

# The Economic Fundamentals of the Digital Economy

The basic features and the implications on  
market structure

# The Digital Economy: A definition (1)

- One useful definition of the Digital Economy is that it revolves around the creation of intellectual property in the form of computer code and includes
  - Computer software
  - Internet-based businesses (such as Internet service providers and content providers),
  - Communication services and equipment designed to support the first two markets,
  - ...

## The Digital Economy: A definition (2)

- The digital economy has three basic characteristics
  1. Intellectual property rights (and their cost structure)
  2. Network effects (direct and indirect)
  3. Rapid and disruptive innovation
- These features have strong implications on market structure

# Basic features of the digital economy: Intellectual property and its structural implications (1)

- Intellectual property is a critical feature of digital economy.
- The creation and application of knowledge (es. production and distribution of new software) typically involves a *high fixed cost and a low marginal cost*
  - The fixed cost is the expenditure incurred in discovering new knowledge
  - The marginal cost is the expenditure incurred in selling the object of that intellectual property and distributing it to a consumer
- There are often scale economies associated with the creation and distribution of intellectual property
- The existence of scale economies, and the particular cost structure (high fixed cost and low marginal cost) can produce highly concentrated markets.

## Basic features of the digital economy: Intellectual property and its structural implications (2)

- In some cases fixed costs can be low in absolute terms. Some examples:
  - Facebook can supply the entire market with social networking services with fixed costs far lower than those of AT&T supplying local telephone service to the entire market in the pre-cellular days of wireline systems.
  - The same is true for Amazon (online retailer) vs. Walmart (traditional retailer). Amazon can provide retail services to a “global” territory without building a wide network of brick-and-mortar shops.
- When the fixed cost is largely composed of the cost of creating knowledge as opposed to the construction of plants and facilities, potential competition may be a more viable threat in Digital Economy industries than in traditional ones, in spite of scale economies

# Basic features of the digital economy: Direct network effects

- A product or service has network effects when its value to a consumer increases with how many other consumers use it.
- Examples:
  - *Communication networks, such as telephone systems, email, text messaging, and social networking sites.* The more people who are connected to a communication network, the more valuable it is to be part of that network because there are more people with whom to communicate
  - *Software programs for which users want to share files.* A program with many users is more appealing, because there are more people with which one can exchange files (Microsoft Word vs. Word Perfect).

# Basic features of the digital economy: Indirect network effects

- In some cases, network effects operate indirectly. Examples:
  - Operating Systems (OS). The value of an OS to a consumer depends on the supply of software applications written for that OS. The more apps that are written for it, the more value a consumer will attach to the OS and the more likely it will be bought. Of course, software developers are more inclined to write an app for an OS with more users, as then there are more potential buyers of that app. We then have a network effect: The more consumers who buy an OS, the more apps will be written for the OS, which then makes the OS of greater value to consumers
- Indirect network effects can also concern complementary products: the more consumers who buy a product, the more complementary products are produced for that product, which then enhances the value of the original product. Examples:
  - Smartphones and accessories (covers, chargers etc.)
  - Smartphone operating system platform— such as Apple's iOS and Google's Android— and apps written for the platform
  - Video game platforms— such as Microsoft's Xbox, Sony's PlayStation, and Nintendo's Wii— and the games written for those platforms. The more consumers who use a PlayStation, the more games are written for the PlayStation, which enhances the value of owning a PlayStation

## Direct and indirect network effects at work: A «pre-digital» example

- Consider local telephone services at the turn of the twentieth century:
  - The construction of a physical network of wires was a very large fixed cost, while the marginal cost of adding a consumer to the network was small (at least in urban areas where population density was high)
  - That an American Telephone & Telegraph (AT&T) customer could only connect with someone who was also an AT&T customer created strong network effects. The more customers that AT&T had, the more attractive it was to join AT&T
  - The combined result of the two “forces” was that while initially there were competing local telephone systems, ultimately only one company, AT&T, prevailed



# Basic features of the digital economy and market structure

- Both high fixed cost—low marginal cost and network effects will contribute to a few firms (perhaps, just one) operating in a market
- Furthermore, these two forces can reinforce each other to produce and sustain market dominance through the process of innovation
- Consider an innovation that produces a better product or service for consumers. The profits earned from that innovation will depend on two factors.
- The first is *the firm's share of the additional value that the innovation creates*.
  - If a firm anticipates that consumers will capture all gains from the innovation, then it would not invest in research and development (R&D). It is then critical that the firm be able to appropriate a sufficient share of the new value created.
- The second factor is *how many consumers will benefit from this innovation*.
  - The total profit generated by the innovation can be expressed as  $(\alpha v - c) Q - F$ , where  $v$  is the economic surplus created on average by the innovation for each unit sold,  $\alpha$  is the share of the surplus captured by the firm (in which case  $\alpha v$  is the revenue earned for each unit sold),  $c$  is the marginal cost of each unit sold (which for intellectual property is typically quite small),  $Q$  is the number of units sold, and  $F$  is the fixed cost of the innovation.
  - The profitability of the innovation is increasing with  $Q$ ; the more consumers who can benefit from the innovation, the larger the revenue generated will be. Another way to think about it is that investing in R&D is profitable if and only if  $\alpha v - c > F/Q$ .

## Again on market structure: Network effects, market share and the incentive to R&D

- A large customer base and a high incentive to invest go hand in hand, which can help to build and reinforce market dominance
- Network effects will tend to result in a high market share and a high customer base (large  $Q$ ) that would benefit from an innovation that improved the product or service being offered
- Hence, a big firm is more likely to find investing in innovation to be profitable, which will serve to perpetuate its dominance
  - *Example.* Social networking sites, such as Facebook and LinkedIn; each site dominates its market because of network effects. With Facebook's large customer base, incurring a fixed cost to develop a better service has a large financial return. A better service, even if quite small (such as Facebook's introduction of the Like button in 2009), will cause each user to spend more time on the site, which, when aggregated across its immense customer base, will attract many more advertising dollars to Facebook.

# Basic features of the digital economy: Rapid and disruptive innovation

- Disruptive innovation must be distinguished from incremental innovation
  - Incremental innovation refers to modest changes in the services provided, such as eBay's "Buy it Now" option or Amazon's "1- Click Ordering." Continual incremental improvements of that sort are an integral part of online markets, because it is easy to change a website (especially compared to changing a manufacturing process)
  - Disruptive innovation is an innovation that has the potential to displace what is considered to be the best product or service in the market. Examples:
    - Google's Page Rank algorithm vs. AltaVista, Lycos, and Yahoo;
    - Atari originally dominated the video-game industry, Nintendo became the new market leader after launching the 8-bit Nintendo Entertainment System in 1985. Later, Sony took over leadership with the arrival of the 32- bit Play-Station in 1995 etc.
- Digital markets continue to be disrupted by the next best technology, which may come from an existing or new firm.

# Competition and disruptive innovation in the digital economy

- Competition from firms with new technologies— rather than competition from existing rival firms—is often the more important force in New Economy industries
- A high rate of disruptive innovation implies the regular supplanting of dominant firms (in standard industries, competition typically focuses on prices and product traits among existing suppliers, and innovation is mainly of the incremental kind)
- Rapid and disruptive innovation also has significant welfare implications. Improvements in products and services (rather than lower prices) are the primary source of consumer benefits. But....
- It is difficult to predict when and from where the next disruptive innovation will come, and thus to what extent any current abuse of market dominance will soon be constrained or made irrelevant by the arrival of a new competitor

# The basic features of digital markets

- The focus of the study of competition in the digital economy is not on how firm behaviors affect static efficiency through their impact on prices, products, services and costs, but on their effect on dynamic efficiency in creating novel products and services and producing major technological improvements that drastically lower costs
- Three main features emerge:
  - The rational expectation of significant market power for some period of time is a necessary condition for dynamic competition to exist. If dynamic competition is healthy, the presence of short- run market power is not a symptom of a market failure that will harm consumers
  - One expects leaders in digital markets to charge prices well above marginal cost and to earn high profits. It is natural in dynamic competition, not an indicator of market failure, for successful firms to have high rates of return, even adjusting for risks they have borne
  - Although static competition is rarely vigorous in the digital economy, the key determinant of the performance of these industries is the vigor of dynamic competition

# The competition for the market and its consequences

- In digital economy industries, the primary force is competition for a market rather than competition in a market. As a result
  - Traditional measures of market competition— such as market concentration, price-cost margins, Lerner indices— are less meaningful
  - Market definition is less useful because competition can come from anywhere (and, therefore, from outside any conventional definition of a market) and could ultimately change what exactly is the market
  - The relationship between market concentration and price is rarely a primary consideration to understand how competition works. More important is the role of potential competition and, in particular, the ease with which a firm with a superior technology could succeed (can a better search engine easily supplant Google? Can a superior operating system take the market from Microsoft? Can a more attractive and efficient auction site induce buyers and sellers to leave eBay?)
  - The heightened importance of potential competition above actual competition means that the acquisition by a dominant firm of an existing rival can be less harmful than the acquisition of a nascent technology owned by a noncompetitor that could prove to be a disruptive innovation

# The main differences between competition for the market and competition in the market

- In the digital economy, the relationship between price and cost is less informative of market power and efficiency than in the traditional economy
- The nature of markets in the digital economy often results in equilibrium prices being largely unrelated to cost. In the case of products with network effects, price may be set very low to attract consumers, build the customer base, and thereby enhance the value of the product.
- For some products and services, price is set at zero (and thus below marginal cost) even in the long run (examples: It costs nothing to use the Google search engine and to be listed under the organic results, though advertisers pay for sponsored listings; it costs nothing to join, post, and message on Facebook, though again advertisers pay; it costs nothing for a buyer to use the services of eBay, though sellers pay a fee to list a good and a commission when the good is sold)

# The main differences between competition for the market and competition in the market: mergers and acquisitions

- In the traditional economy, horizontal and vertical mergers can be a strategy to establish dominance. And in the digital economy?
- Some of the acquisitions include PayPal (\$1.5 billion in 2002) and StubHub (\$310 million in 2007) by eBay; YouTube (\$1.65 billion in 2006) and Motorola Mobility (\$12.5 billion in 2011) by Alphabet (the parent company of Google); Skype (\$8.5 billion in 2011) and LinkedIn (\$26.2 billion in 2016) by Microsoft; and Instagram (\$1 billion in 2012) and WhatsApp (\$19 billion in 2014) by Facebook.
- Very few proposed transactions were considered to have the potential for anticompetitive effects
  - Google's acquisition of Doubleclick (\$3.1 billion in 2011) was criticized by competitors on the grounds that Doubleclick's market power in the ad serving market would enhance Google's position in the search ad market, but the FTC found little basis for that complaint
  - Google's acquisition of ITA Software (\$676 million in 2011), raised some concerns at the DOJ that Google might withhold, degrade, or raise the price of the travel data that ITA provided to other companies serving the flight search market. The acquisition was approved with a conduct remedy
  - The one notable transaction that did not occur was when Yahoo! sought to buy Google in 2008, at which time their combined market share in the general search engine market was over 80 percent. Yahoo! jettisoned its plan after the DOJ expressed that it was likely to challenge it.
- Overall, merger activity in the New Economy has not been constrained by competition authorities due to the lack of identified anticompetitive effects



# The main differences between competition for the market and competition in the market: collusion

- In the general economy, collusion is most common in markets with homogeneous goods or services, such as cement, chemicals, shipping, and vitamins
- Though a lack of differentiation among products and services is not typically a feature of New Economy industries, the desire to coordinate for the purpose of constraining competition is ever present
  - In the e-books case, Apple was found guilty of organizing a conspiracy among book publishers with respect to how they are compensated (and which would have impacted the prices paid by consumers). But: was it a challenge to the market dominance of Amazon?
- There is an increased opportunity for collusion in online retail markets due to enhanced price transparency and the use of pricing algorithms.