2020年度寡占理論 (5)
Procurement of Advanced Technology and Welfare-Reducing Vertical Integration

今日の講義の構成

(a) 調達に関するCSR

(b) 垂直的取引関係

(c) 垂直的取引関係と接続規制

(d) Procurement of Advanced Technology and Welfare-Reducing Vertical Integration

Initial Title : Corporate Social Responsibility-Oriented Procurement and Vertical Integration

Joint work with Sang-Ho Lee and Chul-Hi Park

調達に関するCSR

納入企業に対する責任

・児童労働を使っていない生産・化学物質管理

・環境配慮・個人情報管理・Fair Trade

→一般に費用が増加する

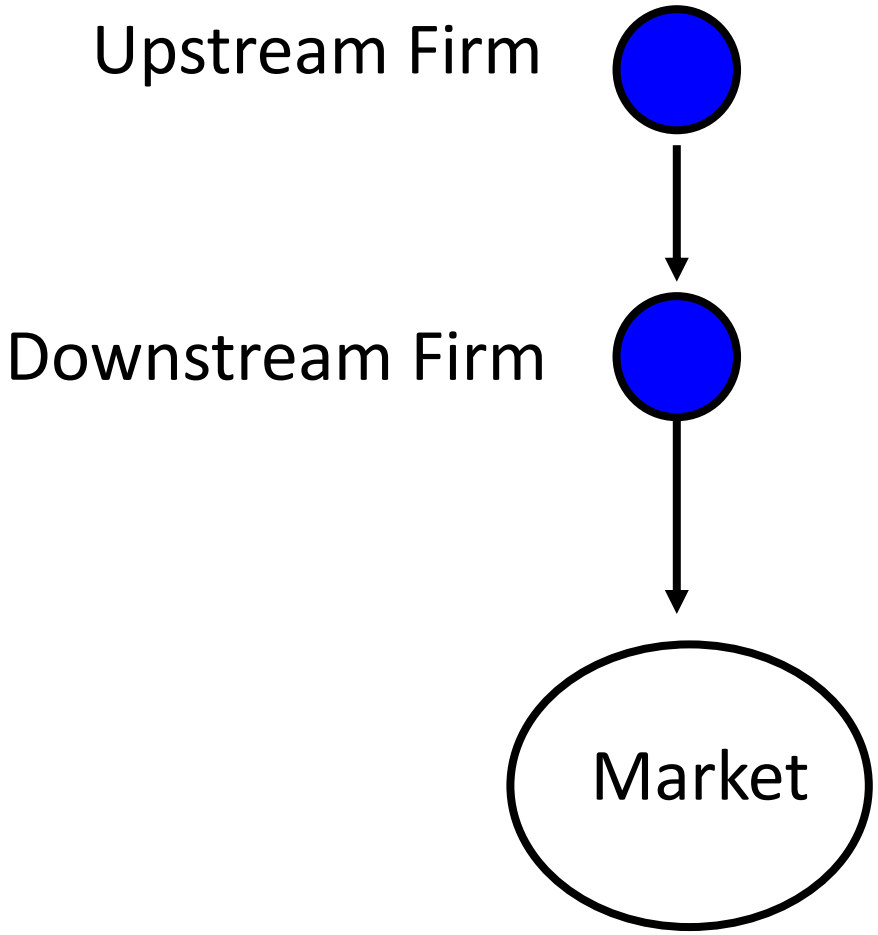
なぜ費用が増加する行動をあえてとるのか

・競争制限効果(前回の議論)

・規制対応←自主的に対応しないと強い規制が入る

・需要拡大効果

vertical relationship



Henceforth, I assume that one unit output of the downstream frim requires one unit input supplied by the upstream firm.

Examples of Vertical Relationship

(1) Manufacturers -- Retailers
(2) Input Suppliers -- Final Product Manufacturers
(3) Whole Sellers -- Retailers
(4) Patent Holders -- Producers
(5) Licenser -- Licensee
(6) Network Holders -- Service Providers
(7) Airlines, Hotels -- Travel Agency
(8) Production Agency -- Broadcastings
(9) MNO -- MVNO

Double Marginalization

Suppose that both upstream and downstream firms are monopolists.

Suppose that the price of upstream product is equal to the marginal cost of the upstream monopolist.

→The downstream monopolist names the monopoly price that maximizes the joint profit of the two firms.

However, if the upstream monopolist maximizes its own profit, it names the price that is strictly higher than its marginal cost.

→Resulting price in the downstream market is higher than the joint profit maximizing price.

Vertical Integration

Suppose that both upstream and downstream firms are monopolists. Suppose that two firms become the integrated firm (vertical integration).

The price at the downstream market after the integration is lower than the price without integration.

Vertical Integration

Suppose that both upstream and downstream firms are monopolists. Suppose that two firms become the integrated firm (vertical integration).

The welfare (consumer surplus + firms' profits) after the integration is greater than that without integration.

Merger between Firms Supplying Complementary Products

As is pointed by Cournot, merger between firms supplying complementary products reduces the prices and improves welfare.

Vertical integration is an example of this general principle.

How to Solve the Problem of Double Marginalization

(1) Vertical Integration
(2) Two-Part Pricing ～Fixed payment ＋Linear Pricing

Linear Pricing = The Price is equal to the marginal cost, the upstream firm obtains profits through fixed payment
～Price discrimination (impossible if the downstream firms can resale the upstream firms' products)

Hotelling

Duopoly Model, Fixed Price Model, Shopping Model.
Consider a linear city along the unit interval [0,1],
where firm 1 is located at x_1 and firm 2 is located at x_2.
Consumers are uniformly distributed along the interval.
Each consumer buys exactly one unit of the good,
which can be produced by either firm 1 or firm 2.
Each firm chooses its location independently.
The firm's marginal production cost is constant and it is c.

Two-Stage Location then Price Model

Each consumer buys the product from the firm whose real price (price +transport cost) is lower. Transport cost is proportional to (the distance)^2.~quadratic transport cost.

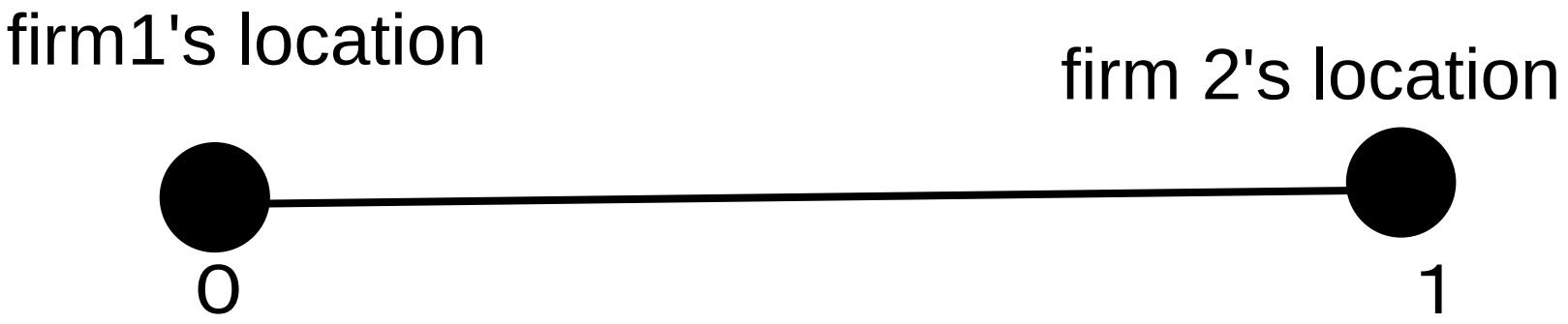
In the first stage, each firm chooses its location independently.

In the second stage they face Bertrand competition.

Each firm i's profit is $(p_i - c)y_i$

d'Aspremont, Gabszewics, and Thisse (1979, Econometrica)

Maximal Differentiation



Property of the equilibrium price

price-cost margin (the equilibrium price – c) is independent of c.

With Vertical Structure

Integrated firm's profit is $(p_1 - c)y_1 + ry_2$
Downstream firm 2's profit is $(p_2 - c - r)y_2$

There is no variable cost in the upstream sector.

Equilibrium Prices

（1）In equilibrium, the integrated firm's price p_1 = downstream frim 2's price p_2.

Downstream firm 2's marginal cost is c + r.
The integrated firm's marginal cost is c (direct production cost) + r (opportunity cost)
⇒Same marginal costs.

（2） Suppose that the equilibrium price is A when r = 0. When r > 0, the equilibrium price is equal to A + r.

Equilibrium Profits

(3) Downstream firm 2's profit is independent of r.

(4) The integrated firm's profit is increasing in r.

Plan of the Presentation of Today's paper

(1) Rough Sketch

(a) Players (b) Time Line (c) Results (d) Intuitions

(e) Welfare Implications

(2) Motivation

(3) Formal Model

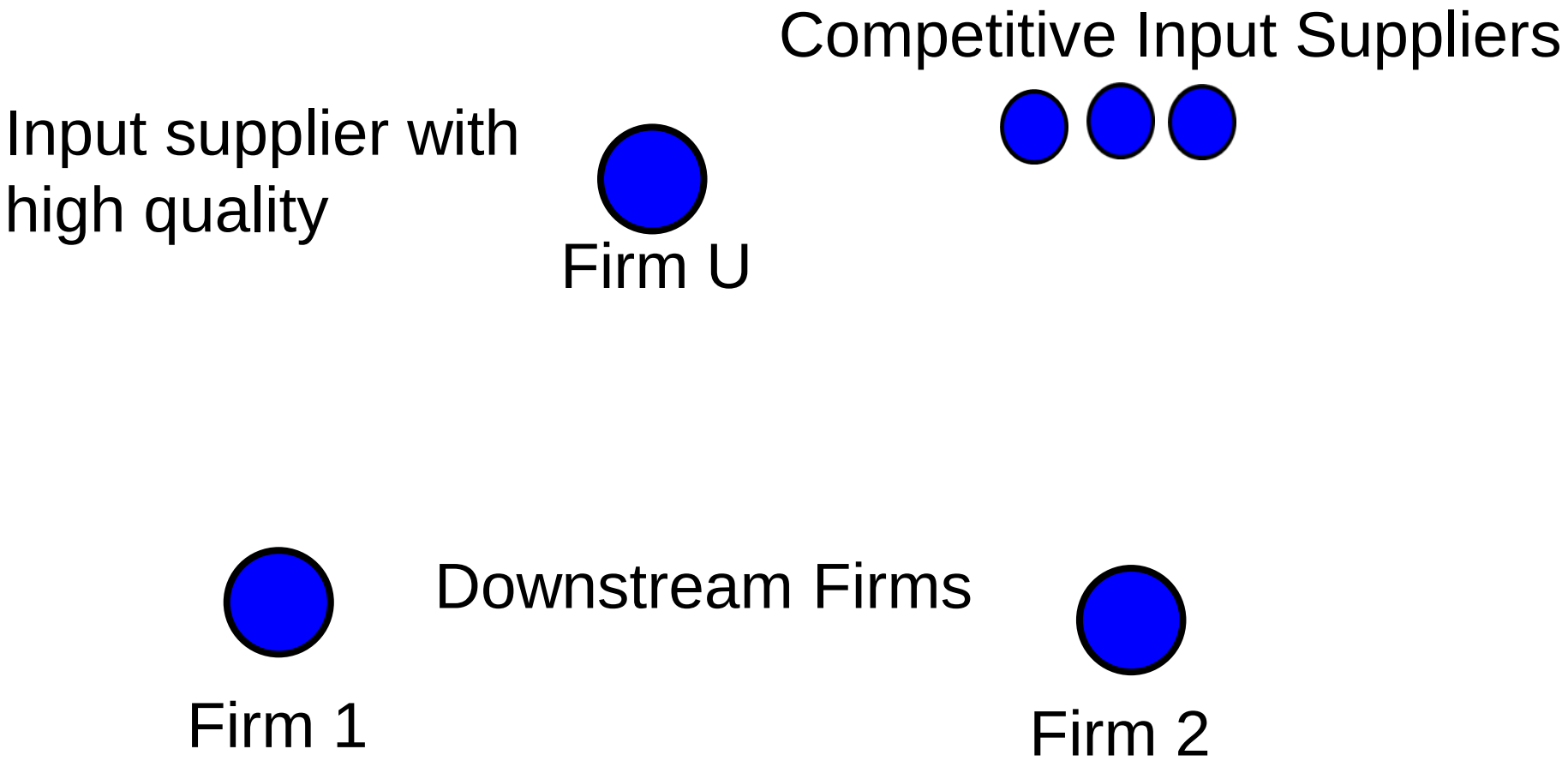
(4) Non-Integrated Case

(5) Integrated Case

(6) Comparison of the Two Cases

(7) Possible Extensions

Rough Sketch (Players)



Time Line (Non-Integrated Case)

- In the first stage, each downstream firm chooses whether to purchase the inputs from the monopolist Firm U or from competitive market (or makes within the firm). In other words, each downstream firm choose whether it commits to adopt Firm U's advanced input or to adopt standard competitive input. Choosing Firm U's input improves the quality of the final product.
- After observing the commitment in the first stage, Firm U chooses its input price r.
- In the final stage, two downstream firms face Bertrand competition in a differentiated product market (linear demand).

Time Line (Integrated Case)

- Before the game, Firms U and 1 are merged.
- In the first stage, firm 2 chooses whether to purchase the inputs from the integrated firm or from competitive market.
- After observing the commitment in the first stage, the integrated firm chooses its input price r.
- In the final stage, two firms face Bertrand competition in a differentiated product market (linear demand).

Results (Non-Integrated Case)

(1) If the quality (demand) enhancing effect is small (large, intermediate), no firm (two firms, one firm) adopt(s) Firm U's input.

(2) If only one firm adopts Firm U's input in equilibrium, then the firm adopting Firm U's input earns more.

(3) If the quality (demand) enhancing effect is small (large, intermediate), no firm (two firms, one firm) should adopt Firm U's input for social welfare.

(4) Given the rival does not (does) adopt Firm U's input, private incentive for adopting Firm U's for the firm is insufficient (can be insufficient and excessive) for welfare.

Results (Integrated Case)

Firm 1 obviously adopts its input.

(1) If the quality (demand) enhancing effect is large (small), firm 2 adopts (does not adopt) Firm U's input.

(2) If the quality (demand) enhancing effect is large (small), firm 2 should adopt (should not adopt) Firm U's input for social welfare.

Results (Comparison)

(1) Firm 2 more likely adopts Firm U's input under vertical integration.

(2) Vertical integration increases the joint profit of Firm U and firm 1 and reduces the profit of firm 2.

(3) If vertical integration does not affect the number of adopting Firm U's input, then vertical integration improves welfare.

(4) Vertical integration may reduce welfare.

Intuitions (Comparison)

(1) Firm 2 more likely adopts Firm U's input under vertical integration.

An increase in P_1 (the price of the final product of firm 1) reduces the output of firm 2, resulting in the reduction of the profit of Firm U if firm 2 adopts Firm U's input.

⇒Under vertical integration, firm 2's adoption of Firm U's input makes firm 1 less aggressive in the final product market, which increase the profit of firm 2.

Therefore, firm 2 has a stronger incentive to adopt Firm U's input under vertical integration.

Collusive effect of adoption of Firm U's input.

Welfare Implications

(1) Anti-competitive effect of adoption of the rival's advanced technology under vertical integration.
e.g., Yahoo's adoption of Googles technology may have anti-competitive effect in ad markets.

(2) No integrated case, the private incentive for first adoption of new technology is insufficient, while the second adoption of it may be excessive.

Examples Illustrating Motivation

Sharp was the only one supplier liquid of crystal display panel made with IGZO (indium-gallium-zinc-oxide) TFT (thin film transistor), the display with quite high energy-saving performance.

Introducing this display substantially improves the quality of mobile phone, tablet, and so on.

The downstream producers could appeal the quality of their products by announcing the introduction of this input.

However, the commitment to pro-cure this input may be risky because other input suppliers could not supply this product and thus the upstream supplier may require a higher price in future.

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Examples Illustrating Motivation

The products made from `non genetically modified soybeans' are highly evaluated and are sold at higher price than the similar product made from genetically modified soybeans in Japan.

However, few consumers outside Japan regards the products of `non genetically modified soybeans' as high quality products, and thus, major suppliers does not treat non genetically modified soybeans. As a result suppliers of non genetically modified soybeans are quite limited and may execute monopoly power.

Examples Illustrating Motivation

Google and Yahoo compete in ad markets.

Yahoo tried to introduce advanced Google's search engine technology, but there is a risk that affects collusion in downstream ad markets.

←Anti-trust departments of USA and EU against it because it stagnates the innovation market of search engine, while that of Japan expressed opinion that there is no problem, and finally Yahoo gave up introducing it.

Examples Illustrating Motivation

Corporate Social Responsibility is often related with procurement.

Child Labor Free Textile, Fare Trade Coffee Beans, Emission-Free (Low Emission) Inputs,...

but suppliers of such products are limited.

Questions

(1) Should introduction of advanced (new) technology be promoted?

(2) Under what conditions does such new technology prevail?

(3) Does foreclosure of such new technology by a downstream firm promote or restrict the adoption of this technology by the rival?

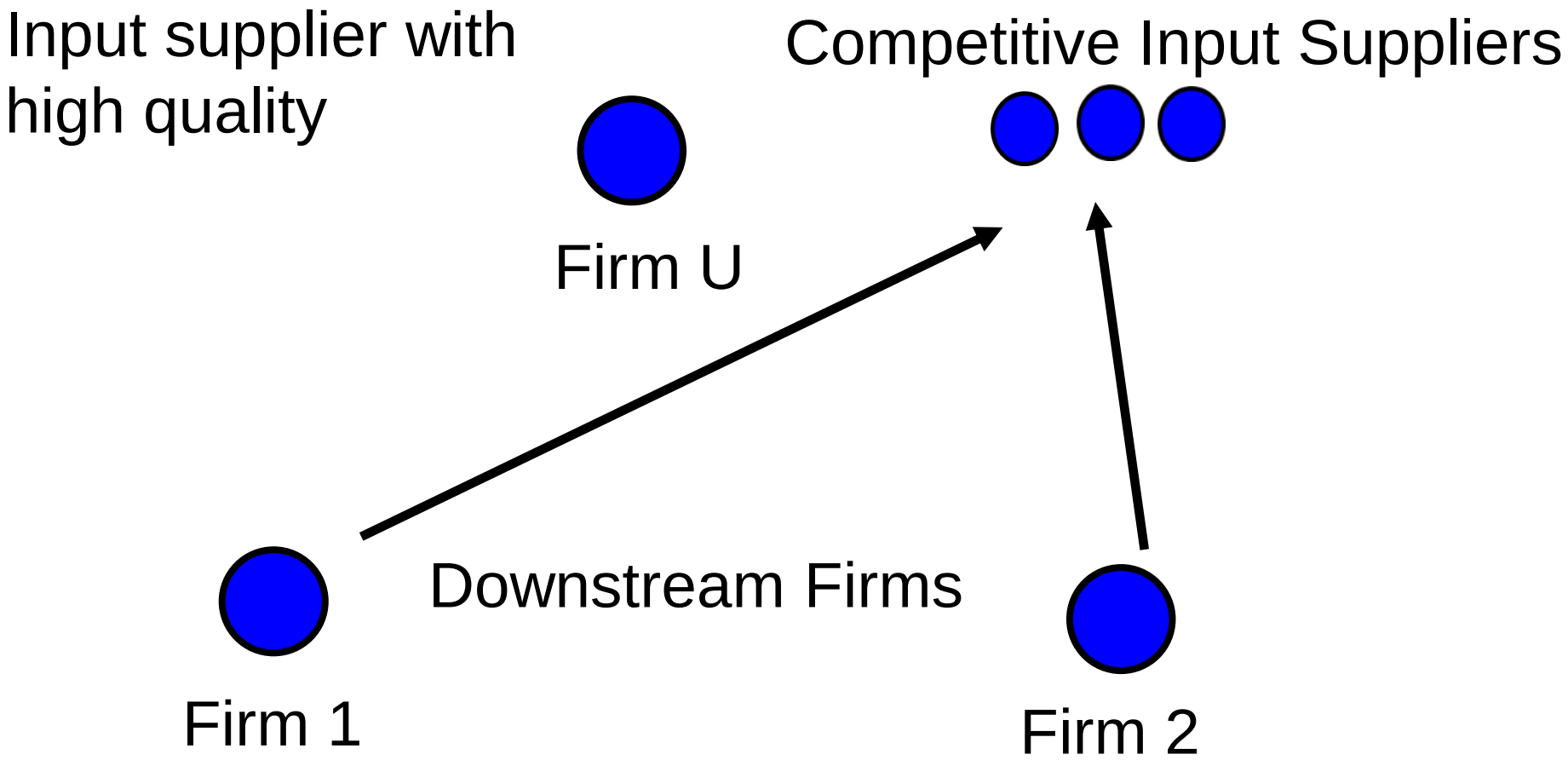
Model

Players: Firm U (upstream firm),
Firm 1, Firm 2 (downstream firms)
Payoff: Its own profit
Demand of final product of Firm i (i=1,2, i ≠j)
$p_i = A_i - q_i - \beta q_j$
β represents the degree of product differentiation.
A_i is A* if it adopts Firm U's input, while it is A < A* if otherwise.
Costs: Marginal cost is constant. Firm i's (i=1,2)
marginal cost is r (the price of Firm U's input) if it adopts Firm U's input, while it is zero if otherwise. Firm U's marginal cost is zero.

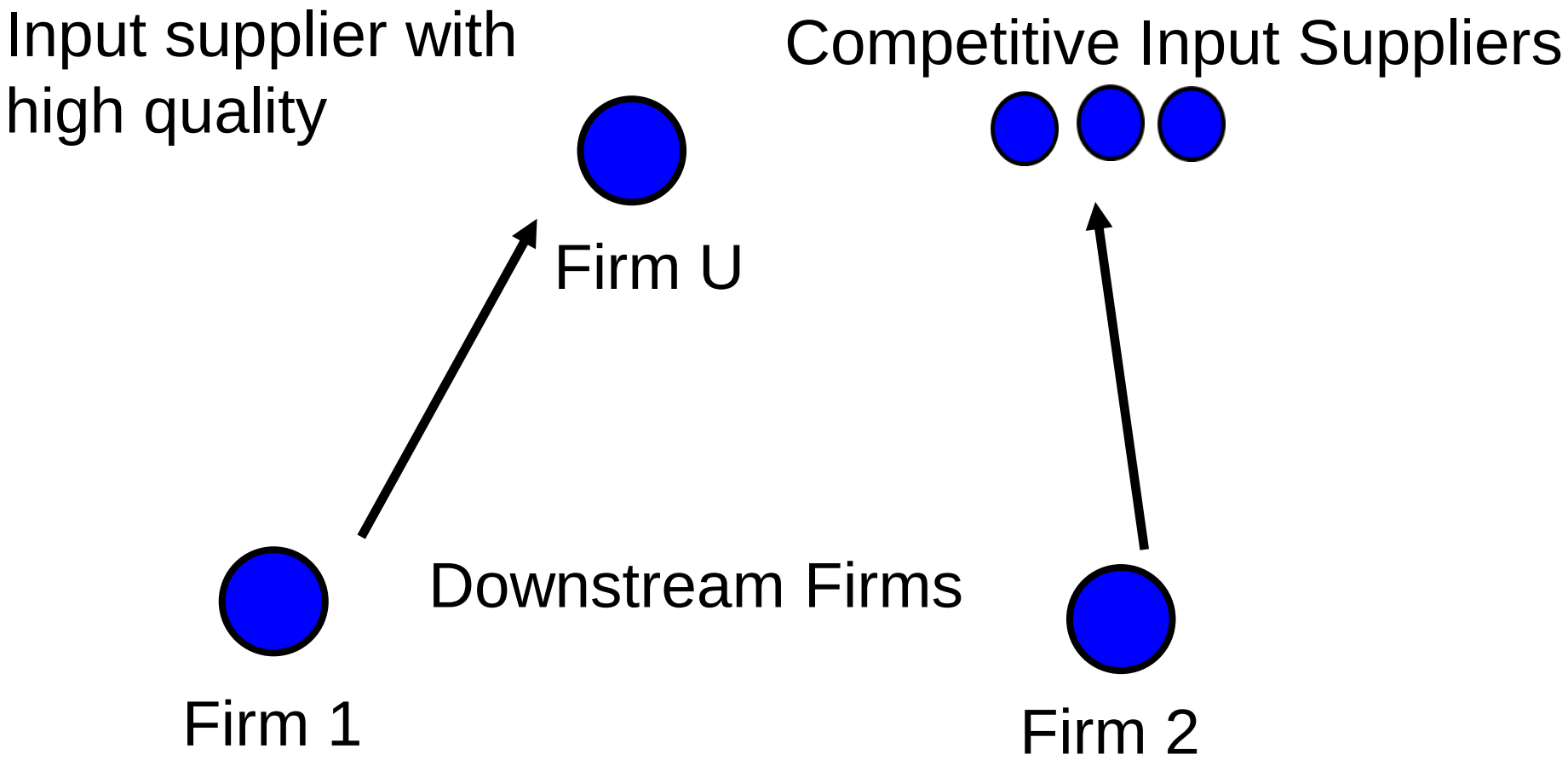
Time Line (Non-Integrated Case)

- In the first stage, Firms 1 an 2 choose Firm U or competitive market.
- In the second stage, Firm U chooses its input price r.
- In the final stage, Each of Firm i (i=1,2) chooses p_i independently.

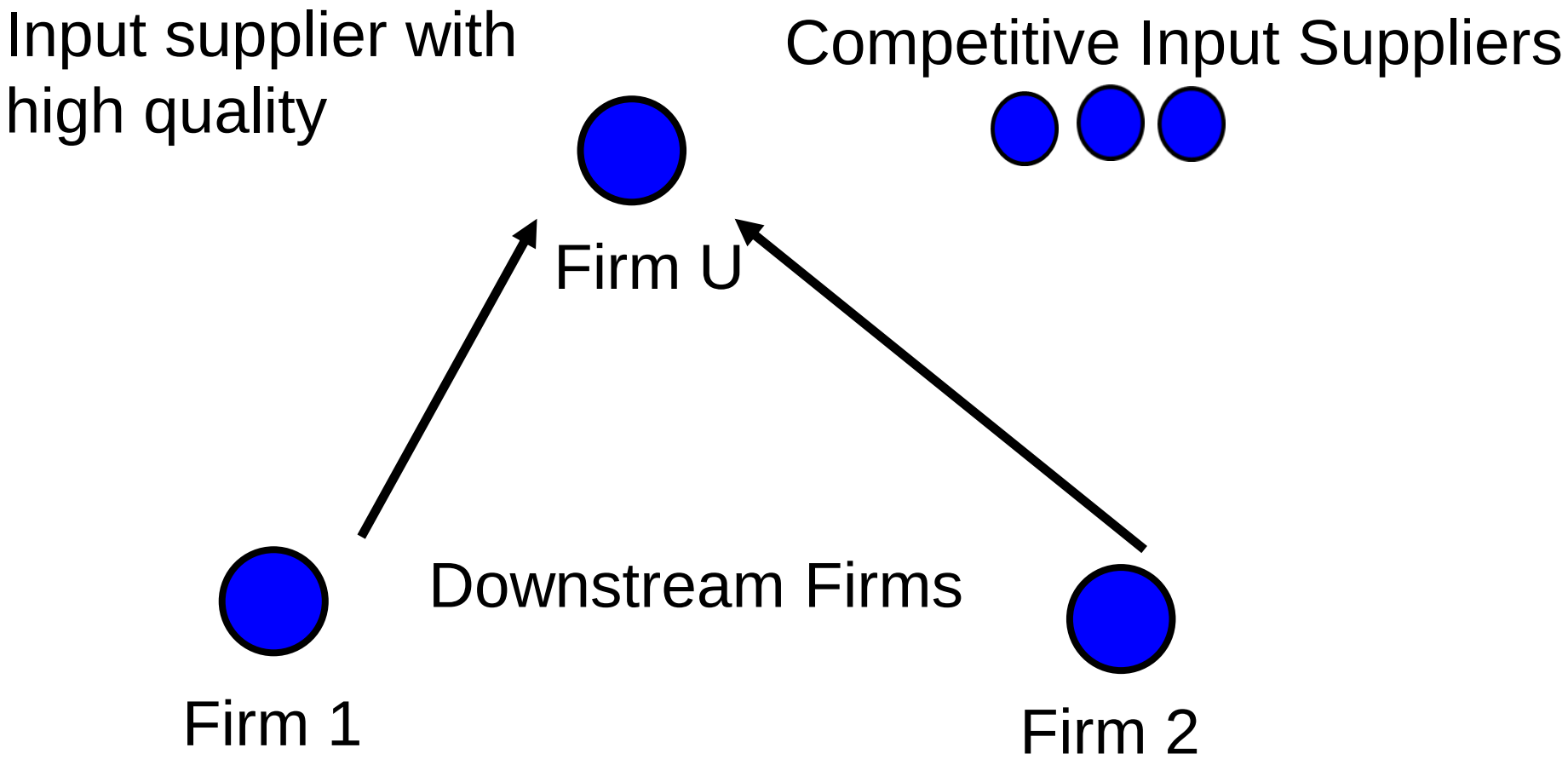
Subgame 1


Input supplier with high quality
Competitive Input Suppliers
Firm U
Downstream Firms
Firm 1
Firm 2

Subgame 2


Input supplier with high quality
Competitive Input Suppliers
Firm U
Downstream Firms
Firm 1
Firm 2

Subgame 3


Input supplier with high quality
Competitive Input Suppliers
Firm U
Downstream Firms
Firm 1
Firm 2

Lemma 1

There exists an equilibrium in which no firm chooses Firm U's input if and only if $A^* \leqq A\pi(1,0)$, .

There exists an equilibrium in which only one firm chooses Firm U's input if and only if $A\pi(1,0) \leqq A^* \leqq A\pi(1,1)$.

There exists an equilibrium in which both firms choose Firm U's input if and only if $A\pi(1,1) \leqq A^*$.

Lemma 2

Suppose that only one firm chooses Firm U's input. If $A\pi(1,0) \leqq A^*$, then the firm choosing Firm U's input earns more.

$\Rightarrow$ If two firms choose whether to adopt Firm U's input sequentially, the first mover chooses to adopt Firm U's input and enjoys the first mover advantage.

Lemma 3

The case in which no firm chooses Firm U's input is best for welfare if and only if $A^* \leqq AW(1,0)$.

The case in which only one firm chooses Firm U's input is best for welfare if and only if and only if $AW(1,0) \leqq A^* \leqq AW(1,1)$.

The case in which both firms choose Firm U's input is best for welfare if and only if $AW(1,1) \leqq A^*$.

Proposition 1

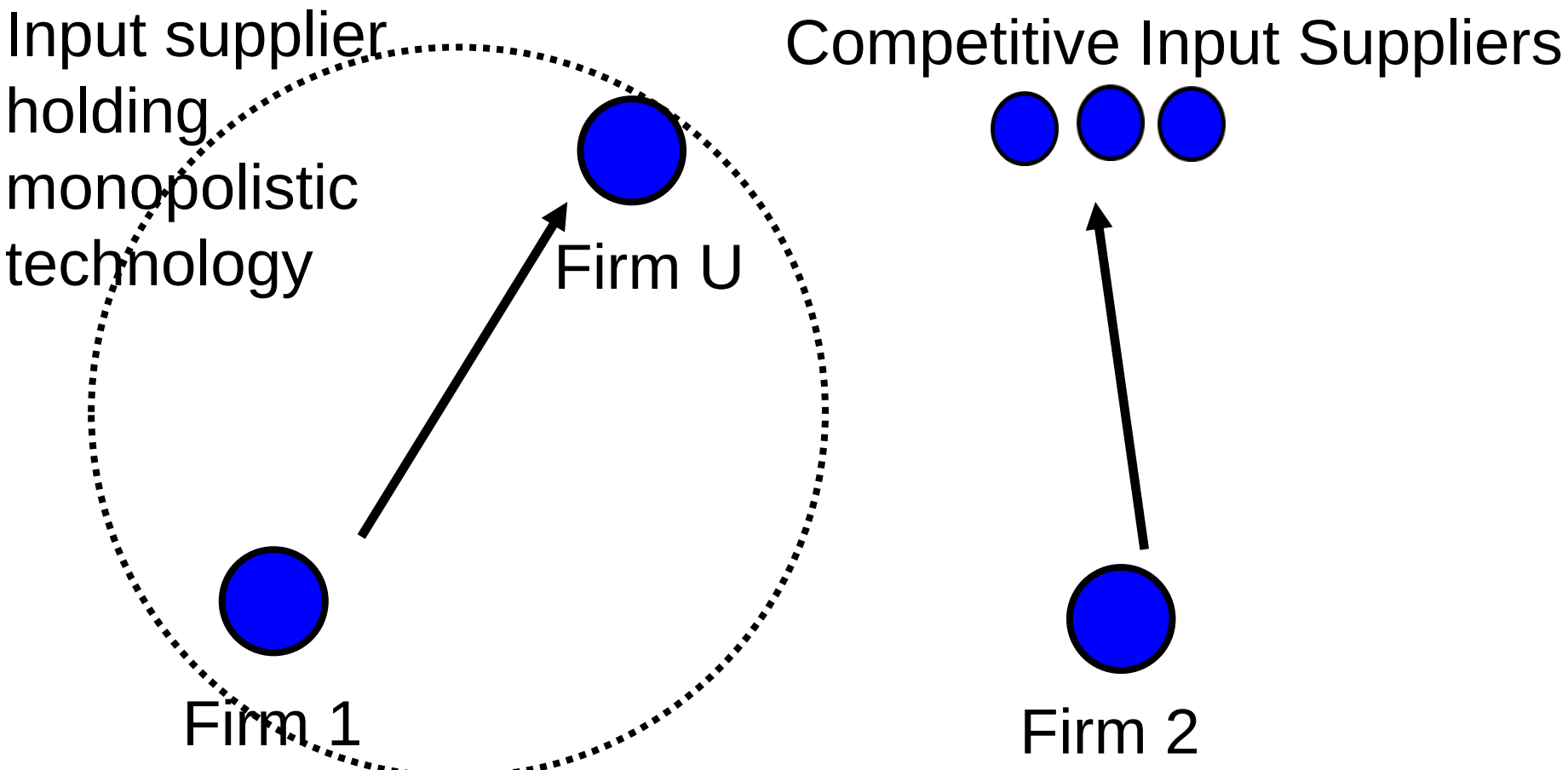
(i) $A\pi(1,0) > AW(1,0)$.
(ii) Both $A\pi(1,1) > AW(1,1)$ and $A\pi(1,1) < AW(1,1)$ are possible.

The private incentive for first adoption of new technology is insufficient, while the second adoption of it may be excessive.

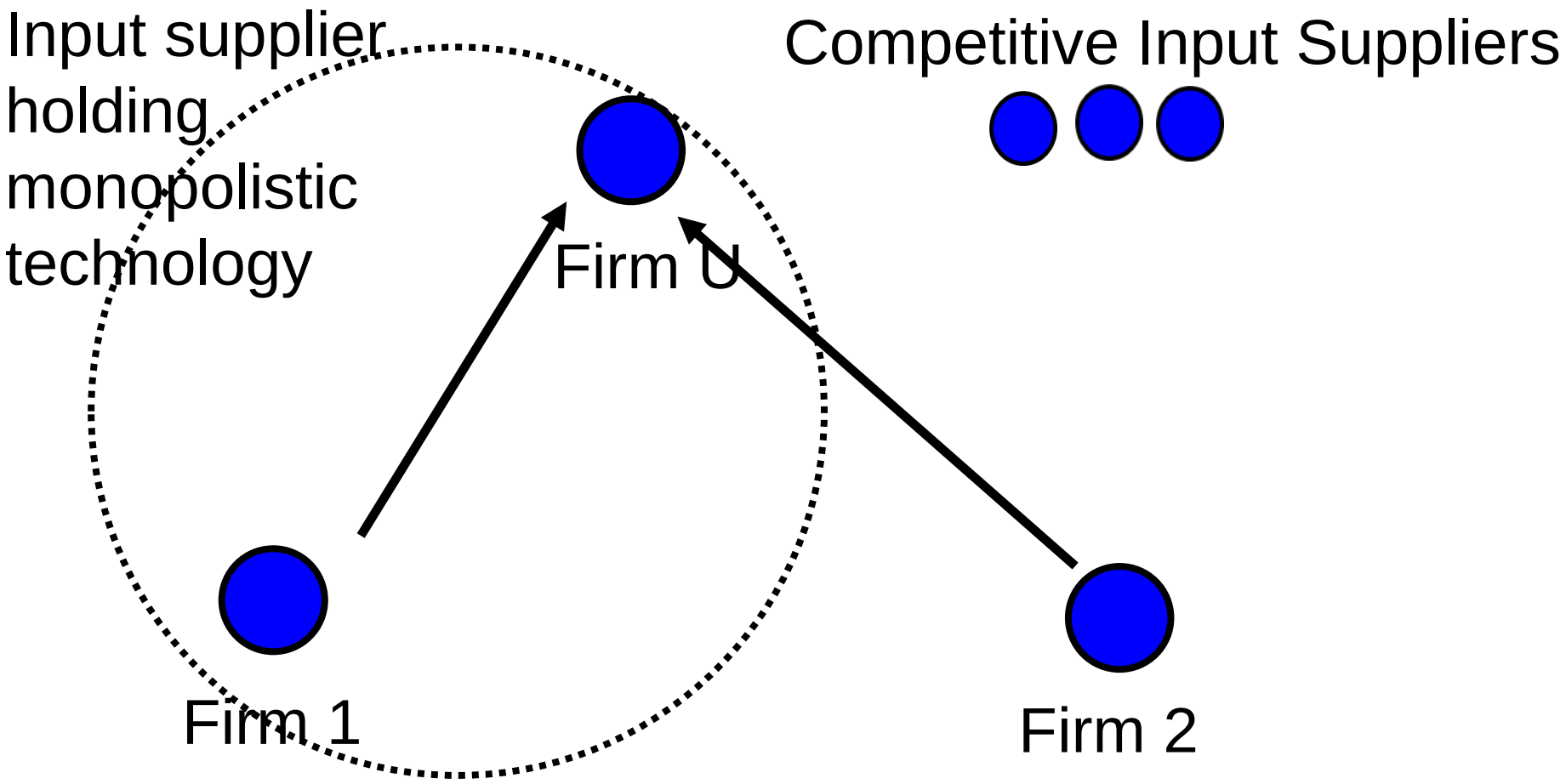
Time Line (Integrated Case)

- Before the game, Firms U and 1 are merged.
- In the first stage, firm 2 chooses whether to purchase the inputs from the integrated firm or from competitive market.
- In the second stage, the integrated firm chooses its input price r.
- In the final stage,each of Firm i (i=1,2) chooses p_i independently.

Subgame 4


Input supplier holding monopolistic technology
Firm U
Firm 1
Competitive Input Suppliers
Firm 2

Subgame 5


Input supplier holding monopolistic technology
Competitive Input Suppliers
Firm U
Firm 1
Firm 2

Profit of Integrated Firm

$p_1 q_1 + r q_2$ if Firm 2 chooses Firm U's input.
$p_1 q_1$ if Firm 2 does not choose Firm U's input.

Lemma 4

Firm 2 chooses Firm U's input if and only if $A^* > A\pi^M(1,1)$.

Comparison between Integrated and Non-Integrated Cases

Proposition 2

$A\pi(1,1) > A\pi^{M}(1,1)$

Vertical integration promotes firm 2's adoption of Firm U's input.

Proposition 3

Vertical integration reduces firm 2's profit.

Vertical integration eliminates the problem due to double marginalization between Firms U and 1 and accelerates competition in the downstream market. This direct effect dominates the collusive effect discussed in Proposition 4.

Proposition 4

(i) If the vertical integration does not affect the adoption of Firm U's input, vertical integration improves welfare.
(ii) Vertical integration may harm welfare if firm 2 adopts Firm U's input under integration but not without integration.

Intuition

Vertical integration eliminates the welfare loss due to double marginalization between Firms U and 1 and improves welfare directly. It accelerates downstream competition and it brings additional welfare gain.

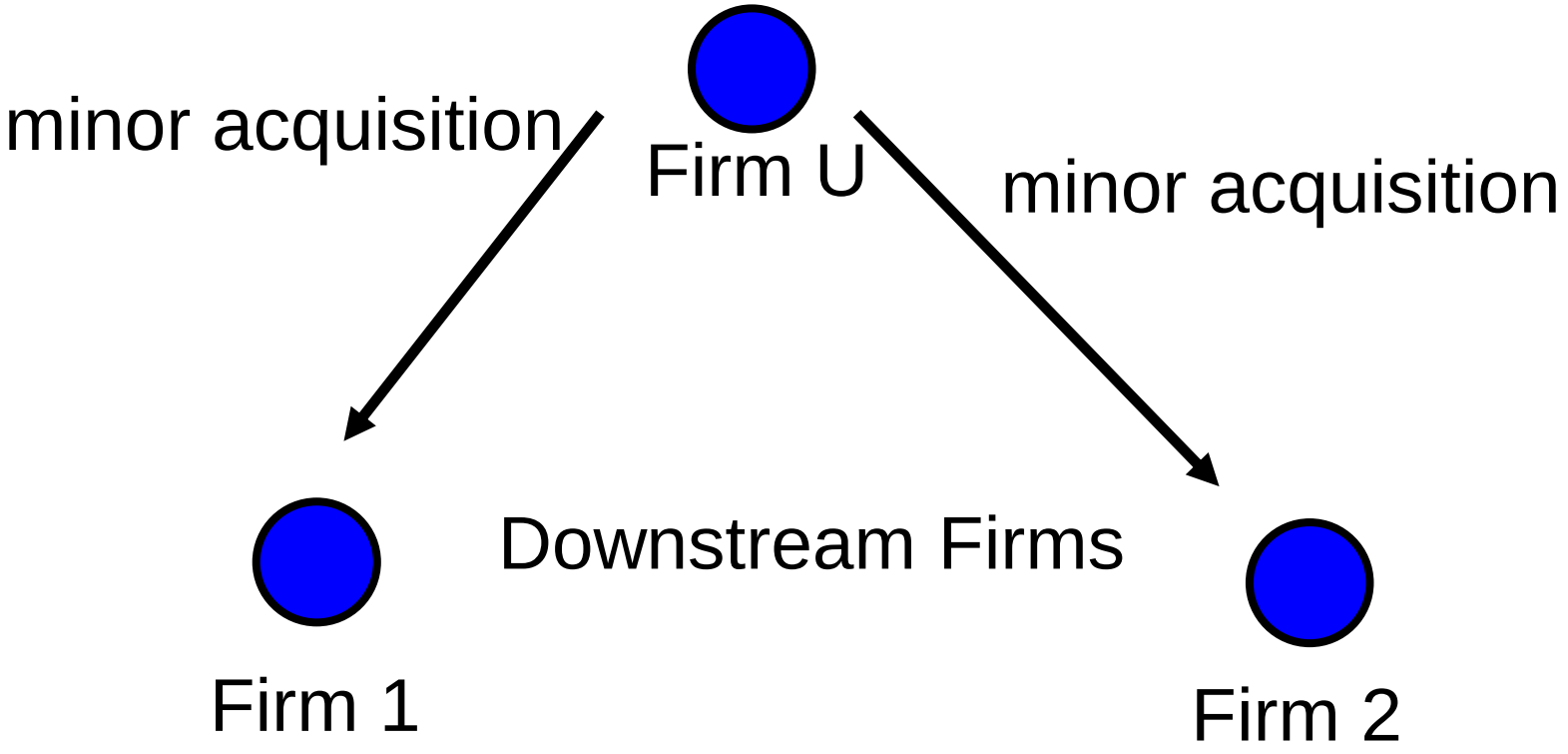
Vertical integration yields unequal output level of firms 1 and 2 and it yields welfare loss. (Remember that the first best is achieved by equal output level by both downstream firms) but this is dominated by the former two effects.

Firm 2's adoption of Firm U's input has anti-competitive effect in the downstream market and it hams welfare. The last effect can dominate the above welfare-improving effect.

Extensions

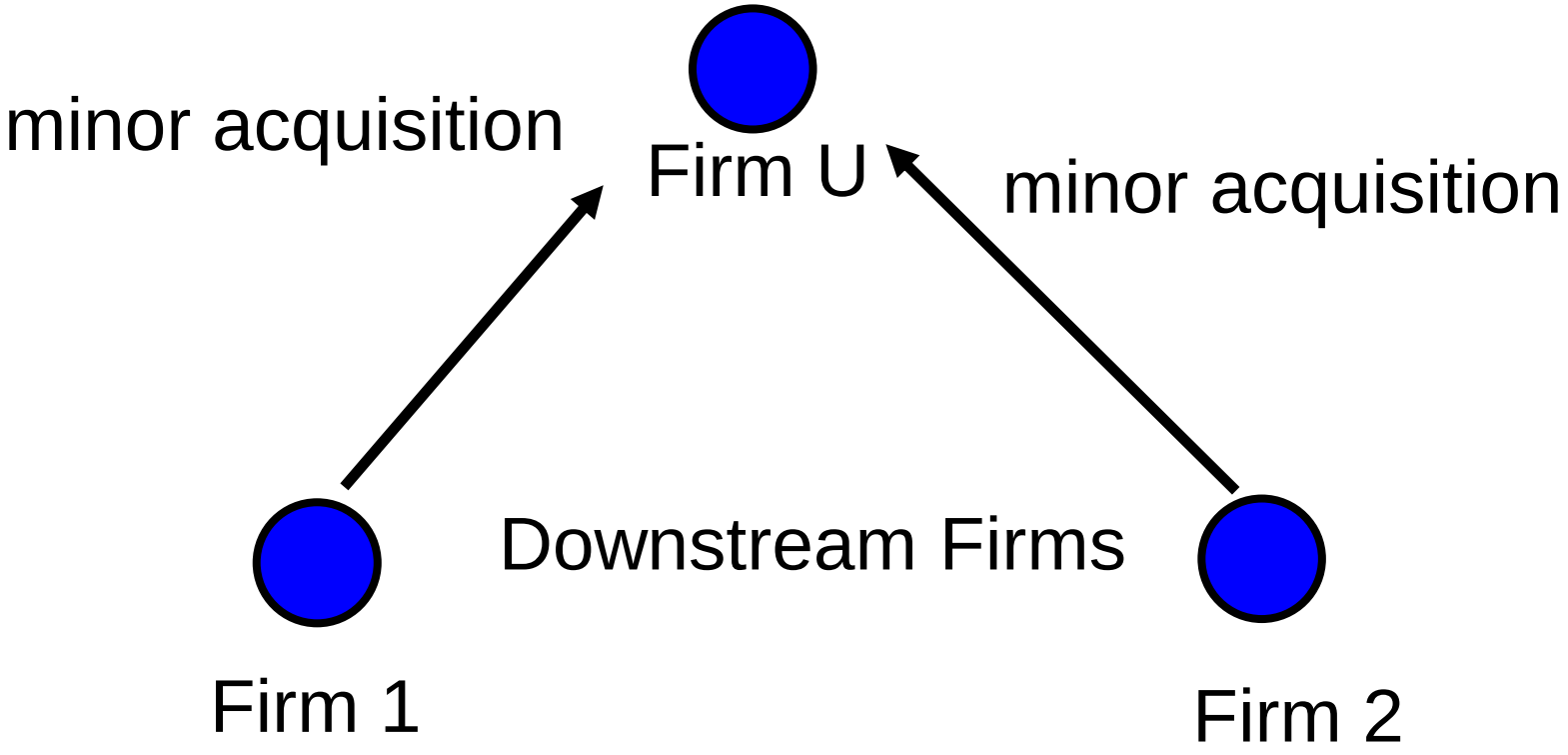
Even minor acquisition of upstream monopolist by downstream firms may be harmful for consumer and social welfare, regardless of whether or the input price is regulated or not (as long as the price exceeds the marginal cost). On the contrary minor acquisition of downstream firms by upstream monopolist does not affect welfare if the input price is regulated and it is beneficial for consumer and social welfare without price regulation.

Minor Acquisition



Firm U names a lower input price to mitigate double marginalization problem

Minor Acquisition



Firms may name higher prices because it takes into account the revenue of Firm U from the rival .

Applications

Yahoo’s introduction of Google’s search engine technology may serve as a collusive device in ad markets.

Make or Buy Decision

Yahoo chooses whether it continues to develop search engine or introduces Google's technology.

The incentive is suboptimal regardless of whether Google has ad market (vertically integrated case) or not.

The welfare loss of the Yahoo's introduction of Google's search engine is greater under vertical integration.

Make or Buy Decision

The welfare loss of the Yahoo's introduction of Google's search engine is greater under vertical integration.

Without vertical integration, Yahoo's introduction of Google's technology raises the input price and it raises the rival's cost, too.

Under vertical integration, Yahoo's introduction of Google's technology raises the final product price directly.

Thank you very much for your kind attention

非常感謝