



**NEW ZEALAND INSTITUTE FOR THE STUDY
OF COMPETITION AND REGULATION INC.**

Competition bad, less Competition better? How industry structure and competition affect investment and welfare in infrastructure industries

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Outline

- Background/agenda
- Context – taxonomy of infrastructure industries
- Motivation
- Some preliminaries
- Brief tour of the theory on industry structure, competition and investment:
 - Others’
 - My own – highlighting the role of forward markets, and “welfare”
- Key lessons, and some tentative NZ applications



Background

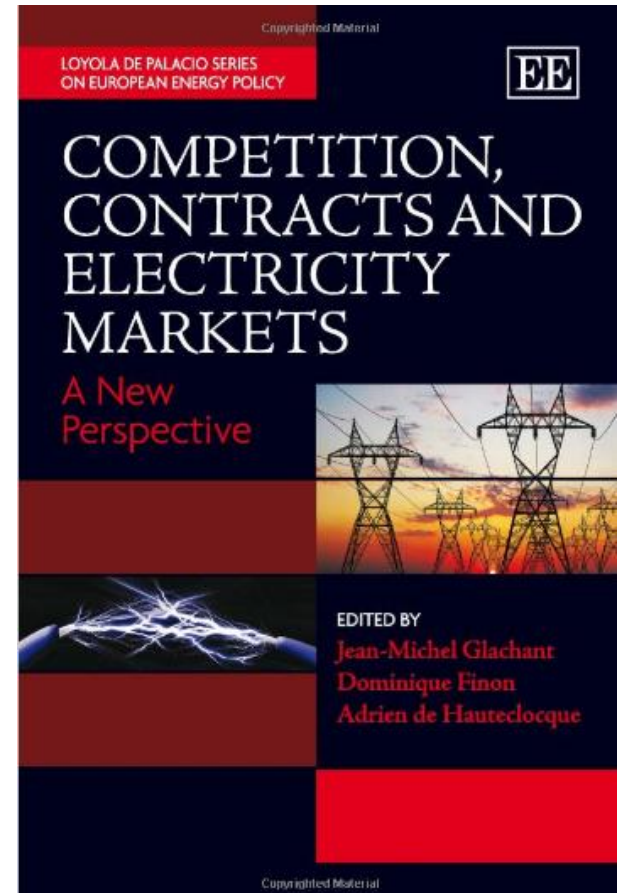
- With Seini O'Connor, just had a book chapter published – “Comparison of long-term contracts and vertical integration in decentralised electricity markets” → retail competition can hurt investment

- On a mission to formalise the analysis, and to extend it to other infrastructure industries with some Toulouse School of Economics flavours

- 2010 Masters research made a start:

Vertical integration vs vertical separation in an imperfectly competitive industry, such as electricity, with retail, wholesale and forward markets

- Tonight’s seminar is a further instalment, based on preliminary doctoral research to be defended in September, with an investment and welfare focus

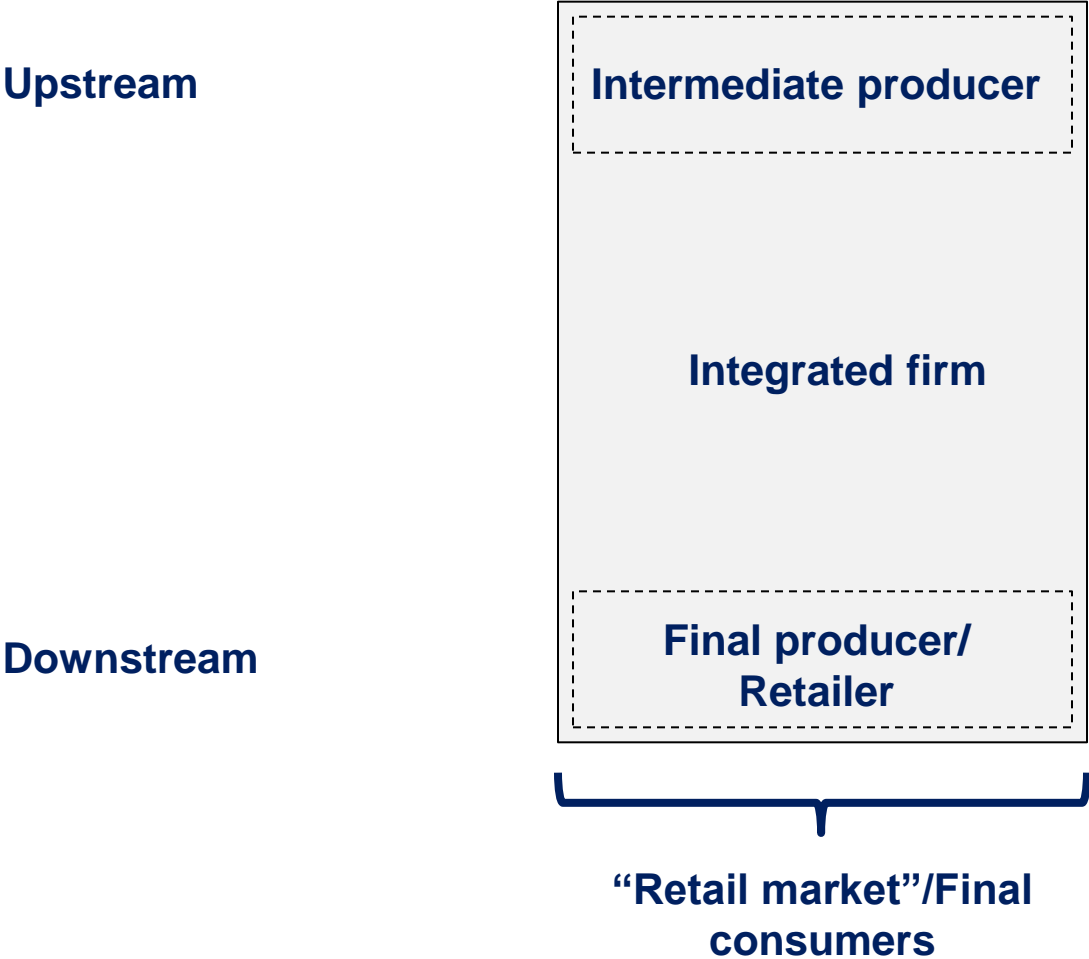


Context

- Consider an imperfectly competitive industry structure with:
 - Upstream intermediate good production
 - Downstream final good production utilising the intermediate good
 - Often with some sort of network in between
- Assuming network side of things is separately owned
- Relevant examples:
 - Electricity – upstream generation, downstream retailing
 - Gas – upstream exploration/extraction/refining, downstream retailing
 - Computers – upstream chips, downstream PCs/phones, etc
 - Dairy? – Fonterra upstream, other processors downstream
- Not considering pure network industries where upstream network(s) connect to downstream retail firms (e.g. telecoms) → big area, ripe for future exploration

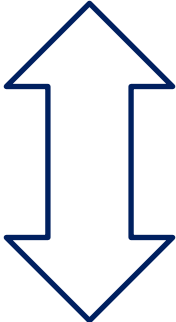


Context – Infrastructure industries v1.0.0



Context – Infrastructure industries v1.1.0

Upstream



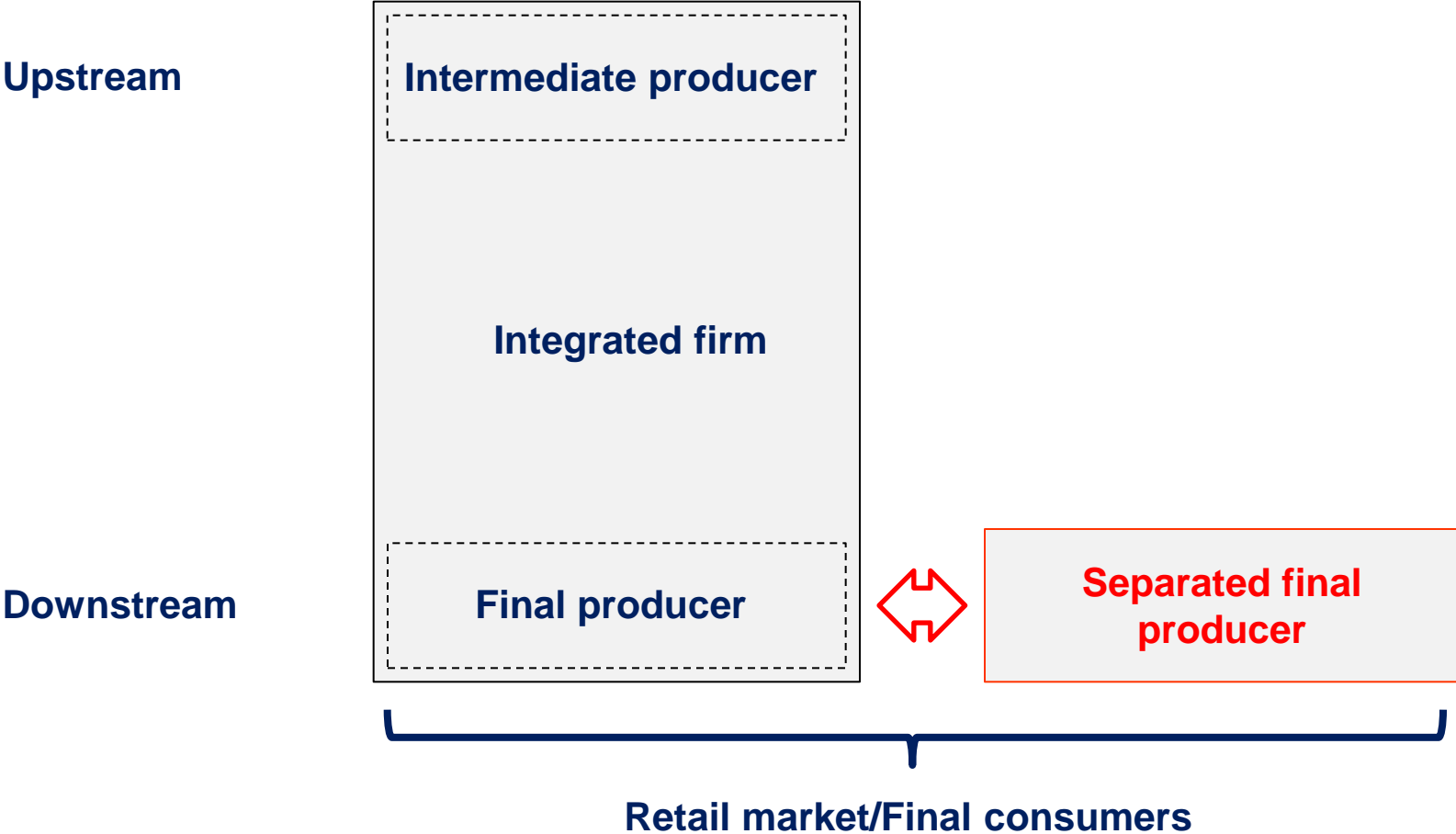
Downstream



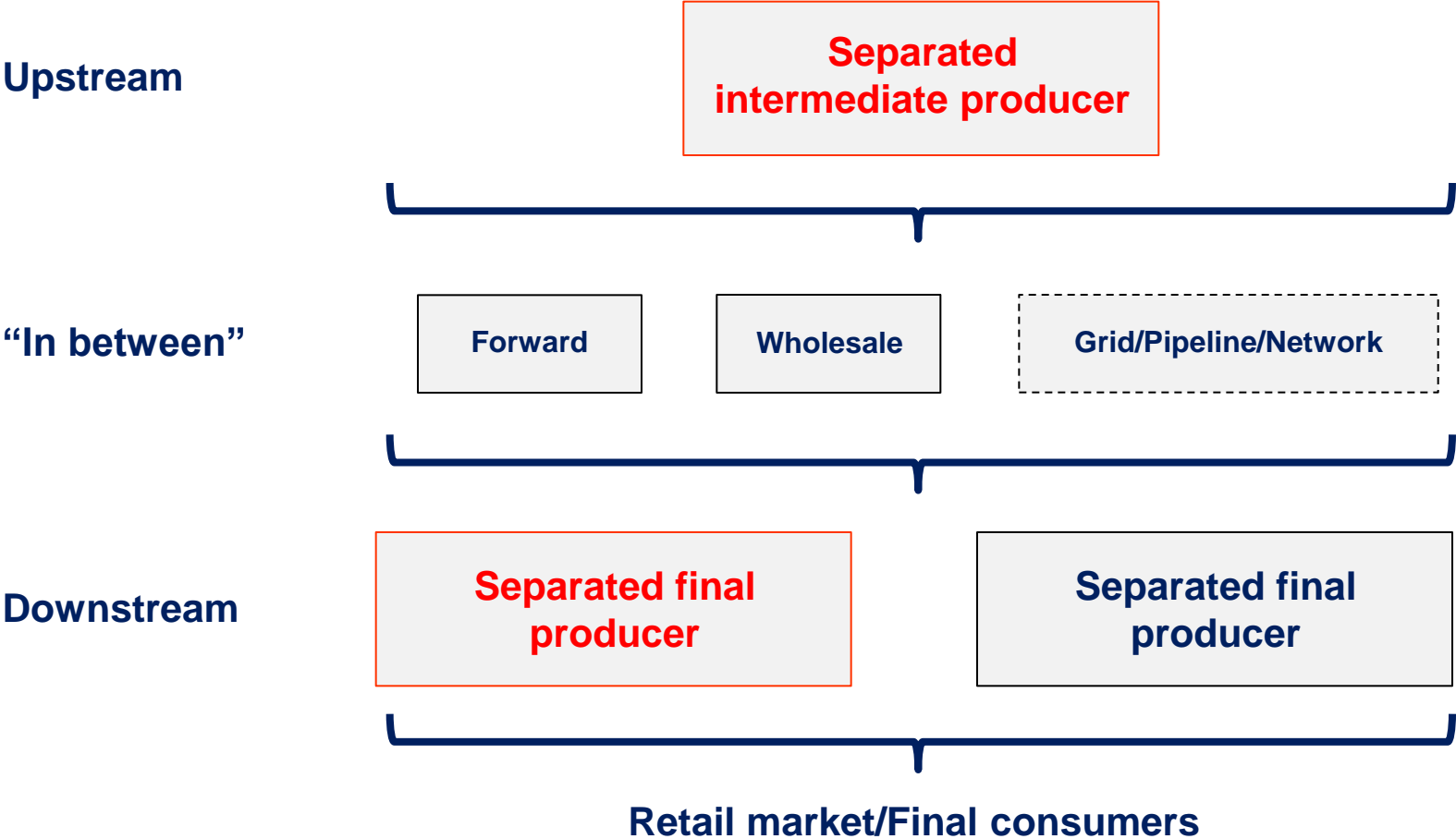
“Retail market”/Final consumers



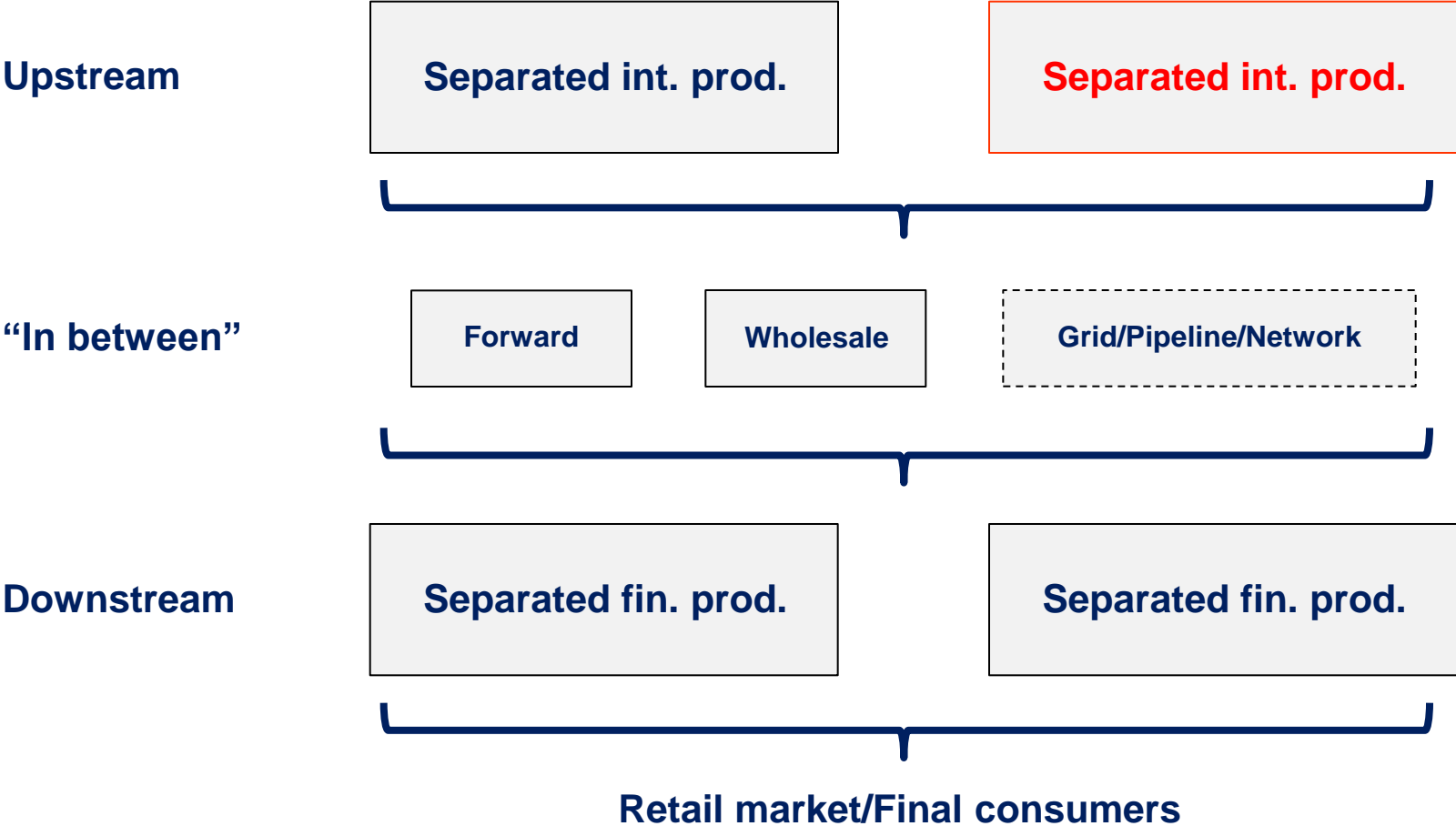
Infrastructure industries v1.0.1



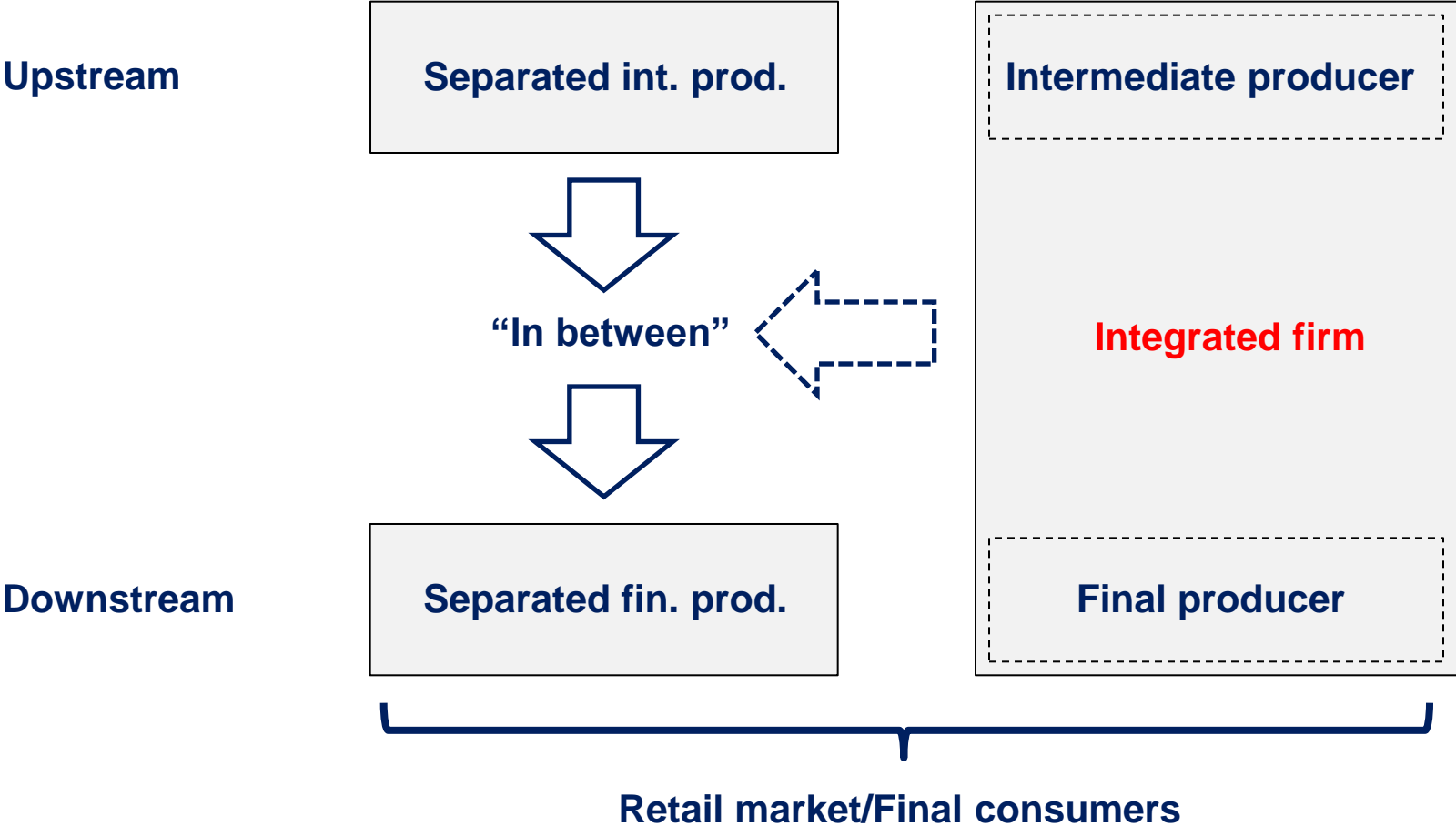
Infrastructure industries v1.1.1



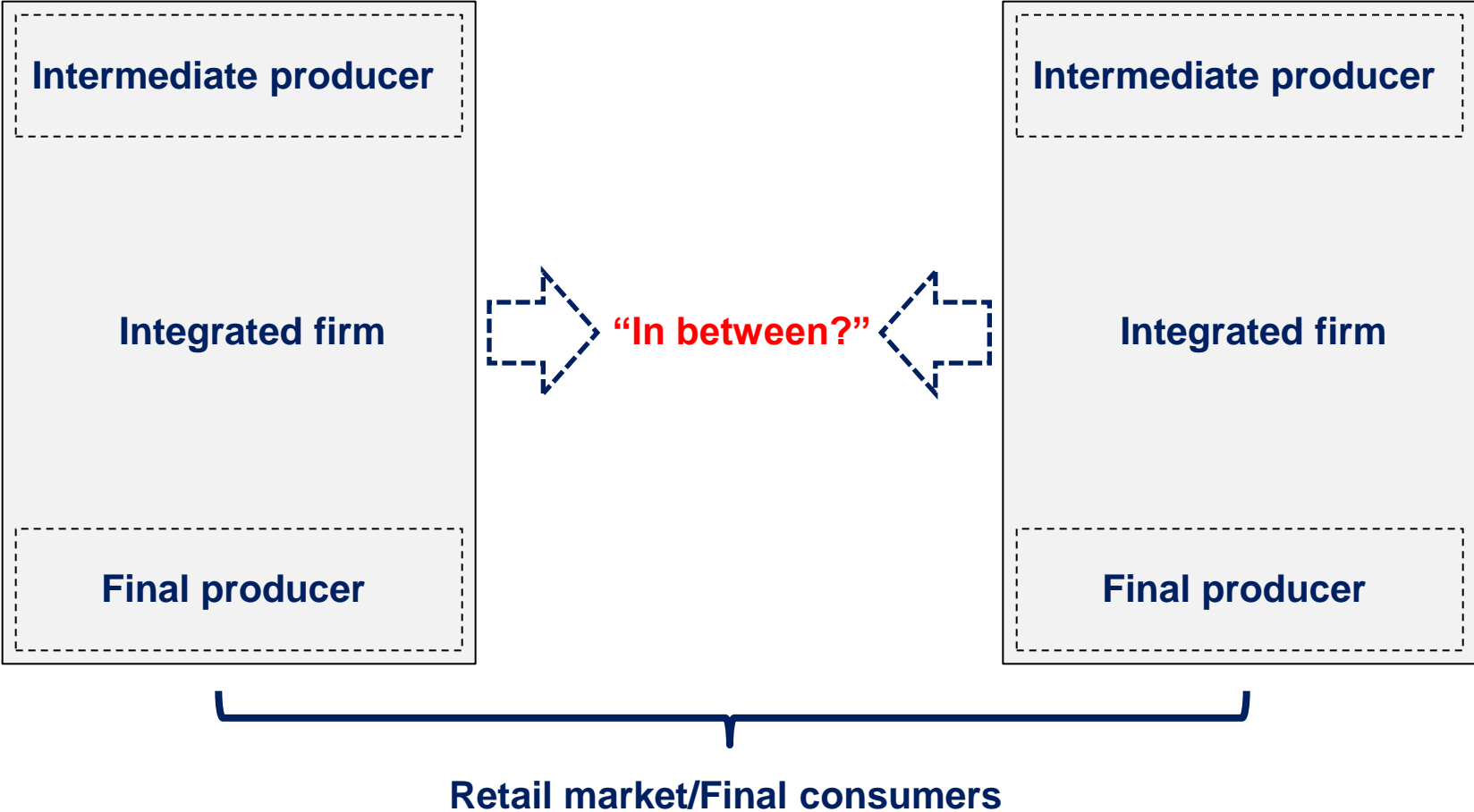
Infrastructure industries v2.0.0



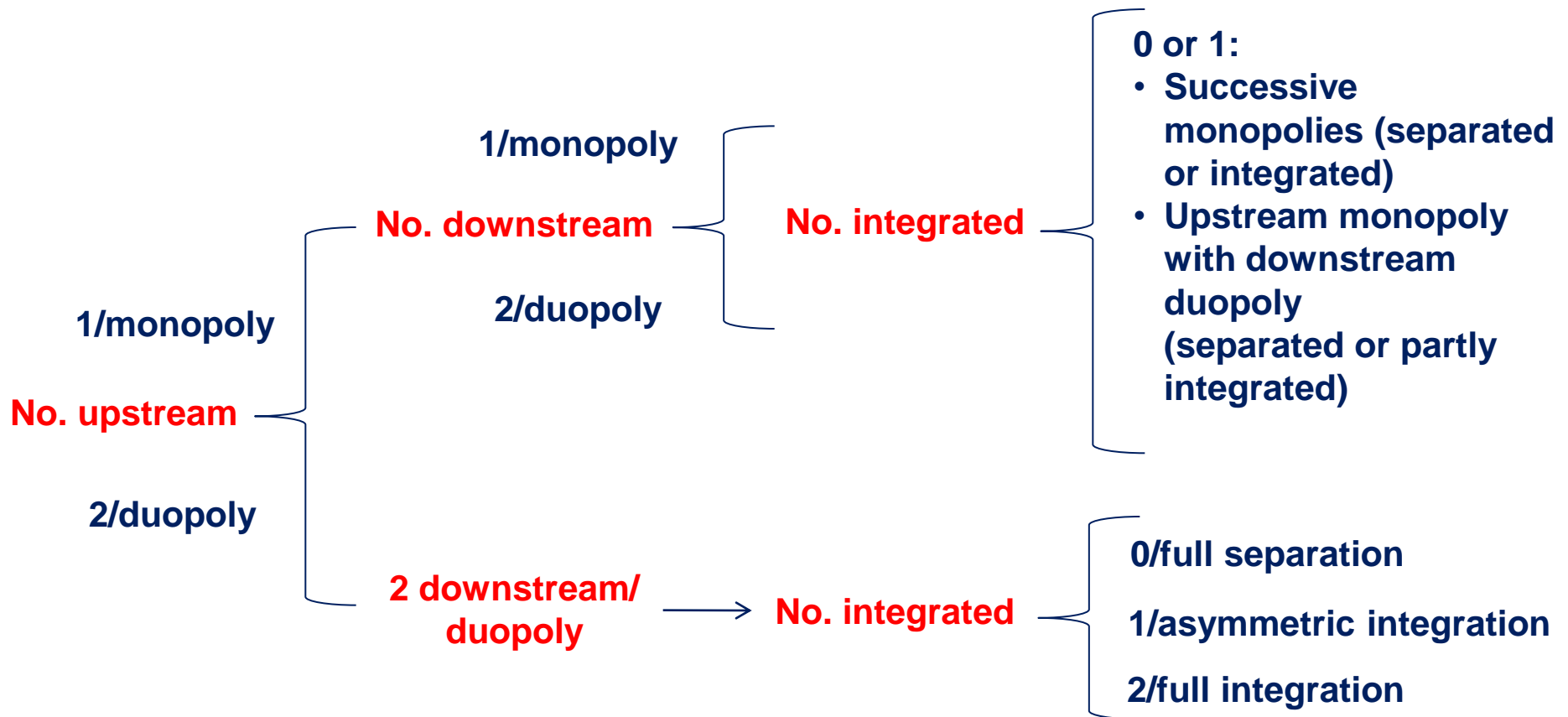
Infrastructure industries v2.0.1



Infrastructure industries v2.0.2



Recap



PLUS (by design, or strategy):

- Wholesale market or not?
- Forward market or not?



Motivation

- So, if you are a regulator, competition authority or reformer, which industry configuration is “best”?
 - Is vertical integration between intermediate and final producers preferable to separation, and does it need to be full integration?
 - Is it worth having a forward market in addition to a “spot”/wholesale market?
 - Do we gain by moving from monopoly to (more) competition?
 - How do these features interact strategically?
- My focus – economic “welfare” (consumer surplus + industry profits), and given its importance, “investment”:
 - Capacity
 - Cost-reduction/efficiency
 - Also – quality, innovation/R&D, ...



Some preliminaries

- Vertical coordination – how to ensure firms at one industry stage account for their decisions' impacts on firms in the other stage:
 - Famous result – vertically integrating successive monopolies removes “double marginalisation” → prices fall, output and profit rise: everybody wins!
 - Integration is not always required for this – certain pricing regimes (e.g. RPM), or legal unbundling, can achieve the same outcome
- Horizontal coordination – how to ensure firms at the same industry stage account for their decisions' impacts on each other:
 - E.g. security of supply in electricity, contagion in banking
 - Monopoly can beat competition on this score!



Preliminaries (cont'd)

- Anticompetitive strategies? – vertically integrated firms can:
 - Foreclose rivals – e.g. not supply rival downstream firms in wholesale (or forward) markets
 - Raise rivals' costs strategy ("RRC") – i.e. buy on wholesale markets to drive up rivals' input price
- Forward markets:
 - Can make intermediate producers compete more aggressively in wholesale markets ("Allaz and Vila 1993 effect") → commitment problem/prisoner's dilemma
 - Enable separated downstream firms to offset RRC by buying forward and then selling wholesale (Meade 2010, over-buy and recycle strategy, "OBR")



Preliminaries (cont'd)

- Consider an industry in which just one firm invests (e.g. in cost reduction), then two firms compete in final production
- Well-known investment strategies flow from the nature of market competition, and how investment by one firm affects the other's profits
- Firms can compete in:
 - Quantities – the more I sell, the less you can (strategic substitutes)
 - Prices – if I raise my price then you can too (strategic complements)
- E.g. if investment hurts other firm's profits, and firms compete in:
 - Quantities – firm over-invests (“top dog” strategy)
 - Prices – firm under-invests to not trigger aggressive competition (“puppy dog” strategy), or deters entry altogether by over-investing (“top dog” again)



A brief tour of the theory – Monopoly

- In general, monopoly leads to lowest investment and welfare compared to either “first best”, or duopoly, even under vertical integration
 - Monopolist wants to restrict output and raise price, so it also restricts investment (setting aside entry deterrence considerations)
 - Integrated monopolist forecloses downstream rivals – forward and wholesale – though welfare and investment are still higher than under separation with two downstream firms → avoiding double marginalisation can matter more than downstream competition
 - Exceptions:
 - Monopoly can invest more than duopoly when duopolists invest sequentially, though welfare still lower (Boom 2002)
 - Monopoly welfare can exceed duopoly welfare despite lower monopoly investment (Boom 2004, Boom and Buehler 2005)
- Monopolist better internalises risk of profit loss due to inadequate investment when blackouts are possible
- integrated duopolists reduce risk of gouging by rivals in wholesale market by increasing retail prices to constrain demand



A brief tour of the theory – Duopoly

- In general, duopoly outperforms monopoly in terms of investment and welfare (see previous exceptions), but still falls short of “first best”
- Furthermore, commonly, duopoly welfare and investment are ranked:
$$\text{Full integration} > \text{Asymmetric integration} > \text{Full separation}$$
- Full integration involves total foreclosure of downstream rivals – wholesale and forward – but benefits of improved vertical coordination outweigh loss of “competition” (contrast full separation)
- Asymmetric integration balances costs of partial foreclosure or RRC against the vertical coordination benefits of partial integration, with the latter prevailing
- Exception – full *separation* can involve higher welfare with lower prices and investment than full integration when producers face blackout risk (Boom 2004, Boom and Buehler 2005) → separated firms still invest more than monopoly to avoid blackouts, but don’t directly boost prices to choke off demand



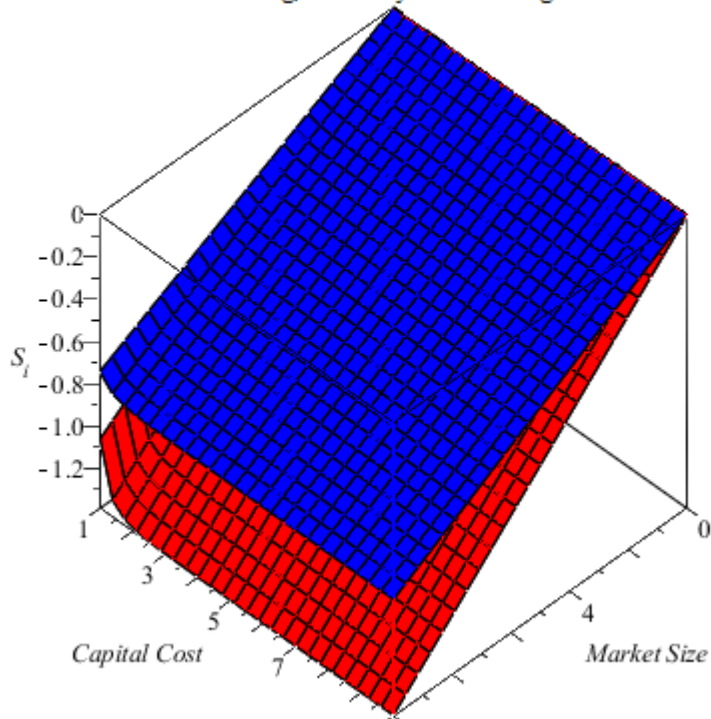
Brief tour – Duopoly (cont'd)

- VI leads to more *downstream*, cost-reducing investment (Buehler and Schmutzler 2008):
 - “Top dog” strategy of VI firm in asymmetric case, harming its downstream rival
 - Rival’s investment reinforces the VI firm’s RRC, boosting demand and hence wholesale price
- VI leads to more *upstream*, cost-reducing investment, and higher welfare (Meade 2011):
 - VI firm’s higher investment in asymmetric case reduces upstream purchases, undermining its own RRC, helping its downstream rival
 - Adding a forward market reinforces this effect by constraining wholesale prices (asymmetric integration and full separation cases only) → VI firm’s investment and rival’s OBR are complementary
- Full integration with foreclosure eliminates RRC altogether (so OBR not needed, and Allaz and Vila effect irrelevant)



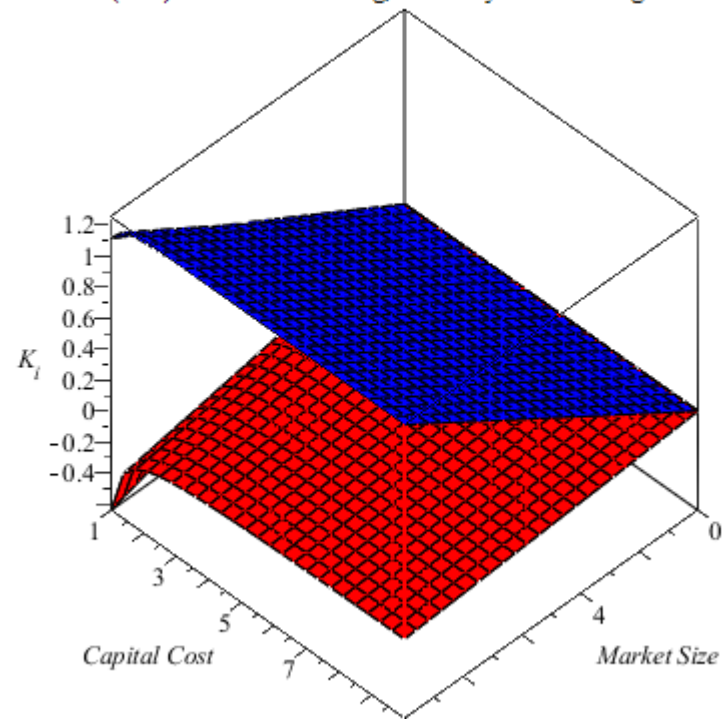
Brief tour – Meade 2011

Integrated firms' upstream output with (red) and without (blue) forward contracting, under asymmetric integration



RRC worsens with forwards ...

Separated downstream firm's upstream demand with (red) and without (blue) forward contracting, under asymmetric integration

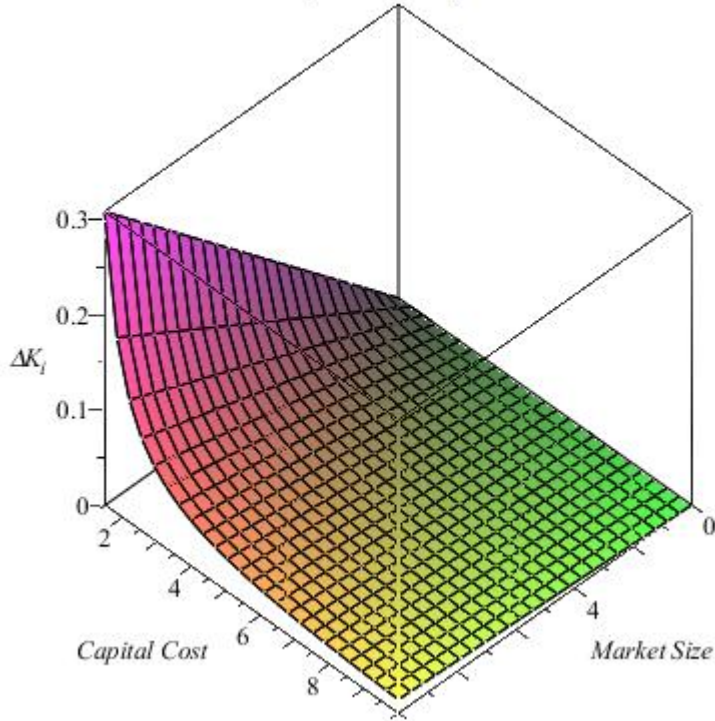


... but forwards enable OBR



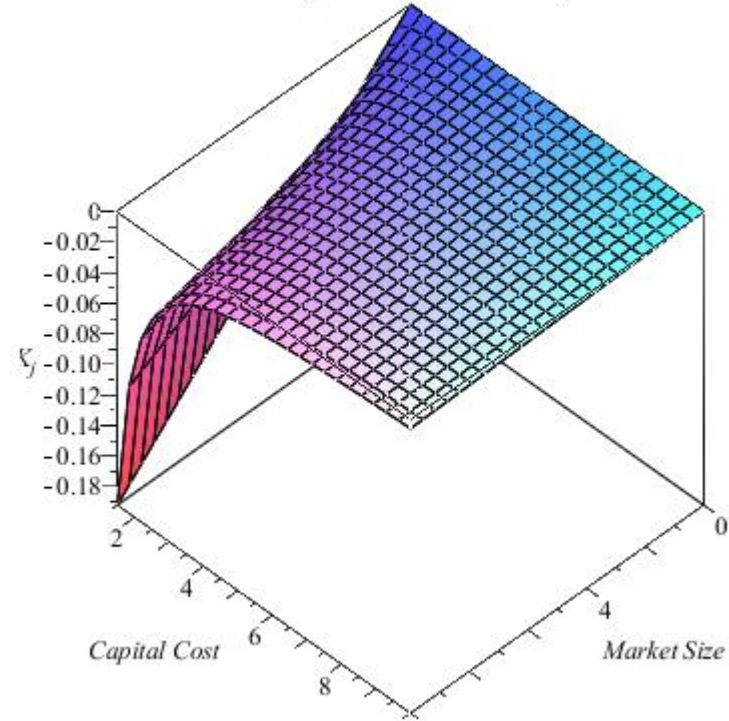
Brief tour – Meade 2011 (cont'd)

Change in Integrated firms' investment due to forward contracting, under asymmetric integration



Forwards boost integrated firm's investment ...

Change in Separated upstream firms' investment due to forward contracting, under asymmetric integration

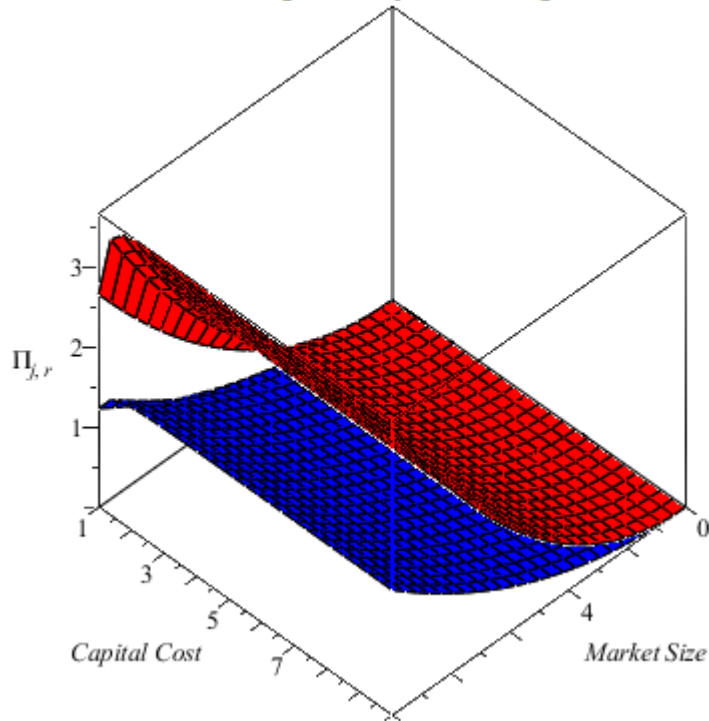


... but reduce separated firm's investment



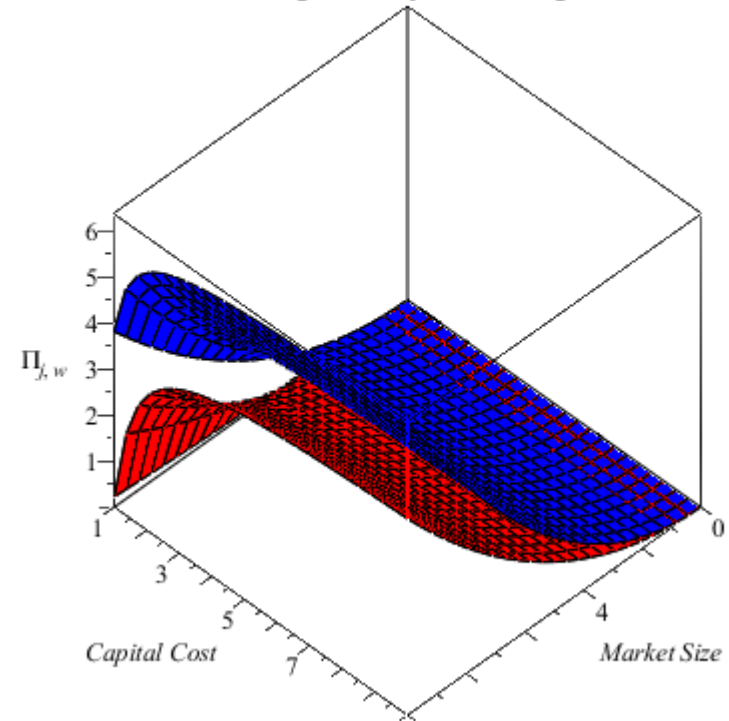
Brief tour – Meade 2011 (cont'd)

Separated downstream firm's profit with (red) and without (blue) forward contracting, under asymmetric integration



Forwards boost separated downstream firm's profit ...

Separated upstream firm's profit with (red) and without (blue) forward contracting, under asymmetric integration



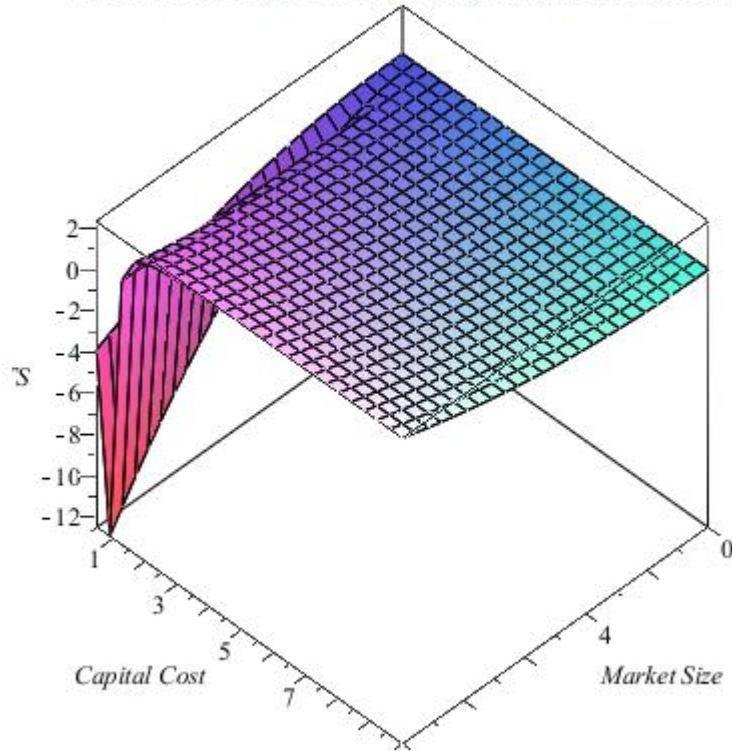
... but reduce separated upstream firm's profit ...

... with integrated firm and industry profits largely unchanged



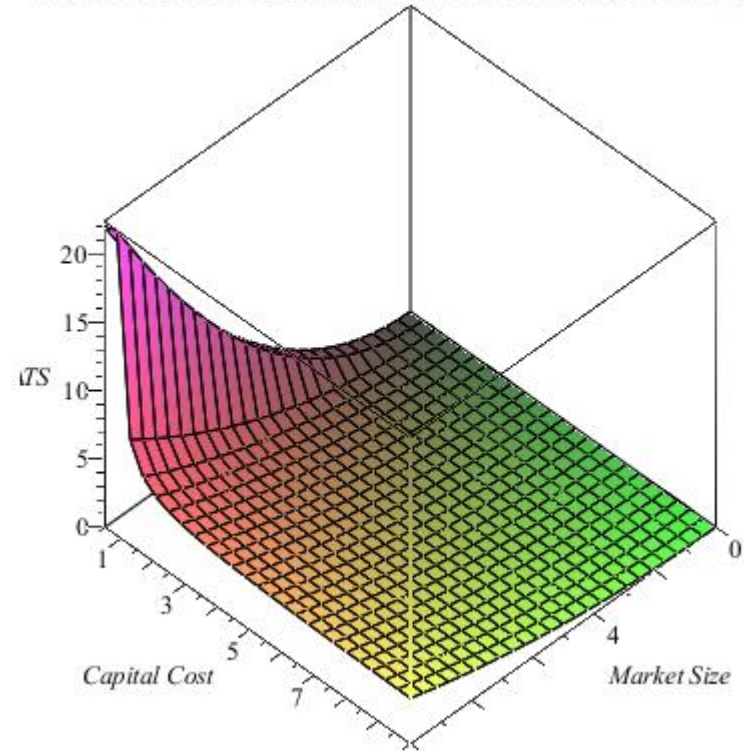
Brief tour – Meade 2011 (cont'd)

Gain in Total Surplus in moving from partial to full integration



Unless capital costs are very low, full integration provides higher welfare than asymmetric integration ...

Gain in Total Surplus in moving from full separation to partial integration



... but asymmetric integration always beats full separation



More on competition and investment

- Long been thought that competition might hinder innovation – e.g. Schumpeter → leaves insufficient profits for investment, and instead firm's innovate to capture market/escape competition
- More recent work (e.g. Aghion et al. 2005) reveals subtle trade-offs between pre- and post-innovation rents, which vary depending on the level of competition → “inverted-U” shaped relationship between competition and innovation
- Early electricity sector research highlighted how competitive pricing can lead to under-investment (Von der Fehr and Harbord 1997)
- More recent electricity work highlights trade-off between benefits of competition and decreased supply security → horizontal coordination worsens with extra competition, increasing blackout risk (Janssen et al. 2010, cf Boom 2004, and Boom and Buehler 2005)
- Growing body of electricity research argues that “hit and run” downstream competition can prejudice upstream investment – especially under vertical separation (e.g. Meade and O'Connor 2011)



Key lessons

- Welfare and investment don't always move together
- Benefits of vertical coordination can be so strong as to offset costs of anti-competitive behaviours → VI good, more VI better
- Desirable attributes of competition must be weighed against its disadvantages, such as reduced horizontal coordination → Competition good, but sometimes less competition is better
- Similarly, horizontal coordination issues can favour VS over VI
- Forward markets can complement other desirable industry features such as VI, and provide potentially powerful counter-measures to firms exposed to anti-competitive behaviours
- Nature of competition, location of investment, industry structure, and competition combine to affect investment strategy



Some NZ applications

- Electricity:
 - Smart metering should reduce blackout risks and hence need for horizontal coordination → favours VI over VS
 - Forcing generators to sell forward substitutes benefits of forward trading for benefits of VI → net result = ?
 - Will increased retail switching hurt investment and supply security?
- Dairy – tolerating VI might be best even though Fonterra can squeeze rivals?
- UFB (taking a deep breath):
 - At what point will improved retail competition conflict with the need for horizontal coordination?
 - Will separating Telecom improve investment and welfare?



Thank you – any questions?



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