Foreclosure, Bundling, and Innovation in Competitive Markets

Alessandro Kadner-Graziano

University of Bayreuth

CRESSE (Rhodos, 02.07.2023)

This paper develops a **theory of harm** for a merger of complements.

This paper develops a **theory of harm** for a merger of complements.

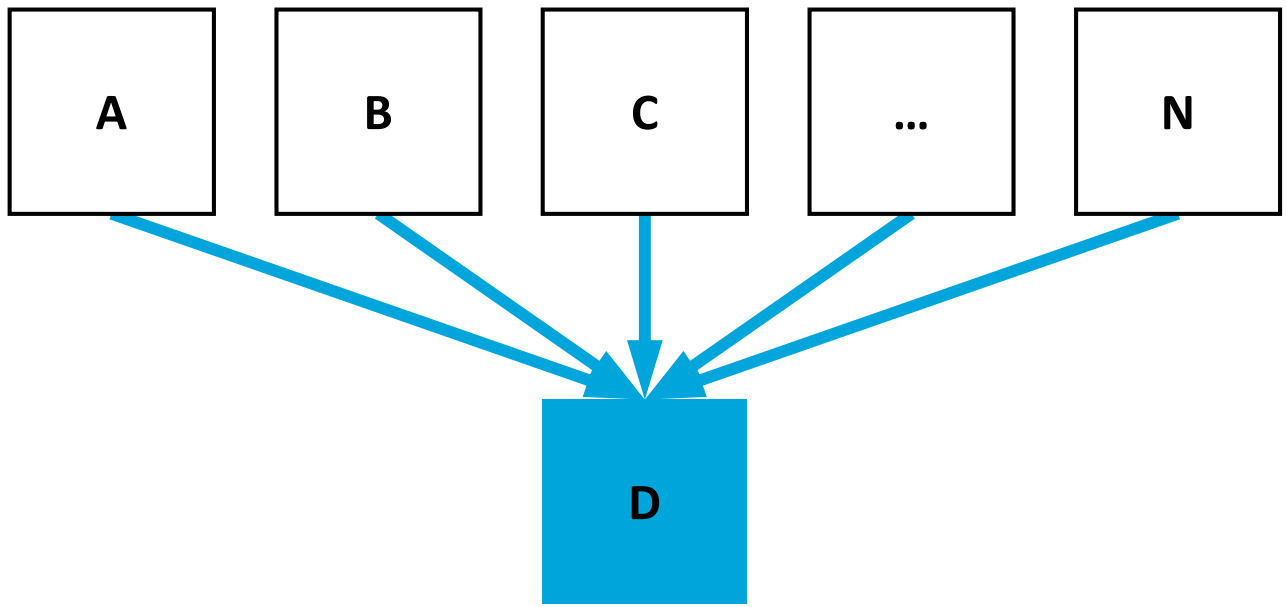
The **combination** of foreclosure and bundling is profitable.

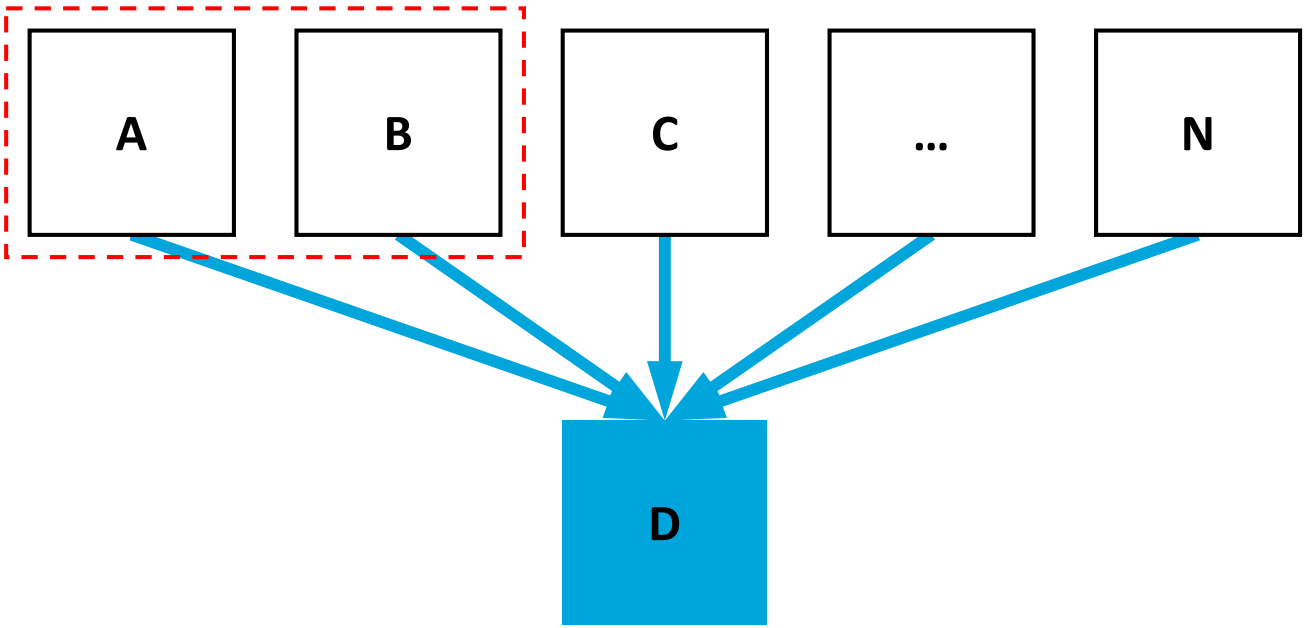
This paper develops a **theory of harm** for a merger of complements.

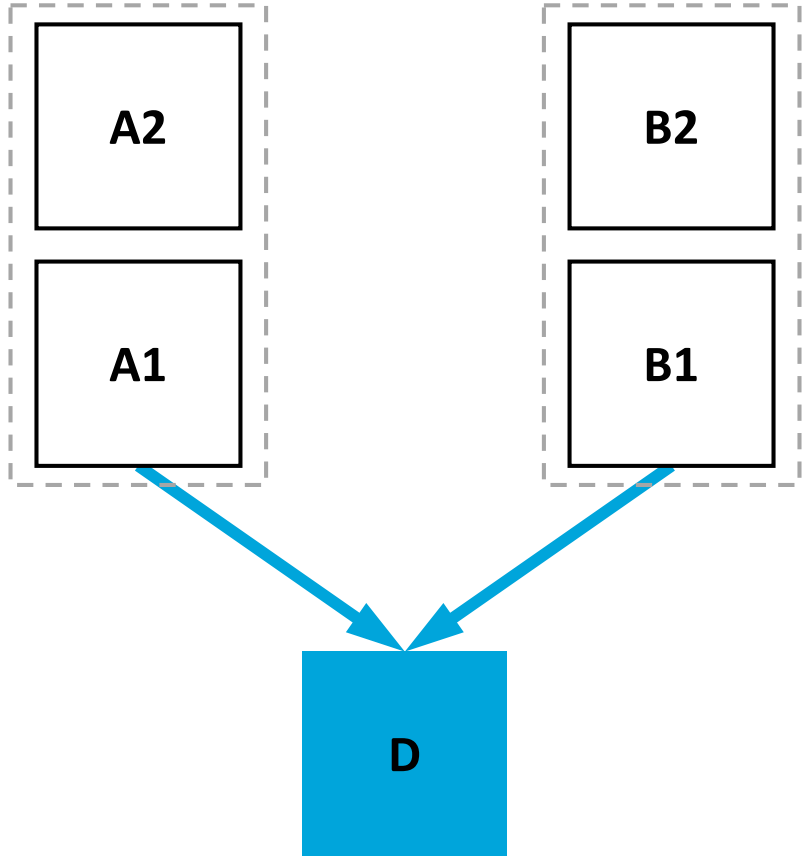
The **combination** of foreclosure and bundling is profitable.

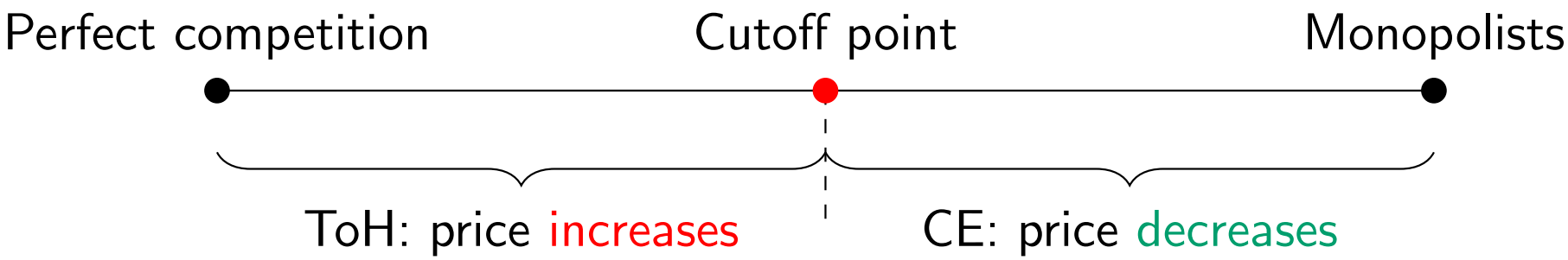
Motivation: the proposed Qualcomm/NXP merger in the chip industry.

1. Cleared in the US
2. Cleared subject to remedies in the EU
3. Effectively blocked by China


A
B
C
...
N
D

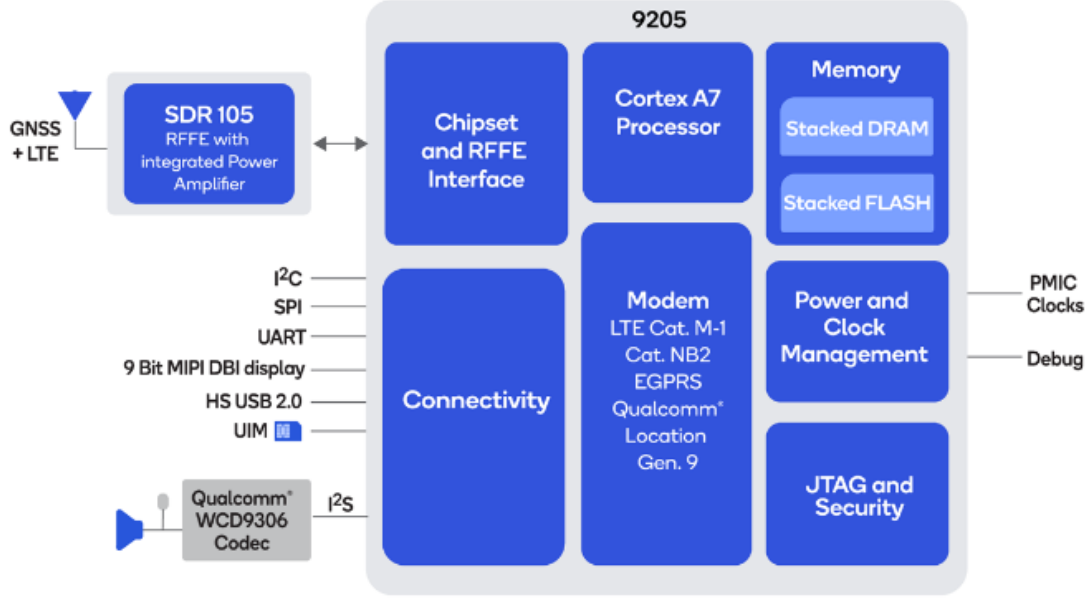

A
B
C
...
N
D

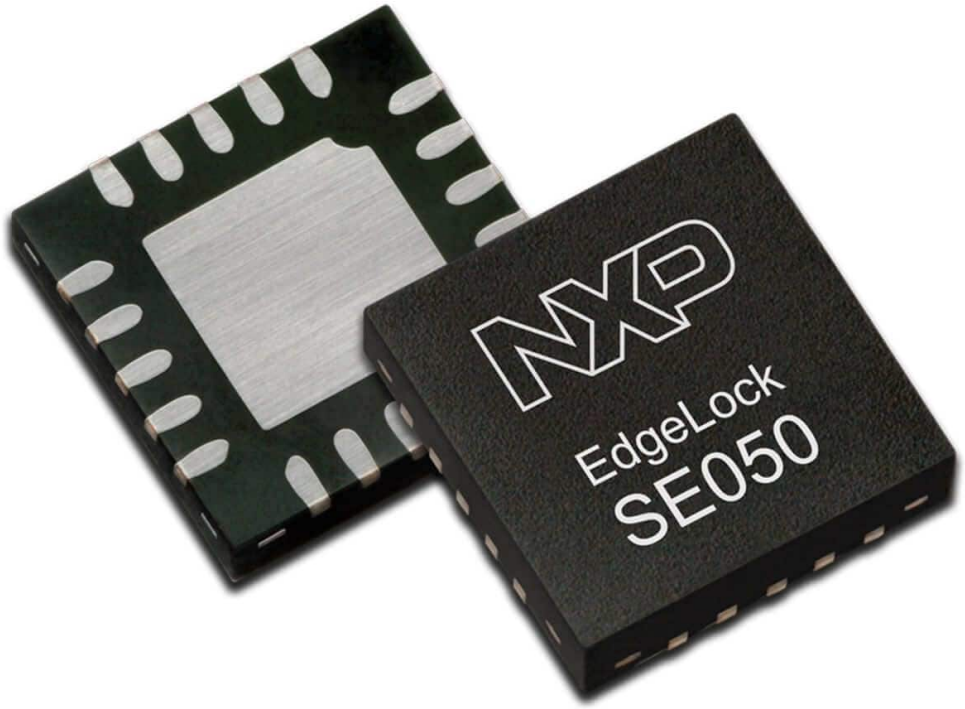

A2
B2
A1
B1
D


Perfect competition
Cutoff point
Monopolists
ToH: price increases
CE: price decreases

- Whinston (1990), Etro (2019)
- Choi & Stefanadis (2001), Carlton & Waldman (2002), Choi (2004)
- Cournot (1838), Kadner-Graziano (2023)
- Ordover, Saloner, Salop (1990), Salinger (1988), Salop & Scheffman (1983, 1987)

Block Diagram




NXP
EdgeLock
SE050

Market A

- Technology owner AT has unit cost c_{AT}.

- Any fringe producer has unit cost $\overline{c_A} > c_{AT}$, or $\underline{c_A} + r$ with $\underline{c_A} < c_{AT}$.

Market A

- Technology owner AT has unit cost c_{AT}.
- Any fringe producer has unit cost $\overline{c_A} > c_{AT}$, or $\underline{c_A} + r$ with $\underline{c_A} < c_{AT}$.

Market B

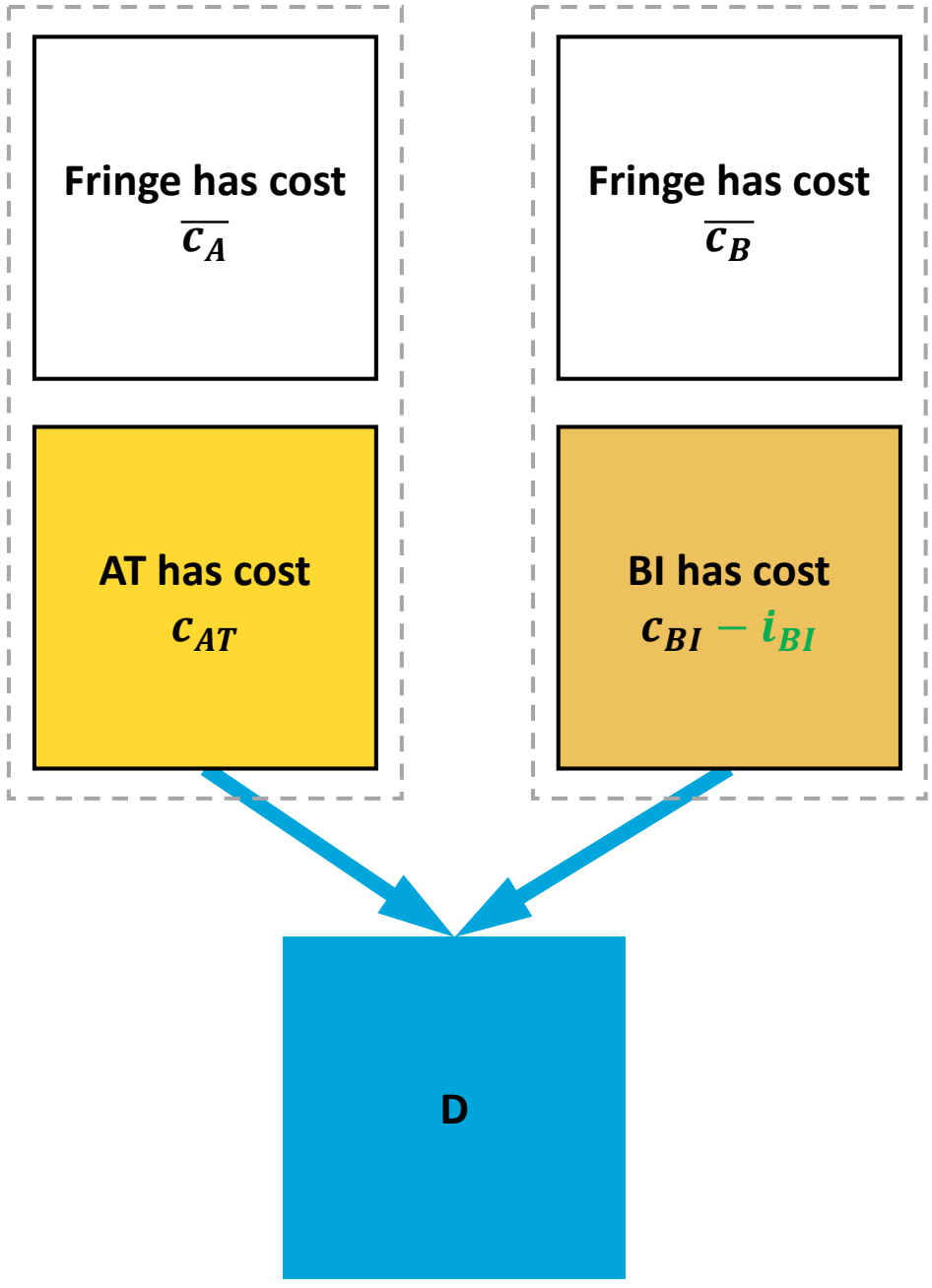
- Incumbent BI has unit cost $c_{BI} - i_I$.
- Any fringe producer has unit cost $\overline{c_B}$, where $\overline{c_B} > c_{BI}$.

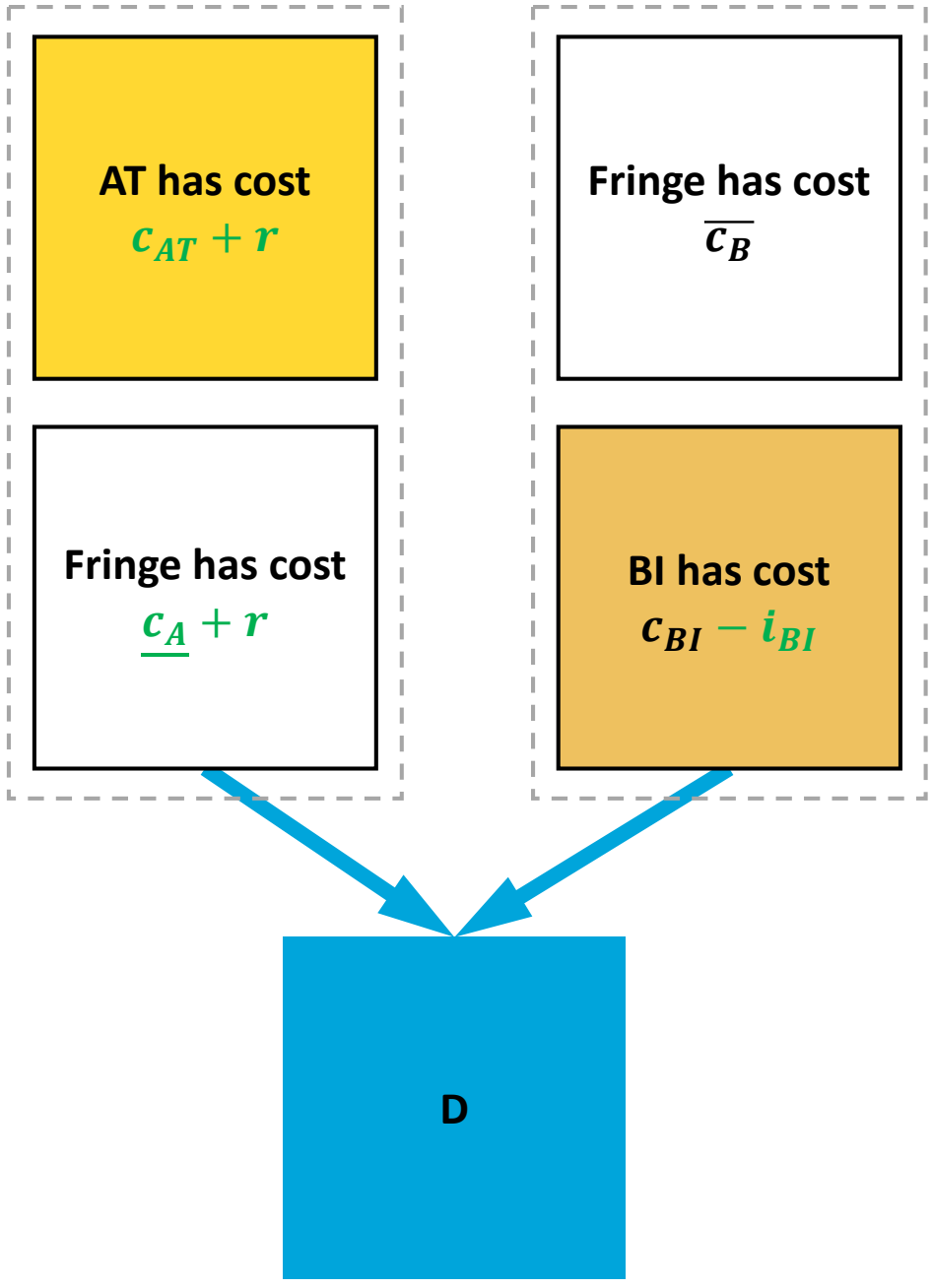
Market A

- Technology owner AT has unit cost c_{AT}.
- Any fringe producer has unit cost $\overline{c_A} > c_{AT}$, or $\underline{c_A} + r$ with $\underline{c_A} < c_{AT}$.

Market B

- Incumbent BI has unit cost $c_{BI} - i_I$.
- Any fringe producer has unit cost $\overline{c_B}$, where $\overline{c_B} > c_{BI}$.
- Potential entrant BE has unit cost 0 with probability $i_E \in [0, 1]$.


Fringe has cost
$\overline{c_A}$
Fringe has cost
$\overline{c_B}$
AT has cost
c_{AT}
BI has cost
$c_{BI} - i_{BI}$
D


AT has cost
$c_{AT} + r$
Fringe has cost
$\overline{c_B}$
Fringe has cost
$c_A + r$
BI has cost
$c_{BI} - i_{BI}$
D

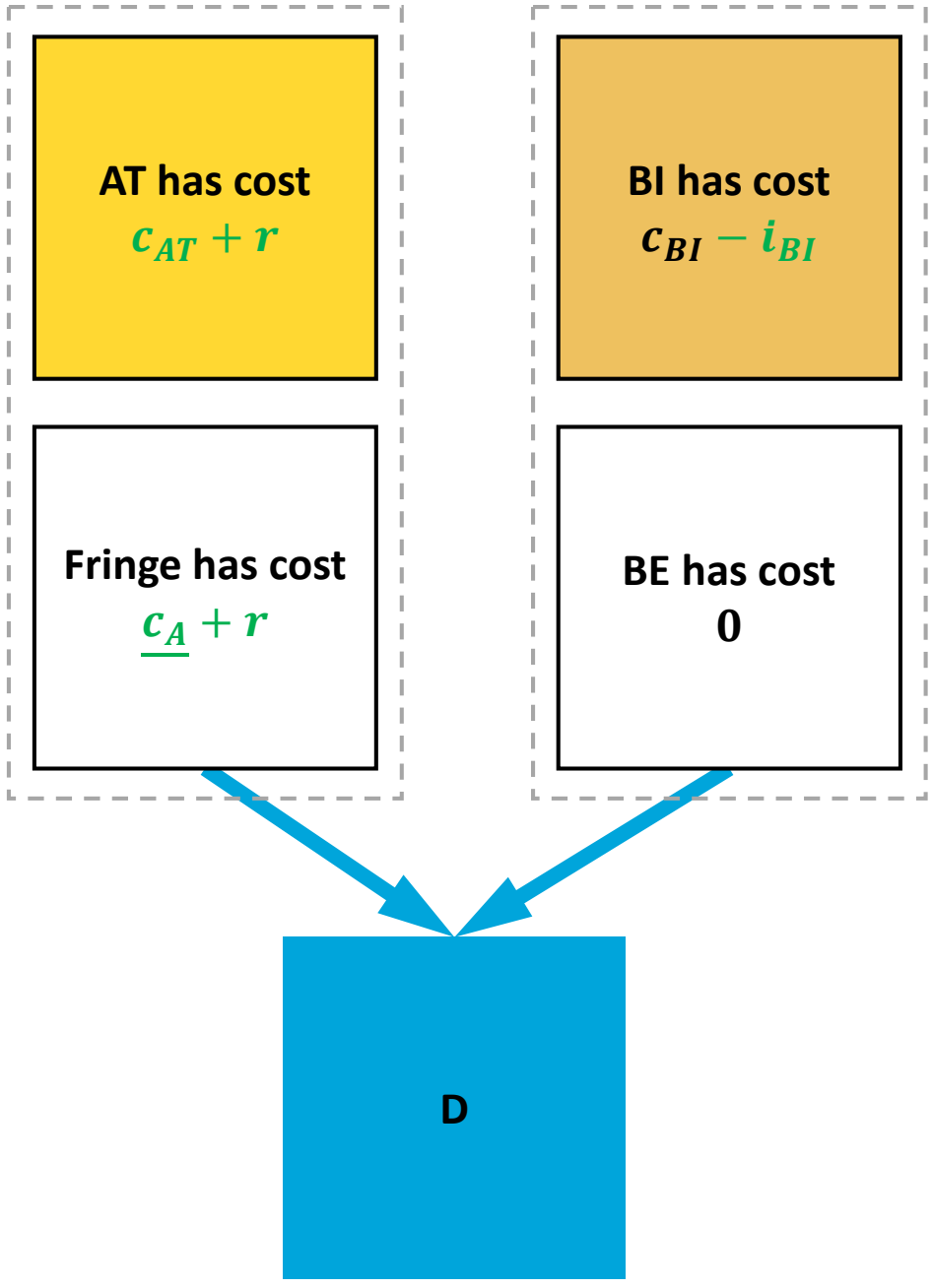

AT has cost
$c_{AT} + r$
BI has cost
$c_{BI} - i_{BI}$
Fringe has cost
$c_A + r$
BE has cost
0
D

Table: Pre-merger timing

Stage	Actions
1	In market A, the technology owner **sets royalty** r.
2	In market B, the incumbent and potential entrant **invest**.
3	All producers compete (simultaneously) in **posted prices**.

In stage 1, $r^* = \overline{c_A} - \underline{c_A}$.

In stage 2, $i_I^* > 0$ and $i_E^* > 0$.

$$\Pi_{BI} = (1 - i_E) \left[\overline{c_B} - (c_{BI} - i_I) \right] Q\left(\overline{c_A} + \overline{c_B} \right) - k(i_I)$$

$$\Pi_{BE} = i_E \left[c_{BI} - i_I \right] Q\left(\overline{c_A} + c_{BI} - i_I \right) - \theta(i_E)$$

In stage 3, prices $= \overline{c_A} + \overline{c_B}$ without entry and $= \overline{c_A} + c_{BI} - i_I$ with.

Remark

Consumers benefit from the incumbent's investment when it does **not** sell.

$\Delta\Pi$	No bundling	Bundling
No input foreclosure	$= 0$	< 0
Input foreclosure	< 0	$\lessgtr 0$

$$\Pi_{BE} = i_E \left[c_{BI} - i_I - (\overline{c_A} - c_{AT}) \right] Q\Big(c_{AT} + c_{BI} - i_I \Big) - \theta(i_E)$$

The merger is profitable if

- the **loss** in input market **A**, from **lost licensing revenue**,

is more than compensated by

- the **gain** in input market **B**, from no or less frequent **entry**.

Condition for **full foreclosure**:

$$c_{BI} - i_I^*(0) - (\overline{c_A} - c_{AT}) \leq 0$$

Proposition

With full foreclosure,

1. Investment i_I increases.
2. Price increases to $\overline{c_A} + \overline{c_B}$.

Remark

The benefits of greater innovation are not passed on to consumers.

Proposition

With partial foreclosure,

1. Investment i_I increases whereas i_E decreases.
2. The expected consumer price can increase or decrease.

Conclusion:

A merger of complements can harm consumers

even if input markets are **competitive** pre-merger

through a strategy that **combines** foreclosure with bundling.