

# The boundaries of the firm in innovation

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# “Open innovation”: New wine, old bottles, or vice versa?

- “open innovation” rooted in management research & practice.
  - Emphasizes conceptual, normative arguments.
- Links between “open innovation” work & extensive work in innovation studies remain underdeveloped.
  - Efforts to link open innovation with “absorptive capacity,” evolving MNC technology-sourcing patterns are welcome exceptions.
  - Little work links firm-level open innovation with aggregate data on organization of innovation.
- Importance of intrafirm & “open” modes of innovation has fluctuated over 20<sup>th</sup> century.
  - What forces, policies have mediated this interaction, evolution?

# Evolution of R&D organization in US industry, 1890-1930

- Lamoreaux & Sokoloff: “Golden age” of independent inventors in US during 1890-1910.
  - L&S argue that growth of markets for IP, emergence of specialised brokers support greater efficiency in innovation and increased US productivity growth (limited empirical support).
  - Supported by stronger IPR in late 19<sup>th</sup> century.
- Growth of in-house R&D, 1890-1920.
  - New kinds of “Chandlerian” (multifcn, multiproduct) firms initiate in-house R&D for several motives:
    - Monitor external technological developments & acquire technologies from external sources (DuPont, AT&T, GE).
    - Exploit learning within the firm from multiple sources (marketing, production, etc.)
  - Motives resemble much of what one hears as the “new wave” of open innovation. Clear recognition by managers of complementarity of external, internal knowledge sources.
  - Services supplied via contract from independent R&D labs (AD Little, Mellon, Battelle) complement in-house R&D.

# Fall & rise of open innovation, 1945 - 1985

- “Open innovation” (OI) of pre-WWII era declines after 1945 in US.
- “Internal linear model” relies on in-house basic research as source for corporate innovation (DuPont).
- Why the shift?
  - Much tougher antitrust policy appears in late 1930s.
  - Combined with greater hostility to strong IPRs.
- Large firms rely on intrafirm sources for innovation, diversify into unrelated lines of business.
- => “open innovation” is not new, but a revival of older practices?
  - Which parts of the “new wave” are new?
  - Characteristics of external sources of innovation?
  - Collaboration “downstream” in commercialization?

# “open innovation” and some data

- What is the relationship between “open innovation” and alliances?
  - Growth in # of alliances may be flattening (see semiconductor alliances, normalized for mortality).
  - Alliance governance seems to be shifting in favor of contract & away from equity mechanisms.
  - Consistent with Cantwell argument that alliances and open innovation are substitutes?
- Changing size distribution of performers of industry-funded R&D in US away from largest firms.

# Semiconductor Industry Alliances, 1990-1999

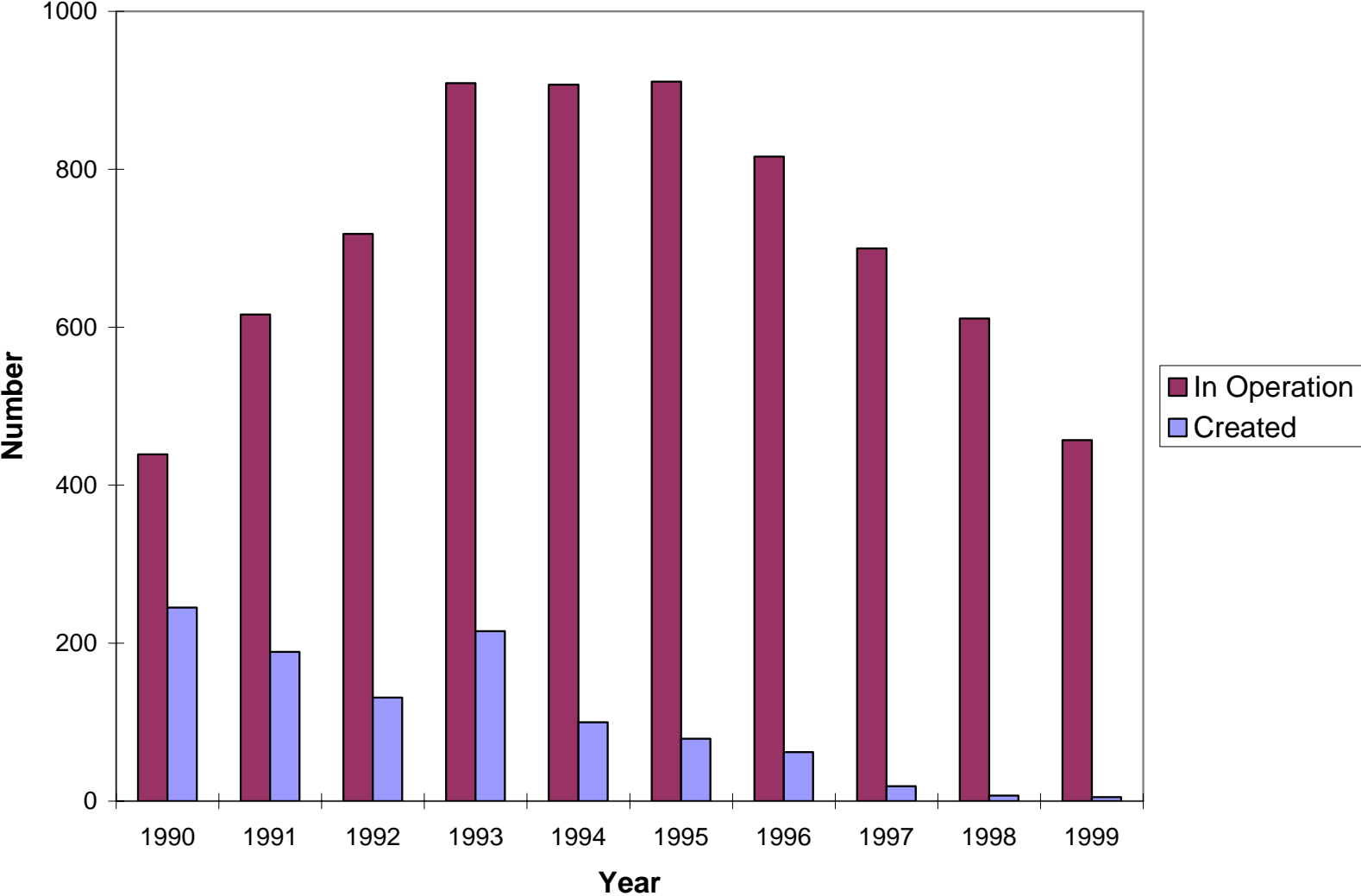


Figure 8: Alliances between US & non-US firms, 1980 - 2003

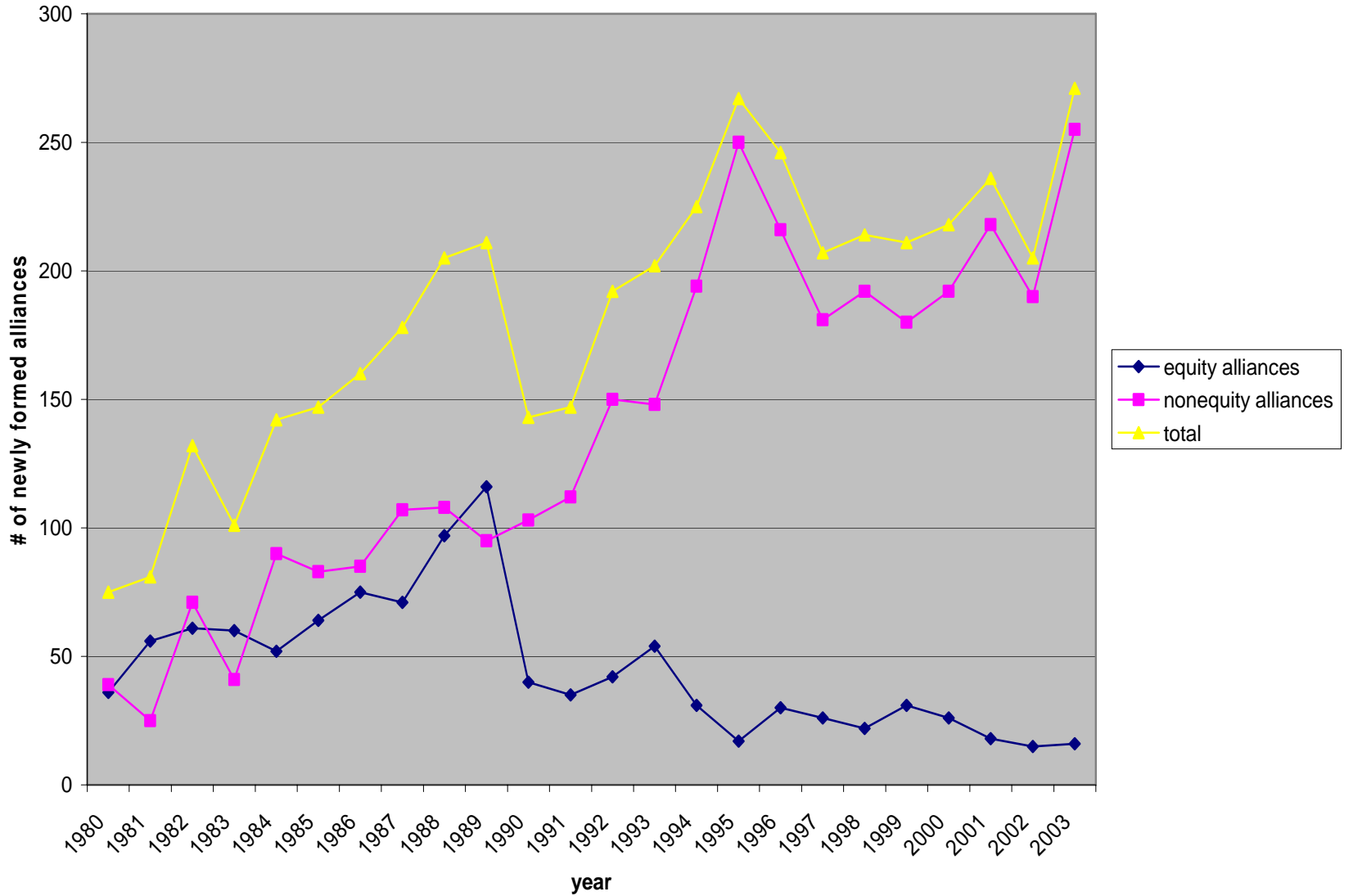
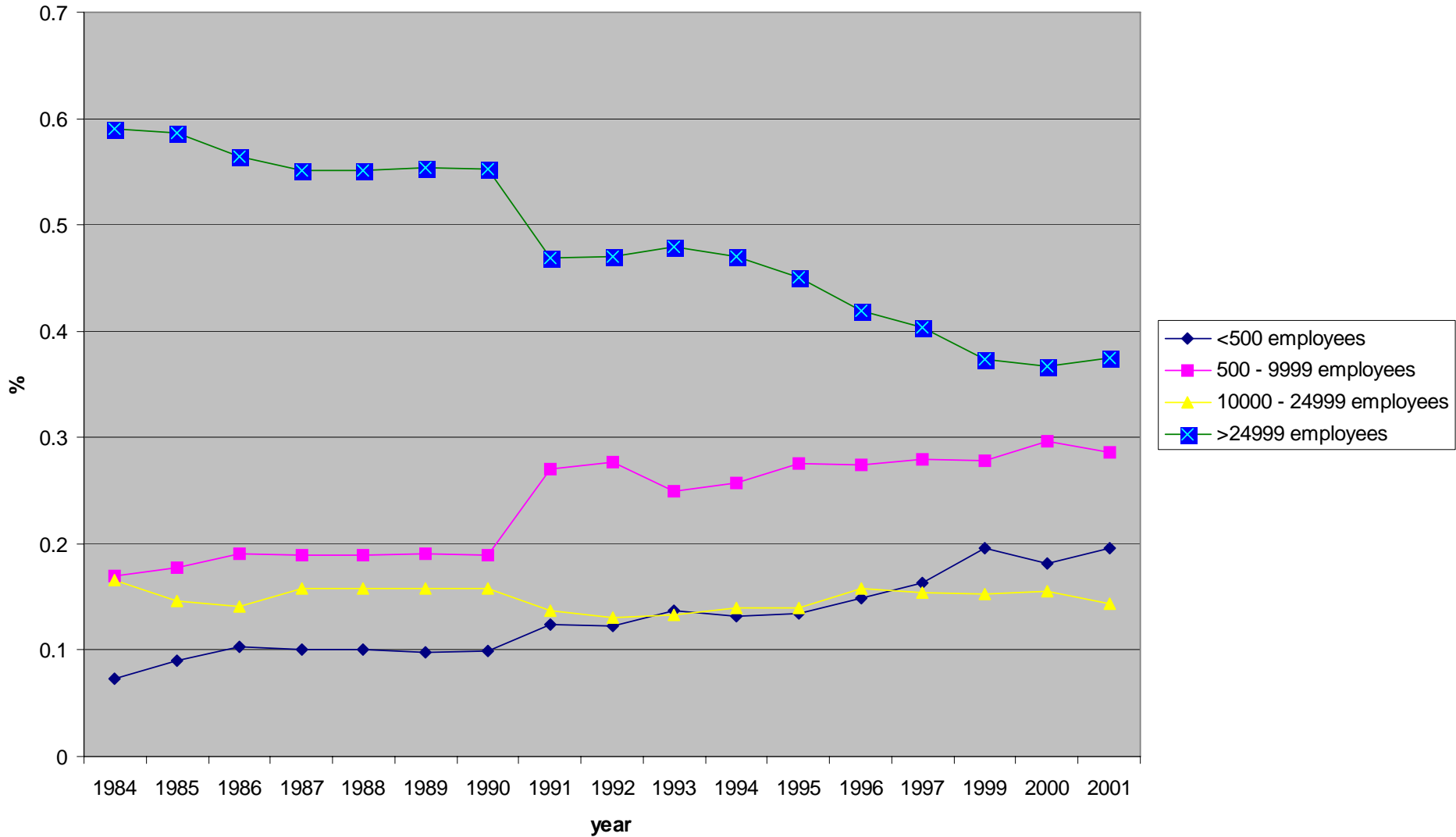


Figure 4: Firm-size class shares of industry-performed R&D (nonfederally funded), 1984-2001



# Vertical specialization & the MNC

- Vertical specialization (VS) a complement to “open innovation.”
- But we measure the extent, evolution of VS poorly if at all, and (not coincidentally) don’t explain it.
  - Mix of stronger IPR, ICT applications, stable interfaces within complex products, market growth as enabling factors.
  - An inevitable outgrowth of industry maturation?
    - Chemicals SEFs have nearly vanished because of strategic decisions by major firms to reintegrate into process technology.
    - Semiconductor VS tends to fail at the “bleeding edge,” where process & product innovation are highly interdependent.
- Interaction of VS, geographic spread of specialized firms affects dynamics of globalization.
  - New firms in industries such as semiconductors can initiate global strategies from their inception, rather than having to grow internal channels, mechanisms, for knowledge sourcing & exploitation.
    - Interaction of VS, globalization, and cross-border collaboration enabled by ICT => both direct and indirect skill biases in ICT innovation in both services, mfg
- Will VS challenge the MNC?
  - How & why are intrafirm MNC processes superior for knowledge transfer, exploitation? Not well understood; Criscuolo: market-valuation benefits of intrafirm “integration” are limited.
  - Similar to challenge raised by external capital markets to intrafirm capital allocation.