

# The Economics of Digital Platforms in Finance

Theme I: Digital Market Design

**Research Question:** How do network effects and two-sided market dynamics shape competition in digital financial services?

PhD Seminar in Digital Finance

## Definition (Rochet & Tirole, 2003)

A market is two-sided if the platform can affect volume of transactions by:

$$V = D^B(p^B) \cdot D^S(p^S)$$

where changing  $p^B + p^S$  while holding total constant changes  $V$ .

## Key Insight

- Price *structure* matters, not just level
- Cannot unbundle without destroying value
- Indirect network effects dominate

## Platform Profit Maximization

$$\max_{p^B, p^S} \pi = (p^B - c^B)D^B + (p^S - c^S)D^S$$

Subject to participation constraints:

$$u^B(n^S, p^B) \geq 0$$

$$u^S(n^B, p^S) \geq 0$$

## Equilibrium Condition

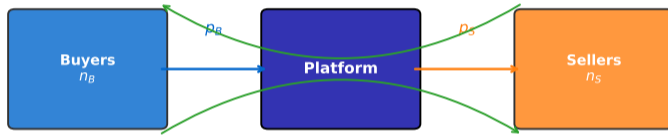
$$\frac{p^B - c^B}{p^B} = \frac{1}{\epsilon^B} \left( 1 - \frac{\alpha^B n^S}{p^B} \right)$$

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Rochet & Tirole (2003), "Platform Competition in Two-Sided Markets," JEEA

## Cross-Side Network Effects

$$u_B = \alpha_B \cdot n_S - p_B$$



$$u_S = \alpha_S \cdot n_B - p_S$$

Optimal:  $p_B + p_S = c$ , but  $p_B \neq p_S$  (price structure matters)

[THEORETICAL MODEL]

Equilibrium pricing structure subsidizes the side with higher cross-side externalities.

## Direct Network Effects

- User value increases with same-side users
- $u_i = f(n_i)$  where  $f' > 0$
- Example: P2P lending liquidity

## Indirect Network Effects

- User value increases with other-side users
- $u^B = g(n^S)$ ,  $u^S = h(n^B)$
- Example: Payment card networks

## Cross-Side Externalities

Define externality parameter  $\alpha$ :

$$\alpha^B = \frac{\partial u^B}{\partial n^S}$$

## Proposition

*In equilibrium, the side with higher  $\alpha$  is subsidized:*

$$p^B < c^B \iff \alpha^B > \alpha^S$$

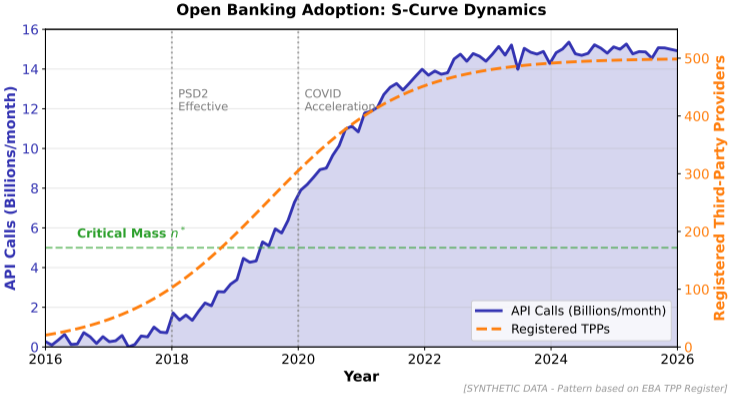
## Finance Applications

- Card networks: Subsidize cardholders
- Robo-advisors: Subsidize retail investors
- Exchanges: Maker-taker pricing

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This explains why many fintech platforms offer free services to one side

# Open Banking API Adoption: Network Effects in Action



S-curve adoption pattern demonstrates critical mass dynamics predicted by network effects theory.

## Single-Homing vs Multi-Homing

### Model Setup (Armstrong, 2006)

With single-homing on both sides:

$$\pi_i = (p_i^B + p_i^S - c)n_i$$

where  $n_i = \phi(u_i^B - u_j^B, u_i^S - u_j^S)$

### Competitive Bottleneck

- One side single-homes (captive)
- Other side multi-homes (competitive)
- Platform extracts rent from single-homers

### Equilibrium Characterization

With differentiated platforms:

$$p^{B*} = c^B - \alpha^B n^S + t^B$$

$$p^{S*} = c^S - \alpha^S n^B + t^S$$

where  $t$  represents differentiation.

### Finance Implication

- Banks multi-home across payment rails
- Consumers single-home (one primary bank)
- Platform power over consumer side

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Armstrong (2006), "Competition in Two-Sided Markets," RAND Journal

## Natural Experiment: Durbin Amendment (2010)

- Capped debit interchange at 21 cents + 0.05%
- Pre-regulation average: 44 cents
- Affected banks with assets > \$10B

## Key Findings (Wang et al., 2023)

- Merchants: Savings \$6.5B/year
- Consumers: Limited pass-through (17%)
- Banks: Reduced free checking, higher fees
- Net welfare: Ambiguous

## Interchange Fee Pass-Through

Channel	Effect
Merchant prices	-0.17%
Bank fees	+\$3/month
Rewards	-12%
Free checking	-25%

## Interpretation

Two-sided market theory predicts rebalancing, not pure transfer.

Wang, Schwartz & Mitchell (2023), *Journal of Financial Economics*

## Data-Driven Network Effects

Beyond traditional network effects:

$$u_i(t) = f(n(t), D(t))$$

where  $D(t) = \sum_{\tau < t} d_\tau$  (accumulated data).

### Learning-by-Doing

- ML models improve with data volume
- Prediction accuracy:  $\epsilon \propto n^{-\beta}$
- Creates increasing returns to scale

## Platform Lock-In Mechanisms

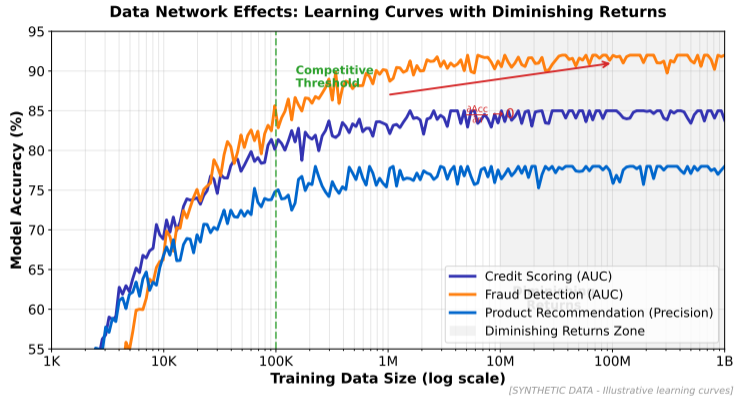
- ④ **Switching costs:** Personalization loss
- ② **Data portability:** Regulatory friction
- ③ **Interoperability:** API barriers
- ④ **Trust:** Reputation not transferable

### Finance-Specific Moats

- Transaction history (credit scoring)
- Behavioral data (fraud detection)
- Network graph (payment flows)

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Data advantages compound over time, creating winner-take-most dynamics



Diminishing returns to data scale create natural limits on data-driven moats.

## Policy Rationale

Open banking mandates (PSD2, Open Banking UK):

- Force data portability
- Reduce switching costs
- Enable multi-homing
- Promote competition

## Economic Analysis

If data is platform's moat:

$$\Pi_{incumbent} \downarrow, \Pi_{entrant} \uparrow$$

But if network effects dominate data:

Minimal competitive impact

## Empirical Evidence (Babina et al., 2024)

UK Open Banking results:

- API calls: 1B+ monthly by 2023
- New entrants: 200+ TPPs
- Market share shift: Limited
- Consumer adoption: 10% active users

## Key Finding

Data portability necessary but not sufficient for competition.

Network effects and trust remain barriers.

## Publishable Research Directions

### ① Data Network Effects Quantification

- RQ: What is the marginal value of transaction data for prediction accuracy?
- Method: Exploit exogenous data access shocks (regulation, partnerships)
- Gap: No causal estimates of data-driven network effects in finance

### ② Platform Interoperability and Welfare

- RQ: Do interoperability mandates increase or decrease total welfare?
- Method: Cross-country comparison (EU PSD2 vs US voluntary)
- Gap: Theory predicts ambiguous effects; empirics scarce

### ③ Embedded Finance and Platform Bundling

- RQ: When does bundling financial services harm competition?
- Method: Structural model of platform scope economies
- Gap: Antitrust authorities lack economic framework

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Strong thesis potential in combining platform economics with financial regulation

## Mathematical

Derive the optimal pricing structure for a payment platform with:

- $u^B = \alpha^B n^S - p^B$
- $u^S = \alpha^S n^B - p^S$
- $c^B = c^S = c$

Show that  $p^B < c$  if  $\alpha^B > \alpha^S$ .

**Due:** Week 2 – Choose one track

## Empirical

Using BIS payment statistics:

- ① Document interchange fee trends across 10 countries
- ② Correlate with card adoption rates
- ③ Test two-sided market predictions

Data: BIS CPMI Red Book

## Research Proposal

Draft 1-page proposal on:

- “Open Banking and Platform Competition”
- Identify natural experiment
- Specify outcome variables
- Discuss identification

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Mathematical exercise tests model mechanics; empirical tests predictions

## Core Papers (Read Before Class)

- ① **Rochet & Tirole** (2003). “Platform Competition in Two-Sided Markets.” *JEEA*, 1(4), 990-1029.
  - Focus: Sections 1-3, Propositions 1-2
- ② **Armstrong** (2006). “Competition in Two-Sided Markets.” *RAND Journal of Economics*, 37(3), 668-691.
  - Focus: Multi-homing analysis, Section 4

## Supplementary

- Rysman (2009): “The Economics of Two-Sided Markets” – Survey
- BIS Paper 117 (2021): “Fintech and digital transformation” – Policy
- Babina et al. (2024): “Open Banking and Competition” – Empirics

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PDFs available on course platform; Rochet-Tirole is foundational