

1. Why do network effects generate winner-takes-all markets?

Institutions: Ownership and Integration

Property rights may help solve externality and investment problems.

Specifically, when there is a single owner of the network, that firm may be willing to sponsor the network by making investments in its growth that competitive hardware suppliers would not. The **video game** industry offers a good example of sponsorship: **Nintendo**, **Sega**, and Atari all sell proprietary hardware and complementary software. It appears that these firms take lower profit margins on hardware than software, recognizing that hardware sales contribute to a large proprietary network and thus stimulate future software sales.

Video games are a great product. Okay. Let's take a look at what Nintendo did to create such a great product. [If the answer is that Nintendo was a monopolist, say: Essentially true. But being a monopoly seller of a poor product isn't going to make you rich. So, before looking at why Nintendo had (almost) no competition, let's take a look at what Nintendo did to create a great product in the first place.]

Strategies to Attract Users to Networks

The sponsor of a hardware/software network has various strategies available to expand the network by convincing consumers that software will be inexpensive in the future. If the network sponsor can make binding commitments, a promise to keep future prices low or to provide a variety of software will suffice.

2. Why is commitment important for customer expectations and adoption?

If the network sponsor cannot make such a firm pricing commitment, then there is a credibility problem. This case is important in practice. After all, consumers buying **Nintendo** hardware lack any assurance as to the future price of **Nintendo**-compatible software, automobile dealers rarely make specific

promises about the future prices they will charge for service or spare parts, and it would have been very difficult for Apple computer company to make price, quality and variety commitments for third-party software that runs on Apple's machines. What strategies or signals might be used in this case?

One possibility is that the network sponsor can indirectly commit itself to a price path involving "competitive" second-period prices by opening the market to independent software suppliers. This is a form of second-sourcing, whereby a firm establishes an alternative source of supply to assure customers they will not be exploited (Farrell and Gallini, 1988). In practice, this may entail establishing an "open" system, so that third parties are permitted to supply components for the sponsor's system on a royalty-free basis.¹⁴ Perhaps the most well-known example of this type of strategy is IBM's decision to encourage independent software developers to write IBM-compatible software when IBM introduced its PC. Similarly, **Nintendo** had a very active program of third-party software suppliers for its **video game** system (but charged them royalties).

3. How does this affect pricing strategy?

A more direct approach is for the network sponsor to make sunk investments that commit it to the supply of software, and to communicate this to consumers. By lowering the marginal cost of software, the optimal price will fall as well. **Nintendo** adopted this strategy when it introduced its **video game** system into the United States.

Competition Between Incompatible Systems

4. How does this affect entry strategy?

So far, we have analyzed one system in isolation. We turn now to competition between "incompatible" systems. Two communications networks are incompatible if subscribers on one network cannot communicate with those on the other network. Two hardware/software systems are incompatible if the components of one system do not work with components of the other system.¹⁶

Examples of incompatible rival systems are in the newspaper almost every week: VHS vs. Beta in videocassette recorders; phonographs vs. cassettes vs. compact discs vs. digital compact cassettes in audio equipment; analog vs. digital protocols for cellular telephone systems; **Nintendo** vs. **Sega** vs. Atari in home **video game** systems; 5 1/4 vs. 3 1/2 floppy disks and disk drives; e-mail vs. fax machines in instant written communications; conventional color television signals vs. high-definition signals in color television; and Visa vs. American Express vs. Discover in credit cards. The list can go on. Incompatible systems also can represent different generations of a single core technology: the **Nintendo** Entertainment System and the Super **Nintendo** Entertainment System accept different game cartridges.

Competitive Strategies in Systems Markets

Because a firm with a small, initial advantage in a network market may be able to parlay its advantage into a larger, lasting one, competition in network industries can be especially intense—at least until a clear winner emerges. One would expect the promotional strategies identified above for a monopoly network to be used quite aggressively in systems competition. For example, dramatic penetration pricing may emerge as the equilibrium outcome, as each firm seeks to establish an installed base and achieve leadership in a systems market.¹⁸ If the ultimate outcome is going to be one of tipping to a single system, the firms are effectively bidding for future monopoly profits. At the same time, it is important to recognize that merely observing a firm with a position of market dominance does not imply that the firm is earning supernormal profits: the firm's quasi-rents may merely reflect costs incurred earlier to obtain the position of market leadership.

5. Describe and explain a strategy that firms use to overcome this problem.

Early and visible sunk expenditures on software may signal to consumers that a hardware supplier is committed to the development of software, as noted above. In the context of systems rivalry, vertical integration of hardware manufacturers into software, or exclusive contracts for use of software, not only

allow the hardware supplier to gain assured access to software, but can also serve to deny access to that software to rival hardware manufacturers. **Nintendo** adopted this strategy by signing exclusive contracts for games developed by third parties, making those games unavailable to **Nintendo**'s rivals, Atari and **Sega**.

Institutions for Achieving Compatibility

Given that firms often disagree on the desirability of standardization, the market outcome may be strongly influenced by the process by which products are made compatible. If side payments are feasible, then it is more likely that the firms will be able to harmonize their interests and adopt the compatibility regime that maximizes industry profits. In this case, the change in consumer surplus is the only remaining wedge between the private and social compatibility incentives.

When side payments are infeasible, one must distinguish between markets in which a firm can unilaterally impose compatibility (say, by building an adapter) and markets in which a firm can unilaterally impose incompatibility (say, by using a proprietary interface). Suppose that one firm favors compatibility, while another opposes it. When the first can unilaterally attain compatibility, that will be the outcome. But when the other firm can unilaterally block it, incompatibility will be the result. For example, **Nintendo** has successfully employed a "lock-out chip" to prevent unauthorized game cartridges from being played on **Nintendo** hardware, but Gillette has found it difficult to prevent rivals from making blades that fit into Gillette razors.