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

LINKING HIGHER-QUALITY INFRASTRUCTURE REGULATION TO TOMORROW'S ECONOMIC GROWTH

1. Telecommunications

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OVERVIEW

The relationship between infrastructure and economic growth (generally and for telecommunications in particular)

Regulation and infrastructure investment:

what we have learned from its application int he telecommunications industry

- over time
- under uncertainty
- as technological and economic circumstances in the industry change

WHAT IS THE ‘PROBLEM’?

Maximising economic growth (actual and potential)

Via efficient investment in infrastructure (the ‘right’ amount’ invested in the ‘right’ technologies at the ‘right’ time)

INFRASTRUCTURE AND ECONOMIC GROWTH

Spillover effects

- investment yields economic benefits beyond cost of project

But only to the extent that there were (underinvestment) frictions originally (or anticipated shortly)

- marginal benefit of investment decreases as more projects are deployed
- if no/few material infrastructure bottlenecks to begin with, or complementary assets are costly (or under-developed) then investing ‘too early’ (i.e. ahead of demand and complements materialising) may be very costly

BROADBAND INFRASTRUCTURE AND ECONOMIC GROWTH: A CAVEAT

Does broadband investment drive economic growth?

Or is broadband investment more likely to occur in areas where economic growth is already strong?

Empirical evidence:

- equivocal (at least in developed countries)
- but generally exhibiting decreasing returns (Gillet, et al), asset complementarities (Greenstein)
- network speed may only be indirectly linked to economic growth (Grimes et al 2009; Kenney & Kenney, 2010)

A BROADBAND 'PRODUCTIVITY PARADOX'? (Howell & Grimes, 2010)

Gains undetected?

- too soon to discern benefits
- not easily discernable/measurable
- accrue outside ambit of study

Broadband not as productive as we would like?

- one-off adjustments, not sustainable growth engines
- decreasing marginal returns relative to costs (most of the gains came from early technologies and applications)
- data transport only a small part of the production function

Negative spillovers?

BUT ASSUMING THERE ARE REAL GAINS 'ON THE TABLE'

Will regulation (of any type) assist in ensuring that appropriate, timely investments improving economic growth prospects are made in a technologically dynamic environment where great uncertainties exist?

THE INFRASTRUCTURE COST 'PROBLEM'

- Large fixed, sunk costs (economies of scale) lead to risks of:
  - underinvestment (missing market, incomplete coverage and loss of spillover benefits) or
  - overinvestment (stranded assets)
- Telecommunications characteristics
  - distinct network effects relating to:
    - infrastructure (interconnecting networks of differing ownership and technologies)
    - applications (interlinked demand for content and connections (two-sided market)

HISTORY OF INFRASTRUCTURE REGULATION

The ‘sunk cost problem’

- very high fixed, sunk costs => scale economies
- firms with market power => allocatively inefficient

Assumption of intractable natural monopoly:

- competing infrastructures will ***never*** be economically efficient
- regulation is needed to ensure
  (a) investments are made in the first place
  (b) inefficient duplication is prevented

REGULATORY ‘SOLUTIONS’

Historic focus has been on networks

- in voice telephony environment, integrated operators provided both network and application (there was no need for the network if customer did not also purchase a voice application)

With only one technology and one application

- fixed line copper-based voice telephony only (yet now similar quality access can be provided to multiple third-party applications over mobile, satellite, wireless, cable, fibre as well as copper)

SOLUTION #1: GOVERNMENT OWNERSHIP OF MONOPOLY FIRM, REGULATED PROTECTION FROM COMPETITION

- Focus on prices paid by consumers – likely closer to cost
  - although price discrimination quite likely – e.g. discounts for elderly pensioners in order to increase total uptake; Ramsey prices
- But diffuse (communal) ownership, absence of competition lead to lead to productive, dynamic inefficiencies
  - consumers still pay higher prices than necessary
  - risk of pursuit of political objectives overriding pursuit of economic objectives (e.g. picking politically preferred technologies, allocating investment for electoral purposes)

SOLUTION #2: REGULATED PRIVATE MONOPOLY FRANCHISE

Focus is on restricting monopoly firm's profits

- rate-of-return regulation

Private owners exert stronger internal disciplines

- addresses productive inefficiencies

But dynamic efficiency problems remain

- either gold-plated' (over) investment or delays in investment in new technologies
- underinvestment in research and development

SOLUTION #3: INCENTIVE REGULATION

Incentive theory – losses will be minimised if the entity controlling the level of the incidence of the risk bears the costs of invoking it

Endeavours to replicate incentives in a competitive market

- decreasing regulated price path emulates market incentives from continual cost control, technological innovation
- regulatory entry barriers can be removed

SOLUTION #3 (cont)

Shifts costs of inefficient investment decisions, r&d risk onto private owners

- incentives to invest better aligned with consumers, total welfare
- profits increase when desirable decisions made (in respect of matters which the firm CAN control)

Enables actual competitive entry to occur when economically feasible

- regulatory entry barriers can be removed

BUT EXPOSES OWNERS TO RISKS THEY HAVE LIMITED ABILITY TO INFLUENCE

- Demand-side uncertainty
  - consumer valuations of firm's products, services
  - consumer valuations of other commercial products and services utilising the firm's products and services as inputs (derived demand)
- Supply-side uncertainty
  - industry-wide technological innovation
    - new (substitute and complementary) products and services
- Regulatory uncertainty
  - regulatory intensity increases only if 'good' outcomes occur
    - regulator has more/better information than when firm made investment decision
  - risk exacerbated the greater the economies of scale available (Evans & Guthrie, 2006)

UNCERTAINTY AND TECHNOLOGICAL INNOVATION

- The greater the pace of technological innovation, the greater are all three uncertainties
- Regulatory risk exacerbated
  - Regulator faces same uncertainties as firm (serial correlation)
    - how to assess a ‘fair’ risk component to include in regulated prices?
  - cost-based regulated prices exclude compensation for the firm bearing costs of ‘exogenous’ risk (Hausman & Sidak, 2005)

RISK ALLOCATION AFFECTS INVESTMENT DECISION

- Usual response to decision-making under uncertainty is to wait for better information (Dixit & Pindyck, 1996)
  - firm refrains from investing until uncertainty reduced to level for which it is compensated under regulated prices
    - welfare accruing from deployment of new technologies forfeited
  - but risk of regulator also becoming better informed and increasing regulatory ratchet intensity increases
  - political assurances of regulatory forbearance insufficient
    - no government can bind its successors (Howell, 2010).

DEMAND-SIDE UNCERTAINTY

- Hypothetical example #1: fibre to the home connections
- Regulator assumes take-up is 70% of households
  - take-up substantially slower than initial estimates
  - actual cost substantially higher than regulated price as scale effects smaller
    - regulated firm makes substantial loss
  - flow-on effect: firm reluctant to invest in another new technology unless compensated for bearing risk (likewise any other firm likely to obtain a dominant position from investing in a new technology likely to become subject to regulation) (Crandall, 2002)

HYPOTHETICAL EXAMPLE #2: FIBRE TO THE FIRM CONNECTIONS

Regulator assumes take-up is 30% of firm; sets price accordingly

take-up is 70% of firms

regulated firm is making profits at regulated price

Regulator revises regulated price downward to new cost

but if firm is a ‘portfolio’ investor - #1 above

must bear down-side unpredictable demand-side risks but cannot appropriate gains from up-side (i.e. ex post expropriation of the returns to the firm’s ‘risk premium’)

firms will not assume investment risks in future => missing market for infrastructure investment

SUPPLY SIDE UNCERTAINTIES

‘Sunk cost problem’ – what is the ‘right’ price to set?

Long **R**un **I**ncremental **C**ost - but which one?

- historic cost?
  - firm has no incentive to invest in newer, cheaper technologies
  - but competitor might, even though incumbent has not recovered full investment cost (inefficient entry)
- continually decreasing price path
  - should encourage incumbent firm to invest in new technologies at appropriate time

EXAMPLE #1: PRE-ANNOUNCED REGULATORY PRICE PATH

Regulator overestimates extent of savings available from innovation (Regulatory error – not in firm's control)

- over-aggressive decreasing price path
- no new cheaper technologies to invest
- firm cannot recover costs; suspends investment, ultimately exits market

EXAMPLE #2: AGGRESSIVE PACE OF INDUSTRY INNOVATION

Means infrastructure cost falls substantially more over time than estimated in the original price path

- ‘historic cost’ problem meets ‘bad news’ principle (Guthrie, 2003)

Regulated price above the new price required to send signal to invest

Regulatory response: reset regulated price to the price for today’s technically efficient LRIC

- stops entrants from inefficiently investing
- but incumbent cannot recover actual (historic) costs incurred under this price (bears all risks of unanticipated price reductions), so runs down infrastructure, does not reinvest

ACCESS REGULATION EXACERBATES INCENTIVE PROBLEMS

Entrants buy from incumbent at regulated prices

Regulated prices continually adjusted to reflect 'best available technology

- why would entrants ever invest in their own infrastructure (even if it could be the best available)?
  - sinking own costs => taking on risk
  - regulation offers competitors 'risk-free' option to enter/exit market
  - incumbent bears all risk in the sector, but receives no compensation for bearing it, plus cannot recover costs under regulated prices
  - no evidence of 'ladder of investment' being climbed (Bourreau & Dogan, 2010)

EMPIRICAL EVIDENCE

Total investment (both entrants and incumbents) less in heavily access-regulated EU countries than less-aggressively regulated countries (Renda, 2006; Grajek & Roller, 2009; Crandall, 2009)

No compelling evidence that access regulation has had a material effect on number of broadband connections sold (Boyle et al, 2008)

only interplatform competition has consistent statistically significant effect (Distasio, et al. 2005; Bouckaert et al, 2010)

STRUCTURAL SEPARATION EXACERBATES ACCESS REGULATION INCENTIVE PROBLEMS

- Infrastructure company cannot compete in retail markets
  - but bears industry uncertainty risks – both demand and supply
  - retailers bear no risks (mismatch of investment horizons)
- "Too many" retailers enter the market (Howell, Meade & O'Connor, 2010)
  - none takes adequate account of effect of their entry on residual demand remaining to other entrants (monopolistic competition with low fixed costs)
    - few incentives to take care in forecasts
    - strategic incentives to over-estimate demand to induce low regulated price

STRUCTURAL SEPARATION EXACERBATES (CONT)

But infrastructure company must meet all forward orders (without own retail arm for 'reality check' of demands) – regulatory condition

Inefficient overinvestment occurs

- demands inevitably 'fail to materialise' at projected level
- many retailers exit
- infrastructure investor left with surplus capacity (stranded assets)

US Dot-com 'bubble'/'bust' 1996-2002 (Crandall, 2002)

STRUCTURAL SEPARATION EXACERBATES (CONT)

- Might overcome some problems by requiring retailers to enter into long term contracts with infrastructure company
  - but if industry is technologically dynamic, a new (bypass) infrastructure may be developed
  - retailers ‘locked in’ to long-term contracts with current incumbent will be ‘undercut’ by new entrant retailers using new technology
    - if probability of new infrastructure development is high, then retailers will not enter into long-term contracts
    - reduces likelihood of investment in current technology by separated infrastructure firm

CONCLUSION

Most current regulatory theory developed in times, industries, where pace of technological change was slow

The greater the pace of change in an industry, the greater the risk of 'getting the regulation wrong'

- genuinely unpredictable uncertainties cannot be abstracted away

Regulation (in its currently popular forms (access regulation and structural separation) is likely hampering the pursuit of economically efficient investment

creating a 'missing market for investment'

has been used to 'justify' a return to government financing (NZ) and operation (Australia) of NBNs

The greatest uncertainties are generated by competition from (currently unregulated) mobile and cable infrastructures

CONCLUSION (cont)

Need to rethink

- what is being regulated
- why it is being regulated
- whether (historic) underlying assumptions are valid in the ‘new world’

Failure to do so may be costly in terms of

- economic growth potential arising from telecommunications infrastructure investment