Addictive Platforms

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July 20, 2021

Motivation

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Potential downside of attention-driven business model

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e.g., recommendation, notification, user interface (cf. Stigler report)

This Paper

Competition for consumer attention

when a firm can trade off quality for attention

1. Competition is not a silver bullet
   - High quality to attract users vs. low quality to capture attention
   - Negative effect may dominate
2. Policy remedy
3. Role of revenue models

Model

Platforms $1, \ldots, K \geq 2$

A single consumer

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No uncertainty or behavioral component

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Platforms $1, \ldots, K \geq 2$

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No uncertainty or behavioral component

1. Each platform $k \in K$ sets addictiveness $d_k \in \mathbb{R}_+$
2. C joins platforms and allocates attention

Consumer Problem

C chooses $J \subset K$ and $(a_k)_{k \in J} \in \mathbb{R}_+^J$ to maximize

$$\sum_{k \in J} u(a_k, d_k) - C\left(\sum_{k \in J} a_k\right)$$

subject to the attention constraint $\sum_{k \in J} a_k \leq \overline{A}$

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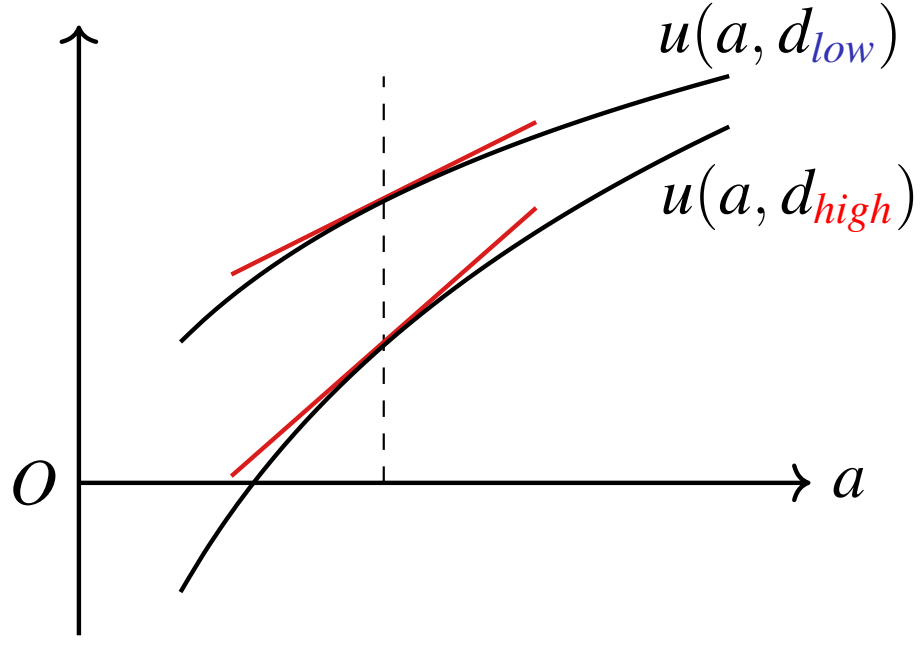
Assumption on $u(a, d)$

Assumption

1. $u(a, d)$ *is increasing and concave in* a*, and* $u(0, 0) \geq 0$.
2. $u(a, d)$ *is decreasing in* d *and negative for some* d.
3. $\dfrac{\partial u}{\partial a}$ *is increasing in* d.



Example: Data Collection

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Platform collects data d for personalization

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$$u(a, d) = (1 + d)v(a) - \ell \cdot d$$

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privacy cost

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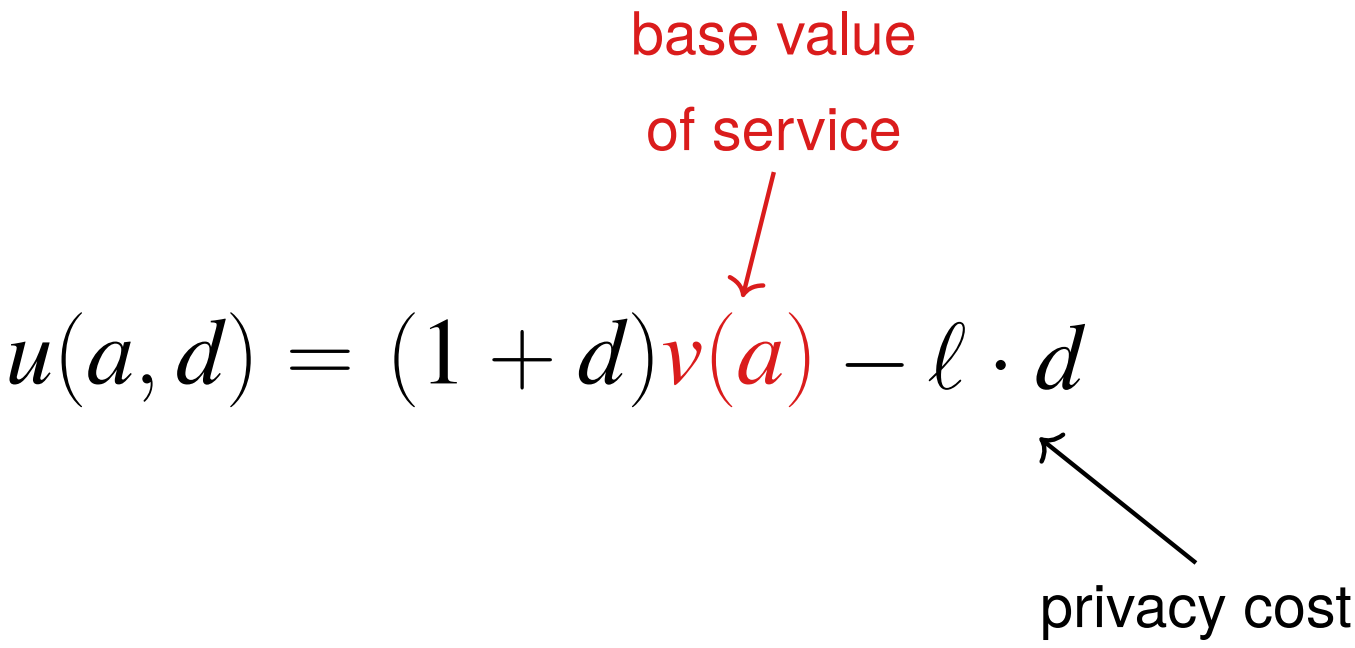

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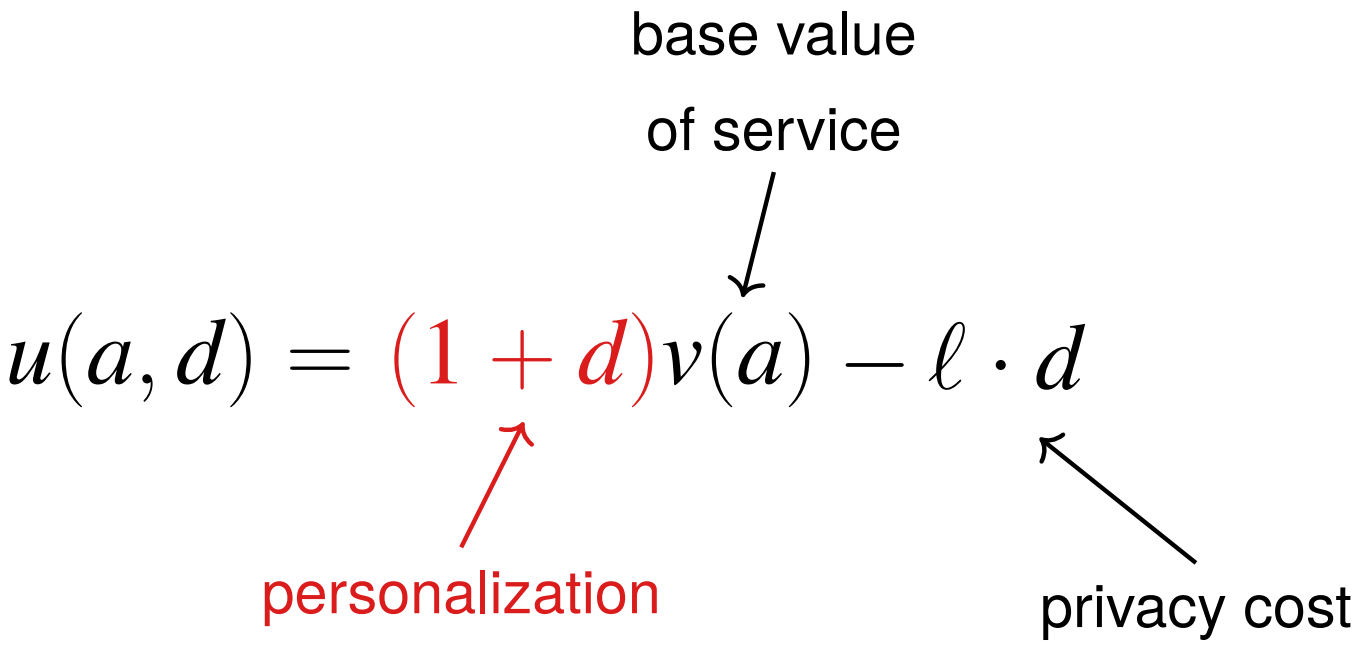

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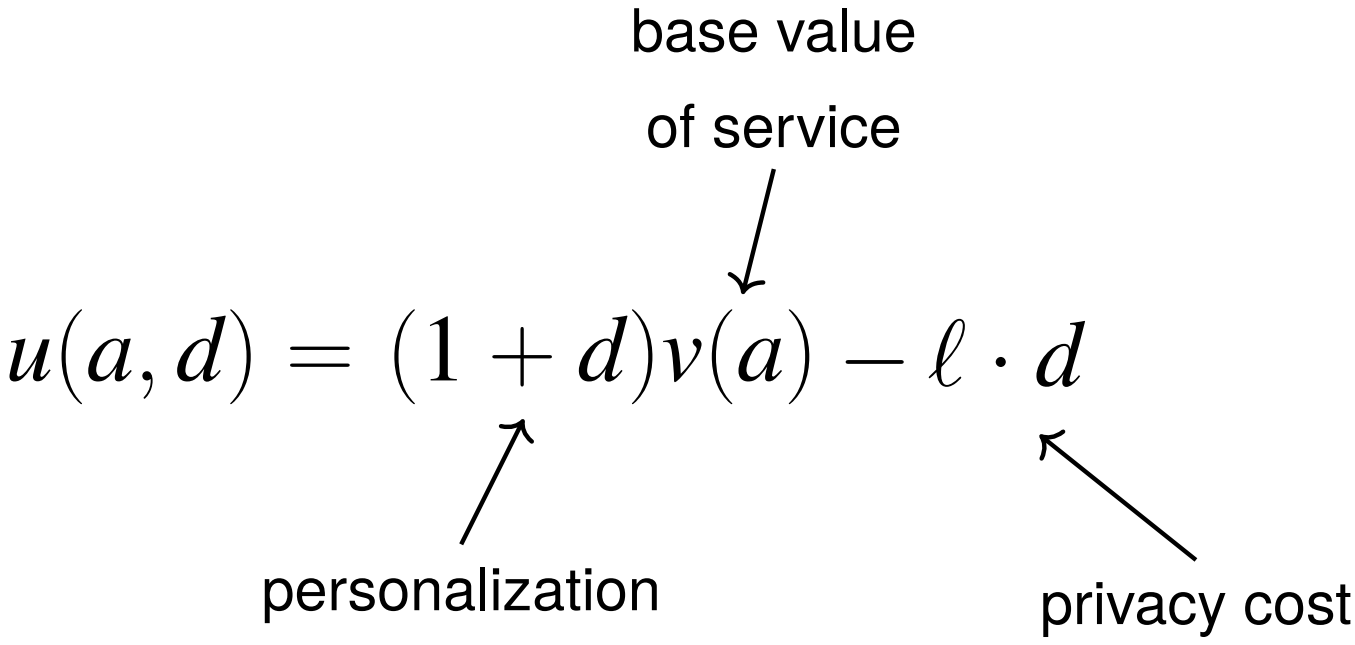

$\ell > \sup v(\cdot) \Rightarrow u(a,d)$ decreasing but $\frac{\partial u}{\partial a}$ increasing in d

Discussion on d

A platform's choice to sacrifice service utility for attention

Complex choices summarized as a shift of $\left(u, \frac{\partial u}{\partial a}\right)$

(cf. Armstrong and Vickers 2006)

Different from price or advertising load

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A platform's choice to sacrifice service utility for attention

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The paper motivates $u(a, d)$ using rational addiction

($d =$ intensity of habit formation)

The Impact of Competition

Compare equilibrium to “no competition benchmark”

Collusive Outcome

No competition benchmark

- Platforms jointly choose $(d_1, \ldots, d_K)$ to maximize total profit
- Consumer chooses between joining all or nothing

Collusive Outcome

The "joint entity" chooses $d_1, \ldots, d_K$ to maximize total attention

Conditional on joining:

- C maximizes $\sum_k u(a_k, d_k) - C(\sum_k a_k)$ s.t. $\sum_k a_k \leq \overline{A}$
- Attention increases in d_k

Participation constraint bounds d_k

Collusive Outcome

P maximizes attention subject to participation constraint

Same addictiveness for all services

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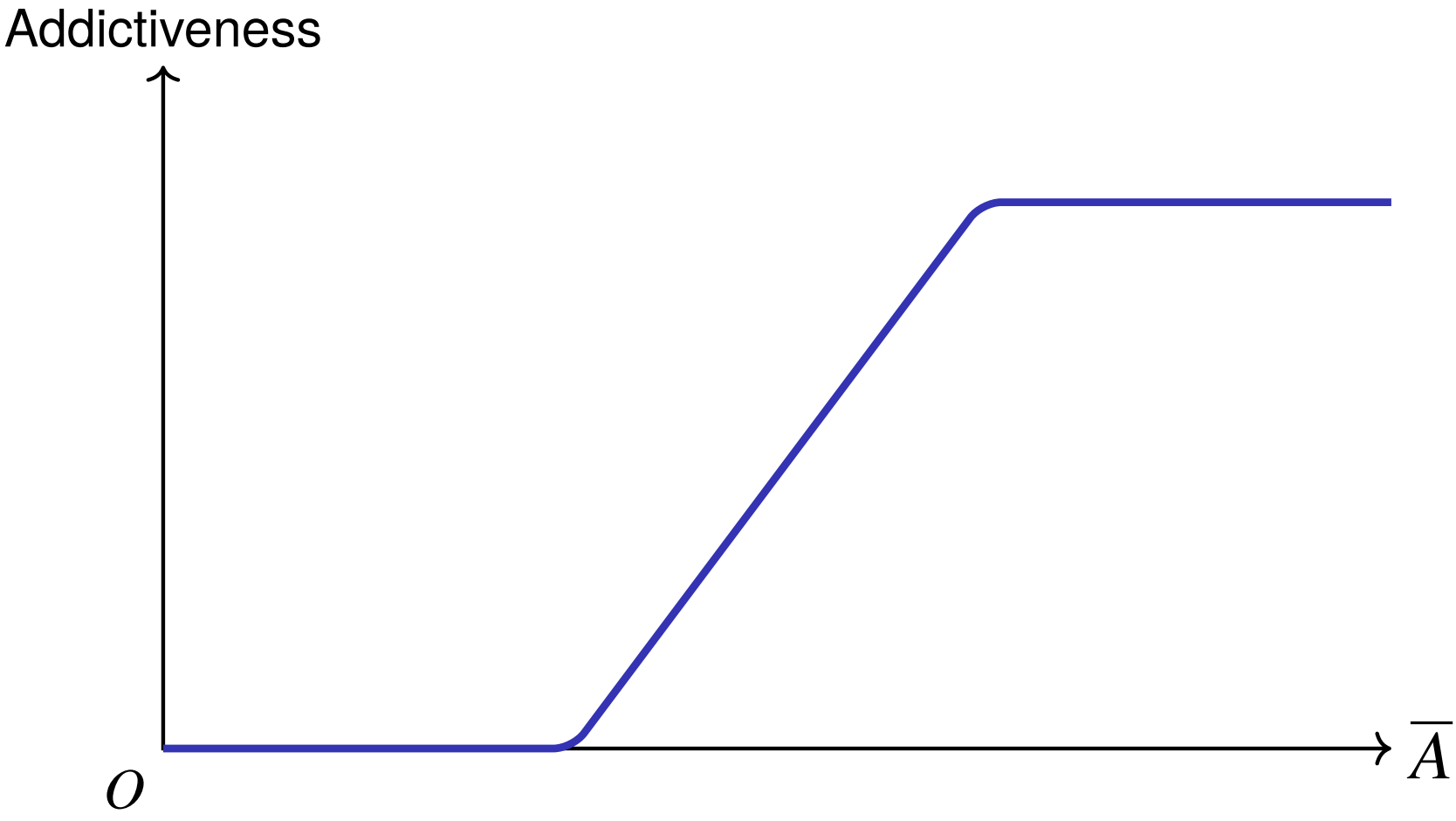

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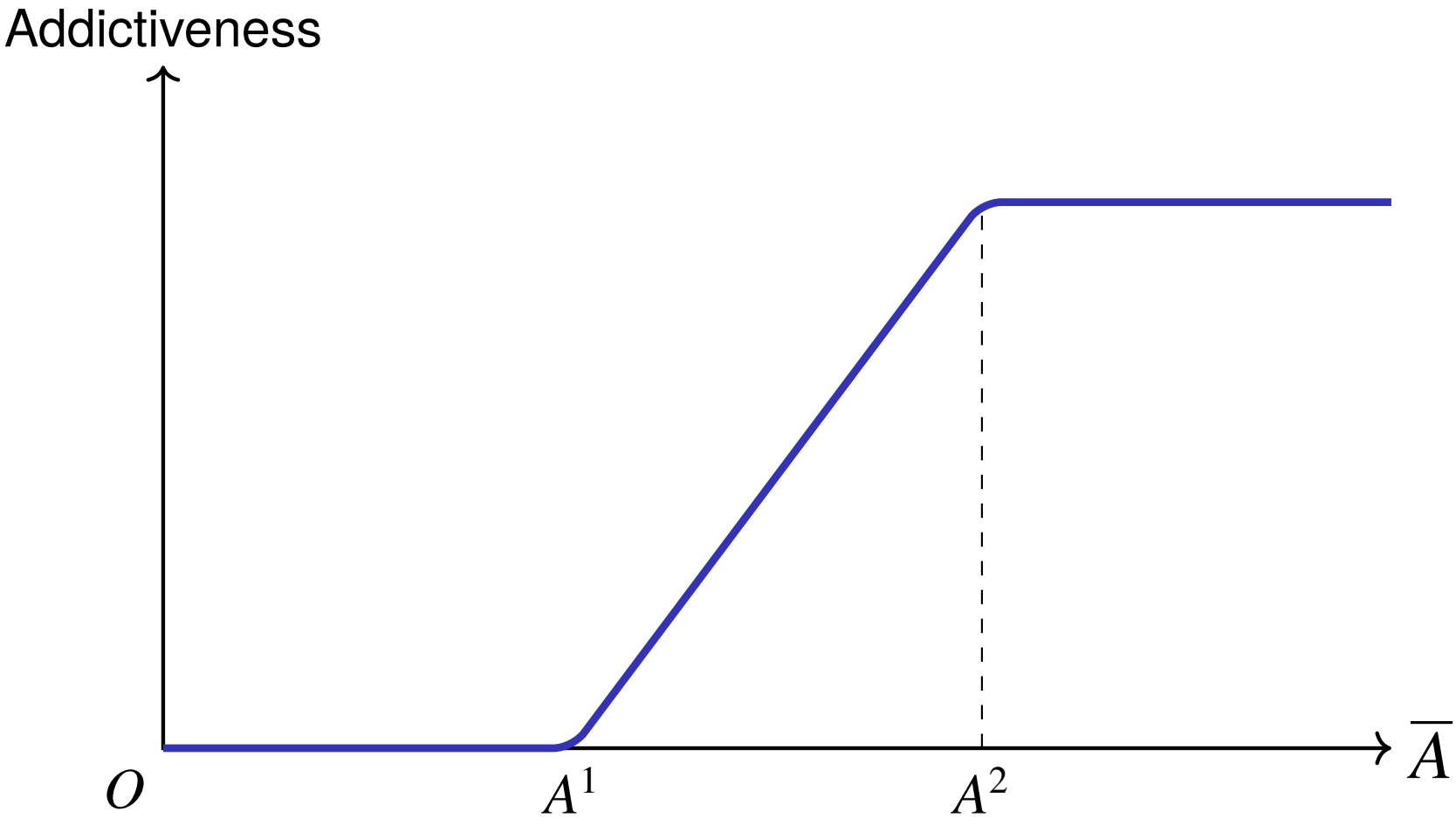

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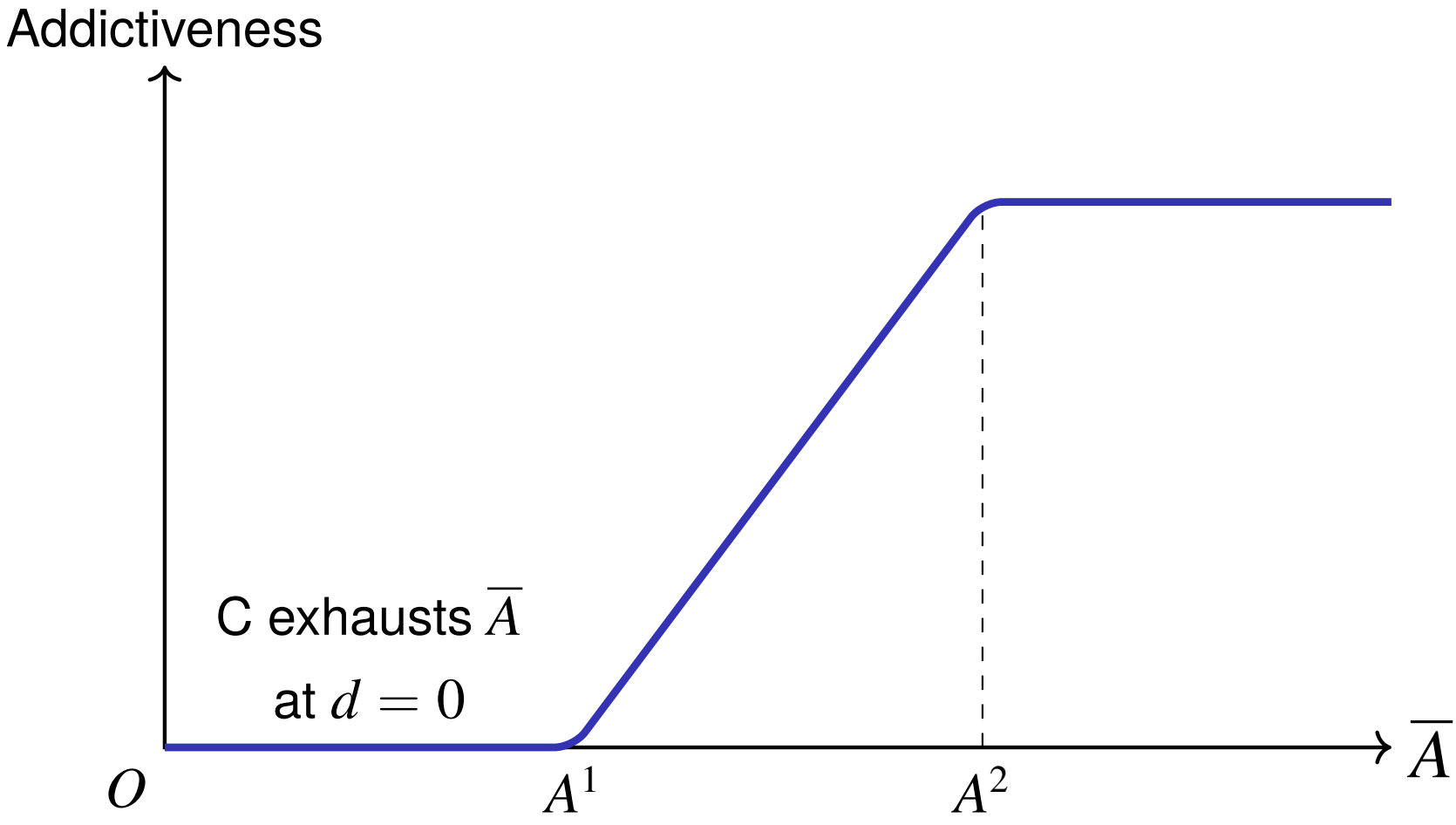

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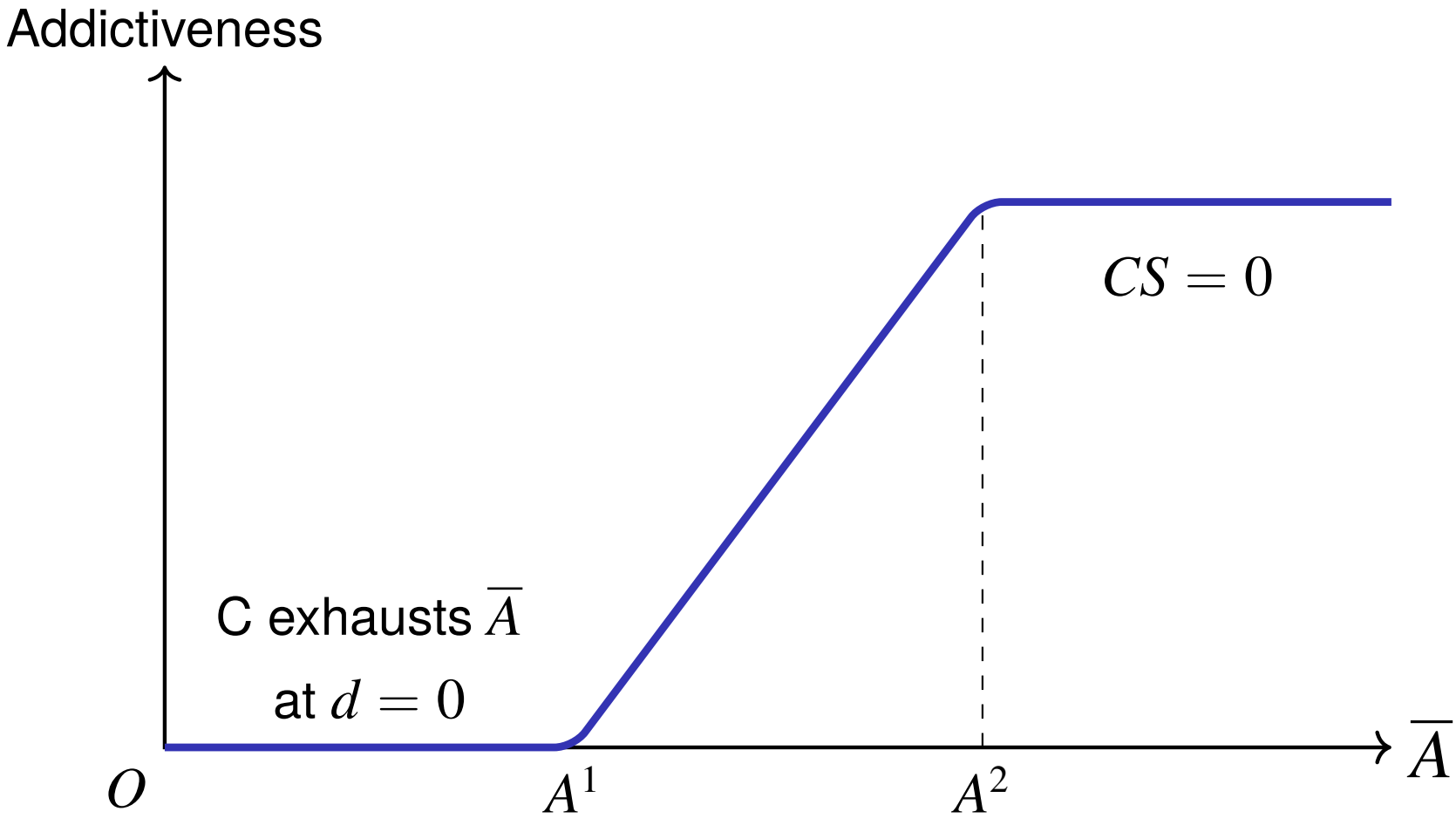

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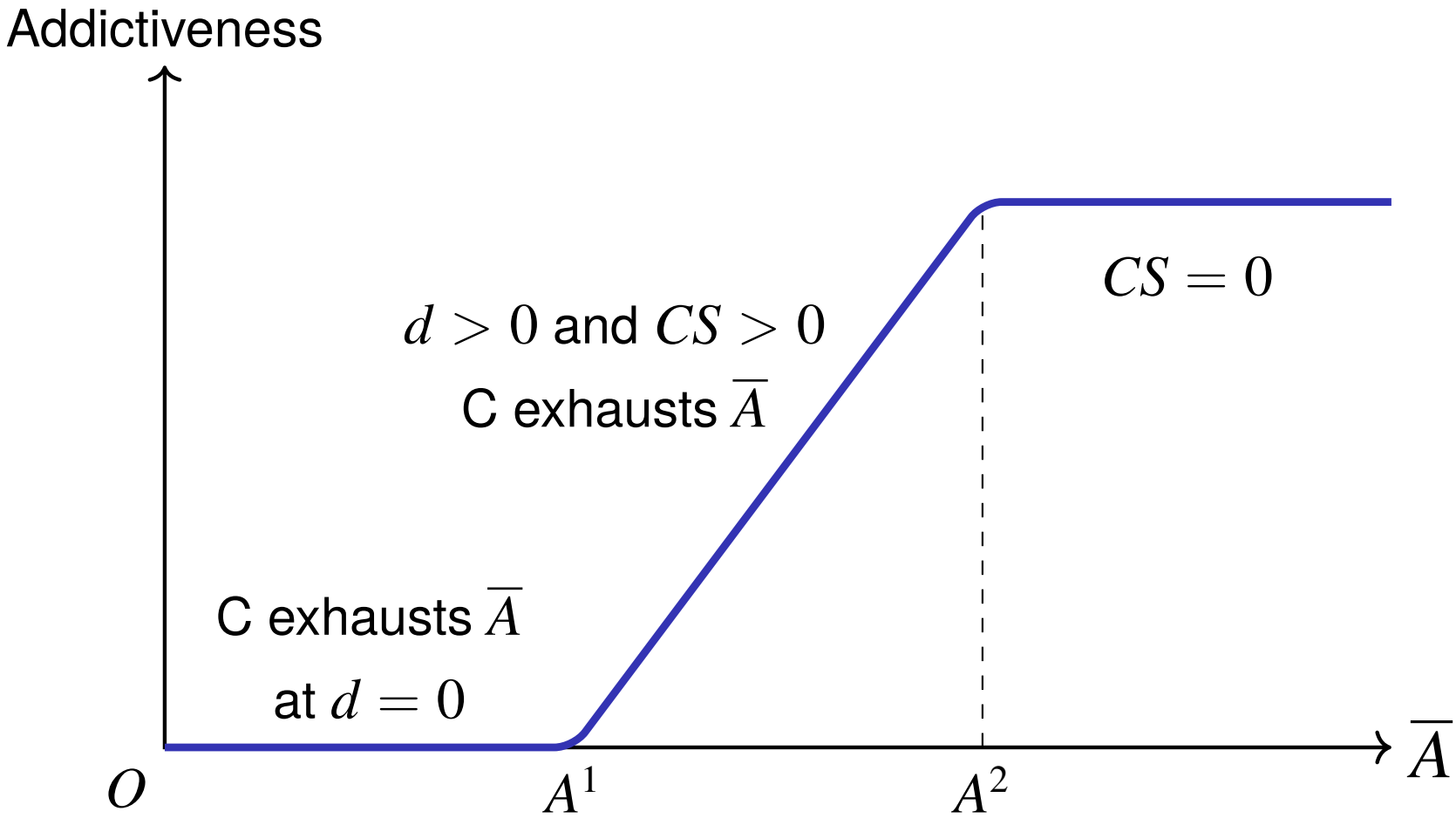
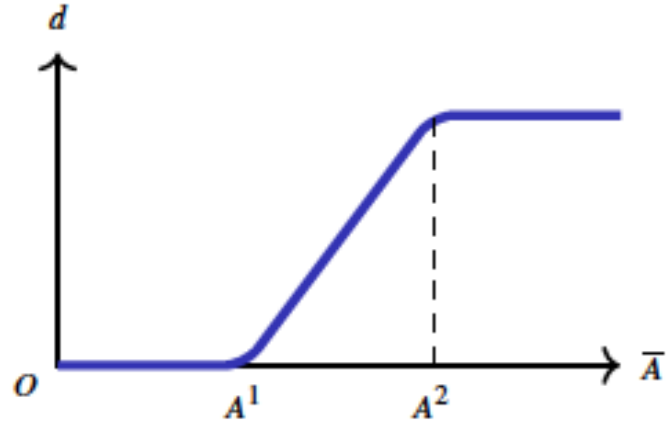


Consumer Surplus Under Collusive Outcome



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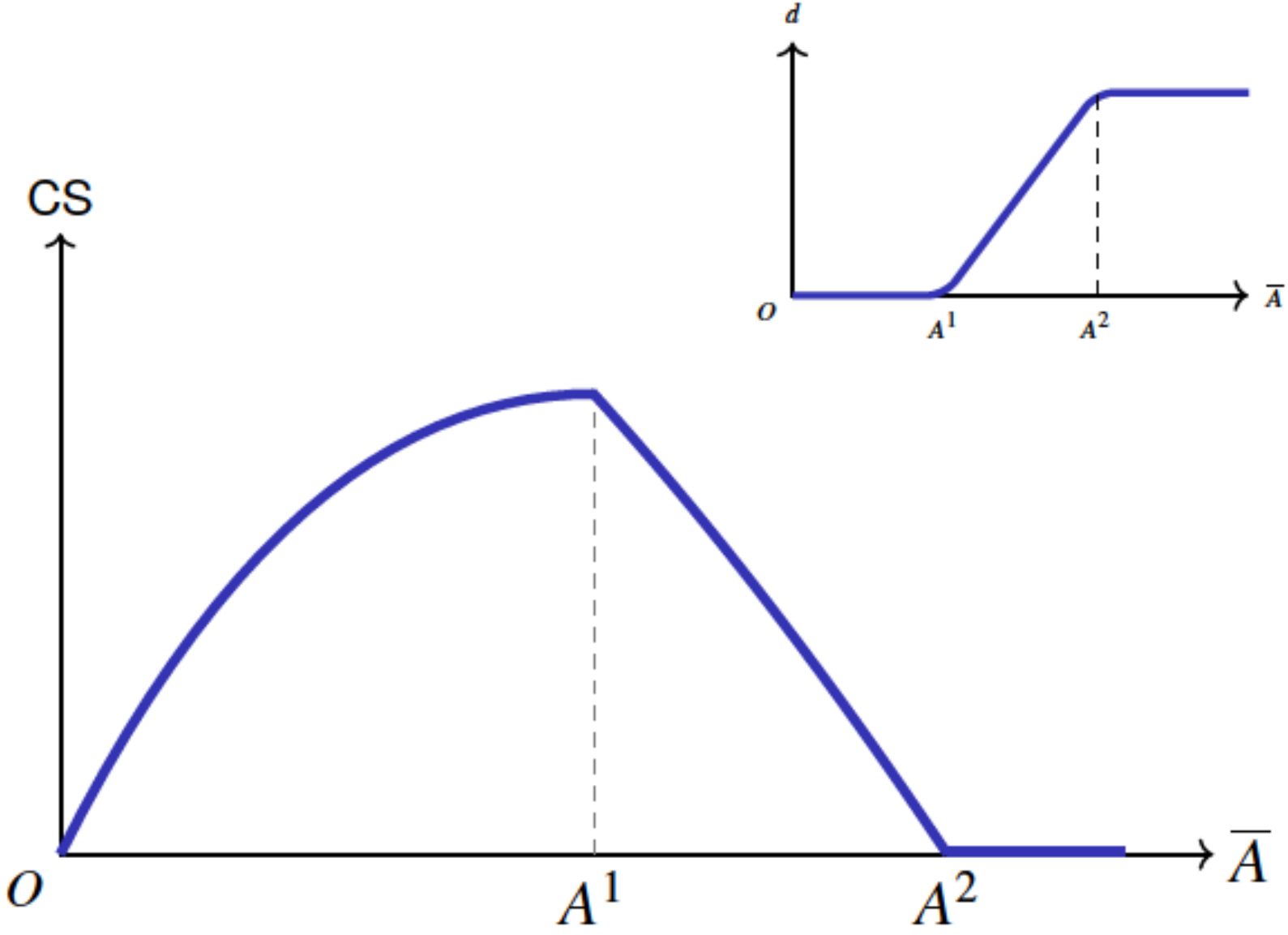

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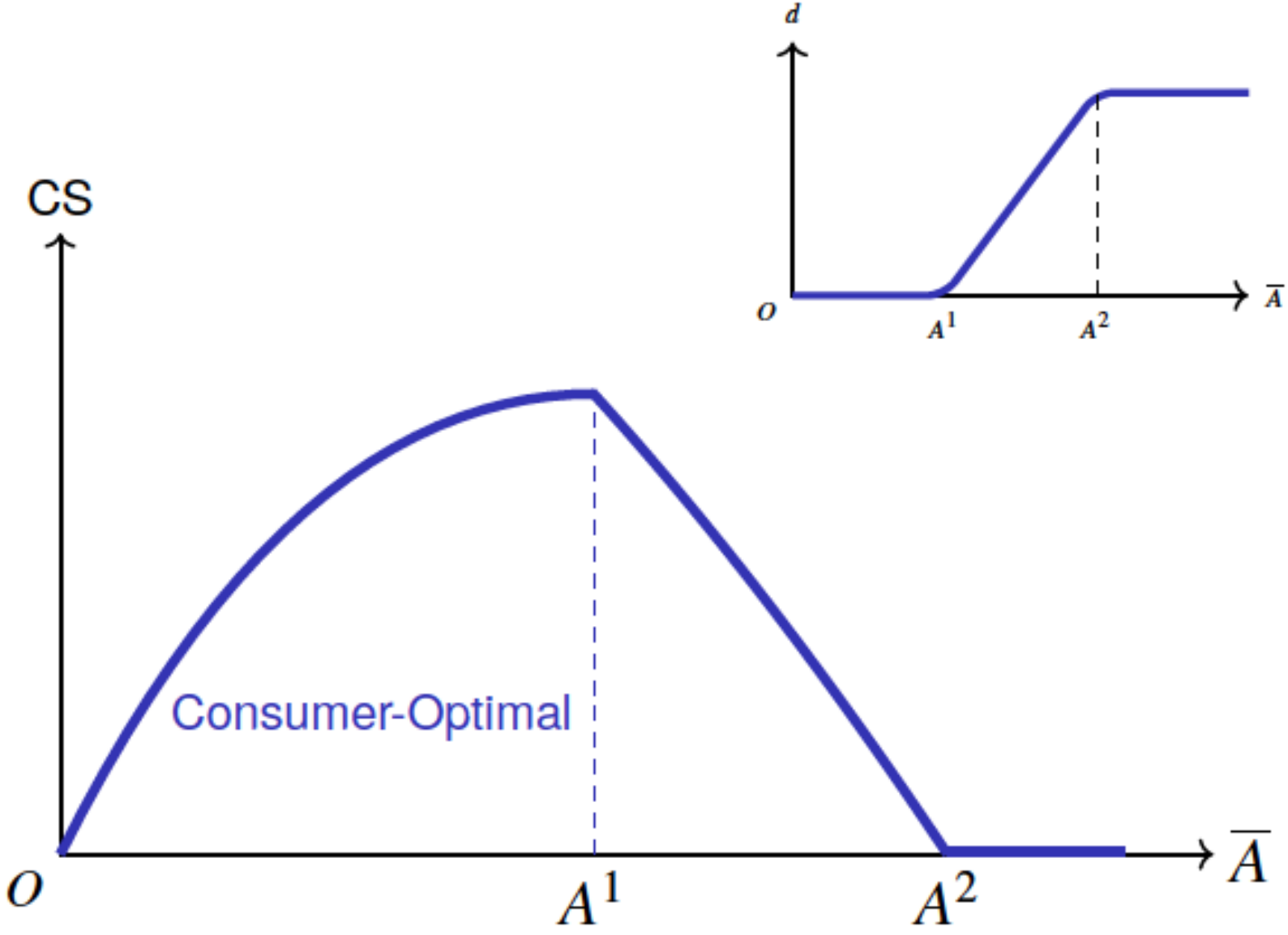

Equilibrium

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2. C joins platforms and allocates attention

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Each P maximizes attention subject to participation constraint

Increase d so long as C joins

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Proposition

In the unique eqm, all platforms choose $d^* > 0$ *that makes the consumer indifferent between joining* K *and* $K-1$ *platforms. The consumer joins all platforms and allocates attention equally.*

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Business stealing incentive $\rightarrow d^* > 0$ even for a small $\overline{A}$

The Impact of Competition

The Impact of Competition

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If $\overline{A} < A^1$ or K is large,

the consumer is strictly better off at the collusive outcome.

If $\overline{A} > A^2$, the consumer is better off at the equilibrium.

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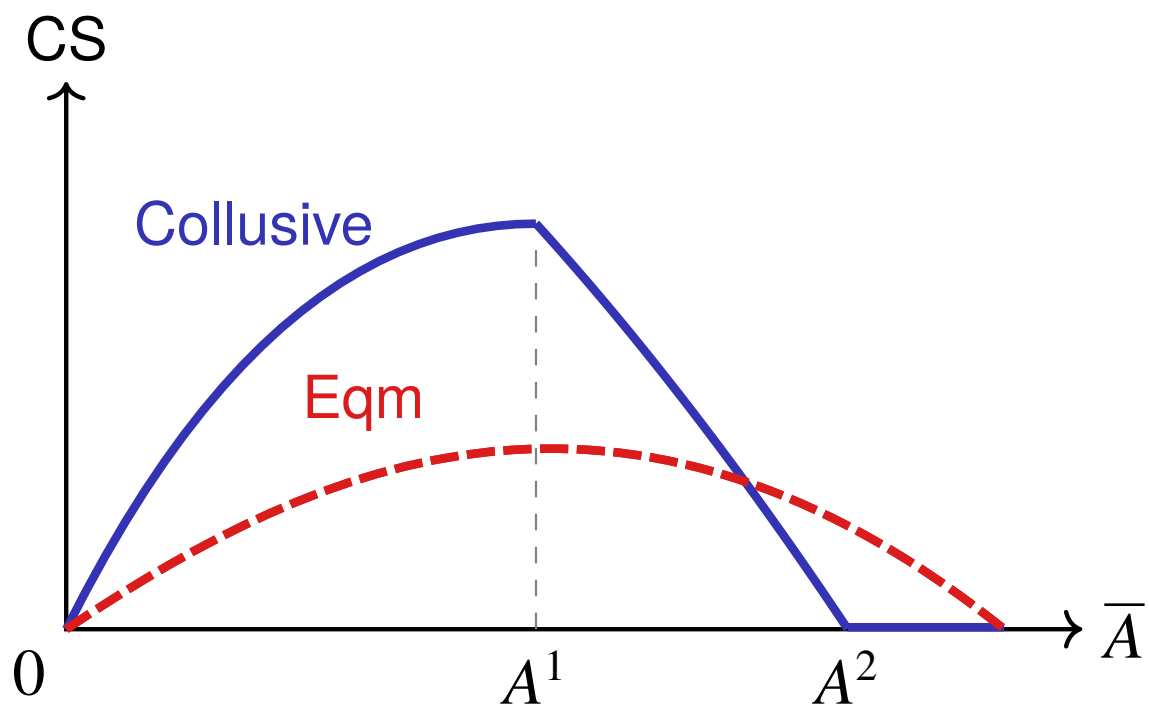

Linear Attention Cost

$u(a,d) = v(a-d)$ and $C(a) = c \cdot a$

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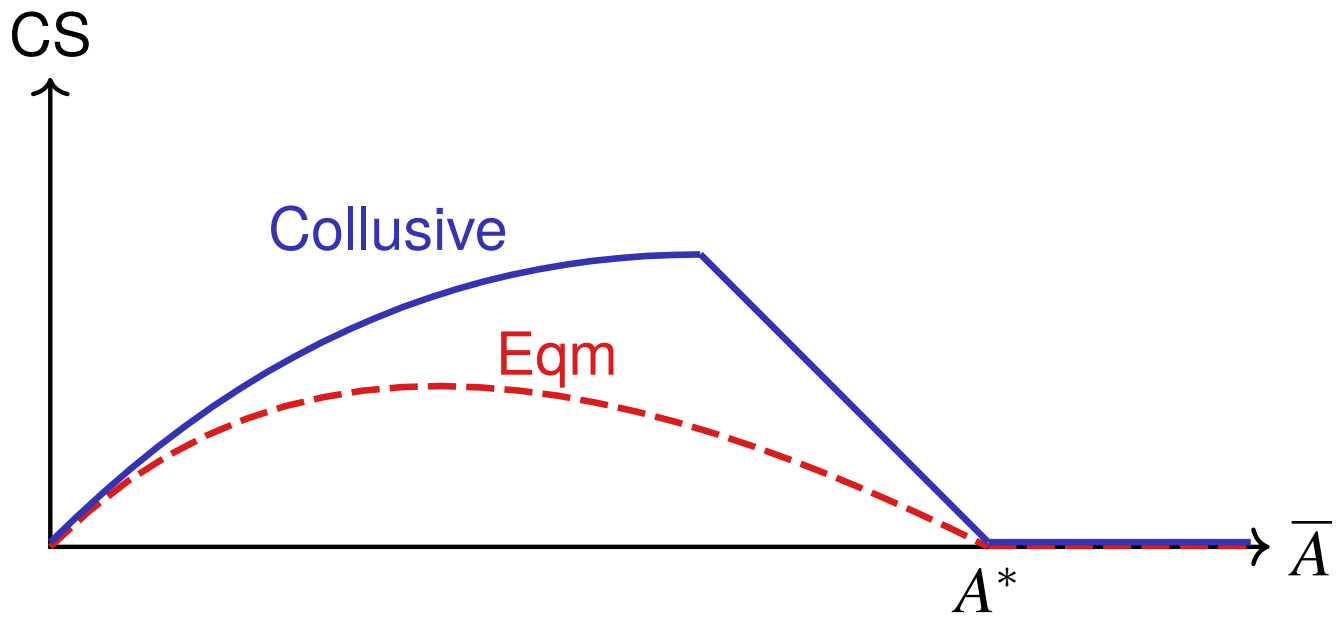
Proposition

There is a unique cutoff A^* such that:

1. *If $\overline{A} < A^*$, CS is strictly higher under the collusive outcome.*
2. *If $\overline{A} \geq A^*$, CS is zero in all markets.*



Costly Investment in Addictive Technology

Stigler report: “platforms make investments to extract data, encourage stickiness and addiction, and promote ever-greater use”

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Assumption

- *Each platform incurs a cost of* $\frac{\gamma d^2}{2}$ *with* $\gamma > 0$
- $u(a, d) = v(a - d)$

Costly Investment in Addictive Technology

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Fix any $\overline{A}$. C is better off under the collusive outcome than the equilibrium if and only if γ is above some $\gamma^* \geq 0$.

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Intuition:

- Low γ: C's participation incentive determines d
  $\rightarrow$ competition reduces d

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Intuition:

- Low γ: C's participation incentive determines d
  $\rightarrow$ competition reduces d
- High γ (new): C's attention allocation incentive determines d
  $\rightarrow$ business stealing incentive increases d

So Far

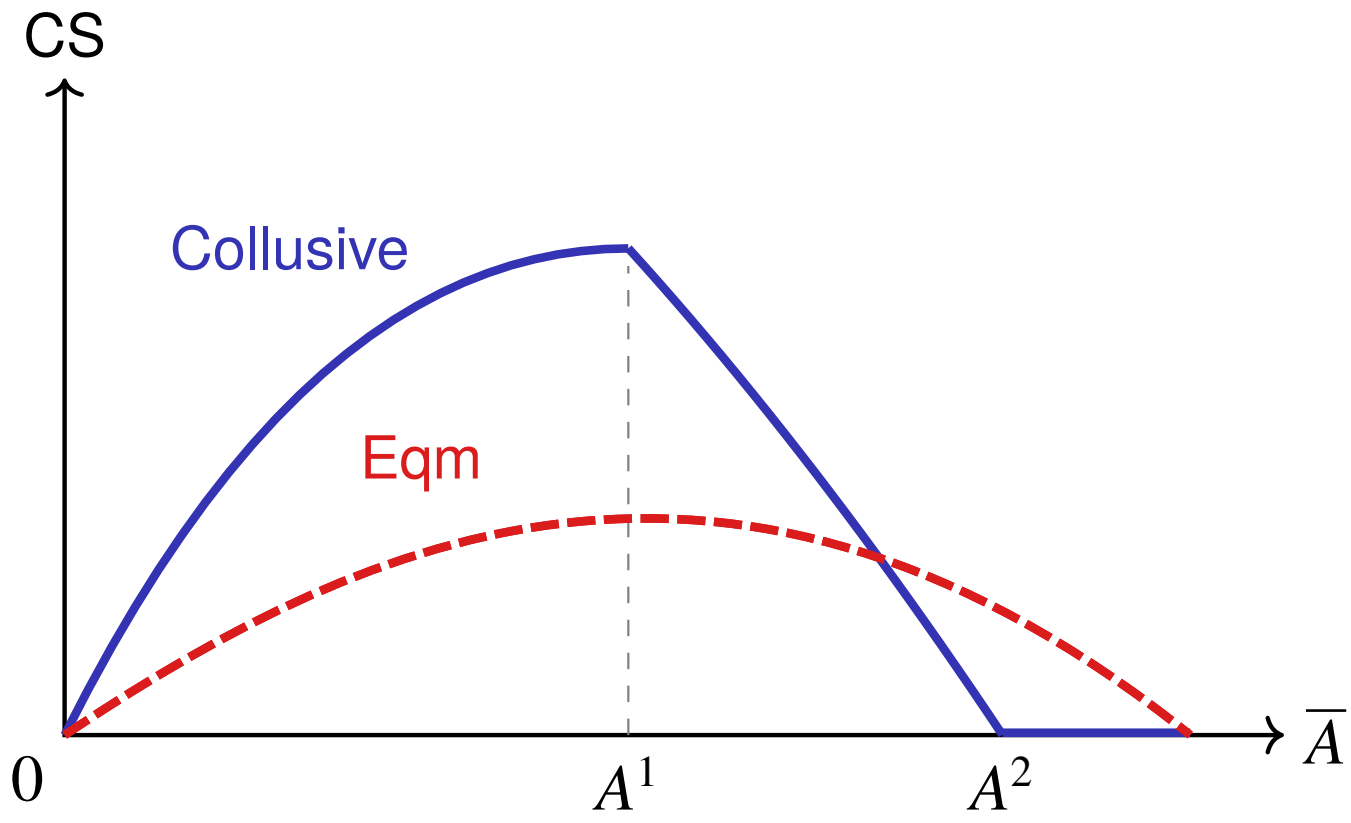
Increased competition for attention could harm consumers

Business stealing incentives: firms sacrifice quality for attention

Digital Curfew

Digital curfew

- Shutdown law in South Korea
- Proposed “SMART” act in the US



Role of Revenue Models

Price competition:

1. Platform k sets participation fee p_k
2. No revenue from attention, only from price

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Equilibrium:

- $d = 0$ and $p^* > 0$
- Collusive outcome for the consumer

Price vs. Attention

Proposition

CS is higher under attention competition if K is greater than some finite cutoff.

Attention comp $\rightarrow$ higher marginal util $\rightarrow$ higher outside option

Extension: Naive Consumers

Consumer misperceives d as sd for $s \in (0, 1)$.

Main result robust

Participation decision less sensitive to d

Higher equilibrium addictiveness & lower ex ante CS

Naivete favors price competition

Recap: Assumption

Assumption

1. $u(a,d)$ *is increasing and concave in* a*, and* $u(0,0) \geq 0$*.*
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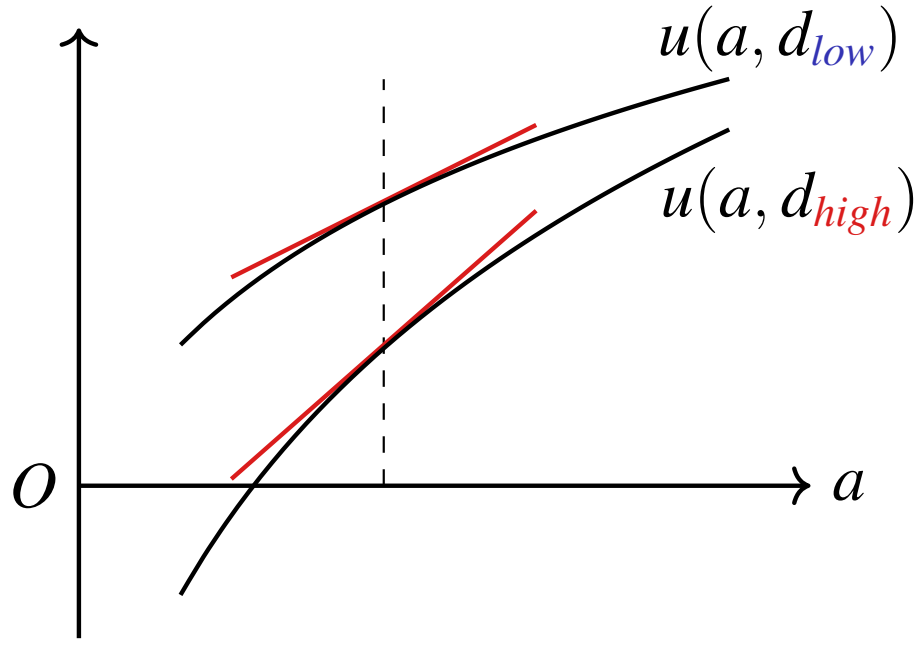

Where Does $u(a, d)$ Come From?

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Linear habit formation (cf. Rozen 2010):

Consume a^* yesterday $\Rightarrow$ utility today $= u(a - const \cdot a^*)$

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Myopic “doer” and forward-looking “planner”

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Myopic "doer" and forward-looking "planner"

$u(a, d)$ as an ex ante payoff of a multi-period model where

- Platform usage exhibits habit formation
- $d =$ intensity of habit formation
- Myopic doer uses the platform
- Forward-looking planner decides whether to join

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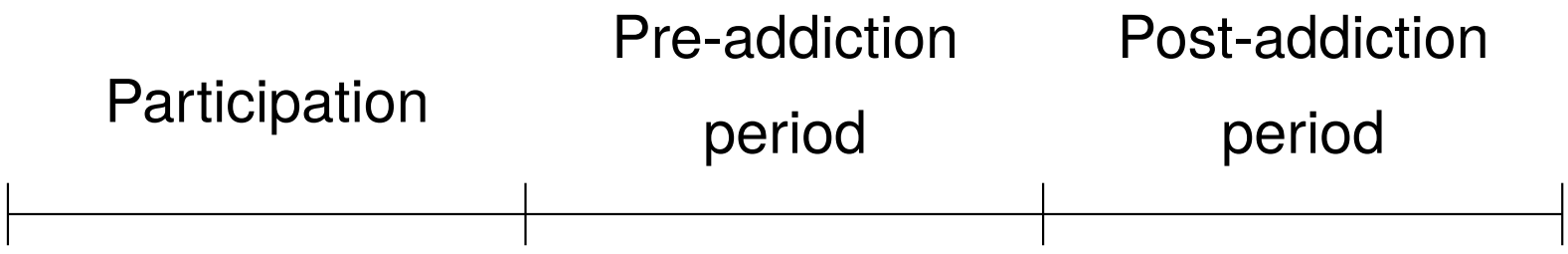

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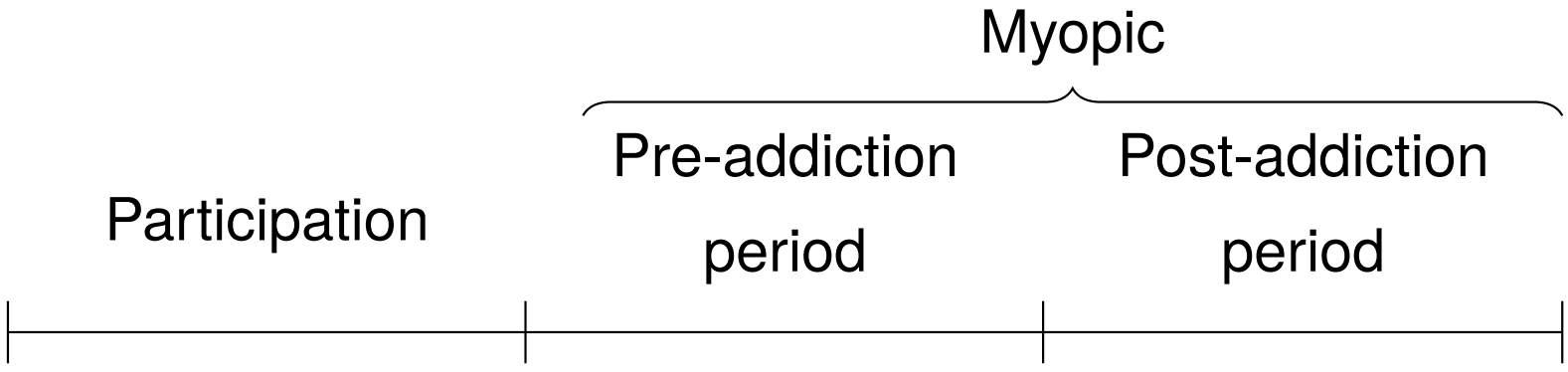

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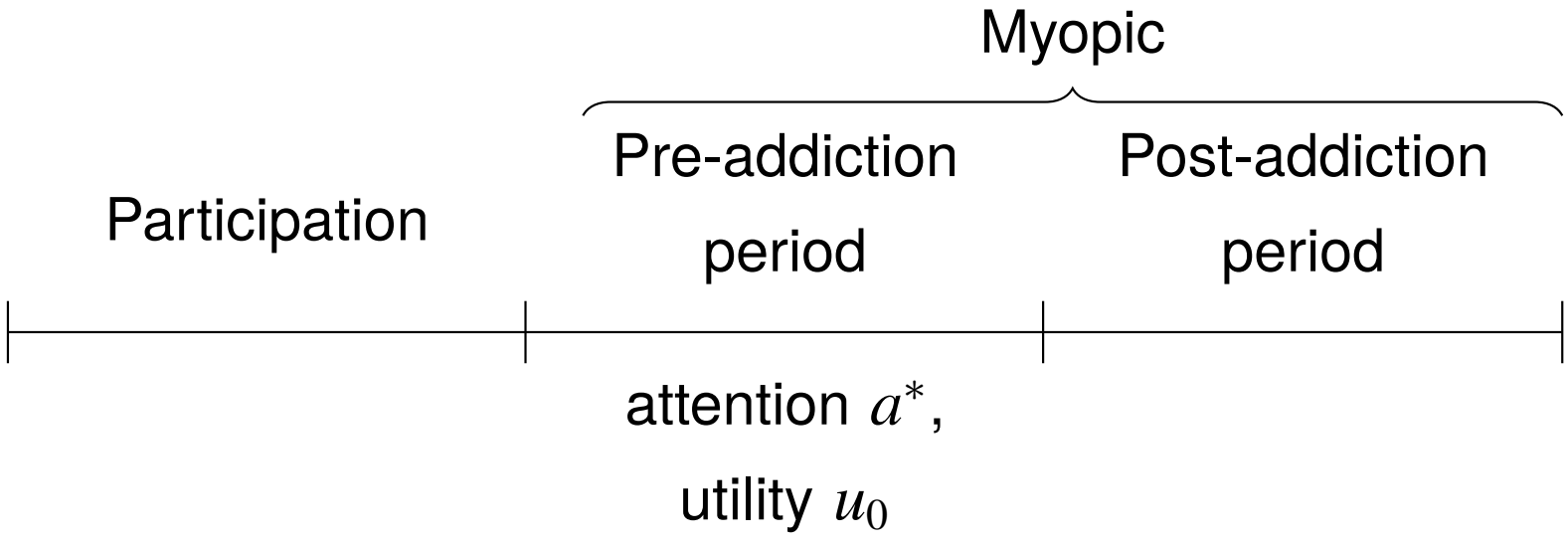

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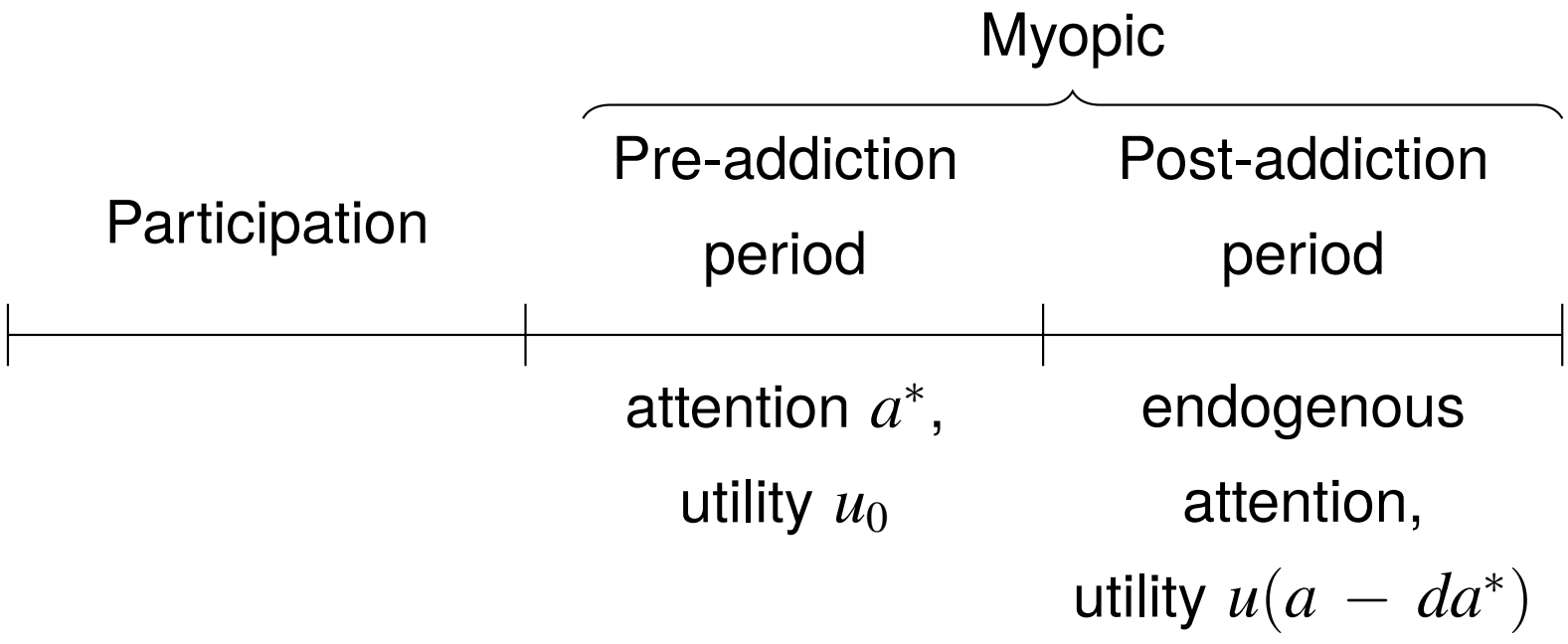

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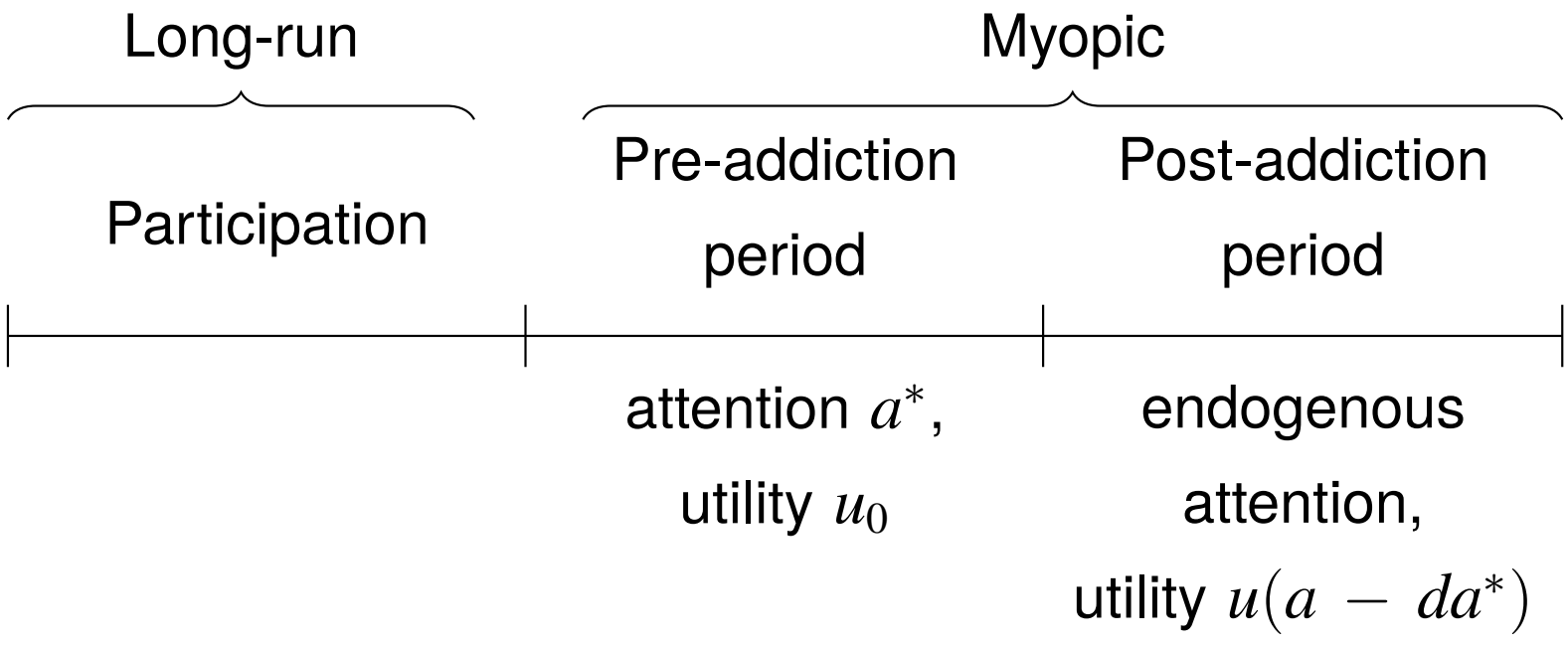

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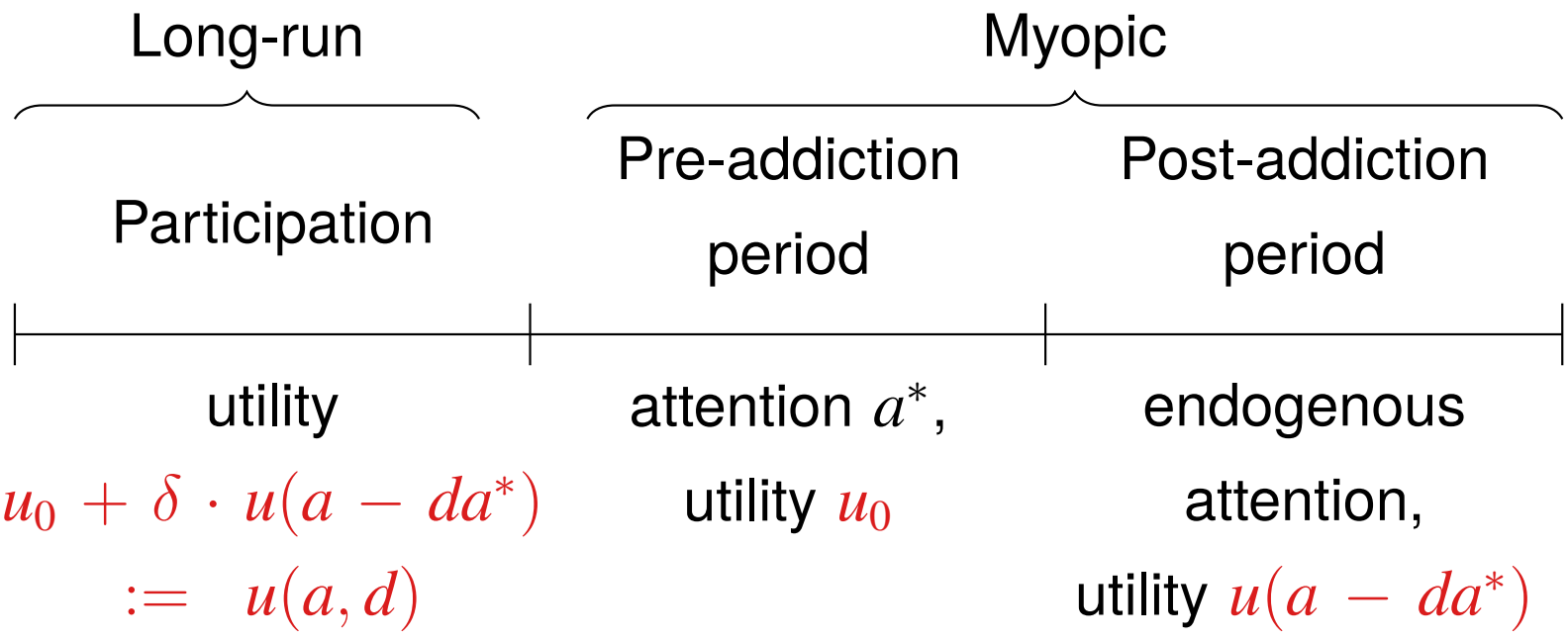

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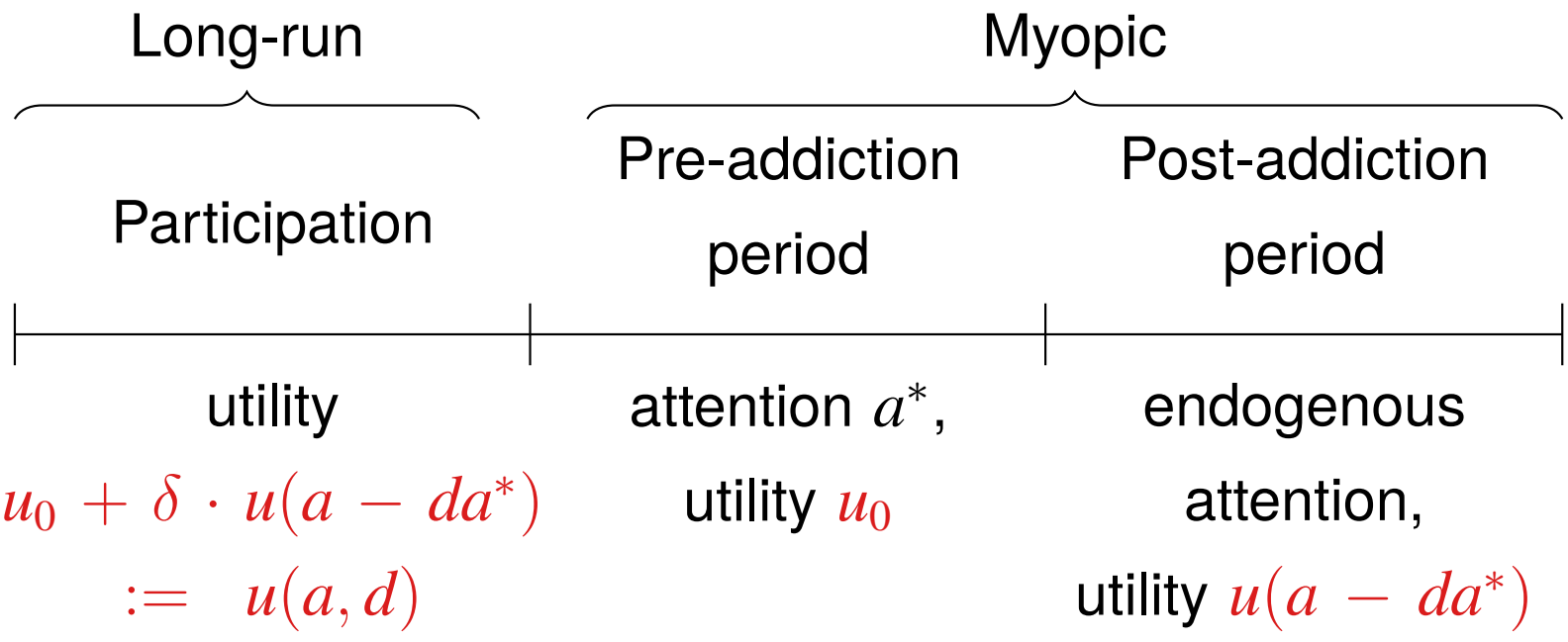

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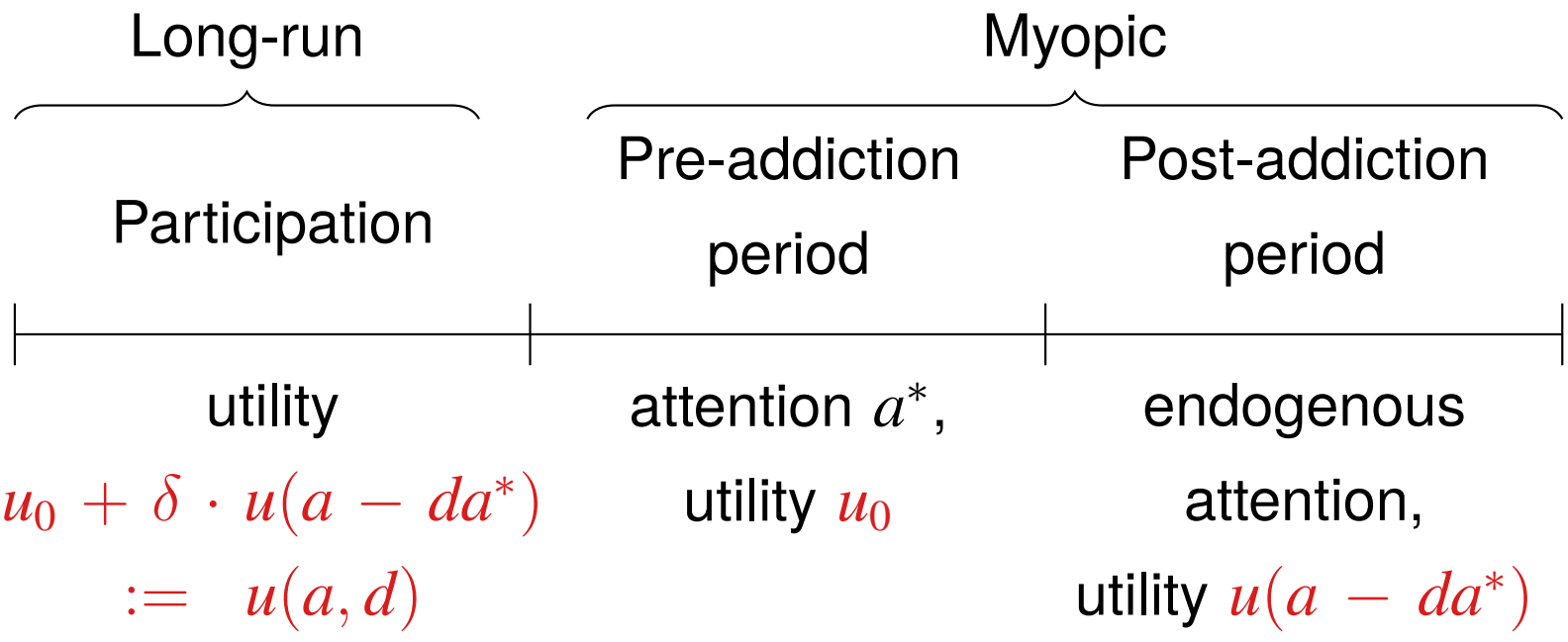

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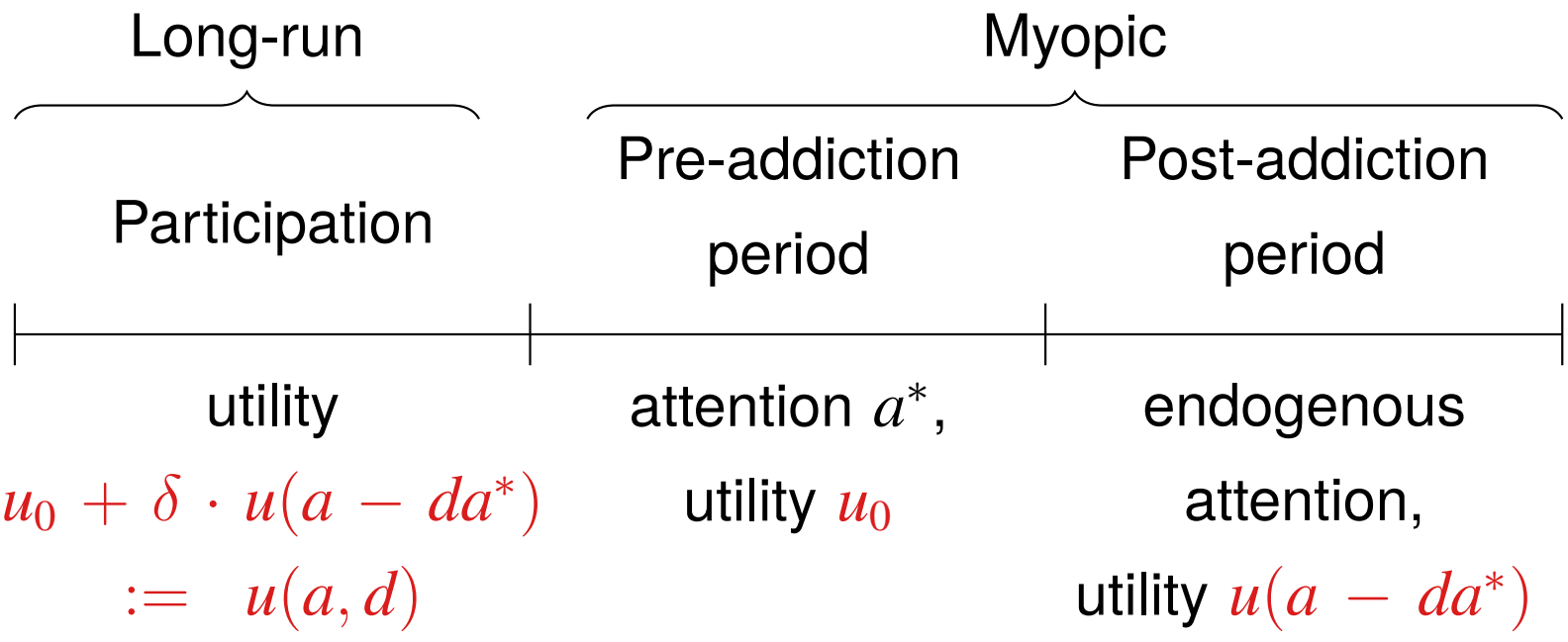

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- Habit formation in platform usage?

Literature (not exhaustive!)

Competition for attention & platform competition

Rochet and Tirole 2003, Anderson and Coate 2005, Armstrong 2006, Bordalo et al. 2016, Anderson and De Palma 2012, Wu 2017, Evans 2017 & 2019, Prat and Valletti 2019, de Corniere and Taylor 2020, Choi and Jeon 2020, Sato 2021, Zennyo 2021…

Negative impact of digital services

Allcott and Gentzkow 2017, Allcott et al. 2020, Mosquera et al. 2020, Alter 2017, Scott Morton et al. 2019, Newport 2019, Rosenquist et al. 2020,…

Recap

Mozilla website:

The Attention Economy to the Addiction Economy

Heather West | July 27, 2018 | 56 responses

*M*uch has been said about the attention economy.

Gamification. Tech addiction. But what happens when those things combine and form an addiction economy online?

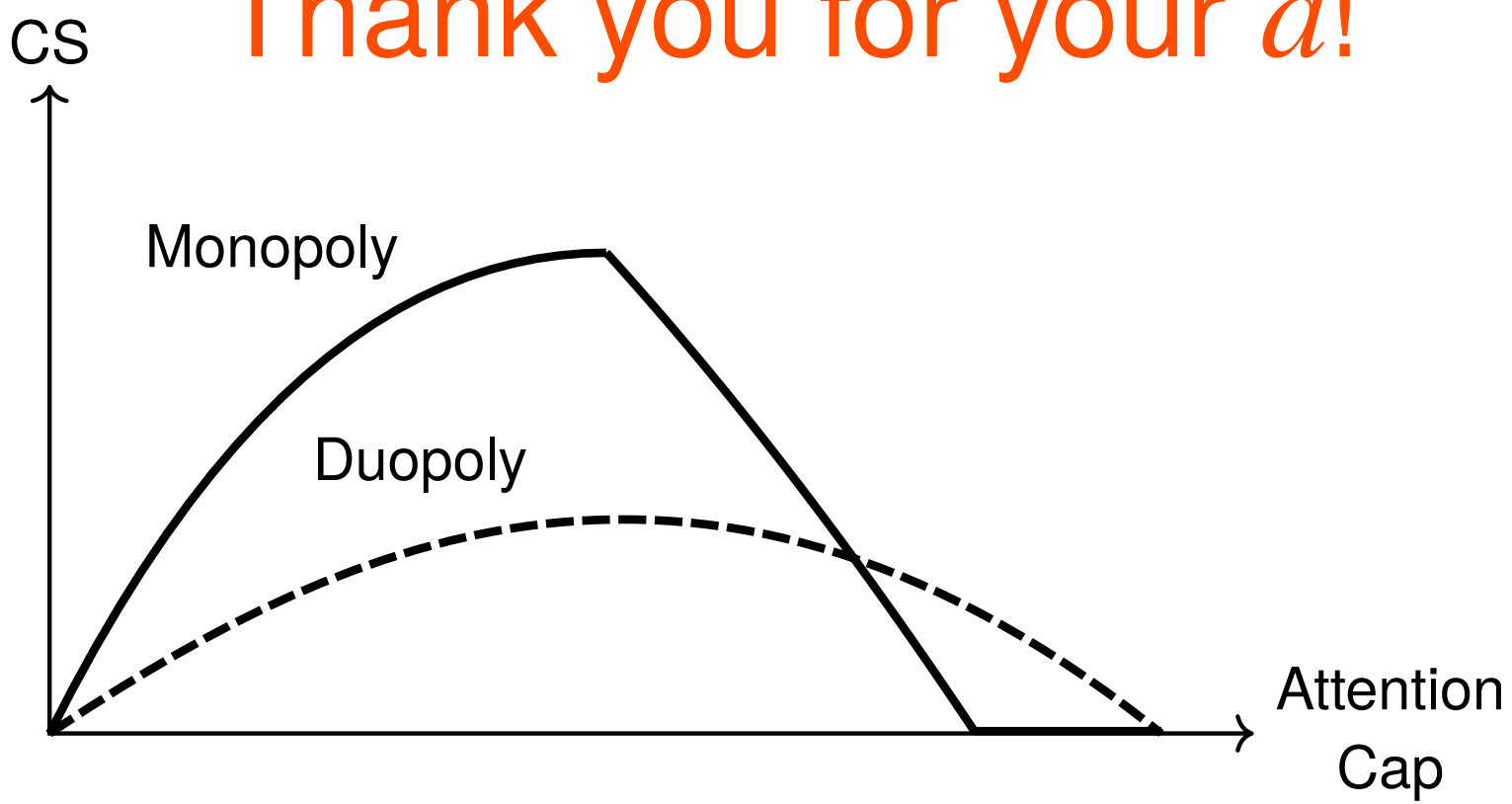
Recap

A strategic variable capturing the quality-attention trade-off

Competition is not a cure-all; firms may sacrifice quality for attention

“Digital curfew” could mitigate the problem

Thank you for your a!



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Digital Curfew

Social Media Addiction Reduction Technology (“SMART”) act in the US (proposed bill)

> *. . . automatically limits the amount of time that a user may spend on those platforms across all devices to 30 minutes a day unless the user elects to adjust or remove the time limit. . .*

Gaming curfew for China, Korea, and Thailand
E.g., Games under 18 will be restricted to 90 minutes of gaming on weekdays and three hours on weekends and holidays.

E.g., Tencent limits “game time to one hour per day for users under 12 and to two hours per day for users between 12 and 18. ”