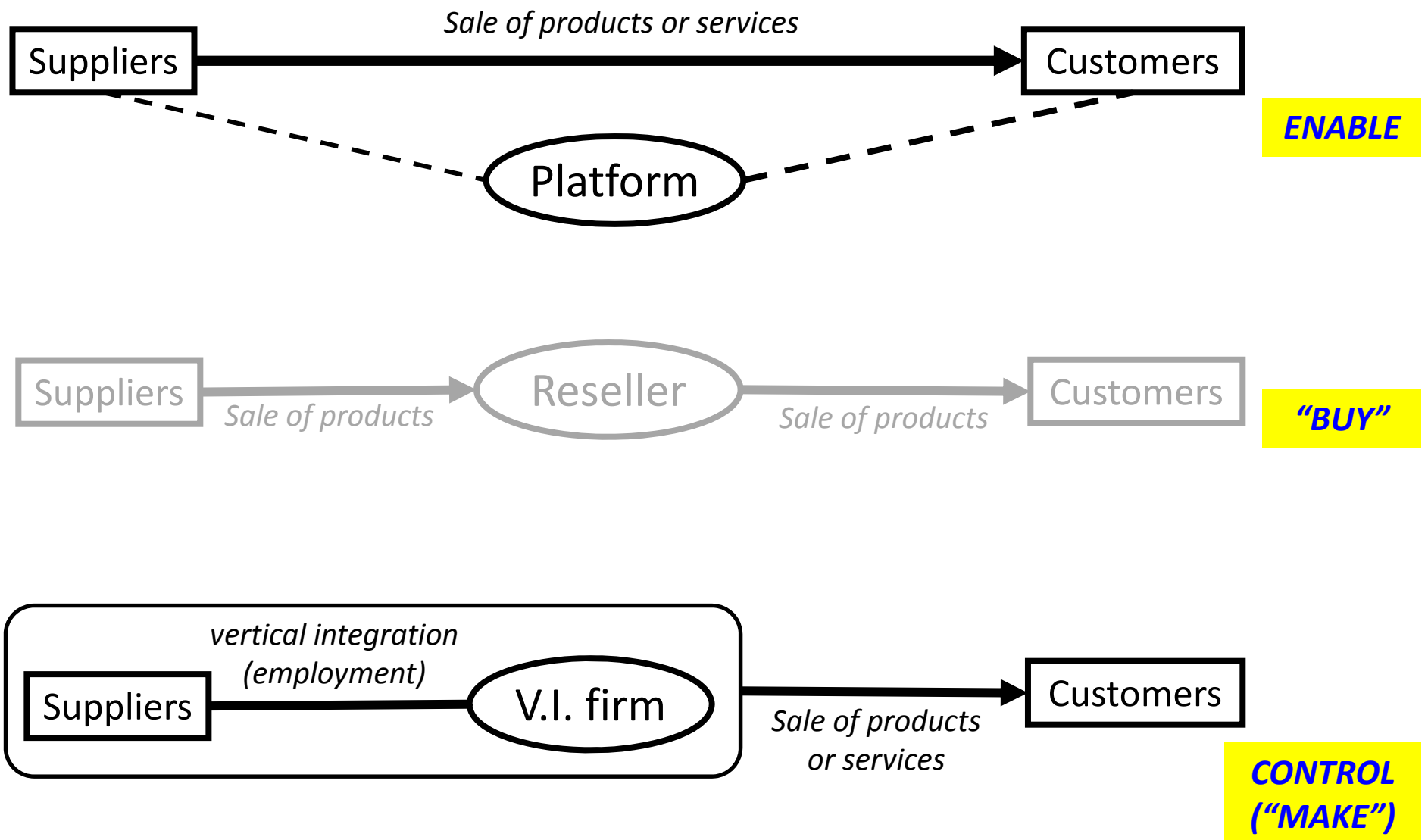


Enabling vs. Controlling

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Enabling vs. Controlling (Employing)



Integrated firms

(employees)

Platforms

(indep. contractors)

infosys

upwork™
formerly oDesk

BCG

THE BOSTON CONSULTING GROUP

HourlyNerd
consulting. on your terms.

Yellow
Cab Co.

UBER

WMM
WASTE MANAGEMENT

RUBICON

RafflesHospital
Singapore

Mount Elizabeth®
IT'S POSSIBLE.

Extent of control by "agents"
(decisions not explicitly contracted upon)

Goal of the paper

- Tradeoffs between two modes of organization: employment (E) mode vs. platform (P) mode
 - Agents hold more control rights in P-mode than in E-mode
 - Complete information & two-part tariffs in both modes
- Extension of “classic” theory of the firm to platforms => some novel & counter-intuitive results

Literature review

- Theory of firm: make vs. buy => make vs. enable
 - Property rights (Grossman & Hart, 1986, Hart & Moore, 1990)
 - + Incentive systems (Holmstrom and Milgrom, 1994)
 - + Novel elements (2-sided moral hazard, transferable action, spillovers)
- Distortions due to revenue-sharing and linear contracts:
 - Holmstrom (1982), Holmstrom and Milgrom (1987), Romano (1994)
- Hagiwara and Wright (2015a) and (2015b)
- Vertical integration in the platform literature:
 - Gawer and Cusumano (2002), Evans et al. (2006), Gawer and Henderson (2007), Rysman (2009)

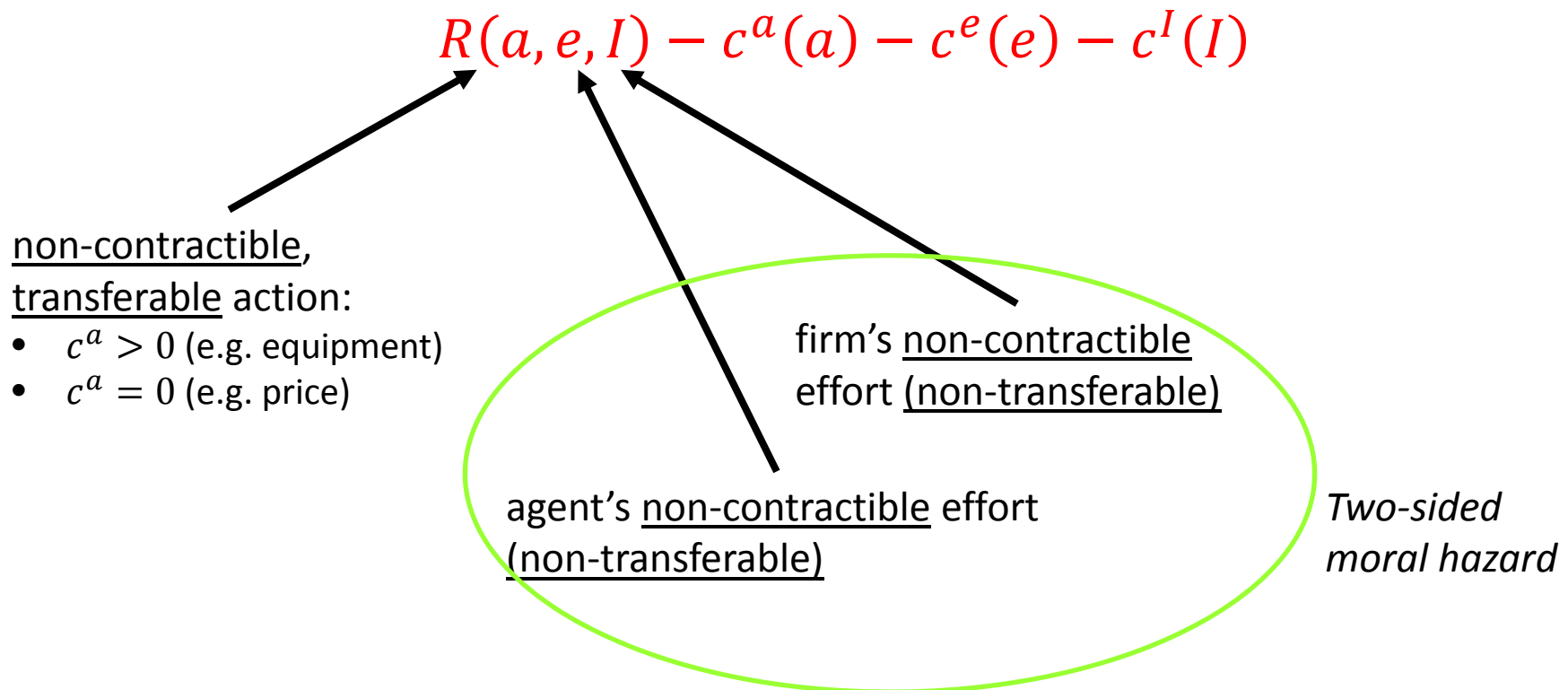
Outline

1. Introduction and motivation
2. Baseline: 1 firm + 1 agent
3. 1 firm + N agents (spillovers)
4. Extensions
5. Conclusions

Baseline: 1 firm + 1 agent

Set-up

- 1 firm & 1 agent. Profits generated by the relationship:



- E-mode (employment): firm chooses a & incurs c^a
- P-mode (platform): agent chooses a & incurs c^a

Examples

	Transferable decisions (<i>a</i>)	Non-transferable investments by agents (<i>e</i>)	Non-transferable investments by the firm (<i>l</i>)
Upwork vs. Infosys; HourlyNerd vs. BCG	training	service quality	quality of online system (monitoring, payment); advertising
Uber/Lyft vs. taxi co's	car quality & maintenance	service quality	quality of app & back-end infrastructure; advertising
Coursera vs. U of Phoenix	curriculum design; advertising of individual & courses	quality of content & its delivery	quality of online infrastructure; advertising of the site

Examples

	Transferable decisions (<i>a</i>)	Non-transferable investments by agents (<i>e</i>)	Non-transferable investments by the firm (<i>l</i>)
Hospitals & their clinics	medical equipment; support staff; advertising of individual clinics	service quality	quality & maintenance of common facilities; advertising of hospital
Franchising	quality & maintenance of outlets; staff benefits & training	outlet manager's effort	product quality (franchisor); national advertising
Producers and sales agents	training; promotion of individual agents	sales effort	quality of product/service; advertising

The example to remember!

	Transferable decisions (a)	Non-transferable investments by agents (e)	Non-transferable investments by the firm (l)
Hair salons	price ($c^a = 0$); hair products; promotion of individual hair dressers ($c^a > 0$)	service quality	maintenance & advertising of salon

Set-up & timing

- 1 firm & 1 agent. Profits generated by the relationship:

$$R(a, e, I) - c^a(a) - c^e(e) - c^I(I)$$

1. Firm chooses E-mode or P-mode & offers contract (t, T) :

agent will get $(1 - t)R(a, e, I) - T$

firm will get $tR(a, e, I) + T$

2. E-mode: firm chooses a and I , agent chooses e
P-mode: firm chooses I , agent chooses a and e

3. Revenues are realized

Optimal profits

- E-mode:

$$\Pi^{E*} = \max_{t,a,e,I} \{R(a, e, I) - c^a(a) - c^e(e) - c^I(I)\}$$

subject to:

$$\begin{aligned} tR_a(a, e, I) &= c_a^a(a) \\ (1 - t)R_e(a, e, I) &= c_e^e(e) \\ tR_I(a, e, I) &= c_I^I(I) \end{aligned}$$

- P-mode:

$$\Pi^{P*} = \max_{t,a,e,I} \{R(a, e, I) - c^a(a) - c^e(e) - c^I(I)\}$$

subject to:

$$\begin{aligned} (1 - t)R_a(a, e, I) &= c_a^a(a) \\ (1 - t)R_e(a, e, I) &= c_e^e(e) \\ tR_I(a, e, I) &= c_I^I(I) \end{aligned}$$

Optimal profits

- E-mode:

$$\Pi^{E*} = \max_{t,a,e,I} \{R(a, e, I) - c^a(a) - c^e(e) - c^I(I)\}$$

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- P-mode:

$$\Pi^{P*} = \max_{t,a,e,I} \{R(a, e, I) - c^a(a) - c^e(e) - c^I(I)\}$$

subject to:

$$\begin{aligned} (1-t)R_a(a, e, I) &= c_a^a(a) \\ (1-t)R_e(a, e, I) &= c_e^e(e) \\ tR_I(a, e, I) &= c_I^I(I) \end{aligned}$$

- Two-sided moral hazard (e, I) + distortion of a

General results

- **Proposition 1:** *In both modes, linear contract is optimal.*
- **Proposition 2:**
 - *If a is contractible or costless (e.g. price) then $\Pi^{E^*} = \Pi^{P^*}$*
 - *If e is contractible or $R_e = 0$ then $\Pi^{E^*} > \Pi^{P^*}$*
 - *If I is contractible or $R_I = 0$ then $\Pi^{P^*} > \Pi^{E^*}$*
- **Proposition 3:** *Suppose $R(a, e, E)$ is super-modular.*
 - *If $t^{E^*} < 1/2$ then $\Pi^{E^*} < \Pi^{P^*}$*
 - *If $t^{P^*} > 1/2$ then $\Pi^{P^*} < \Pi^{E^*}$*

Linear example

- Suppose
 - $R(a, e, E) = \theta a + \gamma e + \delta I$
 - $c^a(a) = \frac{1}{2}a^2$, $c^e(e) = \frac{1}{2}e^2$ and $c^I(I) = \frac{1}{2}I^2$
- **Proposition 4:** *Firm prefers P-mode to E-mode iff*
$$\gamma > \delta$$
- i.e. agent's moral hazard > firm's moral hazard

1 firm + N agents

Set-up and timing

- 1 firm & N agents (symmetric). Total profits generated:

$$\sum_{i=1}^N (R(a_i, a_{-i}, e_i, I) - c^a(a_i) - c^e(e_i)) - c^l(I)$$

Spillovers across transferable actions
=> services can be complements or substitutes

- E-mode – firm chooses all a_i 's
- P-mode – agent i chooses a_i for $i = 1, \dots, N$

General results

- **Proposition 7:** *In both modes, linear contract is optimal.*
- **Proposition 8:**
 - *If a_i 's are contractible then $\Pi^{E*} = \Pi^{P*}$*
 - *If a_i 's are costless (e.g. price) then $\Pi^{E*} \neq \Pi^{P*}$ due to spillovers*
 - *If $R(a_i, a_{-i}, e_i, I)$ is additively separable then $\Pi^{E*} > \Pi^{P*}$*
 - *If I is contractible or $R_I = 0$ then $\Pi^{P*} \neq \Pi^{E*}$ due to spillovers*
- **Two cases of interest:**
 - *Costly a_i 's and additively separable $R(a_i, a_{-i}, e_i, I)$ (investments)*
 - *Costless a_i 's and non-additively separable $R(a_i, a_{-i}, e_i, I)$ (prices)*

Costly a_i 's and additively separable R

- Suppose

$$R(a_i, a_{-i}, e_i, I) = \theta a_i + x(\bar{a}_{-i} - a_i) + \gamma e_i + \delta I$$

$$c^a(a) = \frac{1}{2}a^2, c^e(e) = \frac{1}{2}e^2 \text{ and } c^I(I) = \frac{1}{2}I^2$$

- **Proposition 9:** *Firm prefers P-mode over E-mode iff*

$$\left| x \frac{\gamma^2}{\theta} + \theta^2 + N\delta^2 \right| < \sqrt{\theta^2(\theta^2 + \gamma^2 + N\delta^2) + \gamma^4}$$

- **Proposition 10:** *A larger γ (resp. δ) shifts the tradeoff in favor of the P-mode (resp. E-mode) iff $t^{E*} > t^{P*}$.*

Costly a_i 's and additively separable R

Counter-intuitive results (opposite of “classic” theory of firm):

- Moderately negative $x \Rightarrow$ larger $|x|$ shifts trade-off towards P-mode
 - negative spillovers \Rightarrow over-invest in a_i in P-mode \Rightarrow offset under-investment due to revenue-sharing \Rightarrow closer to first-best
- Very negative $x \Rightarrow$ agents' (resp. firm's) moral hazard shifts tradeoff towards E-mode (resp. P-mode)
 - offsetting effect $\Rightarrow t^{P*} > t^{E*} \Rightarrow$ agents' incentives *less* distorted in E-mode

Costless a_i 's and non-additively separable R

- Suppose

$$R(a_i, a_{-i}, e_i, I) = p_i(d + \theta p_i + x(\bar{p}_{-i} - p_i) + \gamma e_i + \delta I)$$

$$c^e(e) = \frac{1}{2}e^2 \text{ and } c^I(I) = \frac{1}{2}I^2$$

- **Proposition 9:** *Firm prefers P-mode over E-mode iff*

$$-\frac{4k(k + \theta)}{k + 2\theta} < x < 0$$

where $k \equiv \frac{N\delta^2\gamma^2}{N\delta^2 + \gamma^2}$ (combined importance of moral hazard)

Costless a_i 's and non-additively separable R

- Substitutes or strong complements $\Rightarrow \Pi^{E*} > \Pi^{P*}$
 - E-mode internalizes spillovers
- Weak complements $\Rightarrow \Pi^{P*} > \Pi^{E*}$
 - complements \Rightarrow prices too high in P-mode \Rightarrow offset 2-sided moral hazard
(strategic complementarity btw. prices and efforts)
- Agents' and firm's moral hazard have same effect on E vs. P tradeoff
 - revenue-sharing does not distort price \Rightarrow both modes balance 2-sided moral hazard in the same way

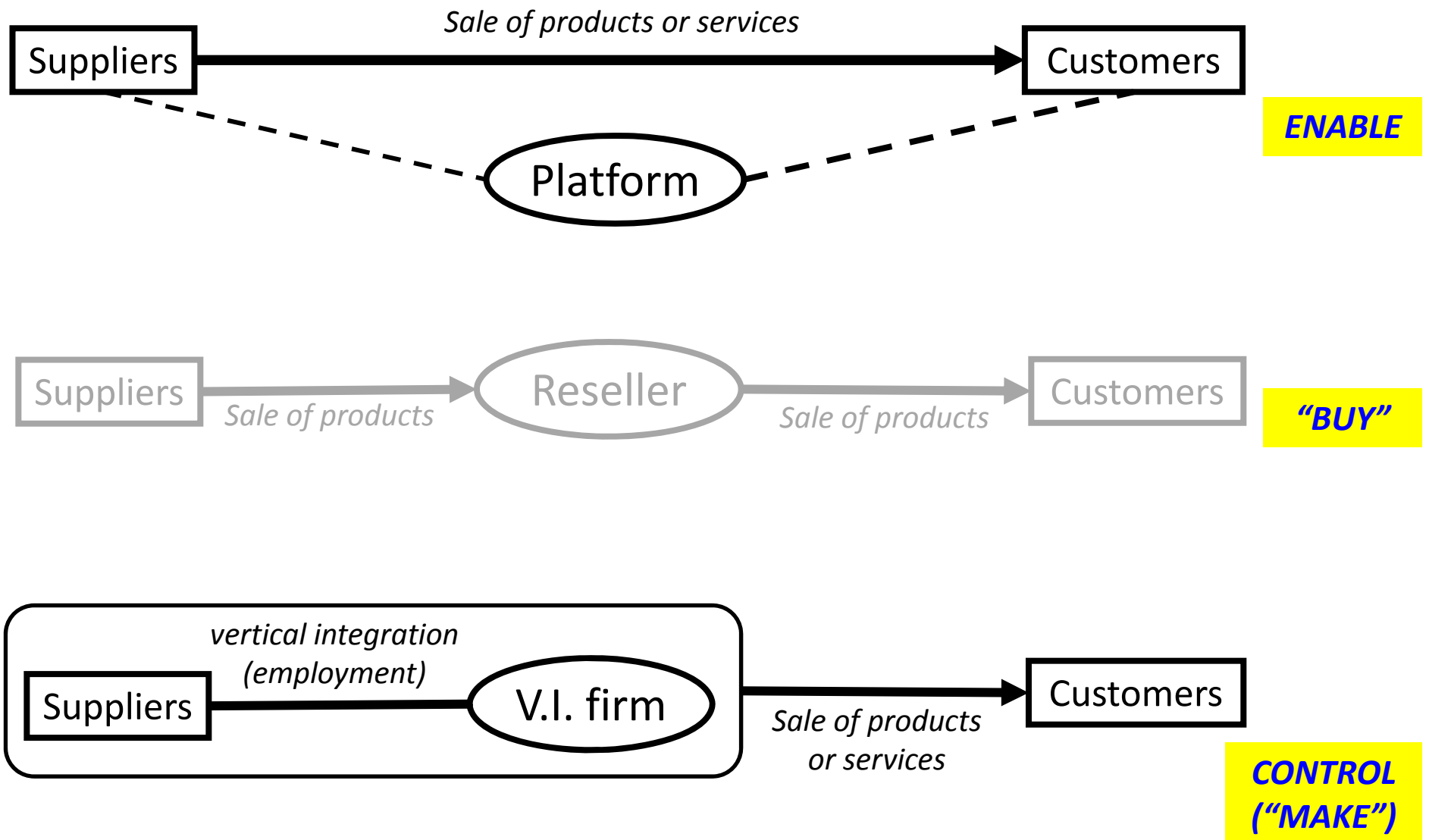
Extensions

- Private benefits
- Timing
 - Ex-ante commitment to I (e.g. infrastructure) => shift in favor of P-mode
- Cost asymmetries
- Hybrid modes:
 - Across services/agents
 - Can be optimal
 - Across transferable actions
 - Cannot be optimal when revenue function is super-modular

Conclusions

- Important strategic choices: positioning between platform (independent agents) and traditional firm (employees)
- Control rights over non-contractible decisions => extend theory of the firm to incorporate platforms

Enabling vs. Controlling (Employing)



Conclusions

- Important strategic choices: positioning between platform and integrated firm
- Control rights over non-contractible decisions => extend theory of the firm to incorporate platforms
- New “style of modeling” (multi-sided) platforms => novel economic tradeoffs + empirical predictions
- Current/future work:
 - Partial delegation as intermediate mode between P-mode and E-mode
 - Competition between different modes

Thank you for your attention.