

# Patent protection and technology transfer – help or hindrance?

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## Two questions

- Two separate questions whose answers may be at odds with each other:
  - Does stronger patent protection encourage technology transfer?
    - How does it affect behavior of foreign firms?
  - Does stronger patent protection encourage technology development?
    - How does it affect behavior of domestic firms?

## [ Two questions (cont.) ]

- The first question is easier to answer but the second is more important:
  1. **Foreign firms:** stronger IP protection in the host country should encourage (or at least not discourage) transfer of technology.
    - Note that this may or may not help local development.
  2. **Domestic firms:** stronger IP could encourage their innovative activities, but can also discourage imitation and inhibit learning and catchup.

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## [ Some useful surveys ]

- **Branstetter, Lee G.** 2004. Do Stronger Patents Induce More Local Innovation? *Journal of International Economic Law* 7(2), pp. 359-70.
- **Maskus, Keith E.** 2004. Encouraging International Technology Transfer, Geneva, Switzerland: ICTSD and UNCTAD Issue Paper No. 7.
- **ICTSD and UNCTAD.** 2003. Intellectual Property Rights, Implications for Development Policy Discussion Paper, Geneva, Switzerland: ICTSD and UNCTAD.

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## 1. Technology transfer

- Takes place via
  - Technology licensing (but some tacit knowledge needs to be transferred)
  - Foreign direct investment
  - Joint ventures
- Enforceable IPRs should encourage all these activities in this order:
  - 1. licensing; 2. JVs; 3. FDI

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## 1. Tech transfer - empirical

- Mansfield (1994) – survey evidence that US multinationals evaluate IP enforcement before making investment abroad
- Lee and Mansfield (1996) – empirical evidence on FDI in 16 countries supports this
- Branstetter, Fishman, and Foley (QJE 2006) – royalty payments, affiliate R&D spending, and foreign patent apps increase for US multinationals following IPR reforms in 16 foreign countries (mostly mid-level developing).
- Fosfuri (RP 2004) – country risk more important than IPRs in promoting tech transfer in chemical processing
- See Maskus survey for further evidence.

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## [ Tech transfer - summary ]

- For middle income countries that already have innovative capacity or capable of imitation
  - Both tech licensing and FDI respond to stronger IP regimes
  - Quality of technology transferred rises, and there is a shift toward licensing (markets for technology)
- Very low income countries see little response
- IPRs are not very highly ranked as an influence on tech transfer, except for R&D facilities and very advanced technologies.

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## [ 2. Technological development ]

- What is the impact of strengthened IPRs on innovation and development within the country?
  - Theory
  - Cross country evidence
  - Individual case studies of patent law changes

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## 2. IP and Tech development - theory

- Grossman and Lai (AER 2004)
  - In general, non-cooperative equilibria choose more IP protection in developed countries than less developed
- Angeles (BE Macro 2005)
  - Welfare effects depend on relative income levels in North and South
- Scotchmer (JLEO 2004)
  - Innovation provided either by IP or public sponsorship
  - Then national treatment and harmonization both lead to too much IP protection and too little public sponsorship in all countries relative to social welfare optimum
  - Small countries will favor more extensive IP rights than large countries (c.p.) – more CS leakage
  - More innovative countries will favor more extensive IP rights (c.p.)

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## 2. IP and tech development - empirics

- Lerner (AER 2001), Moser (AER 2005)
  - Historical studies (19C & early 20C)
- Park-Ginarte (1997)
  - 60 countries 1960-1990
  - IP index based on subject matter, duration, intl treaty membership, enforcement, loss measures
  - IP strength associated with R&D for countries with above median income
  - Simultaneity problem
- Kanwar-Evenson (2003)
  - 1981-1995 period; G-P index
  - Stronger IP and higher R&D intensity associated
  - No correction for simultaneity

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## 2. IP and tech development - empirics

- Lederman and Maloney (2003)
  - 73 countries 1975-2000; G-P index
  - System GMM estimation
  - Longrun response of R&D intensity to one unit move in index is about 1.3 per cent
- Chen and Puttitanum (JDE 2004)
  - 64 developing countries 1975-2000; G-P index
  - Shows that IPRs have a positive effect on innovation (patenting in US)
  - Confirms predicted U-shaped relationship between IP strength and development level (first decreases, then increases)
  - However, identification is weak: trade openness and WTO membership assumed to influence IPRs and not innovation

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## 2. IP and tech development - empirics

- Qian (RE Stat 2007)
  - 85 countries 1978-99 – pharmaceutical patents
  - Uses matched samples and fixed effect estimation – very thorough analysis
  - Patent protection only encourages innovation and R&D at high development levels
- McCalman (JIE 2001)
  - Growth model of bilateral tech transfer
  - Shows large transfers to the US from harmonization of patent rules

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## 2. IP and tech development – country case studies

- Evidence somewhat mixed
  - Western Europe (UK and Germany) had patent protection during industrial revolution
  - Although episodes of innovation without patents existed – chemicals in 19C Germany (process but not product); Cornish pumping equipment (response to aggressive patent enforcement by Watt); Lyons silk weaving cooperative
- 19C US – no national treatment
  - Encouraged local tech development and learning by imitation
- Taiwan – little use of IP until imitation strategy successful
  - Patenting in US starts in 1975 and jumps in 1985
- Korea – see Kim (2002) on technology development and weak IP rights in the early stages
  - Patenting in US jumps in 1988
- Japan – see next slide

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## 2. IP and tech development – case study evidence

- Japan – story not so clear
  - Postwar system of one claim per patent, utility models, pre-grant opposition, early disclosure – designed for incremental/adaptive invention
  - MITI's role in negotiating tech transfer licensing agreements
- La Croix and Kawaura (IEJ 1996)
  - Introduction of pharma product patents in 1970 did increase R&D in that sector
- Branstetter and Sakikabara (RJE 2001)
  - Strengthening of system in 1988-93 did not result in increased R&D
- Branstetter and Nakamura (2003)
  - Further reforms in the 1990s did not increase innovative performance (R&D productivity) either

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## Conclusions

- Stronger patents encourage patenting in general
- Stronger patents encourage tech transfer to mid-level developing countries
- Difficult to find clear evidence of positive impacts of stronger patents on innovation, except in chemical-related sectors
  - Many other factors matter, so the experiments are often not clear
    - we don't see enough variation in patent systems, and it takes time for firms to adjust
  - It is rare to have an independent measure of innovation (other than patents), so R&D effort used as proxy
- Historically, IP systems have developed in parallel with the innovative part of the economy

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## A question

Is the marginal scientist or engineer in a developing country better employed examining patents or doing R&D?

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