

Network effects as infrastructure challenges facing utilities and regulators

Tim Brennan

Professor, Public Policy and Economics, UMBC
Senior Fellow, Resources for the Future

brennan@umbc.edu

The regulation of infrastructure in a time of
transition – Session 1

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Introductory thanks, disclaimers

- Thanks to ACCC for inviting me
- Special thanks to Katrina Huntington for getting me (and all of us) here!
- I don't know as much about the ACCC's organization and mandate as I should
- Will be talking a bit about material outside "normal" regulation, to illustrate today's central theme
- So, perhaps some patience is requested!
- No suggestion, implicit or explicit, that the ACCC should do something it isn't doing, or *vice versa*

Setting out today's project

- **Charge**
 - “Regulation of infrastructure in a time of transition”
 - “Infrastructure challenges in the early part of the 21st century”
- **Which infrastructures?**
 - Electricity
 - Telecommunications
 - Water (not covered today)
- **Which challenges?**
 - Low carbon economy: Will discuss in energy breakout session
 - GFC: more below
 - Technological change: Persistent over time, not just now!

Finding a common theme: Network effects

- Interpret keynote mandate as to say something about a lot, rather than a lot about a little
- **What is common to:**
 - Many regulated industries?
 - Transitional difficulties (e.g., regulation to competition)
 - Technological change?
- **Answer: Network effects**
 - “Network” mentioned three times in conference charge
 - Electricity and telecommunications in particular
 - Interface between competitive sectors and monopoly networks

What do we need to know about networks?

- What are they?
- When is regulatory intervention warranted?
- If so, what should be regulated?
 - Price? Access? Standards?
- If so, how should it be regulated?
 - General competition law
 - Specific statute?
 - Sectoral regulator?
- Most important: Why might regulation be necessary?

Getting our feet wet

- Network effects: Definition and causes—and limits
- Classic concerns; not addressed here
 - Adopting the wrong standard;
 - Open vs. proprietary
- Brief examples outside price-regulated sectors
 - Broadcasting/spectrum use
 - Standard setting
 - Microsoft
- Not central concerns; just for illustration
- Note: regulatory questions still arise
 - Standards approval, competition law

Diving all the way in

- **Telecommunications networks**
 - **Telephony:** Vertical separation, horizontal interconnection
 - **Internet:** Changing nature of standards, “net neutrality”
- **Electricity**
 - **Network effects:** Is transmission a monopoly?
 - **Operations and investment:** Does vertical separation work?
 - **Reliability and competition:** Complements or substitutes?
- **GFC**
 - **Not finance as a crisis for infrastructure**
 - **But finance AS an infrastructure network**
- **Lessons**

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Definition and causes of network effects

- **Consumer end: Network externalities**
 - Value of using a particular product is increased with number of others who use it
 - Using Windows in Uzbekistan
- **Upstream version: Manufacturer interoperability**
 - Software runs on multiple platforms
 - Gains from compatibility outweigh gains from differentiation
- **Broader setting Non-pecuniary horizontal externalities**
 - Shared numbering plan
 - Transmission “parallel flow”
- **Not just economies of scale and scope: Water, rail, air**
 - Some compatibility issues, but not “network effects” driven

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Deferred debates (not entirely for background)

- **Choosing the wrong standard?**
 - QWERTY keyboards
 - Macs vs. PCs
 - VHS vs. Beta
- **Theoretical concern: Self-fulfilling inertia**
 - Adopt because everyone else expected to adopt
 - Lock-in or, in theory, excessive switching
- **A concern in practice?**
 - VHS, QWERTY really better or as good?
 - More on regulatory role below
- **Open vs. proprietary:
Should regulator mandate compatibility?**

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Learning from other sectors: Broadcasting

- **Irony: “Network” used where “network effects” weak**
- **Generally low value in watching what others watch**
 - Shared cultural experience:
Last night’s “Seinfeld” or AFL game at the water cooler
 - Shared civic experiences:
Common news vs. niche ideological programs
- **Network effects of the compatibility sort**
 - Coordinating spectrum use with competitive manufacturers
 - Consistent with making spectrum “property”: zoning
- **Technological change may weaken even this**
 - Spread spectrum: Device finds the content?
 - TCP/IP: Internet makes content specification irrelevant

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A short note on standards

- **Allowing gains from interoperability, compatibility**
- **Refusal to share: iTunes playable only on iPods**
- **Standards pricing like interconnection; will cover below**
- **Industry participants mislead standard setting bodies on patents:**
 - US *Rambus* case; lost on appeal
 - Competition law or contract breach
- **Regulatory issue: The paralysis of choice**
 - Regulator may need to choose with no “best” standard
 - Inherently arbitrary decision, may not stand up to challenge
 - US: AM stereo

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Microsoft: Network effects paradoxes

- **Concern that network effects create monopolies warranting regulatory, competitive action**
- **Network effects part of Microsoft’s dominance**
 - Network externality from ubiquity, noted above
 - Application lock-in, both network externality and upstream compatibility
 - Add in scale effects: 1st copy cost \$1B, 2nd copy cost zero
- **But network effects may facilitate entry**
 - Successful entrant gets monopoly, not duopoly
 - Pre-emptive patent, copyright need not profitably deter
- **Also, if network effects (+) make Microsoft dominant, why should we care about browsers?**

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On to the regulated sectors: Telecommunications

- **Telephony first**
- **Lots of scale effects; network effects subtle**
- **Technological changes affecting scale side**
 - Microwave reduced scale economies in long distance
 - Digital wireless created more local calling alternatives
- **The “wires” accident**
 - Internet protocols allowed cable TV systems to carry calls
 - DSL technology allowed telephone companies to offer broadband digital
 - Will fibre-optic technology restore local physical monopoly?
- **But none of these are network effects!**

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Network effects: Interconnection

- **Not just physical scale, but network externality**
- **Value of telephone depends on range of people one can call**
 - Might decline with people who can call you, e.g., telemarketers!
- **US: Facilitate competition with horizontal interconnection**
 - Allows all entrants to benefit from network effects
- **NOT vertical interconnection**
 - E.g., long distance companies connecting with local
 - Local providers sharing incumbent facilities
 - Those may be important, but not to resolve network effects

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Regulatory responses to interconnection

- **Initially, to facilitate entry**
 - Incumbent could block entry by refusing to complete calls from entrant
 - Exploit market power from the network effects
- **But isn't ONLY a transitional issue**
- **Numerous equal competitors could set high mutual interconnection fee**
 - High price passed on to consumer; like a cartel
 - Exactly like charging a high price to use an industry standard, and sharing the revenues
- **Ongoing oversight may be essential**

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The Internet: "Network of networks"

- **Standards, interconnection issues like telephony**
- **Game changer in possibly eliminating the need for regulatory standards based on type of content (e.g., spectrum for TV)**
- **But some of its history matters**
- **Arose as government, academic enterprise**
- **A history of voluntarism**
 - TCP/IP; ICAAN
 - Html/http: The "World Wide Web"
- **Network effects can magnify effect of voluntary efforts**
 - Also low information costs

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Understanding the “net neutrality” debate

- **Basic idea:** Each provider of broadband service should treat all content equally
- **Arguments against, general and specific**
 - Competition among (2+) providers => regulation unhelpful
 - Even providers with market power have incentives to maximize value of service (speed, access) to customers
 - Eliminating latency in voice, video requires preferential control
 - Management for congestion, prioritisation
- **Arguments in favour**
 - General scepticism regarding competition, incentives
 - Inhibits poorer “little guy” innovation – a big Internet force
 - Horror stories, e.g., Canadian provider cutting union website
 - Inability to commit not to seize profits of content innovators

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A modestly proposed middle ground

- Drawn from “old” telecom
- There, a “universal service” externality—a network effect!!—was used to justify subsidies
- All got service at minimum quality standard
- Suppose there is a similar content “network effect”
- The value of my website depends on quality of links to yours
- Could justify not *equal* quality, but *minimum* quality
- Can’t say benefits exceed implementation cost, but perhaps a better idea (not just as compromise)

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On to electricity

- Like telecom, technological change affected market structure
- New gas generation units efficient at low scale
- In US, (dubious) reaction to 1970s oil shocks showed feasibility of connecting non-utility generators to grid
- This plus general deregulation success led to 1992 legislation, 1996 FERC regulation to open grid to all
- States retain authority to give end-users retail choice
- Movement rapid in 1990s; virtually halted by California market meltdown
- But no network effects other than AC cycle, voltage stds

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But network effects prove crucial

- Competition limited in electricity; wires still regulated
- Local distribution clear—physical economies, but not network effects (unlike telecom)
- Transmission different
 - Grid interconnected to improve efficiency of energy flow, ability to reallocate supplies when net demand varies
 - Interconnection => energy takes all routes to get from A to B
 - “Parallel flow” => my lines change your cost of service
 - Essentially one big entity
- Can't be managed by simple interconnection rules (also unlike telecom)

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Managing network effects – vertical separation

- **Regulation creates untapped monopoly profits**
- **Creates incentive to vertically integrate to capture them**
 - **Discriminate in favour of affiliate**
 - **Cross-subsidize affiliate operations**
- **In US, led to telecom divestiture**
- **Nowhere near that in electricity**
- **FERC sets out independent system operator rules; separation only functional**
- **Canadian experience similar**

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Can vertical separation work in electricity?

- **Crucial differences with telecom in operations, investment**
- **Short-run operations**
- **Telecom**
 - **Both sides adjust incrementally to fixed access price**
 - **Enables RPI – X price caps**
- **Electricity**
 - **Efficient transmission prices at all nodes, varying continuously**
 - **Ensure efficient response to line congestions**
 - **Transmission pricing not simple cost recovery**

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Long-run investment more problematic

- Telecom expansions relatively incremental
- Electricity lumpy, expensive
- Vertical coordination required
 - Transmission wasted without generation
 - Generation useless without transmission
- Multiple users of shared facility => horizontal coordination required
 - Especially true if climate policy leads to huge investments in areas with no generation, transmission
- Both vertical (w/ reg. monopoly), horizontal coordination inconsistent with entrepreneurial independence

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And don't forget reliability

- Recall transmission interconnection as the network effect
- Unlike telecom, network effect failures in electricity are more than a nuisance
- If Generator A can't supply its customers, Generator B, C, and D's customers get blacked out
 - Not the local distribution problem, but a regional issue
 - Recent example: Aug. 2003 Northeast blackout (US and CA)
- *Ex post* liability not feasible
 - Estimating costs likely to be highly uncertain
 - Assigning blame difficult, with billions at stake
 - Any losers could likely declare bankruptcy instead of pay

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Network effect => *ex ante* central control

- The deep tension between reliability and competition
- Not just interconnection with some price oversight
- Standard method: Mandate reserve capacity
 - How much? What kind?
 - Strike price?
 - How imposed? Is the benefit a tax on uses when blackout likelihood increased
 - Capacity market confusion – why here?
- Big question all along: How much central control?
 - Only like an air traffic controller?
 - Or more control over dispatch?
- Agnostic about prospects, even after long time

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On to the GFC

- Or, as we say in the US, the FC
 - You mean there's a globe?
- Nothing to offer on effect of GFC on infrastructure
 - Hard to get credit, recession reduces demand: Obvious
- Rather, the GFC reveals yet another network effect!
- Illustrate even more the breadth of network effects
- Yet reveal similarities in solution

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The high finance network effect comes from ...

- **Other than a couple of bumps in recent decades, finance seemed to be smooth sailing**
- **Almost all policy in the US was deregulatory**
- **However, borrowing at the apex can display a network effect**
 - **Not present when times are good**
- **Key effect is to understand commercial lending**
- **Not really giving money now with payment expected later**
- **But converting illiquid collateral into liquid cash**

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... adverse selection

- **Dictionary borrowing => textbook adverse selection**
 - **Borrowing a signal of lack of intent to pay back**
 - **The market would be either minimal (lemons) or nonexistent!**
- **This is why collateral is required for any lending**
- **In normal times, commercial banks are “good for it” when borrowing short-term to settle accounts**
- **But with uncertainty arising from “toxic assets”, adverse selection arises**
- **Credit market can collapse overnight**
- **Adverse selection creates the network effect!**

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Policy responses to contagion

- **Adverse selection => network effect => negative externality from taking excessive risk**
- **Better information**
 - Require that rating agencies not be paid by borrower
- **Limit the scope of financial instruments**
 - Reduce burden of assessing risk
- **Government provided collateral, like deposit insurance**
 - Extreme version: the “bail out”
 - Moral hazard problem

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Can we pull anything from telecom, electricity?

- **Vertical separation, like regulated/unregulated lines?**
- **Separate insured from uninsured accounts**
 - Line of business restrictions lifted in US
 - Justified not to promote competition—it may hurt it—but to mitigate moral hazard
- **Reserve requirements, like in electricity**
- **Reduce exposure to variance in returns that creates uncertainty among lenders**
- **Everyone more confident that others are “good for it”**
- **Watch out for costs and benefits**
 - Are years of reduced growth worth an avoided recession?

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Lessons

- **Technology, policy, transitions, regulation all intimately connected to network effects**
 - Even though not everything is a network!
- **But the simple concept has multiple causes:**
 - Demand-side network externalities, upstream compatibility value, horizontal non-pecuniary externalities
- **Multiple manifestations**
 - Open vs. closed, wrong standard
 - Spectrum use, standard setting, competition law
 - The regulatory choice paradox
- **Complexities compounded, differences revealed in thinking about telecommunications, electricity**

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From the traditionally regulated sectors

- **Telecom – how to make competition work**
 - Allow all suppliers to benefit from network externality through interconnection rules
 - Policy not just for initial entry but to prevent cooperative price increases
- **Electricity – can we make competition work (I hope)?**
 - Network effect arises from interconnected transmission
 - Efficient pricing makes regulation complex
 - Lumpy investments require horizontal, vertical coordination
 - Reliability, too, introduces central control
- **Finance turns out to be subject to network effects if big banks take on too much risk**

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Two concluding thoughts

- **Scale of governance – potentially international**
 - May networks national or sub-national, but others not
 - Internet standards, numbering plans
 - Electricity grids go across US, Canada boundary
 - The “G” in GFC
- **Conflicts between regulation and competition law**
 - With transitions to competition, when should control go from one to the other?
 - US circa 1980: Antitrust applied absent “plain repugnance” in statutory scheme
 - US circa 2004: If regulator has authority, cost of antitrust outweighs benefits
 - But regulation, efforts to evade it, cause antitrust problems
 - Hope this can be better managed here!

Thank you very much!

Now it's your turn!!