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Comparative Advantage and Digital Trade

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The Law of Comparative Advantage

- Ricardo's Law of Comparative Advantage
  - Formulated for a world where all trade was in goods, produced within countries, then transported between countries
  - Two purposes
    - To explain the pattern of trade
    - To illuminate the gains from trade

The Law of Comparative Advantage

- Statement of the first purpose, to explain trade:
  - Trade if not distorted is based on countries' relative costs of production
  - Since costs may change with trade, best understood with autarky costs (and autarky prices)

The Law of Comparative Advantage

- Theoretical developments
  - First explained with just two goods, two countries, and only one factor, labor
  - Extended to more of each, though with limitations
    - Chain of comparative advantage
    - Heckscher-Ohlin model

The Law of Comparative Advantage

- Theoretical developments
  - Generality of C-A
    - In general predictions for every pair of goods/countries not possible
    - But C-A does hold on average across goods and countries, as correlation
      - By Dixit and Norman (1980)
      - By Deardorff (1980)
    - This was shown to hold for
      - Arbitrary numbers of goods, factors, and countries
      - Intermediate inputs
      - Trade costs

Services

- Services
  - Not initially regarded as trade
    - Changed by Harry Freeman
  - Deardorff (1985)
    - Prompted by my mentor and co-author Bob Stern
    - Asked whether C-A applies to services trade

Services

- Services
  - Modes
    1. Cross-border supply
    2. Consumer movement
    3. Producer presence
    4. Movement of natural persons
  - I also considered "trade services"
    - Services such as transport that are complementary to trade
    - Their providers do follow C-A

Services

- Cross-border supply of services
  - This poses a problem for C-A
  - Uses factors from both countries
  - Autarky prices may show high costs in both, but low when combined
  - So autarky prices mislead for trade

Digital Trade

- This brings me to the question of the latest form of trade: Digital Trade
- I was asked by Simon Evenett to address this as I had for services: Does the Law of Comparative Advantage hold for digital trade?
- Here (and in Deardorff (2017)) I talk through this question for five forms of digital trade that I've been able to think of.
  - "Comparative Advantage in Digital Trade," in Simon Evenett, ed., *Cloth for Wine? The Relevance of Ricardo's Comparative Advantage in the 21st Century* CEPR Press, Center for Economic Policy Research, 2017, pp. 35-44.

Outline

- Five kinds of digital trade
  - Physical products
  - Digital product transmitted digitally
  - Services provided by digital means
  - Storage and applications on The Cloud
  - Online platforms supported by advertising
- Conclusion

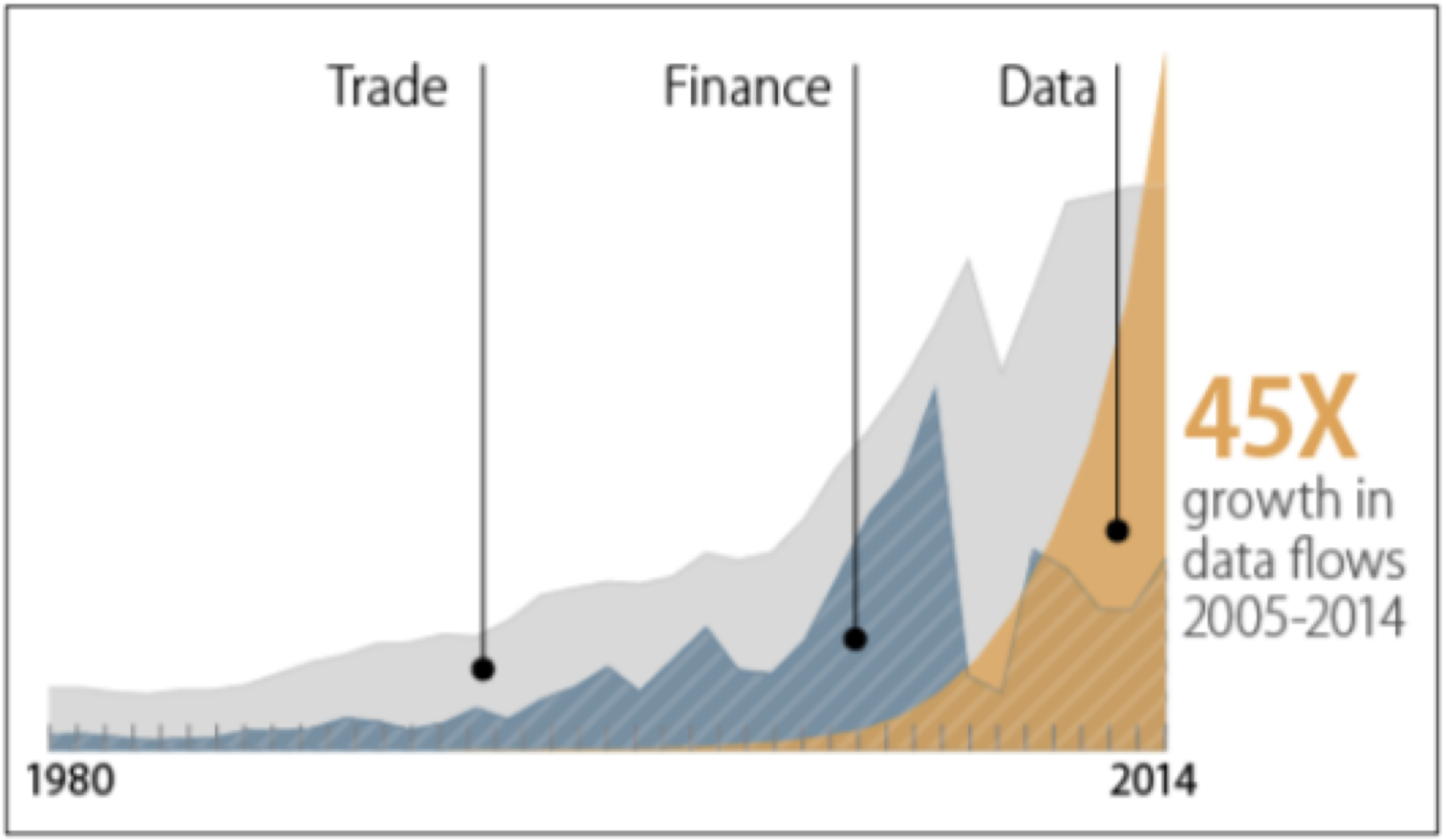
Digital Trade

- Definition
  - USITC (2013)
    - "There is no standard or generally accepted definition for 'digital trade.' "
    - "the delivery of products and services over either fixed-line or wireless digital networks"
  - USITC (2014)
    - "defines digital trade as U.S. domestic commerce and international trade in which the Internet and Internet-based technologies play a particularly significant role in ordering, producing, or delivering products and services"

Digital Trade

- My Definition
  - International commerce for which
    - the product itself is digital
  - and/or any of the following are done via the internet or a other digital technology:
    - advertising
    - ordering
    - delivering
    - payment
    - servicing

Figure 1. Growth in Global Trade, Finance, and Data Flows



Source: McKinsey Global Institute, *Digital Globalization: The New Era of Global Flows*, March 2016.

Source: Fefer et al. (2018)

Digital Trade

- I'll look at five kinds of trade:
  1. Physical products advertised, ordered, and/or paid for digitally, but transported by normal trade means
  2. Digital products (music, movies, books, software) that are transmitted to purchasers via the internet
  3. Services that are provided remotely by digital means
  4. Data storage and computer applications accessible in "the cloud"
  5. Web platforms that serve an international audience and are supported by advertising

Digital Trade

- I'll not look at
  - The "dark web," which apparently may do much of the above, but invisibly and illegally.
  - Cryptocurrencies, such as bitcoin.
  - The physical infrastructure of the internet, such as the trans-oceanic fiber-optic cables that transmit the signals and are owned by companies that charge internet service providers for their use.
  - Other?

1. Physical Products

- Become part of digital trade when advertised, ordered, and/or paid for digitally
  - Example: Amazon, in US takes order from Canada for a good produced in China
  - C-A?
    - Production still reflects C-A of China
    - Amazon is providing a "trade service" based on US C-A

2. Digital products transmitted digitally

- Examples
  - Music
  - Text (books, etc.)
  - Video (movies, TV programs)
  - Computer programs

2. Digital products transmitted digitally

- Distinctive feature
  - Zero marginal cost
    - Of both production and transmission
  - Positive fixed cost

2. Digital products transmitted digitally

- C-A?
  - Doesn't fit Ricardian Model
  - Model's without perfect competition can still conform to C-A
    - Krugman (1981) (though he didn't mention this)
    - I don't know how general this may be

3. Services provided by digital means

- Examples
  - Programmers taking assignments and delivering results over internet
  - Computer service provided with remote control of a computer
  - X-Rays read remotely
  - Manufacturer that builds in facility for remote monitoring and control

3. Services provided by digital means

- C-A?
  - Cost of service depends on wages and other factor prices where service originates.
  - Thus does reflect C-A.

4. Storage and applications on the cloud

- Remote computing is not new
  - Bob Stern and I used a mainframe computer that we never saw
- But now clusters of servers hold
  - Data that can be processed remotely
  - Programs that can be run remotely
- Called "the cloud"

Cloud Servers

Below you can see a map of providers offering cloud servers hosted in specific geographic areas. Click on a marker to see providers available in the specific area.

Due to the many different definitions of cloud servers, or IaaS (Infrastructure as a Service), we have limited the requirements to services that are based on virtualization and automatically provisioned. To set more specific requirements for which clouds you would like to see on the map (such as high availability, scalability, utility based billing, short term commitments and support of specific technologies) please use the filtering function in the bottom of the page.

Cloud Server Map | Data Center Map

Filter Cloud Providers

View only providers that live up to the following requirements:

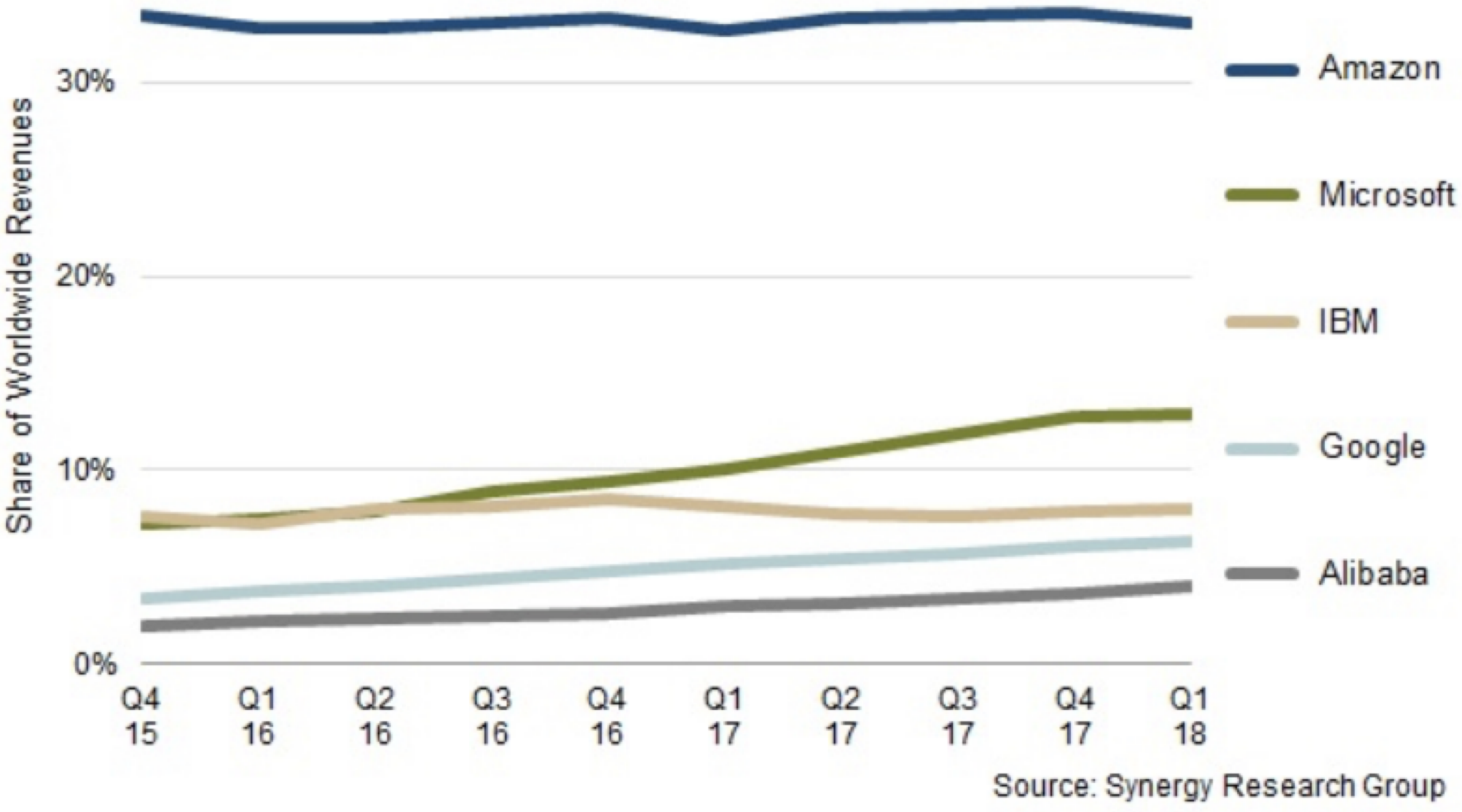
4. Storage and applications on the cloud

- **Top Cloud Companies 2019:**
  - Alibaba.
  - Amazon Web Services.
  - Google Cloud Platform.
  - IBM Cloud.
  - Microsoft Azure.
  - Oracle Cloud.

Source: Datamation

Cloud Infrastructure Services - Market Share Trend

(IaaS, PaaS, Hosted Private Cloud)



Source: Datamation

4. Storage and applications on the cloud

- C-A
  - Servers require
    - Human and physical capital
    - Energy for processing and cooling
  - Each can be in a different place, based on costs

4. Storage and applications on the cloud

- C-A
  - Like my case above of "cross-border services, none these places may have relatively low cost, and thus C-A, by itself
  - Indeed, it is ambiguous and thus arbitrary which location is said to be "exporting" the cloud service.

4. Storage and applications on the cloud

- C-A
  - Costs are crucial, but C-A is not helpful for explaining this form of digital trade

5. Online platforms supported by advertising

- Examples
  - Facebook
    - Instagram
    - WhatsApp
  - Google
    - YouTube
  - Twitter

- Examples
  - WeChat
    - (WeChat)
    - (WeChat)
  - Baidu
    - Toudou Youku
  - Sina Weibo

Source: Dragon Social

5. Online platforms supported by advertising

- What they provide
  - Platform for entertainment and communication
- What they produce
  - Their users' attention
- What they sell
  - Advertising

5. Online platforms supported by advertising

- Is this trade?
  - Yes, if provider and advertiser are in different countries
- C-A?
  - Costs of providers are conventional: human and physical capital
  - But also networks

5. Online platforms supported by advertising

- C-A?
  - Success depends also on "network effects"
    - A successful provider may have higher costs than others, if their history captured the network first
    - Network success may depend on market size
      - Hence advantages for US and China
      - Not S Korea, Finland

5. Online platforms supported by advertising

- C-A?
  - Given the network, profit might be increased by move to where costs are lower
    - But this need not be in one place
    - Same problem as for the cloud

Conclusion

- Is comparative advantage useful for explaining digital trade?
  - Yes for some, but not for others
  - Cloud services may harness costs from more than one country, in each of which autarky costs might be high
  - Platforms depend on network effects that depend more on country size than costs

Thank you.

Questions?