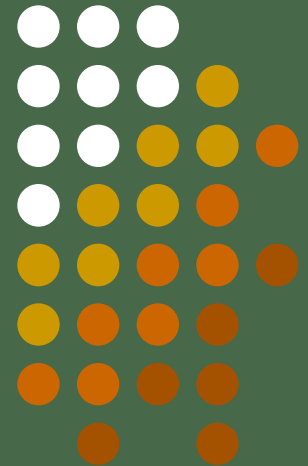


Network Economics, Vertical Integration, and Regulation

Howard Shelanski
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New Institutional Economics

- Key concern is governance of transactions, not price and output.
- Unit of analysis is the transaction
- Key question: why a transaction is (or should be) organized or mediated by one institution as opposed to another:
 - Markets vs “hierarchies”
 - E.g., a firm’s make or buy decision: why does a firm buy some things and make others?



Origins

- Ronald Coase
- Key lessons
 - Property Rights/Default Rules and Transaction Costs Matter
 - Facts and Institutions Matter
- Oliver Williamson
 - Institutions have differing competencies for governing transactions in the presence of transaction costs

Key Assumptions of the New Institutional Economics



- **Bounded rationality:** economic actors intend to be rational but are only limitedly so.
- **Opportunism:** economic actors will expect others to act opportunistically and seek mechanisms (institutions) to protect themselves from hold-up.
- **Asset specificity:** Specific investment is the key variable that allows opportunism and drives firms from markets toward hierarchical institutions.



The “Coase Theorum”

- Pollution example: a plant pollutes and imposes costs on a nearby farm. To what extent should the plant be allowed to pollute or the farmer be allowed to keep farming?
 - theorem version 1: As long as both parties are free to bargain, the final amount of pollution not depend on the initial allocation of property rights.
 - theorem version 2: when transactions costs exist, the final amount of pollution depends on the initial allocation of property rights.

Lessons and Policy Implications



- Institutions arise to economize on transaction costs.
- Sometimes private bargaining is best, at other times other institutions are more efficient.
- Public setting: can inform choice between private market, regulatory, or tax alternatives to resolving, e.g., the pollution problem.
- Private setting: can explain efficiency rationale for firm strategy and structure

Introduction to Network Economics



- What is a “Network Industry?”
- **Broad definition:** An industry that connects users to each other or to producers through a system (or systems) of compatible, interoperable physical infrastructure.
 - Communications networks
 - Power grids
 - Transportation systems
 - Software platforms

What is a “Network Industry?”



- **Economic definition:** An industry whose good or service increases in value to each individual user as the number of other users of the same good or service increases.
 - Communications networks
 - Software platforms



What is a Network Externality?

- The consumer's perspective: A “network externality” is the added benefit a consumer gets as additional consumers join the same network or use the same product.
 - Telephone service benefits a consumer if she can call 10 other people, but it becomes increasingly valuable to her as she can call 100, 1000, or millions of other people.



What is a Network Externality?

- The competitive firm's perspective: A firm's “network externality” raises rivals' costs and creates a barrier to entry by new firms.
- Once a firm has the market lead and offers the largest network benefit, rivals must not only beat the price and technology of the leading firm, but must do so by enough to compensate consumers for the network benefit they lose in switching to the smaller rival.

Are Network Effects Common or Rare?



- Network effects might at first appear common. We benefit as more people demand many kinds of goods.
 - I have easier access to pizza, and pay less for it, because many others also like pizza and many suppliers have entered the market. **But such price and output effects are not true network effects.**
- In a true network externality, there is an increased benefit that comes directly from other people's consumption, putting aside price effects.
- When defined in this way, network effects become less common.



The Key Question

- *When price is held constant, does the value of the service increase with the number of consumers?*
- This question distinguishes true network externalities from related economic phenomena
 - If the answer is yes, then there is a network externality.
 - If the answer is no, the good is not a true network good.

Network Externalities Distinguished from Economies of Scale



- Scale economies arise when a producer's per-unit costs fall as output increases.
- Network externalities arise when a consumer's benefit grows as total consumption increases.
- Scale economies and network externalities need not go together; it is possible to have one without the other.
 - A telephone network might raise its unit costs by expanding into a rural area thus reducing scale economies; but that same expansion increases the network externality the system provides by increasing the number of people each subscriber can call.

Network Externalities Distinguished from Lock-In Effects



- Lock-in effects arise when consumers find it more economically rational to stick with an existing product/service rather than to switch to a competing one.
- Network externalities can create lock-in by making the alternative provider less attractive in terms of the benefit it will provide to the consumer. Even if a competing provider offered payment (or a very low price) to switch, a consumer might decline because of the network benefit she would lose.
- Not all lock-in arises from network externalities; lock-in can occur if other switching costs of moving to the competing good or service are too high. Service termination penalties, incompatibility with already-purchased complementary goods, and sunk costs are factors that might keep consumers from switching even to otherwise better choices.

The Vertical Dimension: Network Effects and Complementary Goods



- The benefit of a network or software platform may come from the availability of complementary products. My operating system is more valuable to me the more applications programs I can run on it. The Internet is more valuable to me the more content and applications it allows me to reach.
- As more other consumers use the Internet, the more developers will have incentive to produce content and applications in turn making the Internet more valuable to me. This is sometimes called an “indirect” network effect or “feedback effect.”

A Note on Transaction Costs and Vertical Relationships



- A central insight of the New Institutional Economics (NIE) is that firms organize transactions so as to minimize the costs of governing those transactions over time. Some transactions are best conducted on the spot market, some through contracts, and some by internalization or vertical integration.
 - There may thus be an efficiency rationale for either partial or complete vertical integration.

Vertical Relationships: Potential Harms



- Vertical relationships can be used to favor affiliated, complementary products and discriminate against unaffiliated products or service providers.
 - Problem may be more severe in network industries because of “tipping to monopoly.”
 - Leads to regulatory proposals and responses
 - Vertical separation
 - Non-discrimination rules

Vertical Relationships: Potential Benefits



- *But*, vertical affiliation can also help the development of new products that might otherwise be too risky. Looking only at the possibility of harmful vertical discrimination might cause one to miss cases where vertical integration was responsible for creating the complementary products in the first place.
 - Benefits may be particularly high in network markets



- **Lesson:** Even where a network or platform appears to benefit from its affiliation with complementary product providers, and vice versa, the total effects of vertical integration must be kept in mind.
- If the vertical relationships economize on transaction costs by internalizing risk and allowing better innovation and adaptation to changing economic circumstances, then such relationships should not be precluded or punished once the product becomes successful.

Distinguishing Good from Bad Vertical Conduct in Networks



- Chicago School Idea: A monopolist—which, by definition, would have the ability to impede competition in adjacent markets—generally will have no incentive to do so” because it cannot enlarge its profits by doing so. Any reduction in value (or increase in price) of the upstream application will be met by a corresponding reduction in demand (or decrease in profits) for platform sales.
 - Monopolists in one market therefore “internalize complementary efficiencies” in complementary markets. We call this the ICE effect.

Exceptions: ICE Does Not Always Hold



- Platform owners can often raise their profits by price discrimination, and even if one assumes the price discrimination itself to be efficient (which is not always the case), platform owners may discriminate against providers of complementary services in order to facilitate price discrimination.

Example



- A copy machine manufacturer may price discriminate by selling the copier at a low price and metering use through sale of repair services. In order for repair services to be a metering mechanism for price discrimination, the copier manufacturer must receive revenues for all repairs done to its copiers. One way the manufacturer can do this is to withhold spare parts from independent repair firms and to do all the repairs itself, eliminating competition and reducing efficiency in the complementary repair market.
- The important point is that whether or not the underlying price discrimination is itself efficient, that discrimination can be profitable for the manufacturer despite any collateral inefficiency it might cause.



Another Example

- A cable network owner could price discriminate by bundling Internet access with some application, say IP telephony. The network could offer consumers two choices: Internet access for \$30 per month, or Internet access for \$25 per month if the consumer also subscribes to the network operator for IP telephone service.
- To make this bundle profitable, the network operator might discriminate in the terms of access it provides to rival IP telephone providers to put them at a competitive disadvantage.
- So long as the increased attractiveness of Internet subscriptions due to the \$5 discount outweighs the decrease in attractiveness due to the reduced choice of IP telephone services, the network operator may find the collateral damage to the upstream applications market nonetheless to be profitable.



Economic Welfare Effects

- This is not to say that there are no possible welfare benefits from the price discrimination described above. By using discrimination (whether through bundling, metering, or some other mechanism) to extract high surplus from one set of users, a network operator may enable another set of users to have access where they would not under a single-price regime.
- This is particularly so in the case for high-fixed-cost services like Internet access, where price discrimination might allow a network to offer some subscribers access at prices closer to marginal cost because it is recovering its fixed costs from other, higher-paying, customers.



Policy Implications

- The ambiguous welfare effects of price discrimination mean that any rule prohibiting discrimination could have unintended, negative consequences because the conduct sought to be barred—price discrimination—is neither always bad nor always good.

Some Consequences of Network Effects and Dynamic Competition



- **Effects on market structure**: When a network externality cannot be shared among firms, the market can “tip” toward monopoly. AT&T regained dominance in the early 20th century by refusing to interconnect with smaller, rival telephone companies.

Implications for competitive strategy



- Early acquisition of customers is critical in the race to capture a network market. The first firm to gain a lead may become dominant, at least for some period of time.
- Low prices, giveaways and other promotions are likely to be common. The market leader will innovate to avoid sharing its network externality with competitors.

Dynamic effects on innovation and competition



- Network effects will drive firms to compete for the market, and not just for market share.
- Just because one firm becomes dominant does not mean all competitors melt away.
 - Some rivals will try to innovate ahead of the incumbent, initiating a new round of competition that may lead to a new firm's becoming dominant.
- Several firms may be competing in R&D even if there is no current product-market competition.



Non-market strategies

- Legal and political means of obtaining access to the incumbent's networks are likely to be attempted, as shown by the recent history of telecommunications.

Network Externalities Pose Regulatory Challenges



- Network markets may tip toward monopoly: As one network gains a market lead, it offers new customers a greater network benefit and reduces the incentives of existing customers to switch to a competitor. The next customers have even greater incentive to join the leader, creating a cycle that can accelerate toward network monopoly.
- But network monopoly is not, as in conventional markets, clearly bad for consumers, because they receive a large benefit from the network externality that can compensate for monopoly pricing.
- A key question for regulators is therefore whether competition can be introduced without reducing the network externality.
 - ***If the network externality cannot be had without the monopoly, rules designed to end the monopoly may harm consumers. In such cases regulators may therefore have to make trade-offs between conventional price/output objectives and network externalities.***

Access, Interoperability, and Network Regulation



- Interconnection, access, and interoperability become key policy instruments in regulating networks
- These tools are more important than retail price regulation, which can deter innovation and dynamic competition by reducing the payoff for competing R&D efforts.
- Interconnection and interoperability, on the other hand, try to preserve competition among firms that collectively provide consumers with a network benefit.

Regulation when Competition and Network Externalities can Coexist



- When interconnection or inter-operability of networks is possible, then multiple networks can compete and jointly create the network externality for each network's consumers.
- But this does not mean regulators should mandate maximum interconnection whenever technologically possible.
- Interconnection has costs:
 - Short-run costs of putting in place the facilities through which interconnection occurs—often a minor concern.
 - Long-run costs of deterring innovation and network investment: A firm may invest less in its network if the benefits of that investment will be shared by interconnecting rivals.



Two Hard Questions

- **Intervention in evolving network market:** Should regulators intervene to ensure sustained competition in an evolving network market, and if so to what extent?
- **Remedies for a network monopoly:** If a network monopoly arises, should regulators try to limit the duration of the monopoly or otherwise constrain its behavior? And if so, how?



Basic Lessons

- Network regulation will always have both costs and benefits
- As markets and technologies change, marginal costs and benefits may change
- Regulation of network industries is therefore likely to evolve over time as the comparative costs and benefits of regulation change.

A Simple Example—the Horizontal Case



- Suppose 2 competing telephone networks have entered a market and the larger refuses to interconnect with the smaller.
- Regulatory question: Should the government require the networks to exchange calls?
- Benefits of regulation:
 - (1) **Price competition**: Consumers get lower prices than under monopoly and get an even higher network benefit as overall demand grows in as a result of the lower prices.
 - (2) **Non-price competition**: May induce the rivals to introduce vertical features (like voice mail or caller ID) to attract customers.



(Simple example, cont'd)

- Costs of regulation:
 - (1) **Reduction of beneficial investment:** network owners may have less incentive to invest in network improvements that rivals can share.
 - (2) **Increase in wasteful investment:** network owners may have incentive to invest in sorting and degrading the quality of traffic from the rival's customers.



(Simple Example, cont'd)

- How regulators decide what tradeoffs to make, and whether they should mandate interconnection, can shift over time.
- Consider a 3-period scenario:



Period 1

Early period of network development: If there is not yet full deployment of the network, investment in infrastructure may be more valuable than competition among the developing networks. One \$ invested in the network has greater social value than one \$ saved on price. Long-run network benefit due to deployment is greater than short-run network benefit from interconnection. ***No mandated interconnection.***



Period 2

Mature period of network deployment: Networks are fully deployed and the market structure might be monopolistic or divided among a few firms. Now, one \$ saved on price might have higher value than one \$ invested in the network. Short-run network benefit from interconnection is greater than the long-run network benefit from marginal deployment. If the firms have not voluntarily interconnected, ***mandate interconnection.***



Period 3

Period of technological change: The original network becomes outdated and needs renewed investment. As the value of the services the old network can support declines compared to the services an updated network could support, the marginal value of one \$ saved on price declines relative to the marginal value of one \$ invested in the network. Long-run network benefits of new service deployment are higher than short-run benefits of new service interconnection.

Deregulate interconnection, at least for new services and infrastructure.

Simple Example—Vertical Dimensions



- Imagine that one of the two competing telephone companies in our example introduces a vertical service, voice mail perhaps.
- Two regulatory questions arise:
 - (1) Must the firm allow other telephone companies access to its voice-mail service?
 - **A possible tradeoff here is between investment in vertical services and competition in basic telephone service.**
 - (2) Must the firm allow other voice-mail providers to serve its basic telephone subscribers?
 - **A possible tradeoff here is between investment in vertical services by outside firms and investment by the network owner in the underlying network if such investment would benefit unaffiliated vertical competitors.**



(Cont'd)

- Of the two sets of tradeoffs above, (2) is probably the more important. As a general matter of competition policy we generally let firms benefit from their proprietary innovations and prefer to let the market force rivals to come up with their own competing innovations, so (1) is of less concern.
- With respect to (2), network access for rival providers of vertical services, we have greater concern because of the practical impossibility and social undesirability of requiring a small creator of a vertical service to also integrate into ownership of a network over which to provide that service.



(Cont'd)

- The benefits of competition in vertical services may be very high, but they will not always be higher than investment in the underlying network.
 - As in the horizontal case, the relative values of the activities might change over time.
- If network regulation is to enhance welfare, it cannot be static.



Lessons from the Simple Example

- Regulators intervening in network markets must be sensitive 2 things:
 - (1) Whether market participants will provide efficient levels of interconnection without regulatory intervention;
 - (2) What the welfare tradeoffs are from regulated interconnection at a given time in the development of the relevant market.
- In sum, regulators must decide whether regulation is necessary to achieve interconnection and whether interconnection will on the whole be beneficial.