

# Lecture # 24 – Economics of the Internet: Net Neutrality & the Digital Divide

## I. File Sharing and Copyright Laws (continued)

- Empirical evidence – how has piracy affected sales?
  - Difficult to study because illegal
    - Two approaches
      - Do album sales fall when music more likely to be pirated?
      - Surveys
    - Challenges
      - In a cross-section (e.g. surveys of individuals), people who like music more likely to both pirate and buy more than others, biasing towards a positive correlation
      - In a cross-section of products, popular products will be both pirated and purchased more frequently, leading to a similar positive bias
      - A panel data helps, but only controls for unobserved fixed individual differences
      - If tendencies to buy and/or pirate change over time, won't help
    - Results
      - Cross-section approaches find little effect of piracy on sales
        - Expected given the biases above
      - Instrumental variable studies
        - Attempt to remove the bias
        - Zester (2006) instruments for P2P activity with measures of computer sophistication
          - Finds negative relationship (30% reduction) between piracy and sales using IV, compared to positive relationship using OLS
      - Studies using different groups
        - Pietz and Waelbroeck (2004): countries with higher Internet penetration have smaller growth of CD sales
      - Panel data studies
        - Rob and Waldfogel (2006) and Waldfogel (2010) find displacement around 10-20% using individual-level panels
        - Studies using product-level panels find mixed results
          - Oberholzer, Gee, and Strumpf use German vacations as instruments (more downloading when home) and find no effect on sales
          - Blackburn (2004) uses RIAA lawsuits in 2003-4 as instrument
            - Finds no effect of piracy overall, but some reduction in sales for better-known artists

- Has piracy affected supply of new music?
  - Difficult to measure supply
    - Looking simply at the number of songs or albums available may skew results
      - Most recordings have few sales
      - 97,751 new albums released in 2009
        - Only 2050 sold over 5,000 units
      - Thus, surplus is not proportional to available titles
    - Waldfogel wants a count of products above a certain quality threshold – that is, what is popular
      - Waldfogel (2011) uses a compilation of lists that track music trends
        - Rolling Stone 500 best albums list of 2004 is an example
        - Is this measure valid?
          - There is substantial agreement in the lists for the music included since 2000 – the post Napster period
          - These albums do generate higher sales
        - Perhaps established artists continue, but it becomes more difficult for new artists to emerge
          - On the best of 2000s lists, most debuted post-Napster, suggesting not a concern
  - Waldfogel notes that while profit-maximizing firms distributing music will have upward sloping supply curves, the art of making music is a solitary activity
    - New technology makes it possible to bypass recording companies
      - Distribution is much cheaper using iTunes
- What is appropriate pricing?
  - Might price discrimination be efficient?
    - If one person buys a CD only to play in a CD player, and a second also copies files to play in an MP3 player, the second person gets more benefits from the CD.
    - If the price of the CD captures the second person's benefits, might the first person be priced out of the market.
    - If the price captures the first person's benefits, the recording company is missing out on some consumer surplus.
  - Note that pricing choices are important
    - By initially charging high prices for videos, movie studios encouraged the development of rentals
    - Led to increased demand for VCRs
    - Disney was the first to lower prices of videos, generating larger sales
      - Thus, if sharing is possible, need lower prices
      - But, lower prices may generate enough volume to raise revenue

- Alternatives for distribution of music
  - Perhaps music should be distributed cheaply. Stars can make money by other means, such as concerts, that are rival goods.
  - Pay per file (e.g. i-Tunes)
  - Subscription services
    - Some music companies have proposed subscription services where users pay a monthly fee for access to music on computers (e.g. Napster)
    - Unlimited downloads available, but can only be used on that machine, to prevent copying.
    - 2005 OECD report notes that, while artists receive 1/10th of the price of a download, similar to what they receive for CDs, they are likely to earn less because people may choose to download one track, rather than a whole CD.
  - Note how the limitations of the technology (here, preventing copying) shape the nature of the solutions.
  - A tax on music storage devices (e.g. MP3 players, CD-R drives)
    - In Canada, makers of recording devices are required to pay a fee, called the Private Copying Tariff that is given to the music industry.
    - Similar fees are used in the U.S. (e.g. 3% for blank tapes)
    - Concern: What about people who use discs to store data? Is it fair that they pay the fee?
  - Cross-subsidization (e.g. free streaming music with a cell phone plan)
- Alternative policy options
  - Stop Online Piracy Act (SOPA)
    - Considered by Congress in 2011
    - Controversial, and did not pass
      - Raised concerns about censorship
    - Would expand authority to protect copyrights
      - Would have barred credit-card firms and advertisers from dealing with foreign sites that violate copyright
        - Note challenge of international jurisdiction makes addressing piracy difficulty
      - Would have asked search engines to take down links to offending sites
      - Required ISPs to block offending domain names
        - Entire domains could have been blocked because of one offending page
  - Strengthening copyright protection.
    - Rather than allowing exemptions that make it unclear when copyrights are infringed, creators should be given the exclusive right of commercial exploitation of their work.
    - This would likely lead to litigation to determine whether infringement has occurred.

- Requiring copyright holders to renew copyrights every five years.
  - In addition, a “use it or lose it” provision would require copyright holders to make their work available to the public.
  - Those unwilling to make a work available to the public would be required to grant a license to those wanting to distribute the work.
  - Would aid distribution, but would weaken existing copyright protection.
- The use of sophisticated encryption technology to discourage reproduction of copyrighted materials.
  - Many firms already make use of such technology.
  - Makes copying more difficult. However, with digital distribution, only one copy is needed for mass distribution.
- Taxing Internet access and the equipment used for such access.
  - Under this proposal, downloads of digital material would be tracked, and the revenues of the tax distributed to copyright holders.
- Digital rights management software (DRM)
  - Allowing creators to determine who can read, copy, or forward files.
    - E.g.: e-mails could be allowed to “expire”.
  - This solution lets markets decide.
    - For example, consumers can refuse to purchase technologies with too many restrictions.
  - Avoids imposing a particular technology, and possibly hindering innovation.
  - Note how this serves to privatize information: “The basic problem is that DRM is trying to turn information into something other than information so you can’t pass it on.”
  - Digital Millennium Copyright Act (DMCA) of 1998 supports this option, by legislating that “no person shall circumvent a technological measure that effectively controls access to a work protected.”
  - However, the industry seems to be moving away from DRM.
    - In the late 2000s, Apple negotiated variable pricing for songs in return for dropping DRM
      - Companies began to drop DRM because downloads were occurring anyway, and DRM is inconvenient for legal users
      - Note that dropping DRM hurts Apple’s market power with iTunes
- The news media face similar challenges
  - Smaller newspapers are closing
  - Broadcast news ratings are falling
  - Audiences are split across more sources
    - More people get news from Internet than from newspapers
    - People tend to seek out sources they like, rather than read a single source of news

- Like music, there are fixed costs to production, but the marginal costs of distribution are near zero
  - Enables large sources (e.g. *The Guardian*, *LA Times*) to reach a broader audience than before
  - Demand at web sites may fluctuate (e.g. political sites popular near elections), but less costly for the company than for newspapers, since few fixed costs to cover
- Internet has also increased competition
  - Newspapers used to be local monopolies in most towns
  - There are so many similar stories about general news that charging would be difficult
- Prospects for charging for news
  - Despite these challenges, advertising revenue is not enough
  - Payment options
    - Allow first articles free, but charge frequent readers
      - A form of price discrimination
      - Lets casual reader brought to a site see the article, but generates money from those with higher demand
    - Wall Street Journal only charges for certain types of articles
      - Deals with issue of having many substitutes for some types of news
      - Charge for more specialized articles
        - These will face less competition, and those who want to read it likely have higher WTP
    - Micropayments
      - Pay small amounts per article
- Aggregators
  - Collect thousands of stories with links to the full article
    - 22% of referrals to news sites come from search engines like Google
  - Make money via advertising
  - Some offer commentary as well (e.g. Drudge Report or Huffington Post)

## II. Regulation of IT Networks

### A. Convergence of Technologies

- Regulatory issue: convergence of technologies
  - As media providers move into new platforms (e.g. digital phone, television via fiber optic cable providers such as Verizon), regulation needs to keep up.
  - Traditionally, these firms have been covered by separate standards.
  - Why convergence?
    - Convergence can help cut costs, retain customers, and provide new revenue streams.
      - For example, as more people move away from land-line phones, providing Internet service or TV is a new source of revenue for telecommunication companies.
    - Similarly, if telecommunication companies bundle services, clearly cable companies want to as well.
  - Key questions
    - Should incumbent operators share next-generation networks with rivals?
      - The goal is to make sure firms face competition.
      - US does not require Verizon and AT&T to make high-speed networks available to others.
        - Instead, regulators view an alternate technology (cable) as competition, as 95% of homes have cable.
        - However, the US auction of wireless spectrum in January 2008 required the winning bidder to accommodate any mobile device that doesn't harm the network.
          - This was the first time that the US required a network be open to rival companies.
          - The FCC hopes this will encourage innovation.
            - The spectrum being allocated is that currently used by analog television.
            - Because it travels long distances, it could be useful for a nationwide network.
      - The UK requires that BT make its network open to rivals.
        - Key difference: in the UK, only 50% of homes are wired for cable.
    - Should firms be allowed to offer multiple media?
      - Some countries, such as Japan, do not allow it.
      - In the US, it is allowed, but telecoms need approval from local authorities.
        - To avoid this, the industry is lobbying for federal regulations.
        - Cable companies offer this is unfair, as they must provide coverage throughout their markets. Without



## *B. Network neutrality*

- High-speed Internet providers currently provide equal access to all users.
    - Both users and content providers pay access fees to Internet service providers (ISP)
      - There are fixed fees for access, and may be variable usage fees depending on bandwidth or time used
      - However, all users are charged the same prices – there is no price discrimination
  - Information on the Internet is sent as electrical signals through phone wires, cable networks, or fiber optic lines.
    - These lines are expensive
    - Companies running lines directly to homes and businesses (the “last mile”) have market power.
    - Example: Level 3 vs. Comcast
      - Level 3 provides a “highway” that handles traffic between web sites
        - Has a contract with Netflix
      - Comcast customers use their ISP to access the highway (e.g. as on-off ramps)
    - In 2010, the FCC announced plans to classify the last mile as a “telecommunications service” rather than a “information service”
      - FCC regulates providers of telecommunications services
        - When ISPs used telephone lines to reach consumers, this last mile was regulated
        - Changed as consumers moved to broadband
          - Most other developed countries have extended open access to other service providers
      - Providers cannot discriminate across users
        - Common carriage
      - Providers must pay into a fund that subsidizes rural networks
- Two-sided markets and network effects
  - Internet access is a two-sided market – both users and content providers pay for access
    - Shopping malls, credit card payment services are other examples
  - In such markets, network effects are important
    - More users increase the value of a service
      - Provide more customers to content providers, more services for customers
    - At the same time, negative network externalities, such as congestion, may occur
    - In such networks, different pricing for different users may make sense
      - E.g. credit card companies charge merchants, but often subsidize customers

- In January 2014, a Federal appeals court ruled (*Verizon v. FCC*) that the FCC does not have authority to enforce net neutrality
  - FCC was planning to appeal
  - FCC proposed new rules on February 19, 2014 that would restrict, but not outlaw, discrimination
    - Would require providers to disclose practices
      - Those that “strayed from their promises” would face greater enforcement
- Some have proposed charging bandwidth-intensive users (e.g. Google, Netflix, Yahoo) for operating these networks.
  - These charges would be to a specific ISP (e.g. Comcast)
    - These are known as termination fees, based on usage in telephone networks, where one network charges another to “terminate” its calls
  - Those that pay will receive priority for their Internet traffic.
    - For example, could be used to provide faster downloads for videos or games.
  - Telecommunications companies say this will encourage more investment in infrastructure.
  - The *NY Times* article on Comcast vs. Level 3 (a Netflix partner) is an example
    - Level 3 accuses Comcast of charging a new fee to Internet video companies
      - Level 3 has a contract with Netflix
      - Comcast customers use their ISP to access the highway (e.g. as on-off ramps)
    - Comcast wanted Level 3 to pay a recurring fee to transmit movies to Comcast customers
      - Note that Netflix at the time had 20% of US download traffic
      - Comcast said that the increased traffic from Netflix placed an unfair burden on its network and its customers
    - At the time, Comcast was merging with NBC Universal
    - A concern was that NBC content would be favored
      - E.g. by having faster streaming than competitors
      - Netflix was a direct competitor for the types of content provided by cable companies
  - Comcast also briefly slowed access to file sharing sites in 2007, but stopped after advocacy groups complained to the FCC
  - After the court ruling in 2014, Netflix and Comcast announced an agreement through which Netflix would pay Comcast extra for faster access
    - Netflix said its customer had been experiencing delays
    - Comcast said that they weren’t the cause
      - Rather, they said that the intermediaries Netflix uses to deliver content to Comcast were trying to provide too much data at one time

- Arguments for net neutrality
  - Network neutrality reduces the cost of access
    - In essence, it subsidizes content creation
  - Increases competition by making it easier to switch ISP
    - If companies could discriminate, different providers might have access to different content
    - Cable and satellite TV is an example
  - Proponents of net neutrality argue that price discrimination will stifle innovation, as start-ups will not have the same quality access as large firms.
  - Transaction costs make charging a non-zero price difficult
    - There are many small content providers (e.g. blogs)
  - They are pushing for legislation to mandate net neutrality.
    - So far, has not passed. Democrats tend to favor, but some pro-union Democrats are opposed because telecom unions are concerned the regulations would lower investment in new infrastructure, costing them jobs.
  - Justification for common carriage – initially applied to transportation, but the Economist argues that the same principles apply to IT
    - Transporters have a natural monopoly
      - Need to be restrained from using it
    - Transporters often use public infrastructure
      - Should be required to provide public service in return
    - Transport essential to commerce
- Arguments against
  - Cable companies already compete against telephone companies for the last mile
  - As a result, companies such as Verizon have invested in fiber optic networks to stay competitive
    - Only true, however, in densely populated areas
  - Key question: if net neutrality continues, how will firms pay for telecom infrastructure investments?
    - Will costs be passed on to consumers?

### III. What is the Digital Divide?

- The “Digital Divide” refers to gaps in access to information technology.
  - The gaps can be:
    - Across nations (e.g. compare access in Africa vs. North America)
    - Across regions (e.g. urban vs. rural access)
    - Across income levels (e.g. poor vs. high income families)
- Key questions:
  - Why is the digital divide (not) a problem?
    - Clearly, equity issues are involved.
    - However, we don’t get upset about differences in diffusion of DVD players, for example. Why is IT different?

- Is the divide a short-term phenomenon, due to diffusion, or a chronic problem?
  - Recall that diffusion typically follows an S-curve.
    - If learning by doing makes new technologies cheaper, it would not be surprising for high-income people to be the early adopters.
      - Figures 12.1 & 12.2 in the Compaine paper show the costs of selected technologies falling over time. In fact, costs have fallen more quickly for computers.

#### IV. The Digital Divide in America

- Historical perspective
  - Universal access to information goes back to the Communications Act of 1934, which required access to telephone service throughout the U.S.
    - Until that time, rural areas had been underserved.
    - Led to nationwide averaging of phone rates – the price of phone service is not dependent on the cost of providing service.
    - The key economic issue is the possibility of a network externality. Does everyone benefit from universal service, by being part of a complete network?
  - Later, the digital divide referred to ownership of personal computers.
  - Now, it refers to Internet and telecommunications access.
- Broadband gaps within the US
  - US broadband service is generally slower than in other countries.
    - US ranks 35 out of 148 countries in Internet bandwidth (measure of capacity)
    - US ranks between 14th and 31st for average connection speed
  - Service varies by region
    - Fastest speeds in NE corridor
    - Some cities that built their own networks have fast speeds
      - Examples include Bristol, VA, Chattanooga, TN, and Lafayette, LA
        - Their cities are comparable to foreign countries
        - Can be expensive
          - Chattanooga: Internet service with 1GB/second speed costs \$70/month
          - Lafayette: Internet service with 1GB/second speed costs \$1000/month
          - Compare to Seoul, where similar service is subsidized and costs just \$31/month
    - Rural areas may lack service
      - Roughly 18 million rural Americans lack access to reliable broadband networks
      - The community in the *Economist* article “Sweet land of subsidy” provides an example

- Other municipalities focus on providing free Wi-Fi
    - Philadelphia and San Francisco are examples
    - Does this make sense?
- Who benefits from access?
  - *NY Times* article cites a study where doubling broadband speed increases GDP by 0.3%
  - However, another study found that broadband expansion does not increase average wages or employment rates
- Compared to other technologies, such as television, microwave ovens, and automobiles, the rate of Internet adoption has been fast. Why has adoption been fast?
  - Rapidly declining costs and increasing power of the hardware.
  - Improved ease of use
    - Point & Click operating systems make using a computer simple.
  - Increased availability of local Internet service providers (ISP).
    - By 1998, just four years after Netscape, 92% of the U.S. population had access via a local phone call to 7 or more ISPs.
  - Decreasing cost of Internet access
    - There is much competition.
      - 85% of the population lives in or adjacent to counties with 21 or more ISP competitors.
      - Only 2.55% live in counties with three or fewer competitors.
    - Note that while this may have been true for dial-up, it may not be true for broadband.
  - Expanding availability of broadband access
    - Initial investment went to high-income, high-density areas.
    - The investment was cost-effective here.
  - Network externalities associated with e-mail and chat utilities
    - Early e-mail systems, such as Prodigy, were proprietary. Users could only contact other members of the service.
    - Open systems encourage diffusion.
- What information should be part of the digital divide debate?
  - If subsidies are desired, should access to all information on the Internet be subsidized, or just “useful” information?
  - What does universal access mean?
    - For telephones, policy guaranteed access to a dial tone. It did not subsidize the use of phone services, which, in many places, were priced above cost so that universal service could be provided.
    - Ironically, rural poor are more likely to have telephone service than urban poor.
      - This is often by choice. Perhaps urban families see phones as less important.
    - Must access be in the home, or is access at a public library sufficient?
  - As more consumers drop landlines for cell phones, the fixed costs of maintaining the lines are spread across fewer consumers

- Policy issues within countries
  - The key question: What, if anything, should be done to decrease the gaps in access?
  - Universal Service Fund Fee
    - A charge to telephone companies that is typically passed on to consumers.
    - The Federal Communications Commission (FCC) requires telecommunications carriers to pay 6.8% of their interstate and international calling revenues to subsidize Internet use in public libraries and schools, as well as phone service for low-income customers and rural health care providers.
      - Some companies, such as AT&T, charge consumers more than 6.8%.
      - They say it is because some users, such as those with calling cards, don't pay the fee. The higher charge is needed to ensure that they meet the revenue requirement.
        - Note the connection to tax incidence theory here. Demand for telephone service will be inelastic, so consumers will bear much of the tax burden.
  - In 2011, the FCC directed \$4.5 billion from universal service funds to go to high speed Internet access for rural areas
  - More recently, as we discussed in class, cities have turned to providing wireless network access as a solution to the digital divide.
    - Note that some states prohibit municipalities from providing low-costs broadband service
      - In some parts of San Antonio, over 70% of households have no Internet service
      - However, state law prevents the city from providing low-cost access
    - Does providing public Wi-Fi make sense?
      - Issues to consider:
        - How to finance
          - Advertising
          - User fees
            - Should there be subsidies for low-income users?
      - Concerns
        - Is it unfair competition to incumbent telecommunication firms
        - Will wi-fi provide interference with other communications?
        - There is no common wi-fi standard
          - Will communities get locked in to one?
        - Is it a good use of taxpayer money?
        - What happens when the technology becomes obsolete?

- Potential benefits
  - Tempe installed wi-fi, first for its own use, and reduced its telecommunication costs by 1/3
  - Useful in areas without fiber optic lines in place
- Can we view wi-fi as a utility? If so, should it be state run?
  - Other countries have done a better job providing infrastructure. Consider example of Stockholm and Australia in the Economist.
    - Government lays the cables, which are considered public utilities.
    - Private companies use them to provide service.
    - In Stockholm it takes 30 minutes to change providers