Overview

Monopoly

Market Structure

- Four main categories of market structure
  - monopoly (max market power)
  - oligopoly (a small number of firm, strategic interaction)
  - monopolistic competition (differentiate product, zero profit in long run)
  - perfect competition (no market power)

- In practice, the most popular measure of market concentration is Herfindahl-Hirschman index (HHI)

$$HHI = \sum_{i=1}^{n} s_i^2, \quad s_i \in [0, 100] \text{ is firm } i\text{'s market share}$$

See U.S. Department of Justice & FTC
(www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c).

Market Structure

- Monopoly, one supplier in a market.
  - Demand side is many non-strategic consumers
  - no close substitute, no potential entrant
  - Monopsony: one buyer facing a group of non-strategic sellers
    e.g. Toyota buying auto parts; Walmart hiring labor in a small town
  - standard industry classification
    (en.wikipedia.org/wiki/Standard_Industrial_Classification)

- Why? barriers to entry/sources of market power
  - technical barrier: natural monopoly, unique resource, innovative
    technology, unique location
  - legal barrier: patent, license, exclusive franchise, regulation (health, safety,
    protect domestic firm, etc.)
  - other barrier: advertisement, switching cost/search cost (consumer
    inertia), network effect

Monopoly Behavior

- Monopoly chooses a point as its supply.

$$\pi^M = \max_Q \left\{ P(Q) \times Q - C(Q) \right\} = \max_Q \left\{ [P(Q) - AC(Q)] \times Q \right\}$$
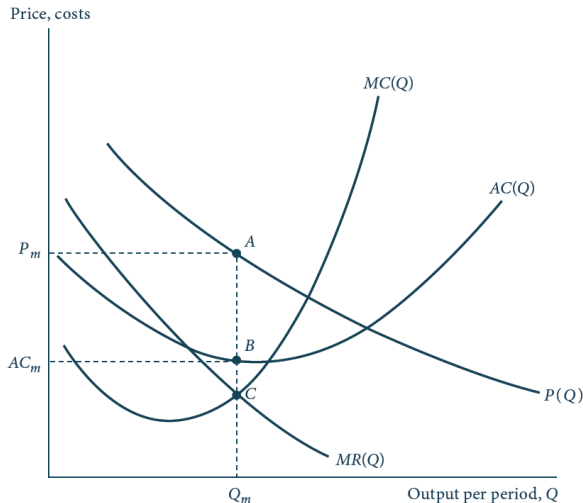
Monopoly Behavior

- Monopoly market equilibrium
  - $MR(Q) = MC(Q)$
  - Monopoly supply is a point (Q_m, P_m) (not a supply curve)
  - markup pricing rule
  $$\frac{P_m - MC(Q_m)}{P_m} = -\frac{1}{e_{D,P}}$$
  - monopoly profit
  $$\pi^M = [P(Q_m) - AC(Q_m)] \times Q_m$$

- Example 14.1
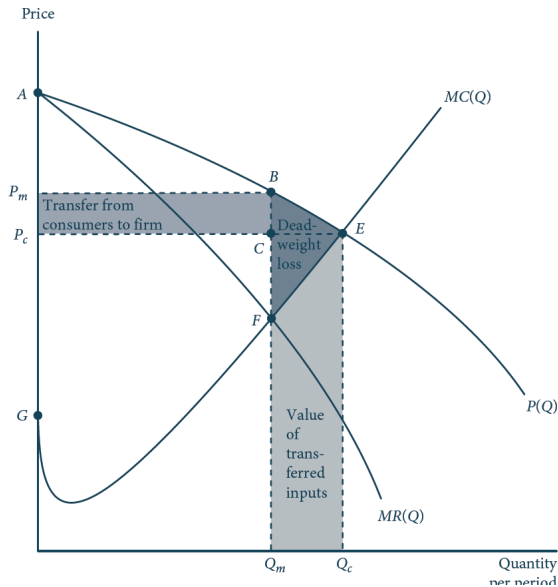 $$Q = 2000 - 20P, \quad C(Q) = \frac{1}{20}Q^2 + 10000$$

- Example 14.2
  $$P = a - bQ, \quad MC = c$$
  $$Q = aP^e, \quad MC = c$$

Monopoly Behavior

- Welfare: when demand is inelastic, the deadweight loss is large.

Taxing Monopoly

- Impact of a quantity tax on monopolist (with constant MC)
  - Consider the case of constant marginal cost, $MC = c$
  - After the case, $MC = c + t$
  - For linear demand, the price increase by $\frac{t}{2}$
  - By markup pricing rule, price can increase more than the amount of tax. Supply reduces a lot, causing huge efficiency loss.

$$p = \frac{c + t}{1 - \frac{1}{|e_{D,P}|}}$$

$$\frac{dp}{dt} = \frac{1}{1 - \frac{1}{|e_{D,P}|}} > 1$$

Monopolistic Competition

- Monopolistic competition
  - free entry market of differential products
  - each firm faces a downward-sloping (residual) demand curve
  - Firms will enter the market unti zero profit
  - equilibrium condition
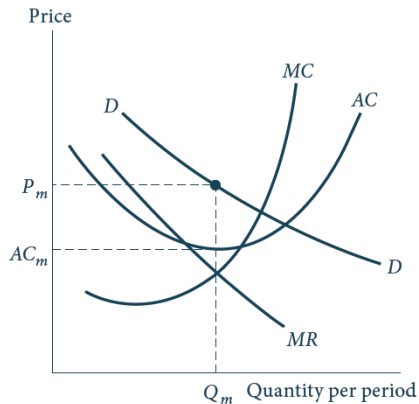 $$\begin{cases} P^* = AC(q) \\ MR(q) = MC(q) \end{cases}$$

- Example: $P = a - q$, where a varies with entry/exit of other firms.
  $C(q) = q + 4$
  $$AC(q) = 1 + \frac{4}{q} = P^* = a - q$$
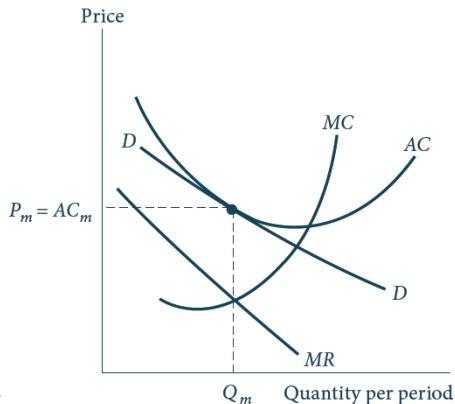 $$MR(q) = a - 2q = MC(q) = 1$$

Monopolistic Competition
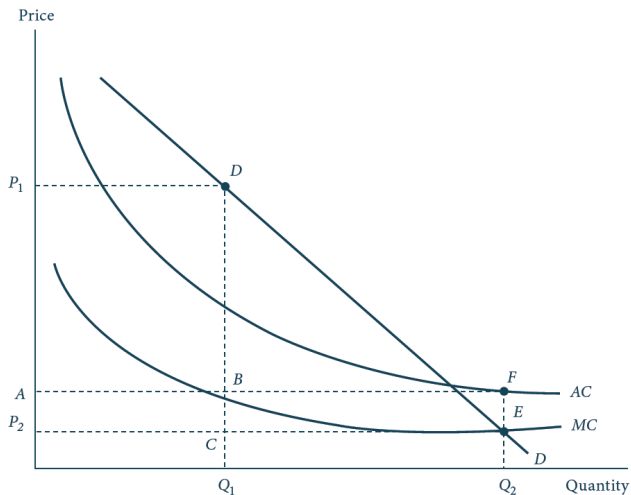
- Monopolistic competition

(a) Monopoly with large profits

(b) Zero-profit monopoly

Natural Monopoly

- Natural monopoly: market demand locates at where AC decreases.

Natural Monopoly

- Natural monopoly price regulation
  - MC pricing: efficient quantity in the short-run, but the monopoly make a loss in the long run.
  - Zero profit if set price at $p = \min AC$ (minimum efficient scale).
  - step pricing (figure from www.wsd.gov.hk)

Tier	Consumption	Rate(HK$)	Charges(HK$)
first	12x127/121.64 = 12.529	0.00	0.00
second	31x127/121.64 = 32.366	4.16	134.64
third	19x127/121.64 = 19.837	6.45	127.94
fourth	remaining 1.268	9.05	11.47
Total	66.000		274.05

- Other regulation
  - rate of return regulation*
  - cost accounting and asymmetric information*
  - market / mechanism design, e.g. auction*

Price Discrimination

- Price discrimination is a way of exercising market power
  - First-degree (perfect): price differs by units and consumer's identity
    e.g. personalized discount, coupon, bargaining
  - Second-degree (screening)*: offer the same pricing menu to everyone but
    aim to "screen" different consumers.
    e.g. quantity discount (non-linear pricing), business/economy class,
    insurance menu (premium, deductible, copay).
  - Third-degree (group pricing): sell output to different group of people for
    different price, but same price for individual within each group.
    e.g. student/senior discount, military discount, international edition.

- Requirement: monopoly position, no resale among buyers, information
  about demand, being legal.

- There are many other ways to exercise price discrimination. For example,
  bundling, product differentiation, advertisement, branding, exclusive
  contract, merger & acquisition, entry deterrence ...

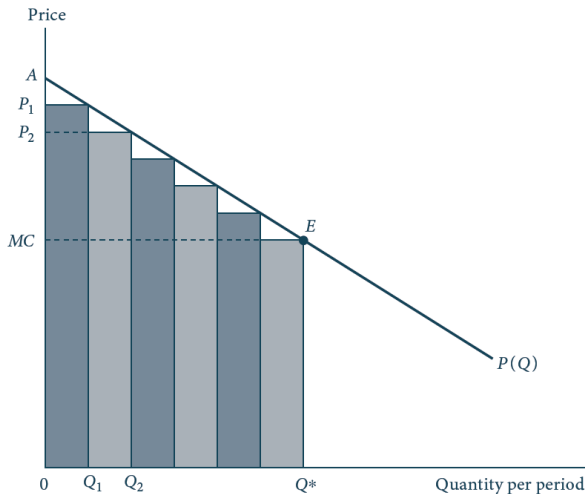# Price Discrimination

- First-degree price discrimination
  - sell to each person his/her willingness-to-pay, capture all CS.
  - require no resale across individuals and knowledge of consumer's valuation.
  - big-data based personalized pricing
  - e.g. Uber surge pricing, Alipay micro-finance

- Example 14.4

$$P = 100 - \frac{Q}{20}$$

Price Discrimination

- First-degree price discrimination

Price Discrimination

- Many unit-demand consumers with different valuation
  - need to know each individual's valuation

- Individual consumer with a diminishing marginal utility for different quantity
  - Achieve 1st degree price discrimination by quantity two-part tariff or discount
  - Charge price that varies with how much an individual purchase q

  $$T(q) = A + pq \Rightarrow \text{average price} = \frac{A}{q} + p$$

  - Each consumer faces the same menu (p, q combinations) but may choose different item.

Price Discrimination

- Costco mainly earn its profit from membership fee (A)
  www.youtube.com/watch?v=NBKS4lMq5lI

Price Discrimination

- Third-degree price discrimination
  - grouping pricing
  - require no resale across groups

- Example 14.5

$$P_1 = 24 - Q_1, \quad P_2 = 12 - 0.5Q_2, \quad MC = 6$$

  - Compute profit-maximizing third-degree price discrimination prices.
  - What if regulator impose a uniform-price policy?
  - Compare monopoly profit. (Monopoly's profit will reduce given extra restriction on pricing.)
  - Serve two group or just one group?
  - welfare implication (ambiguous)
  - Uniform-price policy may cause unintended consequence: the monopoly may shutdown one market and hurt the consumers.

Price Discrimination

- Third-degree price discrimination

$$P_1 = 24 - Q_1, \quad P_2 = 12 - 0.5Q_2, \quad MC = 6$$
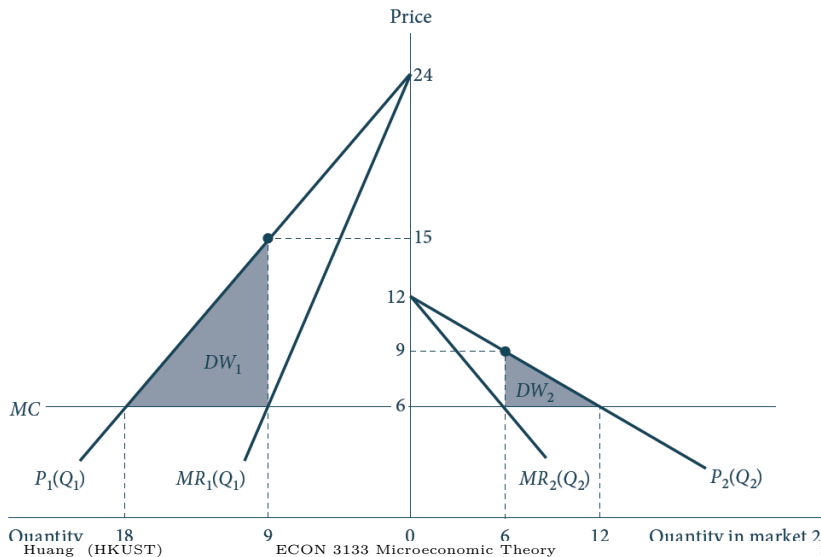
Discussion

- In the US, once a firm defeats the strongest competitor, its opponent becomes the Department of Justice.

- Challenges in regulating monopoly
  - How to define an industry/market? Monopoly may face competition from outside the market.
    e.g. mobile carriers and WeChat
  - relationship between monopoly and innovation
  - domestic monopoly and international competition

- More about antitrust and competition policy in oligopoly section

Discussion

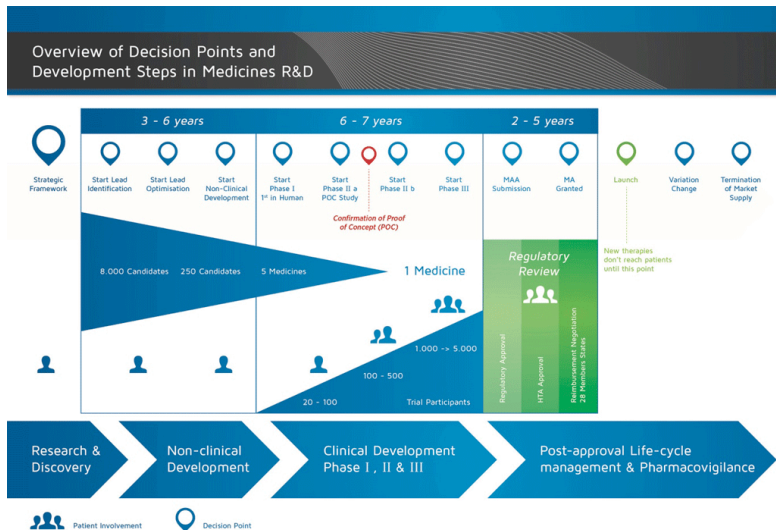- United States vs. Microsoft, 2001

Discussion

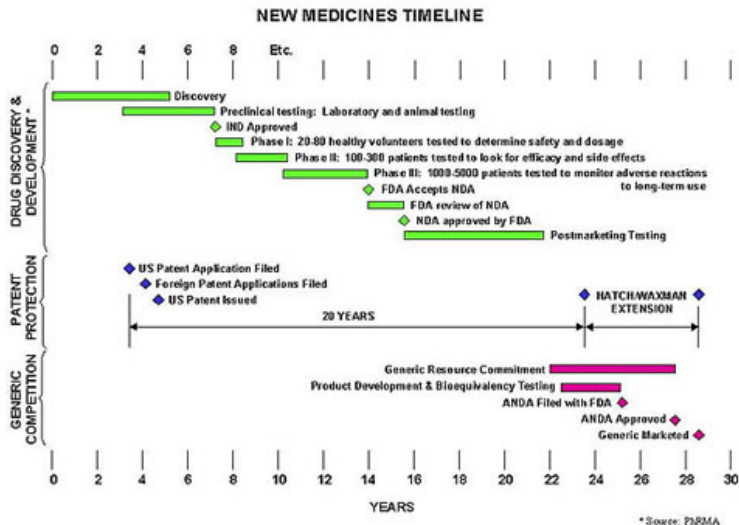- United States vs. Google/Facebook/Amazon/Apple, 2020

Discussion

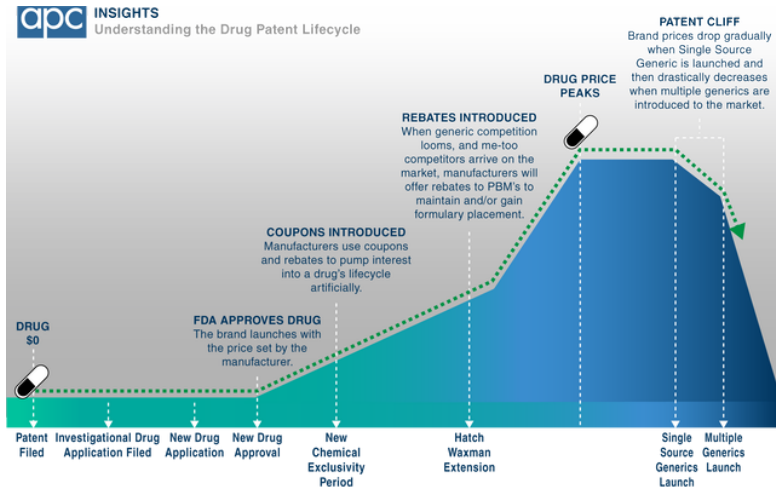- In the US, patents are good for 20 years after the invention of the drug.

Discussion

- Development of new drug on average costs \$2 billion and 20 years.

NEW MEDICINES TIMELINE

Discussion

- After the patent expires, other firms can start producing generic drugs.

apc **INSIGHTS**
Understanding the Drug Patent Lifecycle

PATENT CLIFF
Brand prices drop gradually when Single Source Generic is launched and then drastically decreases when multiple generics are introduced to the market.

DRUG PRICE PEAKS

REBATES INTRODUCED
When generic competition looms, and me-too competitors arrive on the market, manufacturers will offer rebates to PBM's to maintain and/or gain formulary placement.

COUPONS INTRODUCED
Manufacturers use coupons and rebates to pump interest into a drug's lifecycle artificially.

FDA APPROVES DRUG
The brand launches with the price set by the manufacturer.

DRUG $0

Patent Filed | Investigational Drug Application Filed | New Drug Application | New Drug Approval | New Chemical Exclusivity Period | Hatch Waxman Extension | Single Source Generics Launch | Multiple Generics Launch

Discussion

- Private R&D investment prefers short-term projects
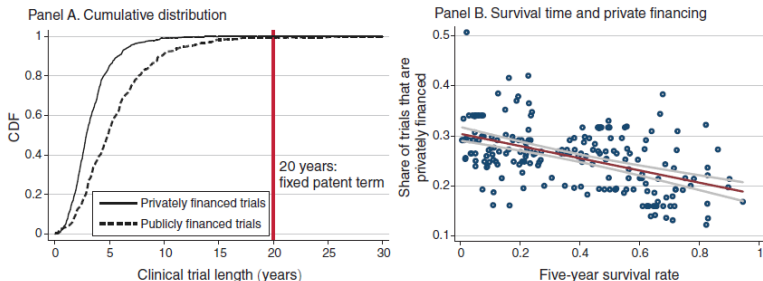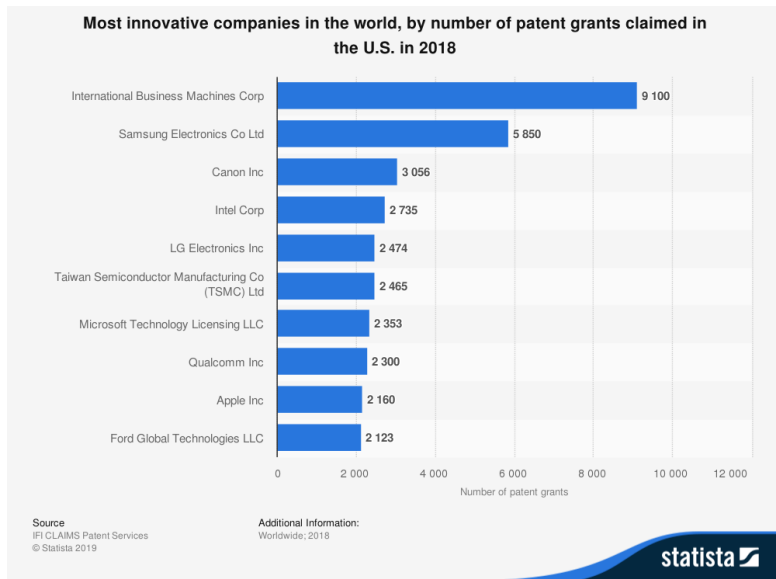 Figure from "Do firms underinvest in long-term research: evidence from cancer clinical trials."

FIGURE 5. SURVIVAL TIME AND FINANCING OF CLINICAL TRIALS

Notes: This figure shows two analyses of how public and private financing of clinical trials differ. Panel A plots the cumulative distribution function of clinical trial length in years, omitting the handful of observations with length greater than 30 years for improved readability. The level of observation is the clinical trial. The vertical line at 20 years denotes the length of the fixed patent term. Panel B plots the relationship between the five-year survival rate among patients diagnosed with each cancer-stage between 1973–2004 (the cohorts for which five-year survival is uncensored), and the share of clinical trials enrolling patients of that cancer-stage from 1973–2011 that were privately financed. The level of observation is the cancer-stage. For details on the sample, see the text and online Data Appendix.

Discussion

- Large firms innovate to maintain market power.

Most innovative companies in the world, by number of patent grants claimed in the U.S. in 2018

Company	Number of patent grants
International Business Machines Corp	9 100
Samsung Electronics Co Ltd	5 850
Canon Inc	3 056
Intel Corp	2 735
LG Electronics Inc	2 474
Taiwan Semiconductor Manufacturing Co (TSMC) Ltd	2 465
Microsoft Technology Licensing LLC	2 353
Qualcomm Inc	2 300
Apple Inc	2 160
Ford Global Technologies LLC	2 123

Number of patent grants

Source
IFI CLAIMS Patent Services
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Additional Information:
Worldwide; 2018

statista

Discussion

- Joseph Schumpeter's view on innovation and destructive creation
  - An entrepreneur has the incentive to innovate and gain the monopoly profit.
    "If one wants to induce firms to undertake R&D, one must accept the creation of monopolies as a necessary evil."
  - An existing monopoly faces the pressure from potential entry and must innovate to maintain market power
  - Creative destruction (drastic innovation): a newly innovated product (business model) destroy the existing ones.
  - This is a fundamental power for economic growth.

- Why an entrepreneur (challenger) can beat a existing monopoly (incumbent)?
  Reinganum (1983) "Uncertain innovation and the persistence of monopoly."

|	Certain	Uncertain
Incremental	incumbent	incumbent
Drastic	incumbent/challenger	challenger

Discussion

- Creative destruction in hard disk drive industry
  Figure from "Estimating the innovator's dilemma: Structural analysis of creative destruction in the hard disk drive industry, 1981–1998"
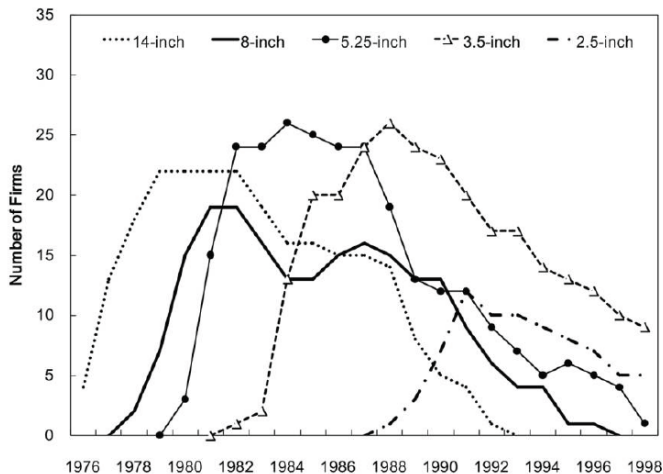
Discussion

- Creative destruction in mobile communication

The Evolution of Mobile Communications, from 1G to 5G

1G — 1980's
2G — 1993
3G — 2001
4G — 2009
5G — 2020?
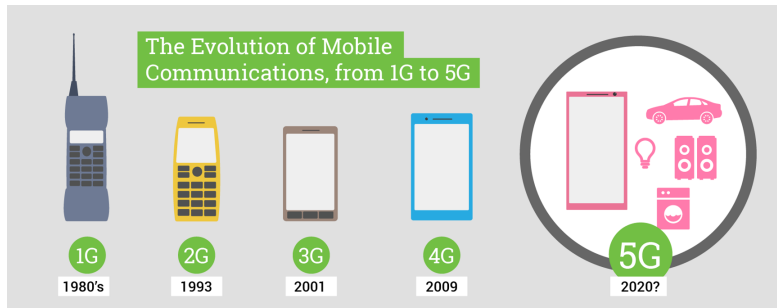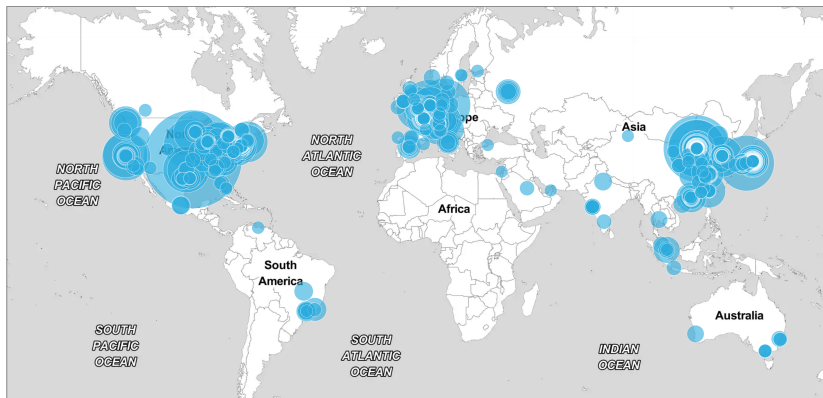
Discussion

- International competition and supporting domestic monopoly
  Figure from Fortune 500

Discussion

- Report from New York Times
  (www.nytimes.com/2017/09/27/business/dealbook/siemens-alstom-merger-china.html)

Siemens and Alstom Form European Train Giant to Beat Chinese Competition

Siemens Alstom would make systems and equipment for two of Europe's high-speed rail lines, Germany's ICE and France's TGV, which can zip between cities at about 185 m.p.h. Patrick Hertzog/Agence France-Presse — Getty Images