

Regulating network charges

A potential framework for NBN pricing

UWA Business School

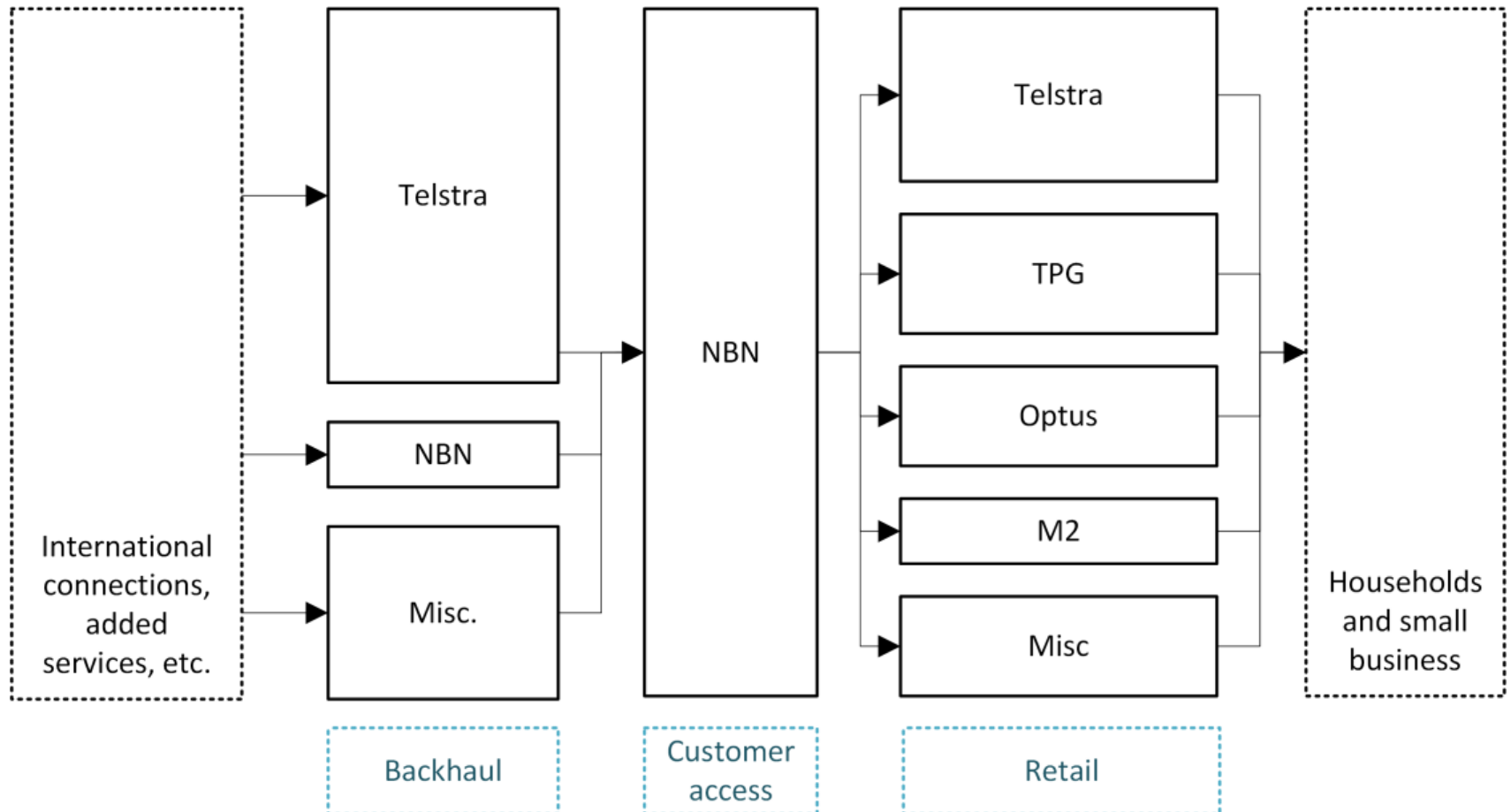
ACE 2017

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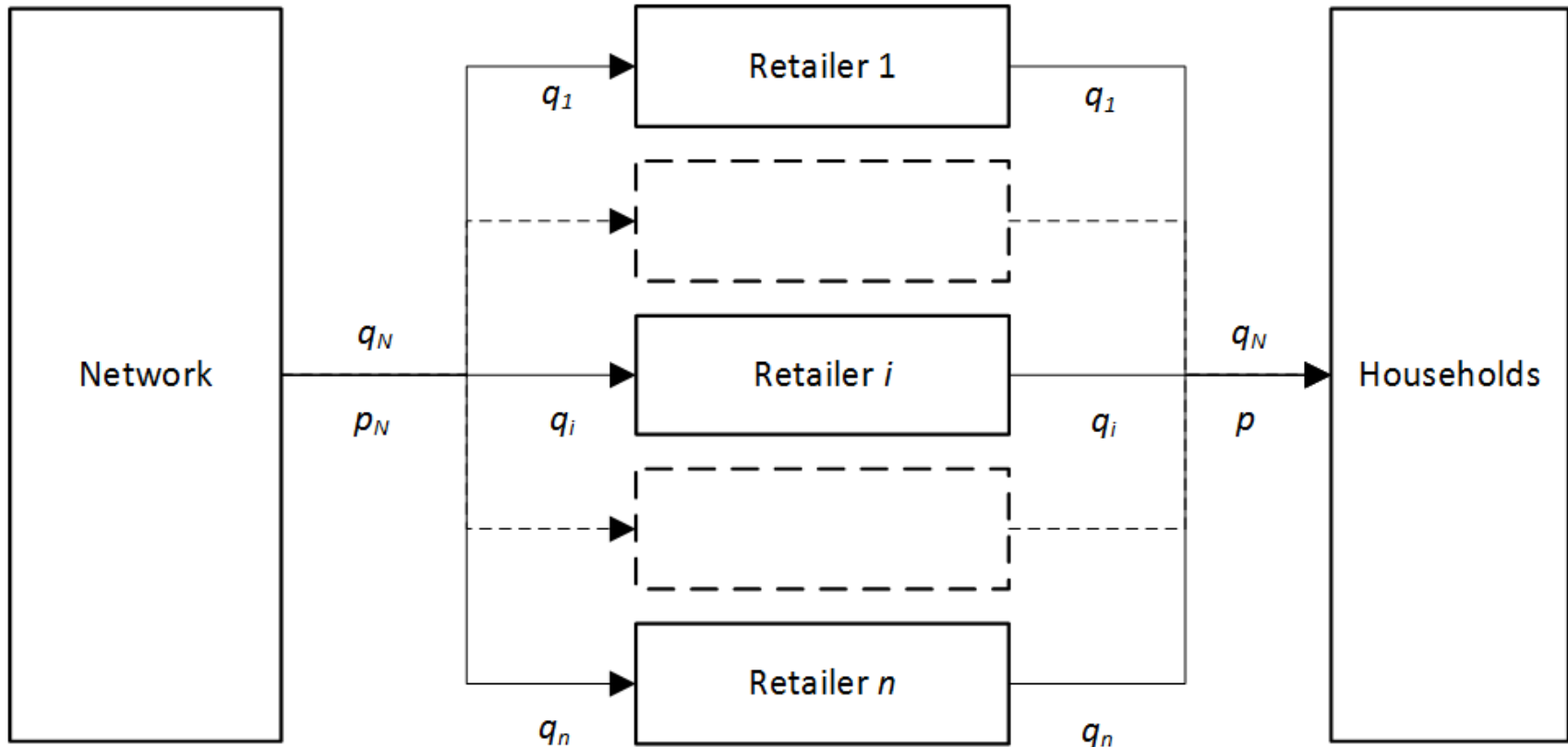
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Australian broadband industry

The Australian NBN is an atypical industry intervention



Broadband industry model



Stage 1: Regulator sets p_N .

Stage 2: Retailers simultaneously set q_i .

A monopoly supplying an oligopoly, partial equilibrium.

How should the regulated network access price (p_N) be set?

What is the effect of oligopoly size?

Prior literature

Gans (2001) *Regulating private infrastructure investment: Optimal pricing for access to essential facilities*

- Network and retail competition
- No structural separation

Haucap & Klein (2012) *How regulation affects network and service quality in related markets*

- How network charges affect incentives to invest in quality
- Exogenous network charge and Bertrand competition

Grajek & Röller (2012) *Regulation and investment in network industries: evidence from European telecoms*

- Trade-off between regulation and investment

Assumptions and equations

Costs: Retailers have constant marginal costs c , no fixed costs.

Network has no variable or fixed costs.

Household demand:

$$p = \alpha - \beta q_N$$

Profits:

$$\pi_i = pq_i - (p_N + c)q_i$$

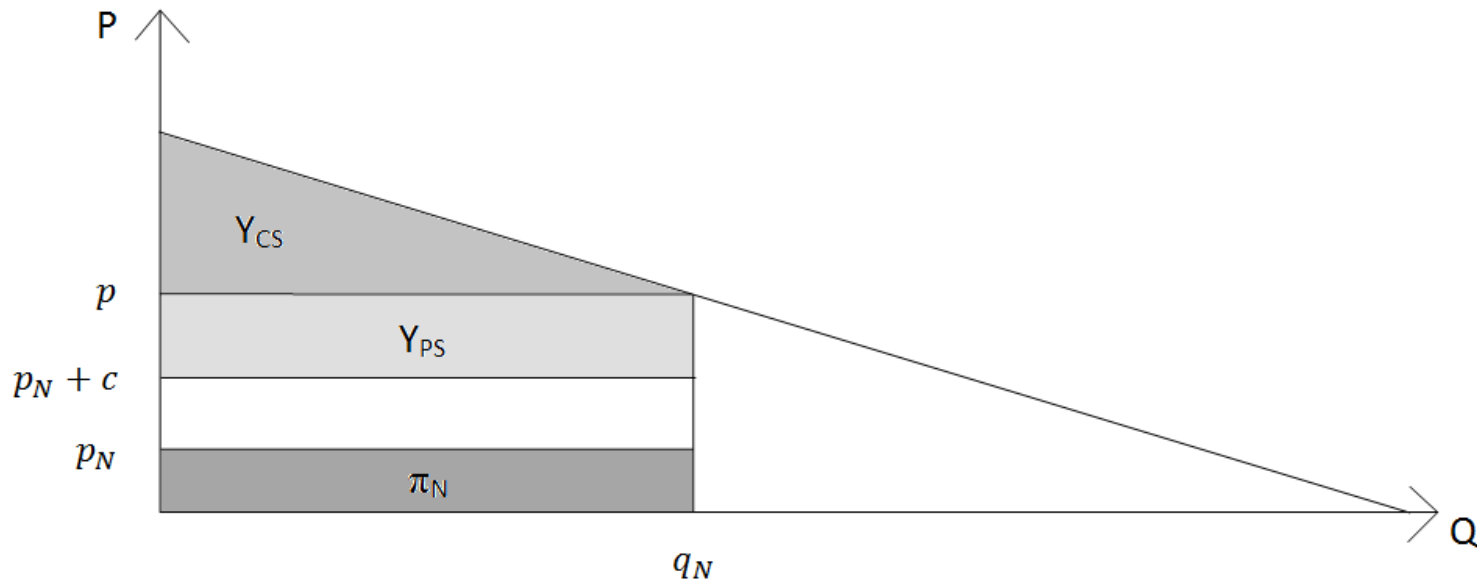
$$\pi_N = p_N q_N$$

Cournot equilibrium outcome:

$$p = \frac{\alpha + n(p_N + c)}{n + 1}$$

$$q_N = \frac{n}{n + 1} \frac{\alpha - c - p_N}{\beta}$$

Elements of surplus



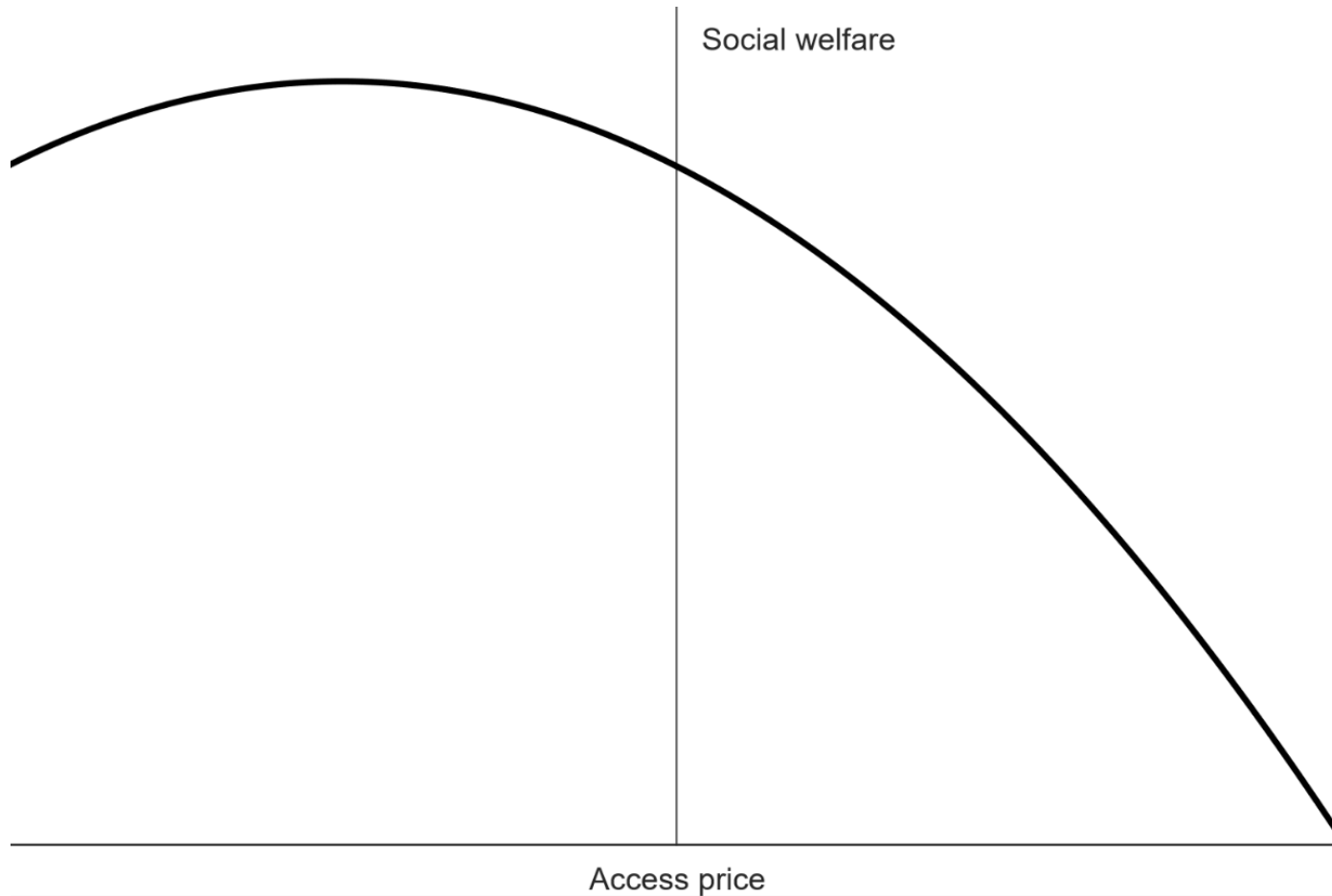
Social welfare:

$$Y = Y_{CS} + Y_{PS} + \pi_N$$

$$Y = \frac{n^2}{(n+1)^2} \frac{(\alpha - c - p_N)^2}{2\beta} + \frac{n}{(n+1)^2} \frac{(\alpha - c - p_N)^2}{\beta} + \frac{n}{n+1} \frac{p_N(\alpha - c - p_N)}{\beta}$$

Welfare optimisation

$$p_N = \frac{c - \alpha}{n}$$



Regulator's objective function

Weighted surpluses:

$$Y_R = 3(\chi Y_{CS} + \psi Y_{PS} + \omega \pi_N)$$

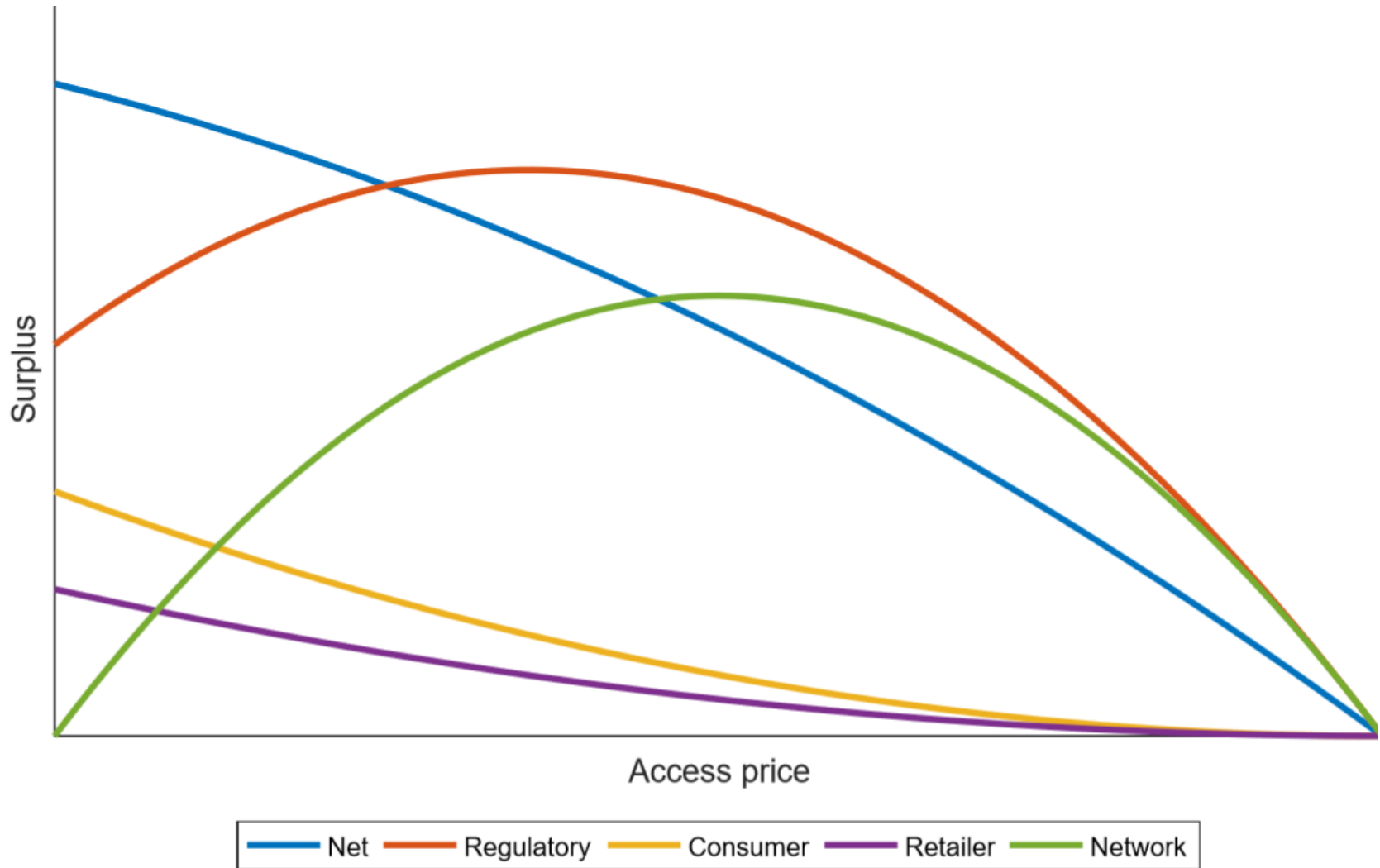
$$\chi + \psi + \omega = 1$$

For an optimised retail duopoly:

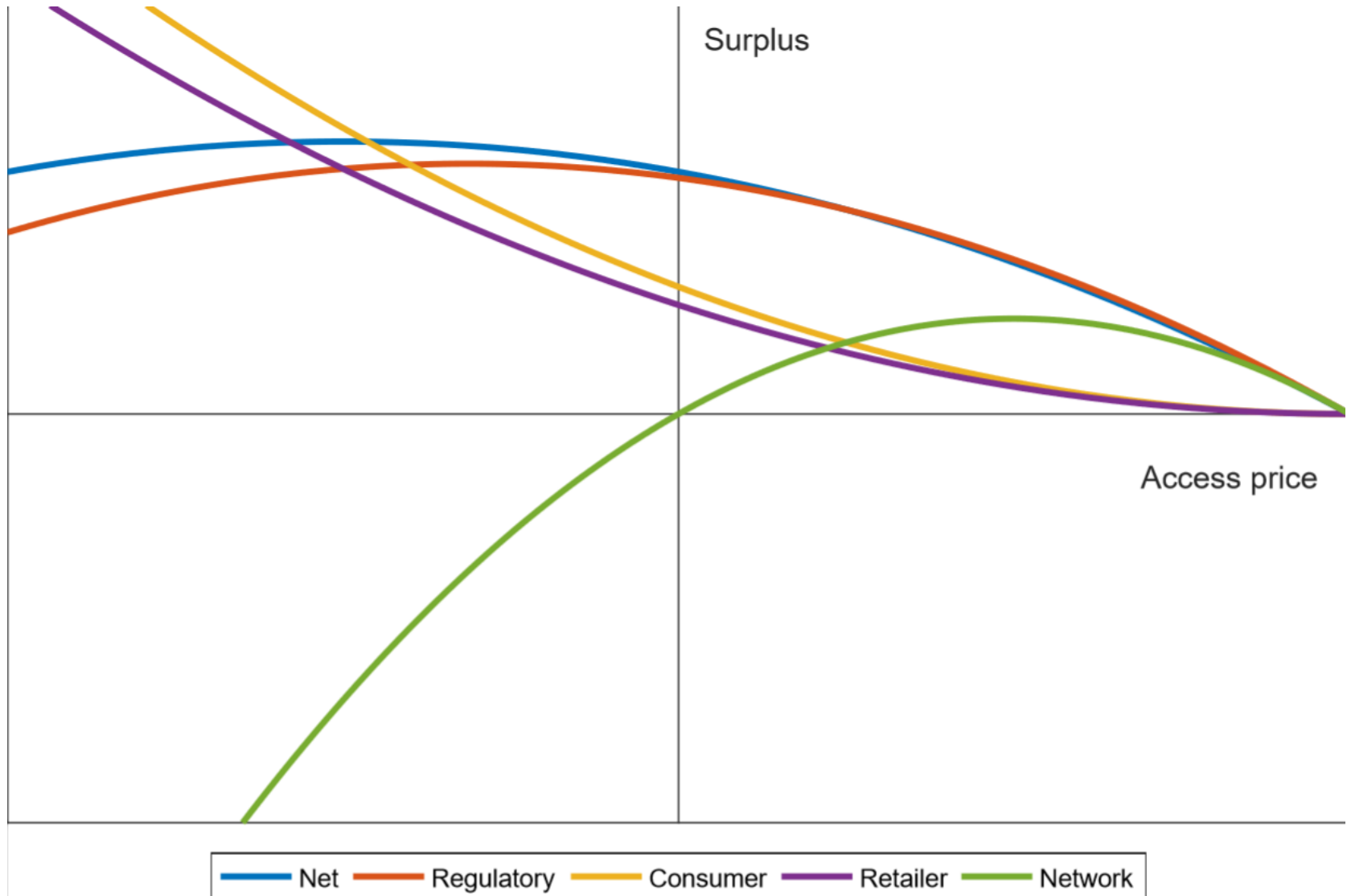
$$p_N = \frac{\alpha - c}{2} \left(\frac{2 - 5\omega}{3 - 4\omega} \right)$$

$$q_N = \frac{\alpha - c}{\beta} \left(\frac{\omega}{4\omega - 1} \right)$$

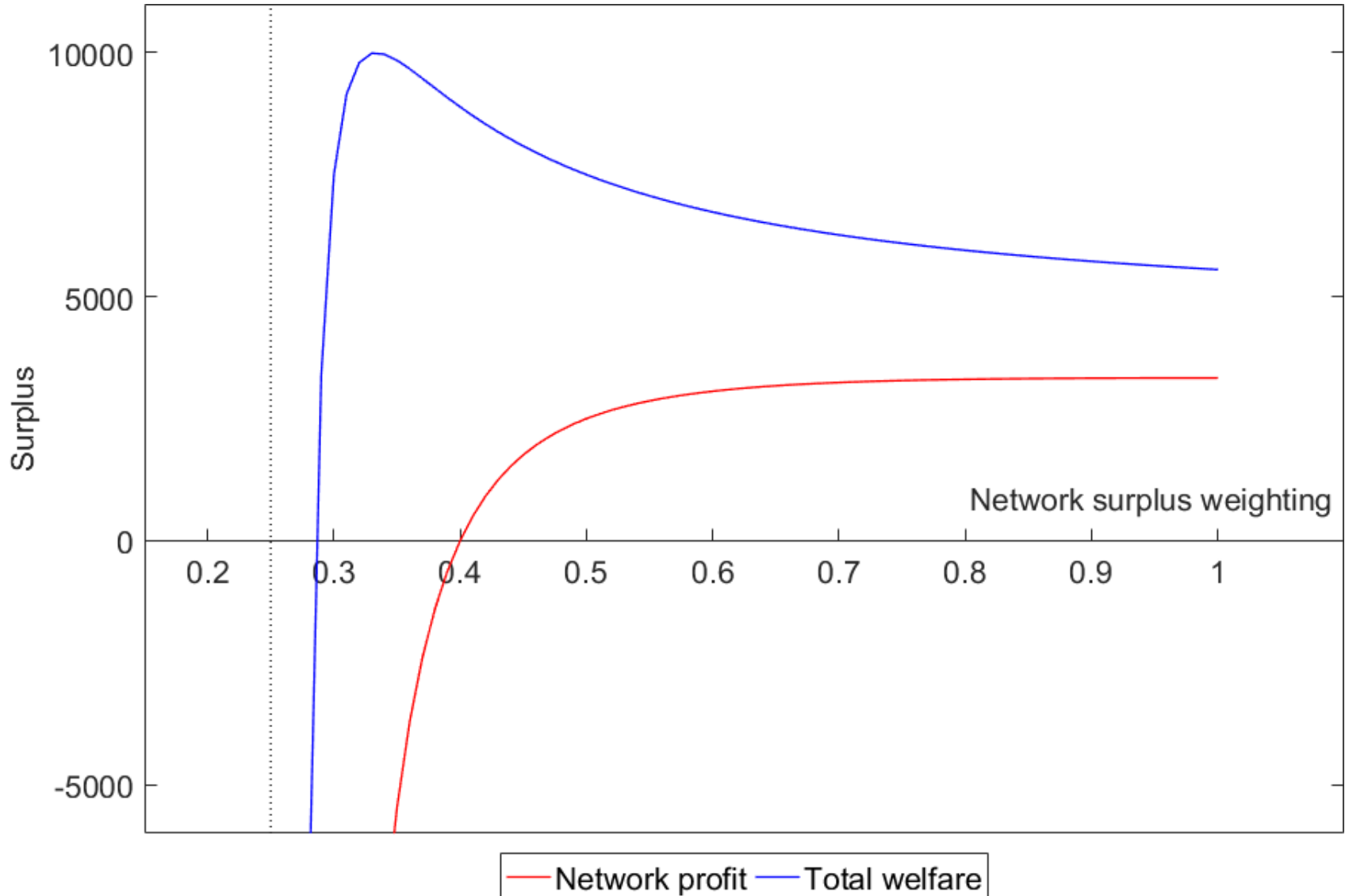
Welfare – favour network profit



Welfare – favour retailers and consumers



Welfare versus regulatory optimisation

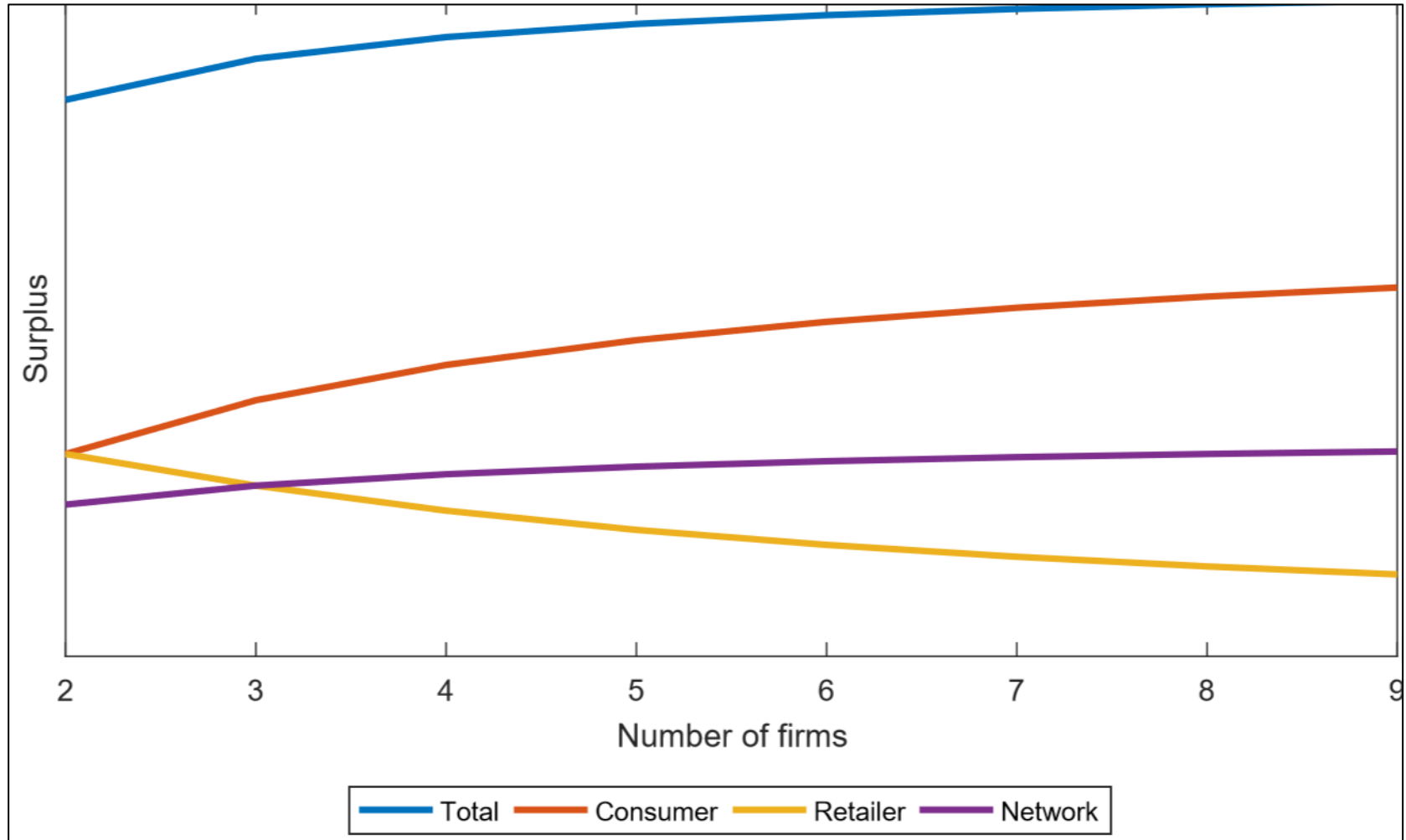


Welfare effects

Network profit weight	Access price	Total quantity	Network profit	Welfare
1	50.0	1.67	83.3	139
0.4	0.0	6.67	0.0	889
0.3333	-100.0	10.0	-1000.0	1000

Retail duopoly, $\alpha=200$, $\beta=20$, $c=0$

Number of firms



Regulatory levers

	Increase retail competition	Decrease network access price
Consumers	Benefit	Benefit
Retailers	Detriment	Benefit
Network	Benefit	Detriment

Discussion

General outcomes

- Pure welfare maximisation requires subsidised network access.
- Regulatory actions trade-off consumer, retailer and network profits.
- In network access pricing, consumer and retailer interests are aligned, network opposed.
- In firm entry and exit, consumer and network interests are aligned, retailers opposed.

Australian NBN implications

- Eventual privatisation versus welfare.
- Credibility of future price regulation.

Limitations and extensions

- Cost model
- Whole government fiscal analysis

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