

# The Globalization of R&D: China, India, and the Rise of International Co-invention

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# Overview

- Interesting paper – learned a lot, especially about co-invention – highlights:
  - Contrast to Korea and Taiwan is striking
  - Possible lack of spillovers to indigenous enterprises an important finding, confirms some other work on technology development (e.g., Intel in Costa Rica)
  - related to a central innovation policy problem, how best to diffuse technology knowhow and increase learning in developing countries
- Excellent data sources, lots of work putting them together
- Some confirmation from interviews in China (why not India?)
- Discussion (based on paper, not presentation):
  - Summary of results
  - Thoughts on patent system context
  - Additional references, especially for Chinese patent data

# Summary of results

- By patent, for domestic invention only:
  - Both co-invented and MNC-owned patents are cited more often than other Chinese origin patents
  - Also true for Indian-origin patents, but co-invention and MNC patents are nearly collinear
  - More recent MNC patents have become more valuable in China and India, as have co-invented patents in India
  - Value? Or knowledge spillover?

# Summary of results

- By patent, within MNC, across countries
  - Co-invention and domestic invention do not matter for Chinese patent value, may be negative in India
  - The more experience the firm has in China, the more productive is co-invention and Chinese invention
  - Not true for India, in fact, experience associated with less productive invention in terms of US cites
  - Grant delays and team size suggest higher value, as others have also found

# Minor queries & comments

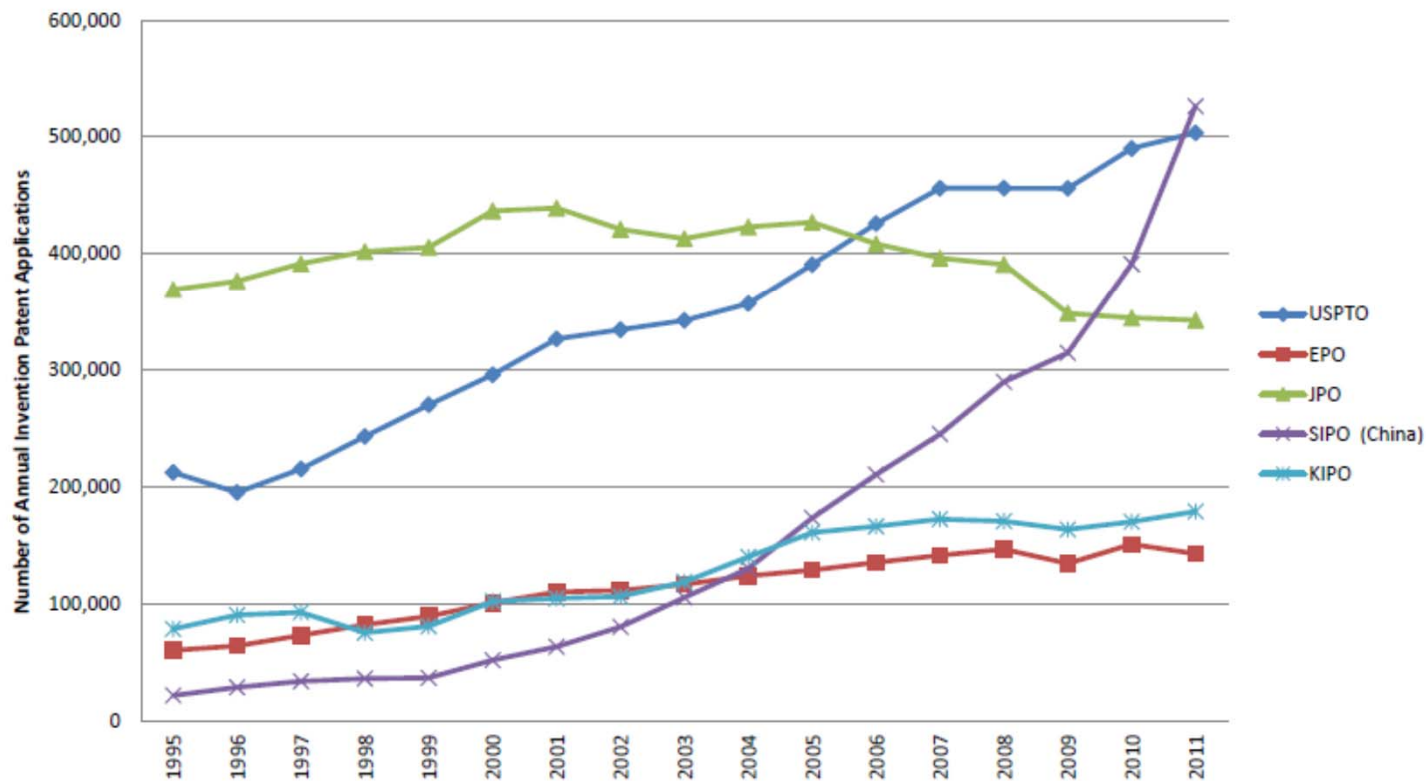
- Technology dummies very coarse – what happens if you use better categories?
- Use only examiner cites to control for “localization” in citing
- Compare results with self-cites, which are associated with private value (HJT 2005)
- Some of the hypotheses are not hypotheses: “might” ... “could” ... they are questions
- How do these results fit with those in Arora, Branstetter et al. on Indian pharma & IP?

# Context – domestic patent systems

- China (Lei 2012)
  - Modern system introduced 1985, based on German system
  - 1992 – extended scope (pharma), term to 20 years
  - 1994 – joined PCT
  - 2001 – TRIPS, injunctions, damages
  - 2009 – novelty strengthened, China-first filing requirement removed, damages increased,....
  - Combination of hardware & software is patentable
- India (T C James, Ministry of Industry, 2007; Kanwar 2013)
  - Long history of patents, except pharma; based on English system (1856, after 1852 law)
  - 1998 – joined PCT
  - 1999 – mailbox apps for pharma- marketing rights
  - 2002 – several changes for TRIPS compliance (20 years, appellate board)
  - 2005 – first pharma patents available; full TRIPS compliance
  - Software as such not patentable
- Conclusion: India lags China by about 4-5 years in updating their patent

# Things are changing fast...

## 2. China is receiving the most invention patent applications in the world



SIPO patenting growth - Source: Can Huang (2012), from WIPO data.

NB. comparison to grant data (180,000 in 2011) suggests 4 year lag.

# Some literature (SIPO data)

- Huang (2011) – estimate value of invention & utility patent rights in China 1986-1998, based on renewal data – those owned by foreign firms have higher value
- Lie Yun (2011) – parent MNCs tend to take out invention patents, Chinese subs take out utility model patents.
- Huang & Wu (2011) – nanotech patenting in China driven by the state institutions, not firms
- Lei, Wright & Sun (2012) – patent subsidies at local & central level increase patenting significantly



# Some literature (USPTO data)

- Eberhardt, Helmers & Yu (2012) – match USPTO & SIPO patents to Chinese Census of Manufacturing
  - Chinese firm patenting accounted for by a tiny, highly select group of Chinese companies in the ICT sector (Foxconn, Huawei, ZTE, etc)
  - These companies account for nearly all Chinese USPTO patent filings as well as the vast majority of domestic SIPO invention patents
  - They are younger, larger and substantially more export-oriented than firms patenting exclusively in China.
- Zheng (2011) – similar analysis of industry & technology trends as this paper, using USPTO data
- He & Tong (2013) – match USPTO patents to traded Chinese firms – so far they have created a dataset, but not analyzed it.

# Some literature (QPML)

- Consistency result:
  - Gourieroux, Montfort, and Trognon (1984), Pseudo-Maximum Likelihood Methods: Application to Poisson Models, *Econometrica* 52:701-720.
- Application to patents, including efficient QPML
  - Hall, Griliches, and Hausman (1986), Patents and R&D: Is there a lag?, *International Economic Review* 27: 265-83.