{aligned}$$

where:

- $b_i$ are the *gross* benefits of users on side $i$ from interacting with one user on side $j \neq i$, $i, j \in \{1, 2\}$; $b_i$ is distributed with cdf $F_i$

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards
- Monopoly platform model:

$$\begin{aligned} U_1(p_1, n_2) &= (b_1 - p_1)\, n_2 \\ U_2(p_2, n_1) &= (b_2 - p_2)\, n_1 \end{aligned}$$

where:

- $b_i$ are the *gross* benefits of users on side $i$ from interacting with one user on side $j \neq i$, $i, j \in \{1, 2\}$; $b_i$ is distributed with cdf $F_i$
- the platform only charges per-transaction fees $(p_1, p_2)$

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards
- Monopoly platform model:

$$U_1(p_1, n_2) = (b_1 - p_1)\, n_2$$
$$U_2(p_2, n_1) = (b_2 - p_2)\, n_1$$

where:

  - $b_i$ are the *gross* benefits of users on side $i$ from interacting with one user on side $j \neq i$, $i, j \in \{1, 2\}$; $b_i$ is distributed with cdf $F_i$
  - the platform only charges per-transaction fees $(p_1, p_2)$

- Two-sided demands:

$$n_1 = 1 - F_1(p_1) \equiv D_1(p_1)$$
$$n_2 = 1 - F_2(p_2) \equiv D_2(p_2)$$

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards
- Monopoly platform model:

$$U_1(p_1, n_2) = (b_1 - p_1)\, n_2$$
$$U_2(p_2, n_1) = (b_2 - p_2)\, n_1$$

  where:
  - $b_i$ are the *gross* benefits of users on side $i$ from interacting with one user on side $j \neq i$, $i, j \in \{1, 2\}$; $b_i$ is distributed with cdf $F_i$
  - the platform only charges per-transaction fees $(p_1, p_2)$
- Two-sided demands:

$$n_1 = 1 - F_1(p_1) \equiv D_1(p_1)$$
$$n_2 = 1 - F_2(p_2) \equiv D_2(p_2)$$

- Platform profits (assume 0 marginal costs):

$$\Pi = (p_1 + p_2)\, D_1(p_1)\, D_2(p_2)$$

# Rochet and Tirole: alternative view of two-sidedness

- Starting point (Rochet and Tirole 2002 and 2003): credit cards
- Monopoly platform model:

$$U_1(p_1, n_2) = (b_1 - p_1) n_2$$
$$U_2(p_2, n_1) = (b_2 - p_2) n_1$$

where:

  - $b_i$ are the *gross* benefits of users on side $i$ from interacting with one user on side $j \neq i$, $i, j \in \{1, 2\}$; $b_i$ is distributed with cdf $F_i$
  - the platform only charges per-transaction fees $(p_1, p_2)$

- Two-sided demands:

$$n_1 = 1 - F_1(p_1) \equiv D_1(p_1)$$
$$n_2 = 1 - F_2(p_2) \equiv D_2(p_2)$$

- Platform profits (assume 0 marginal costs):

$$\Pi = (p_1 + p_2) D_1(p_1) D_2(p_2)$$

- Anything shocking in this model?

# Rochet and Tirole: alternative view of two-sidedness

- No indirect network effects! (demands depend only on prices)

# Rochet and Tirole: alternative view of two-sidedness

- No indirect network effects! (demands depend only on prices)
- Recall our "usual" model:

$$U_1 = B_1 + \alpha_1 n_2 - P_1$$
$$U_2 = B_2 + \alpha_2 n_1 - P_2$$

# Rochet and Tirole: alternative view of two-sidedness

- No indirect network effects! (demands depend only on prices)
- Recall our "usual" model:

$$\begin{aligned} U_1 &= B_1 + \alpha_1 n_2 - P_1 \\ U_2 &= B_2 + \alpha_2 n_1 - P_2 \end{aligned}$$

- Two-sided demands:

$$\begin{aligned} n_1 &= D_1 \left( P_1 - \alpha_1 n_2 \right) \\ n_2 &= D_2 \left( P_2 - \alpha_2 n_1 \right) \end{aligned}$$

# Rochet and Tirole: alternative view of two-sidedness

- No indirect network effects! (demands depend only on prices)
- Recall our "usual" model:

$$U_1 = B_1 + \alpha_1 n_2 - P_1$$
$$U_2 = B_2 + \alpha_2 n_1 - P_2$$

- Two-sided demands:

$$n_1 = D_1 \left( P_1 - \alpha_1 n_2 \right)$$
$$n_2 = D_2 \left( P_2 - \alpha_2 n_1 \right)$$

- Key difference: pure *usage* (transactions) model vs. pure *membership* (access, affiliation) model

# Rochet and Tirole: alternative view of two-sidedness

- No indirect network effects! (demands depend only on prices)
- Recall our "usual" model:

$$U_1 = B_1 + \alpha_1 n_2 - P_1$$
$$U_2 = B_2 + \alpha_2 n_1 - P_2$$

- Two-sided demands:

$$n_1 = D_1 \left( P_1 - \alpha_1 n_2 \right)$$
$$n_2 = D_2 \left( P_2 - \alpha_2 n_1 \right)$$

- Key difference: pure *usage* (transactions) model vs. pure *membership* (access, affiliation) model
  - indirect network effects only appear when there are some membership benefits/costs

# Rochet and Tirole: alternative view of two-sidedness

- No indirect network effects! (demands depend only on prices)
- Recall our "usual" model:

$$U_1 = B_1 + \alpha_1 n_2 - P_1$$
$$U_2 = B_2 + \alpha_2 n_1 - P_2$$

- Two-sided demands:

$$n_1 = D_1 \left( P_1 - \alpha_1 n_2 \right)$$
$$n_2 = D_2 \left( P_2 - \alpha_2 n_1 \right)$$

- Key difference: pure *usage* (transactions) model vs. pure *membership* (access, affiliation) model
  - indirect network effects only appear when there are some membership benefits/costs
- Rochet and Tirole (2006) integrates the two models:

$$U_1 = B_1 + \left( b_1 - p_1 \right) n_2 - P_1$$
$$U_2 = B_2 + \left( b_2 - p_2 \right) n_1 - P_2$$

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$. *Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$, *i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$. *Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$, *i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$. *Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$, *i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$. *Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$, *i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral
  - bilateral electricity trading

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$*. Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$*, i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral
  - bilateral electricity trading
  - anytime the two sides can negotiate "efficiently" (Coase theorem applies)

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$. *Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$, *i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral
  - bilateral electricity trading
  - anytime the two sides can negotiate "efficiently" (Coase theorem applies)
- Problems with this definition?

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$. *Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$, *i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral
  - bilateral electricity trading
  - anytime the two sides can negotiate "efficiently" (Coase theorem applies)
- Problems with this definition?
  - Coase theorem rarely applies $\Longrightarrow$ pricing structure rarely neutral

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$*. Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$*, i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral
  - bilateral electricity trading
  - anytime the two sides can negotiate "efficiently" (Coase theorem applies)
- Problems with this definition?
  - Coase theorem rarely applies $\Longrightarrow$ pricing structure rarely neutral
  - All merchants (e.g. Wal-Mart, 7-11) are two-sided?!

# Rochet and Tirole: alternative view of two-sidedness

- **Definition of two-sidedness**: *consider a platform charging per-transaction fees* $(p_1, p_2)$*. Then the market for interactions between the two sides is one-sided if and only if volume of interactions between the two sides only depends on* $p \equiv p_1 + p_2$*, i.e. it is insensitive to the allocation of* $p$ *between the two sides (pricing structure).*
- Examples of one-sided markets:
  - VAT tax (merchants and consumers): neutral
  - bilateral electricity trading
  - anytime the two sides can negotiate "efficiently" (Coase theorem applies)
- Problems with this definition?
  - Coase theorem rarely applies $\Longrightarrow$ pricing structure rarely neutral
  - All merchants (e.g. Wal-Mart, 7-11) are two-sided?!
  - Are firms two-sided platforms?

Thank you for your attention.