Payments & the DNA of BigTech

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Question

Why do BigTech platforms venture into payment services?

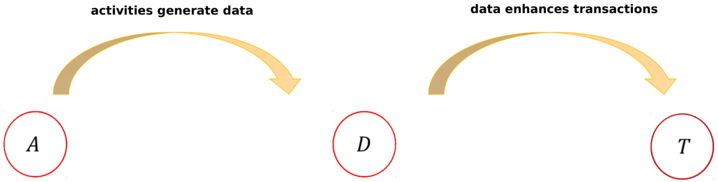
How should policy makers evaluate such efforts?

1) The BigTech business model depends heavily on generating data and monetizing them.

2) We need to understand how overcoming payments frictions influences the trade-off between generating and monetizing data.

3) Features of the data technology drives BigTech's incentives to introduce payment services.

It's all about the Data

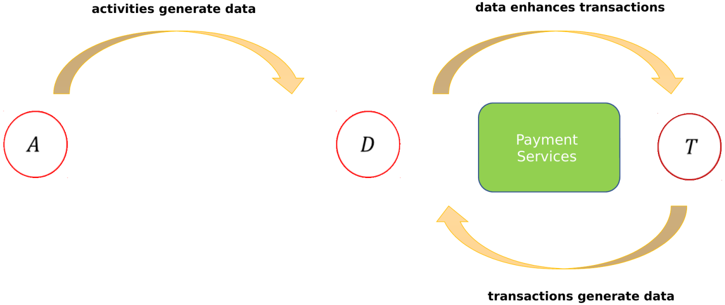


Monopoly platform offers online activities (**A**).

Activities generate data (**D**) that have social value in transactions (**T**).

The **trade-off** is between **monetizing data** and the resulting **loss of privacy**.

Incentives for Payments

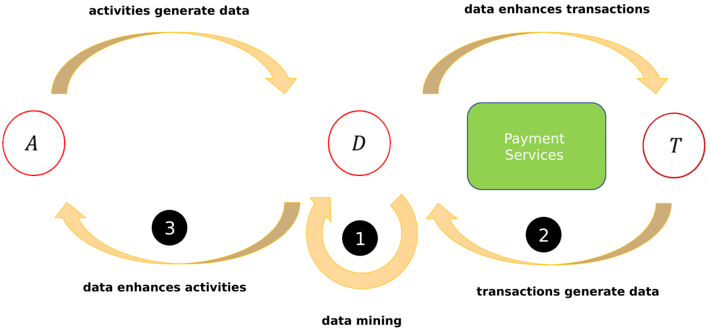


Payment services increase the number of transactions *and* generate additional data.

Payment services influence the trade-off between data sales and privacy.

This creates an **additional, new channel** for introducing payments.

Data Technology Matters



The trade-off for the platform depends on the feedback loop that the data technology creates.

Feedback loops introduce additional inefficiencies.

Model

Monopoly platform offers activities to buyers.

Activities generate information about buyers' preferences (data).

Platform sells this information to sellers (monetization).

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Trading Stage:

- random trade size ε
- info creates social value $\mathcal{S}\varepsilon$
- no info
  Buyer: $\mathcal{S}_b\varepsilon$; Seller: $\mathcal{S}_0\varepsilon$
- with info
  Seller gains $\mathcal{S}_s\varepsilon = (\mathcal{S} + \mathcal{S}_b)\varepsilon$

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Platform Stage:

- buyers choose acitivity a_i
- payoff $(v - p)a_i - \frac{a_i^2}{2}$
- data cause loss for buyers of w.p. δa_i
- individual demand ε not observable

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Payments friction?

Buyers and sellers can only trade with probability η.

Activities and Privacy Loss

Demand for platform activities

$$V(\varepsilon) = \max_{a(\varepsilon)} \underbrace{(v-p)a(\varepsilon)}_{\text{gain from activities}} \underbrace{-\frac{a(\varepsilon)^2}{2}}_{\text{cost of activities}}$$

Platform profit

$$\Pi(\tilde{\eta}) = \max_{p} \int \underbrace{pa(\varepsilon)}_{\text{platform revenue}} dG(\varepsilon)$$

Activities and Privacy Loss

Demand for platform activities reacts to privacy loss

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Optimal pricing involves subsidies

$$p = \frac{v - \boldsymbol{\eta}\delta(\mathcal{S}_b + \mathcal{S}_s)\varepsilon}{2}$$

Individual demand implies heterogeneous privacy concerns

$$a(\varepsilon) = \bar{a} + \boldsymbol{\eta}\delta\mathcal{S}_b(\mathbb{E}(\varepsilon) - \varepsilon)$$

Payments and Privacy Concerns

Platform considers profits and costs of unobservable privacy concerns from payments introduction

$$\Pi(\tilde{\eta}) = \underbrace{\left(\frac{v + \delta\tilde{\eta}\mathcal{S}\mathbb{E}(\varepsilon)}{2}\right)^2}_{\text{Activities \& Data}} \underbrace{-\delta^2\tilde{\eta}^2\mathcal{S}_s\mathcal{S}_b\mathbb{V}(\varepsilon)}_{\text{Unobservable Privacy Costs}} \underbrace{+\tilde{\eta}\mathcal{S}_0\mathbb{E}(\varepsilon) - \mathbf{1}_{\tilde{\eta}}k\mathbb{E}(\varepsilon)}_{\text{Net Costs of Introduction}}$$

Result:

The platform introduces payment services ($\tilde{\eta} = 1$) at cost $k\mathbb{E}(\varepsilon)$ if and only if

$$\boldsymbol{\frac{2v}{\delta} - (1+\eta)\Lambda} \geq \left(\frac{4}{(1-\eta)\delta^2\mathcal{S}}\right)(k - (1-\eta)\mathcal{S}_0)$$

where

$$\Lambda \equiv 4\frac{\mathcal{S}_s\mathcal{S}_b}{\mathcal{S}}\frac{\mathbb{V}(\varepsilon)}{\mathbb{E}(\varepsilon)} - \mathcal{S}\mathbb{E}(\varepsilon)$$

is the net cost of privacy concerns for the platform.

Implications

1) Payments introduction by BigTech is driven by a **new trade-off** between the value generated by data through activities and privacy concerns.

2) Network effects on the platform **increase incentives** to introduce payment services.

3) Monopolistic platform and imperfect price discrimination implies **too little payments adoption**.

4) Unobserved heterogeneity of its users implies a distortion for the platform which **amplifies underadoption**.

5) Some users may lose from data services. **Payments**, however, **improve welfare for all** users.

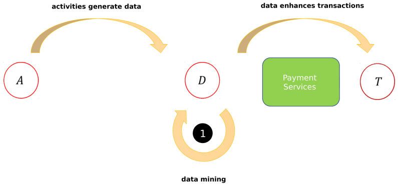
Feedback Loop: Data mining

Law of Motion

$$\mathcal{D}_t = \gamma \mathcal{D}_{t-1} + \delta_t \bar{a}_t$$

Privacy loss w.p.

$$\mathcal{P}_t = \gamma \mathcal{D}_{t-1} + \delta_t a_t$$



Today's data output is an input to produce more data output tomorrow.

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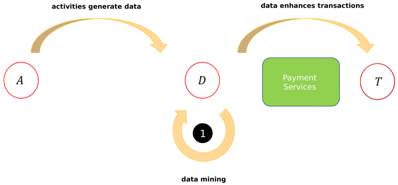


Today's data output is an input to produce more data output tomorrow.

Results:

1) Platform has additional incentives to introduce payments.

2) For large γ there is overadoption, since individual users do not take into account dynamic effect.

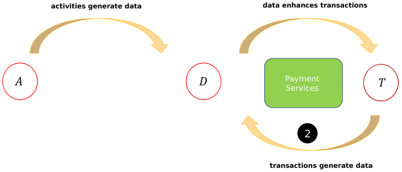
Feedback Loop: A/B Testing

Law of Motion

$$\mathcal{D}_t = \gamma(\mathcal{D}_{t-1} + \mathbf{1}_{\tilde{\eta}}\tau) + \delta_t \bar{a}_t$$

Loss of surplus w.p.

$$\mathcal{P}_t = \gamma\mathcal{D}_{t-1} + \delta_t a_t + \mathbf{1}_{\tilde{\eta}}\tau$$



Experiments require payments technology ($\mathbf{1}_{\tilde{\eta}} = 1$), are costly for sellers ($\mathcal{L}_s$), but yield additional data tomorrow.

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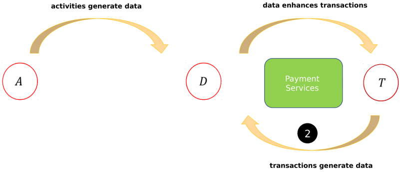

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$$\tau > 0 \text{ if and only if } -\mathcal{L}_s + \gamma\mathcal{S}_s = \mathcal{S}_0 - \left(\frac{1}{2} - \gamma\right)\mathcal{S}_s > 0$$

Results:

1) Platform has additional incentives to introduce payments.

2) Platform, however, neglects social costs for buyers from experimentation.

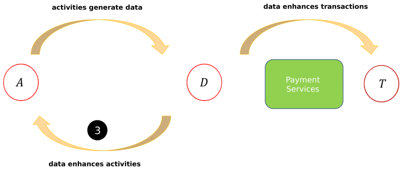
Feedback Loop: Data Enabled Network Effect

Law of Motion

$$v_t = v_{t-1} + {\color{red}n}\mathcal{D}_{t-1}$$

Privacy loss w.p.

$$\mathcal{P}_t = \delta_t a_t$$



Today's data help improve the value of activities tomorrow.

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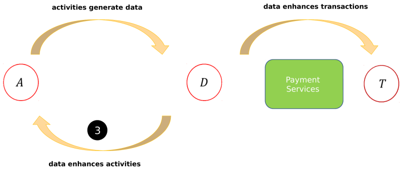


Today's data help improve the value of activities tomorrow.

Results:

1) Network effect $\boldsymbol{\delta n}$ increases the platform's incentives to introduce payments.

2) Platform underadopts payments as it neglects the full social value of data.

What to take away?

1) For BigTech, there is a new trade-off for the introduction of payments between the social value of data and the costs of privacy.

2) Overadoption of payment services arises when feedback loops generate additional data, e.g. through data mining and testing.

3) Public policy needs to understand the role of data technology in business models better.

Do public payments crowd out data?

Can public payments compete?

Traditional Payment Providers vs. BigTech

Examples?

Banks

Credit Cards

These providers also have incentives to generate and monetize data from their operations.

There are some crucial differences.

- generate data as a by-product from payment or loan services ($v \approx 0$?)
- smaller scope to cross-subsidize (less market power?)
- smaller social value of information (redistribution?)
- feedback loops are different (network effects?)

Microfoundation

Buyers have valuation of generic good $(\underline{u}, \bar{u})$ which is private information.

Buyers value customized good at $\bar{u}$, but prefer only one of two types.

<u>No info:</u> Seller offers generic good at price

$$\underbrace{(\underline{u} - 1 - \bar{c})}_{\text{pooling offer}} > \underbrace{\frac{1}{2}(\bar{u} - 1)}_{\text{customized good}} > \underbrace{\frac{1}{2}(\bar{u} - 1 - \bar{c})}_{\text{separating offer}}$$

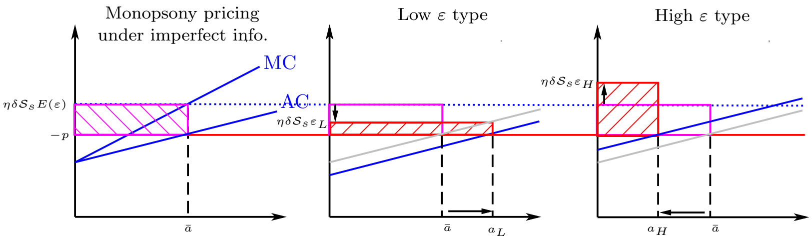
<u>Info:</u> Seller offers customized good at price

$$\mathcal{S}_s = \bar{u} - 1$$

	Unknown (trade generic)	**Known (trade special)**
Buyer's surplus	$0.5(\bar{u}-\underline{u}) \equiv \mathcal{S}_b$	0
Seller's surplus	$\underline{u}-1 - \bar{c} \equiv \mathcal{S}_0$	$\bar{u} - 1 \equiv \mathcal{S}_s + \mathcal{S}_0$
Total surplus	$0.5(\bar{u}+\underline{u}) - 1 - \bar{c}$	$\bar{u} - 1$

Social value of data? $\mathcal{S} = \mathcal{S}_s - \mathcal{S}_b$

Platform: Costs of Privacy Loss



Privacy concerns ε cannot be observed by the platform.

This creates an informational rent for the users of the platform.

The rent is equivalent to a cost for the platform for compromising privacy.