Innovation Policy

Today’s lecture

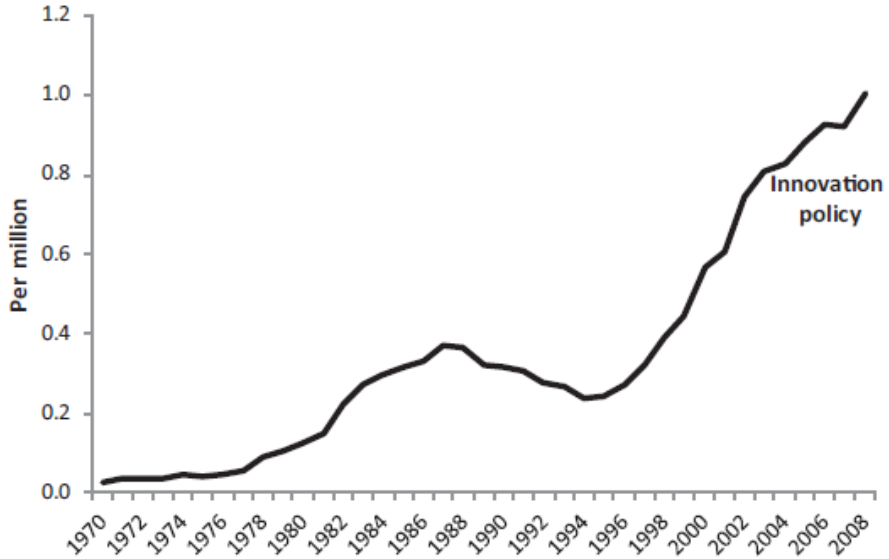
- References
  - Edler, J., & Fagerberg, J. (2017). Innovation policy: what, why, and how. *Oxford Review of Economic Policy*, *33*(1), 2-23.
  - Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research policy*, *15*(6), 285-305.

Innovation policy

- During the last two to three decades policy-makers have increasingly became concerned about the role of innovation in economic performance and the solution of challenges that arise
- Definition, design, implementation, and governance of innovation policy

How long have innovation policy existed?

Figure 1: The frequency of the term 'Innovation Policy' according to Google



Source: Own calculation based on information from https://books.google.com/ngrams, consulted on 31 May 2016.

- What is innovation policy?
- What is innovation?

Schumpeter and beyond

- Introduced the distinction between invention (a novel idea for how to do things) and innovation (carrying it out into practice)
- two aspects of innovation novelty and implementation
- novelty may not necessarily mean ‘new to the world’, it can also refer to something that is new to those that produce or use the innovation
- novelty does not have to be of the radical kind, offering new functionalities and/or disrupting existing practices
- For Schumpeter, a main reason for his distinction between invention and innovation was the realization that what matters economically and societally is not the idea itself but its exploitation in the economic and social system.

Rosemberg

> most important innovations go through drastic changes in their lifetimes—changes that may, and often do, totally transform their economic significance. The subsequent improvements in an invention after its first introduction may be vastly more important, economically, than the initial availability of the invention in its original form. (Kline and Rosenberg, 1986, p. 283).

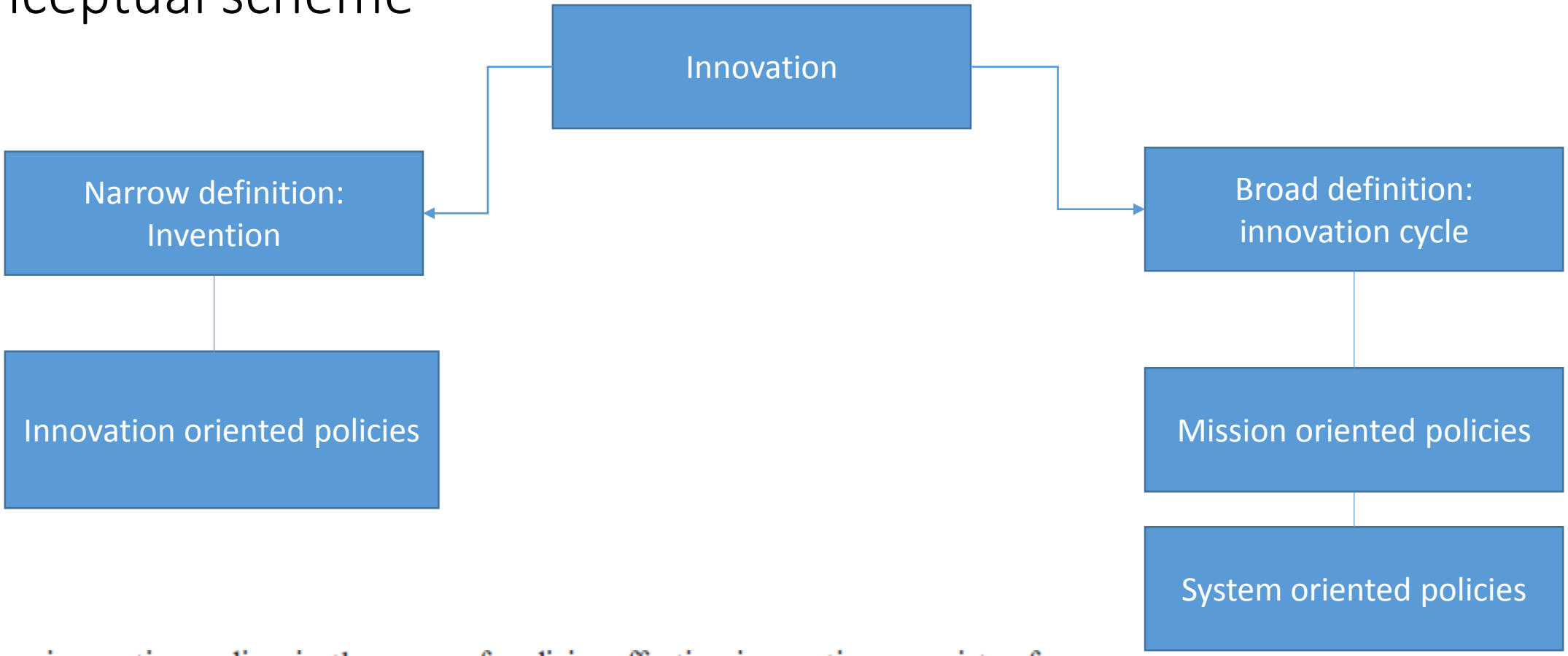
There are different perspectives on innovation, and this is also reflected in Policy:

- narrow perspective, considering invention only
- broader, more holistic perspective, which emphasizes the importance of looking at the entire innovation cycle from the creation of novel ideas to their implementation and diffusion.

Innovation Policies

- *Mission-oriented policies* (Ergas, 1986) are aimed at providing new solutions, which work in practice, to specific challenges that are on the political agenda.
- *Invention-oriented policies* have a narrower focus, in the sense that they concentrate on the R&D/invention phase, and leave the possible exploitation and diffusion of the invention to the market.
- *System-oriented policies* are of more recent origin and focus, as the term suggests, on system-level features, such as the degree of interaction between different parts of the system; the extent to which some vital component of the system is in need of improvement; or the capabilities of the actors that take part.

A conceptual scheme



Thus, innovation policy, in the sense of policies affecting innovation, consists of a range of different policies (and policy instruments) that have been introduced at various points in time, with different motivations, and using a variety of labels, including, increasingly, innovation policy. Some of this may have to do with terminological shifts (Lundvall and Borras, 2004; Boekholt, 2010). For example, much of what is called innovation policy today may previously have gone under labels such as industrial policy, science policy, research policy, or technology policy.[3]

Interaction with other policies…

Why innovation needs policy?

- Market failure approach
- Innovation system approach
- Path dependency

Market failure approach

- if the pay-offs are so large, why don’t private firms undertake the investments themselves?
- Firms cannot fully appropriate the gains from their investment→underprovision of knowledge with respect to social optimum
- This justifies three instruments:
  - Public production of knowledge
  - Subsidies to R&D in private firms
  - IPRs

Critics to the market failure approach

- Goveranance failure risk: policy advice can turn out to be «vague» and worsen the situation
- Accessibility to knowledge: each person/firm cannot appropriate of all the knowledge
- Capabilities: knowledge spillovers are not enogh, capabilities are needed to handle knowledge

Innovation system approach to innovation policy

- Late 1970's economic slowdown→ increasing worries on how to switch growth trends
- Innovation seen as key→how and if policy can contribute to innvation activity
- National System of Innovation approach (NIS) as a framework to respond to these challenges
- Evolutionary theory: how the environment can fuction as a resource for firm level innovation and how policy can contribute to it
- Failure:

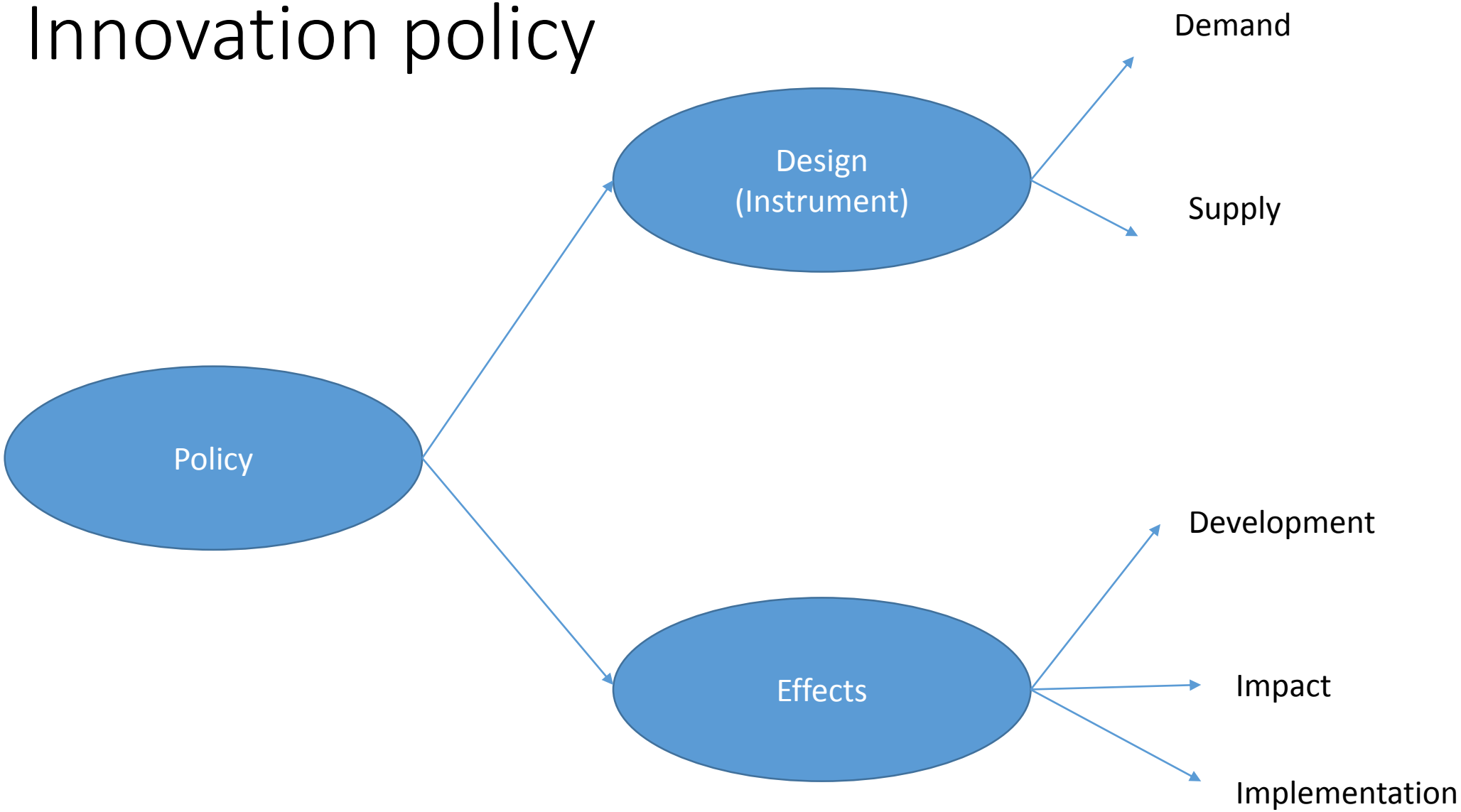
- if the system does not sufficiently provide demand for innovation access to complementary knowledge and skills, or supply of finance—we may speak of a ‘system failure’ hampering innovation activity
- the state should not limit itself to provide funding for basic knowledge and help to protect innovation through implementation of IPRs, as the market failure perspective would suggest, **but also identify and rectify such systemic problems**
- **Holistic approach** to policy: consider not only innovation and industrial aspects but also other aspects (e.g. environmental policy)

Path dependency

vs

- While variety-creation is the source of long-run growth, selection processes, by eliminating the least promising solutions, contribute to much-needed efficiency
- Selection may give raise to path-dependency, namely the course of tech. change is linked to the development of some innovation wrt another
- Path dependencies are difficult to change course at a later stage

Innovation policy



Policy instruments

Factors of influence:

- Understanding of the matter
- Practice
- Stakeholder involved

Table 1: Taxonomy of innovation policy instruments

	Innovation policy instruments	Overall orientation		Goals						
		Supply	Demand	Increase R&D	Skills	Access to expertise	Improve systemic capability, comple-mentarity	Enhance demand for inno-vation	Improve frame-work	Improve discourse
1	Fiscal incentives for R&D	●●●		●●●	●○○					
2	Direct support to firm R&D and innovation	●●●		●●●						
3	Policies for training and skills	●●●			●●●					
4	Entrepreneurship policy	●●●				●●●				
5	Technical services and advice	●●●				●●●				
6	Cluster policy	●●●					●●●			
7	Policies to support collaboration	●●●		●○○		●○○	●●●			
8	Innovation network policies	●●●					●●●			
9	Private demand for innovation		●●●					●●●		
10	Public procurement policies		●●●	●●○				●●●		
11	Pre-commercial procurement	●○○	●●●	●●○				●●●		
12	Innovation inducement prizes	●●○	●●○	●●○				●●○		
13	Standards	●●○	●●○					●○○	●●●	
14	Regulation	●●○	●●○					●○○	●●●	
15	Technology foresight	●●○	●●○							●●●

Notes: ●●● = major relevance, ●●○ = moderate relevance, and ●○○ = minor relevance to the overall orientation and stated innovation policy goals of the listed innovation policy instruments.
Source: Adapted from Edler *et al.* (2016*b*, p. 11).

Effects

- while it may be possible to assess the immediate effects, such as whether R&D support leads to more R&D performed or not, it is much more challenging to assess the wider effects, for example on innovation, productivity, and jobs, which presumably is what policy-makers are interested in
- Due to: i) innovation difficult to measure; ii)long lags between implementation and effect; iii) in case of more policies, difficult to understand which had an effect

Policy in the EU and US

- https://ec.europa.eu/growth/industry/innovation/policy_en
- https://www.innovationpolicyplatform.org/content/united-states

An important aspect the policymaker might consider: Innovators and Profitability

- Teece (1986): offers a framework to explain why full appropriability of profits from innovation can be difficult.
  - **RQ: why innovators cannot appropriate of all the benefits of their innovation**?
- Focus on the **innovators**: those firms which are first to commercialize a new product or process in the market

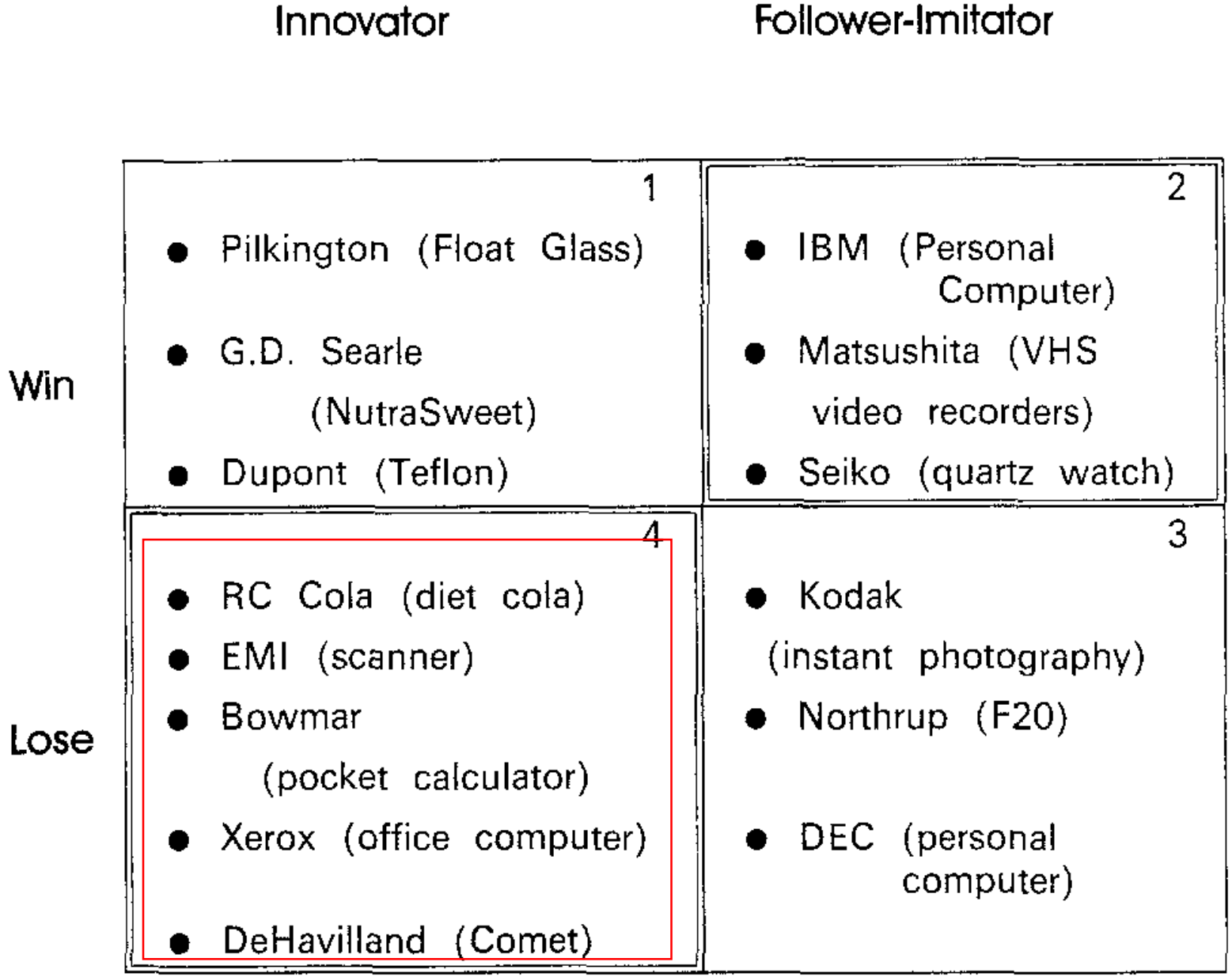


Fig. 2. Taxonomy of outcomes from the innovation process.

What determines profitability of an innovation?

- Appropriability regime
- Complementary assets
- Dominant design

Regime of appropriability

- Factors that govern innovators' ability to capture profits from innovation
  - Nature of technology
  - legal protection

Fig. 3. Appropriability regime: Key dimensions.

Design

- A new design emerge: a class of design emerges as the most promising after extensive trial and errors (e.g Ford T). Competition is on the design (Who is the innovator?)
- The the design get established: competition shifts towards price because the cost of uncertainty is now lower

The existence of a dominant design watershed is of great significance to the distribution of profits between innovator and follower. The innovator may have been responsible for the fundamental scientific breakthroughs as well as the basic design of the new product. However, if imitation is relatively easy, imitators may enter the fray, modifying the product in important ways, yet relying on the fundamental designs pioneered by the innovator. When the game of musical chairs stops, and a dominant design emerges, the innovator might well end up positioned disadvantageously relative to a follower. Hence, when imitation is possible and occurs coupled with design modification before the emergence of a dominant design, followers have a good chance of having their modified product annointed as the industry standard, often to the great disadvantage of the innovator.

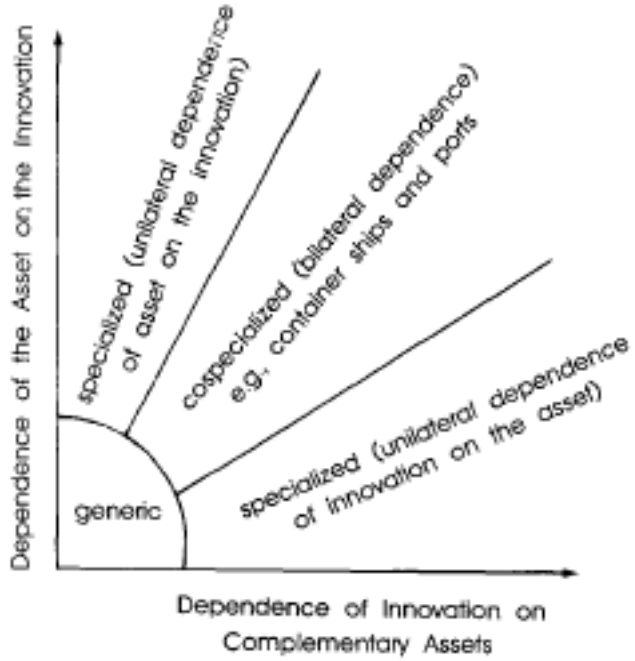
Complementary assets

Let the unit of analysis be an innovation. An innovation consists of certain technical knowledge about how to do things better than the existing state of the art. Assume that the know-how in question is partly codified and partly tacit. In order for such know-how to generate profits, it must be sold or utilized in some fashion in the market.

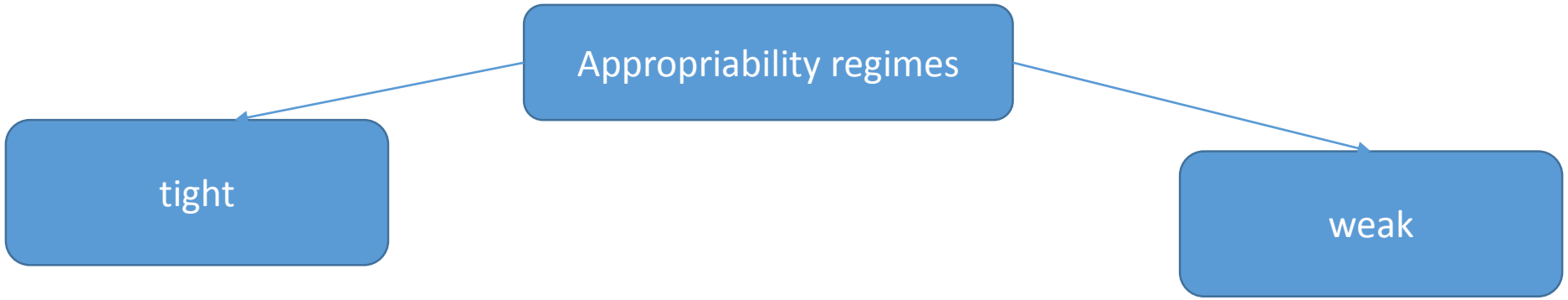
In almost all cases, the successful commercialization of an innovation requires that the know-how in question be utilized in conjunction with other capabilities or assets. Services such as marketing, competitive manufacturing, and after-sales support are almost always needed. These services are often obtained from complementary assets which are specialized. For example, the commercialization of a new drug is likely to require the dissemi-

- Generic: do not need to be tailored on the innovation
- Specilized: unilateral dependence between innovation and assets
- Cospecialized: bilateral dependence

Different degree of specialization are associated with different costs



Implications



- Ensures the innovator the needed time to improve adjust or further develop the design of the product without beign eclipsed by the imitators
- Ensures enough time to access the complementary assets:
  - Specialized asset: costly and valueless if the relation breaks down

Turn to business strategy to keep imitators at bay

New design

The cost of prototyping is relatively low

The firm is tightly couplet with the market

Established design

Need for specialized and cospecialized assets

The CAT scanner

The scanner which EMI developed was of a technical sophistication much higher than would normally be found in a hospital, requiring a high level of training, support, and servicing. EMI had none of these capabilities, could not easily contract for them, and was slow to realize their importance. It most pro

strategic error compounded by the very limited intellectual property protection which the law afforded the scanner. Although subsequent court

tures copied. Two competitors, GE and Technicare, already possessed the complementary capabilities that the scanner required, and they were also technologically capable. In addition, both were experienced marketers of medical equipment, and had reputations for quality, reliability and service. GE and Technicare were thus able to commit their R&D resources to developing a competitive scanner, borrowing ideas from EMI's scanner, which they undoubtedly had access to through cooperative hospitals, and improving on it where they could while they rushed to market. GE began taking orders in 1976 and soon after made inroads on EMI. In 1977 concern for rising health

The CAT scanner

- EMI had the knowledge but was barely able to handle it
- IPRs regime where lax
- Competitors had:
  - Knowledge
  - Complementary assets but also RELATIONS
  - More competitive when certificate of need where introduced
- By 1978 EMI lost market share leadership to competitors
- Even though the inventor of the CAT won the nobel prize, EMI failed to appropriate the lion's share of profits from their innovation

Lessons from the world's best-known fast-follower: Samsung

(link to the full article: https://www.london.edu/faculty-and-research/lbsr/diie-innovation-icons-samsung#.WiBIDkriaUk)

- Samsung didn’t invent the mobile phone – that honour goes to Motorola – but it took a transformative new technology and ran with it

- growing and innovating since 1938, when it started out as a food exporter shipping dried fish and flour from Korea to China
- In the 1950s it got into life insurance and textiles
- Samsung Electronics was founded in 1969. In the early 1990s Samsung started producing processors and hard drives for PCs, exporting them to companies including today’s smartphone rivals Apple
- In 1983, when Motorola launched the Motorola 8000, Samsung was still proudly making black-and-white TVs
- has become a dominant force in consumer electronics. It introduced its first Android phone, the Galaxy S, in 2010
- the Motorola brand name has all but vanished: only the “Moto” product name is left as a small reminder of what was once a pioneering company at the forefront of innovation

How has it achieved its success?

- Samsung is the classic fast follower: they're attuned to what competitors are doing and what other people are bringing to market first. They watch like a hawk as others gain traction and then very rapidly come up with their own version. (design→price competition)
- Remember too that Samsung is a company with a **vast amount of technological expertise**. They make about 50% of the world's microprocessors in some sections of the market. They're one of Apple's biggest **suppliers**, providing memory chips, touchscreen glass and other components. The reason they're able to move so fast is because they already have so many other **general-purpose technologies** that underlie consumer electronics. So **moving quickly is about bundling together new and existing technologies**. (complementary assets)

- Push the boundaries
  - Apple has had a long running legal dispute with Samsung over patent infringement, and in December 2015 Samsung paid out a US$548 million fine to resolve the matter.
  - Bold advertising. In 2013 Apple funnelled 0.6% of its revenue into advertising. Samsung spent 5.4% of its revenue, a staggering US$14 billion, on marketing and promotion. To put this into perspective, Coca Cola spent US$3 billion on similar activities in the same year. Samsung sponsored the Olympics and The X Factor. And it's not afraid to directly take on its competitors, with ads that send up the hipster geek stereotype of the typical Apple customer. (complementary assets)

- newer companies that are now moving into Samsung’s territory on mobile, notably the Chinese players such as Xiaomi, Huawei and ZTE that similarly take existing products made by other companies and improve and refine them to produce something they can call their own. “They’re playing Samsung’s game but Samsung invented it.”
- EO Kwon Oh-hyun told his staff recently that Samsung was now aiming to become leaner and meaner: “We should adapt ourselves to the new environment instead of sticking to our success in the past. I believe now is the time for us to turn ourselves into a first mover from a fast follower.”