

# TECHNOLOGY TRANSFER AND ... INTELLECTUAL PROPERTY RIGHTS IN DEVELOPING COUNTRIES

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# ISSUES

- ◉ How IPRs affect inward technology transfer
  - Particularly technology-intensive goods, services, and capital
  - ... beyond sales & distribution, low-wage production
- ◉ Effect of inward technology transfer on local innovation
  - Foreign technology as an input into local innovation
- ◉ Effect on capacity for outward technology transfer
  - Capacity of local firms to engage in outward technology transfer

# BACKGROUND

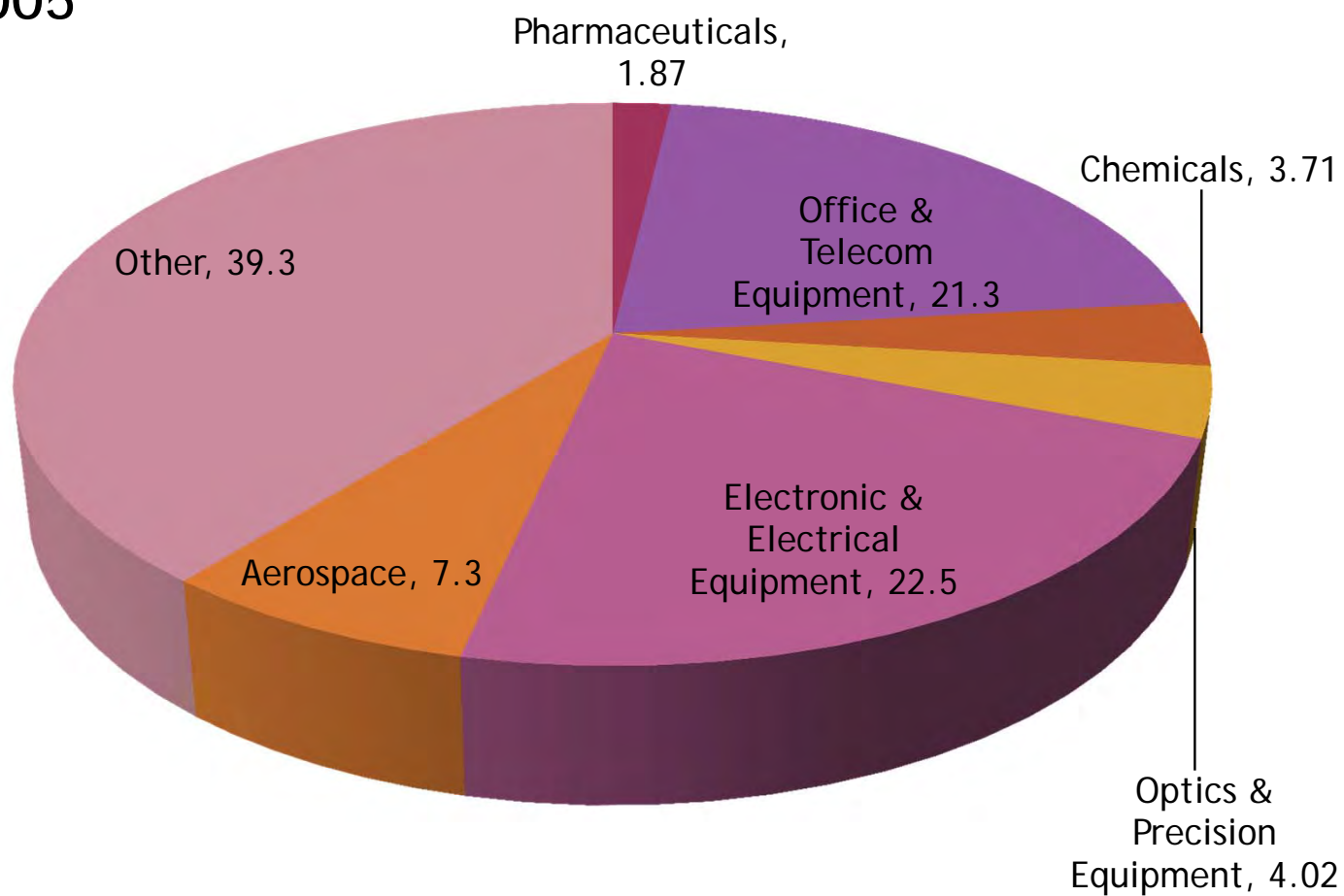
- ◉ Article 66.2 of TRIPS Agreement
  - Obligation of Developed Countries to assist in technology transfer to Least Developed.
- ◉ Modes of technology transfer
  - Foreign Direct Investment (FDI), Trade (Merchandise & Services), and International Licensing
- ◉ Trends Across Country Groups
  - Developed, Developing, and Least Developed (United Nations Classification)

# TRENDS IN TECH. TRANSFER

| Country Group   | Mode                | Mean 2005 (\$billions) | % Δ since 1995 |
|-----------------|---------------------|------------------------|----------------|
| Developed       | Inward FDI Stock    | \$244.9                | 169.8%         |
|                 | Merchandise Imports | \$236.2                | 56.2%          |
|                 | Service Imports     | \$58.4                 | 53.4%          |
| Developing      | Inward FDI Stock    | \$35.8                 | 234.3%         |
|                 | Merchandise Imports | \$47.3                 | 91.4%          |
|                 | Service Imports     | \$9.2                  | 70.4%          |
| Least Developed | Inward FDI Stock    | \$2.05                 | 262.8%         |
|                 | Merchandise Imports | \$2.2                  | 103.8%         |
|                 | Service Imports     | \$0.92                 | 91.1%          |

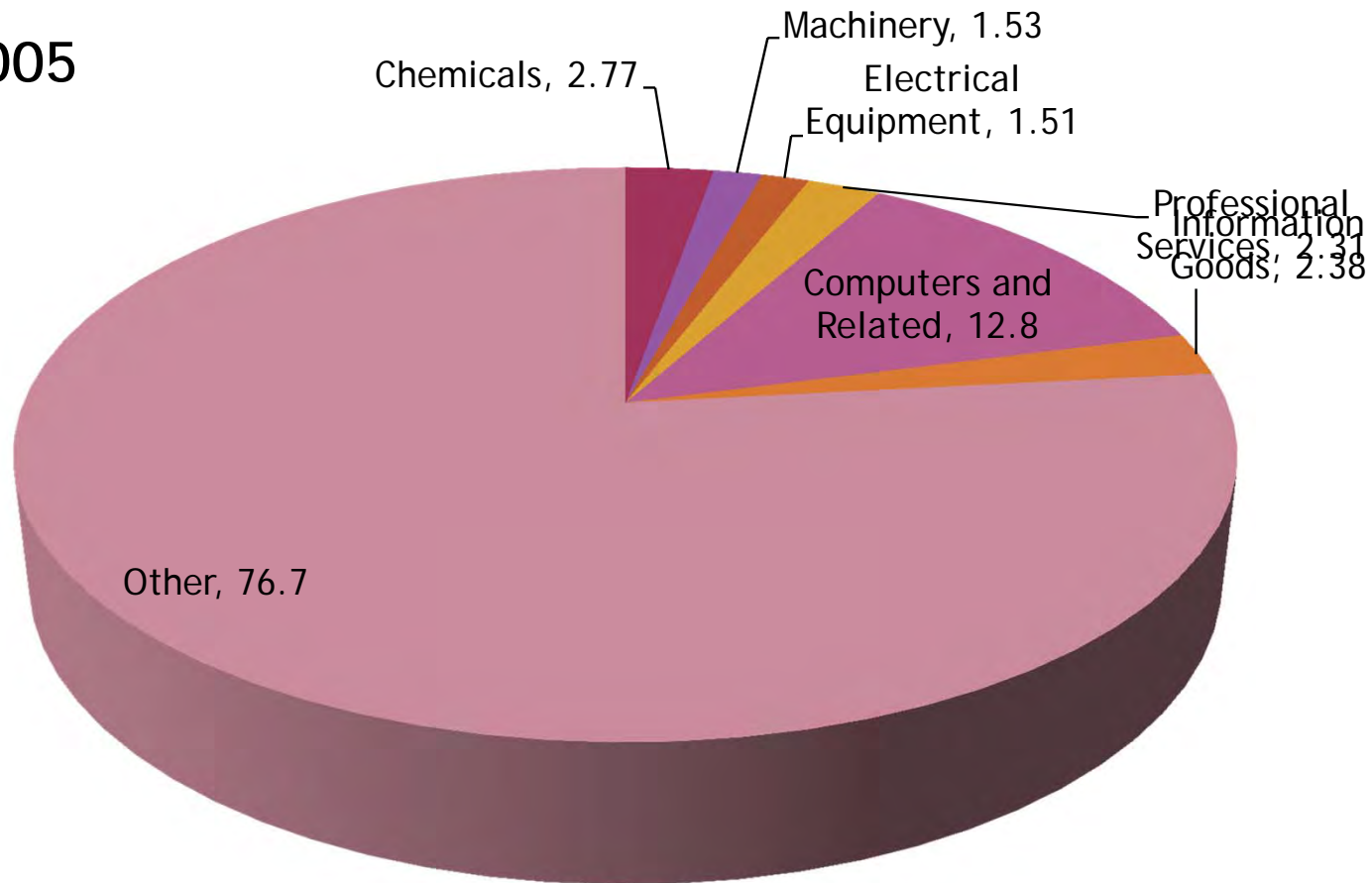
## % COMPOSITION OF MERCHANDISE IMPORTS OF DEVELOPING & LEAST DEVELOPED COUNTRIES

2005



## % COMPOSITION OF ASSETS OF FOREIGN AFFILIATES OF U.S. MNCs IN DEVELOPING & LEAST DEVELOPED COUNTRIES

2005



# CONCEPTUAL FRAMEWORK

- ◉ Global Perspectives
  - North-South
- ◉ Trade, FDI, and Licensing as a “vehicle” for technology diffusion
- ◉ IPRs and Trade, FDI, Licensing
  - Market Expansion vs. Market Power
    - ◉ *Role of Imitative Capacity*
  - Ownership, Location, and Internalization (OLI)
  - Volume & Composition of Technology Transfers



# PREVIOUS EVIDENCE

- ◉ Mansfield (1994), Lee and Mansfield (1996)
- ◉ Fink and Primo Braga (1998, 1999)
- ◉ Maskus (1998, 2004), Maskus et al. (2005)
- ◉ Smith (1999, 2001)
- ◉ Mayer and Pfister (2001)
- ◉ Javorcik (2004)
- ◉ Nunnenkamp and Spatz (2004)
- ◉ Park and Lippoldt (2005)
- ◉ Branstetter et al. (2006, 2007)
- ◉ Nicholson (2007)



# GAPS IN PREVIOUS WORK

- ◉ Dated

- Evidence before TRIPS Agreement (1995)
- Location vs. Volume of transfers

- ◉ Unresolved Issues

- Have FDI to developing countries been technology-intensive?
- Vintage of technology?
- Controls for other institutional factors

# TASKS

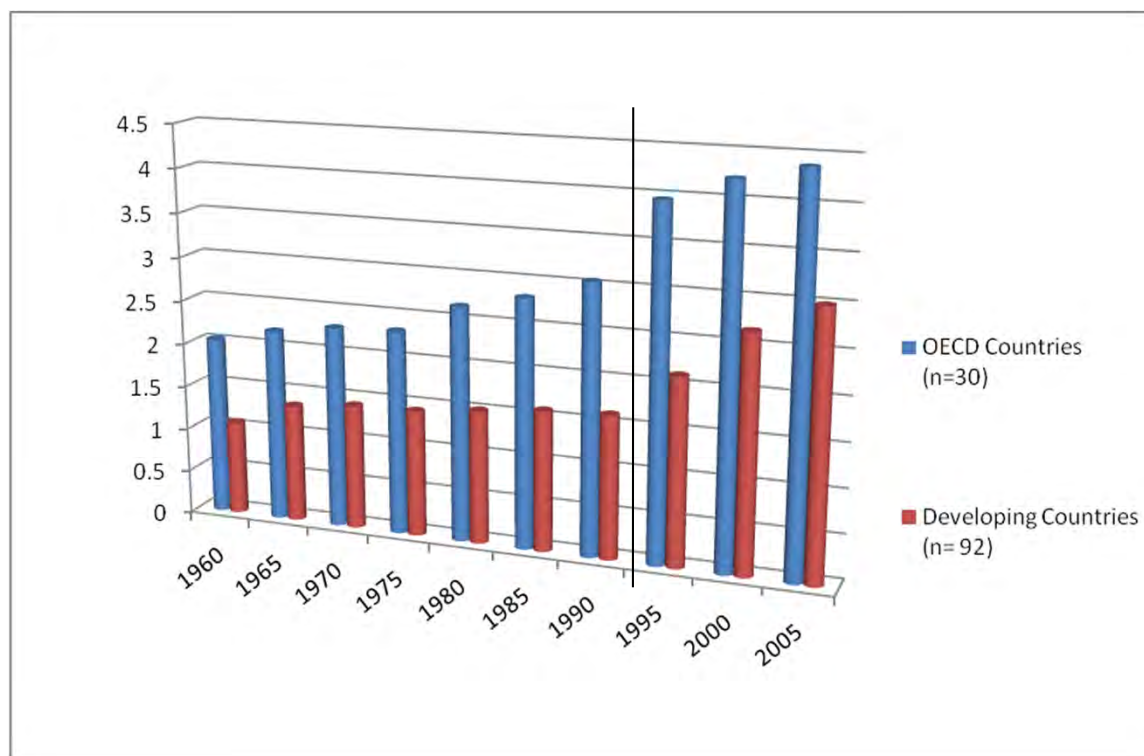
- ◉ Measures of intellectual property rights
  - Patent Protection
  - Copyrights
  - Trademarks
  - IPR Survey (perceptions of enforcement adequacy)
- ◉ FDI, Trade by sector breakdown
  - Do IPRs stimulate technologically-intensive technology transfers?
- ◉ Other institutional controls
  - Property rights in general, legal effectiveness, 'Doing Business' index, governance, trade policy

# GLOBAL IPR DEVELOPMENTS

| Country Group   | Index of Patent Rights 0 - 5<br>(%Δ since 1995) | Index of Copyrights 0 - 1<br>(%Δ since 1995) | Index of Trade-Mark Rights 0 - 1<br>(%Δ since 1995) | Executive Opinion Survey (IPR) 1- 7 |
|-----------------|---|--|---|-------------------------------------|
| Developed       | 4.4   | 0.80   | 0.70  | 5.5                                 |
|                 | (10%)   | (14.3%)                                      | (16.7%)   |                                     |
| Developing      | 3.3   | 0.60   | 0.60  | 3.5                                 |
|                 | (37.5%)   | (20%)  | (20%)   |                                     |
| Least Developed | 2.4   | 0.42   | 0.36  | 2.7                                 |
|                 | (26.3%)   | (0%)   | (33.3%)   |                                     |

| Correlations | Patent | Copy | T Mark | IPR Survey |
|--------------|--------|------|--------|------------|
| Patent       | 1      |      |        |            |
| Copy         | 0.53   | 1    |        |            |
| T Mark       | 0.57   | 0.58 | 1      |            |
| IPR Survey   | 0.62   | 0.36 | 0.37   | 1          |

## EVOLUTION OF THE PATENT RIGHTS INDEX, 1960-2005



- The vertical bar indicates the advent of the TRIPS Agreement.

# EMPIRICAL ANALYSIS: PANEL DATA

## ◉ Dataset

- 122 countries
- 1990 - 2005

## ◉ Dependent Variables of Interest

- Inward FDI (acquisition, expansion of facilities)
- Merchandise Trade (source of capital goods)
- Services Trade (FDI is conduit for services)

## ◉ Perspectives

- Different types of IPRs
- Different groups of countries
- Different industries

# RESULTS

- ◉ Patent rights important to FDI, trade
  - Copyright, trademark not statistically significant
  - Enforcement adequacy also important
  
- ◉ Across country groups
  - Quantitative impact larger in Developed countries (role of complementary factors)
  - IP Statutes important in Least Developed countries (more than perceptions of enforcement)
  - IP has 'market power effects' in smaller markets
  - Developing country group is relatively most heterogeneous

# RESULTS ...

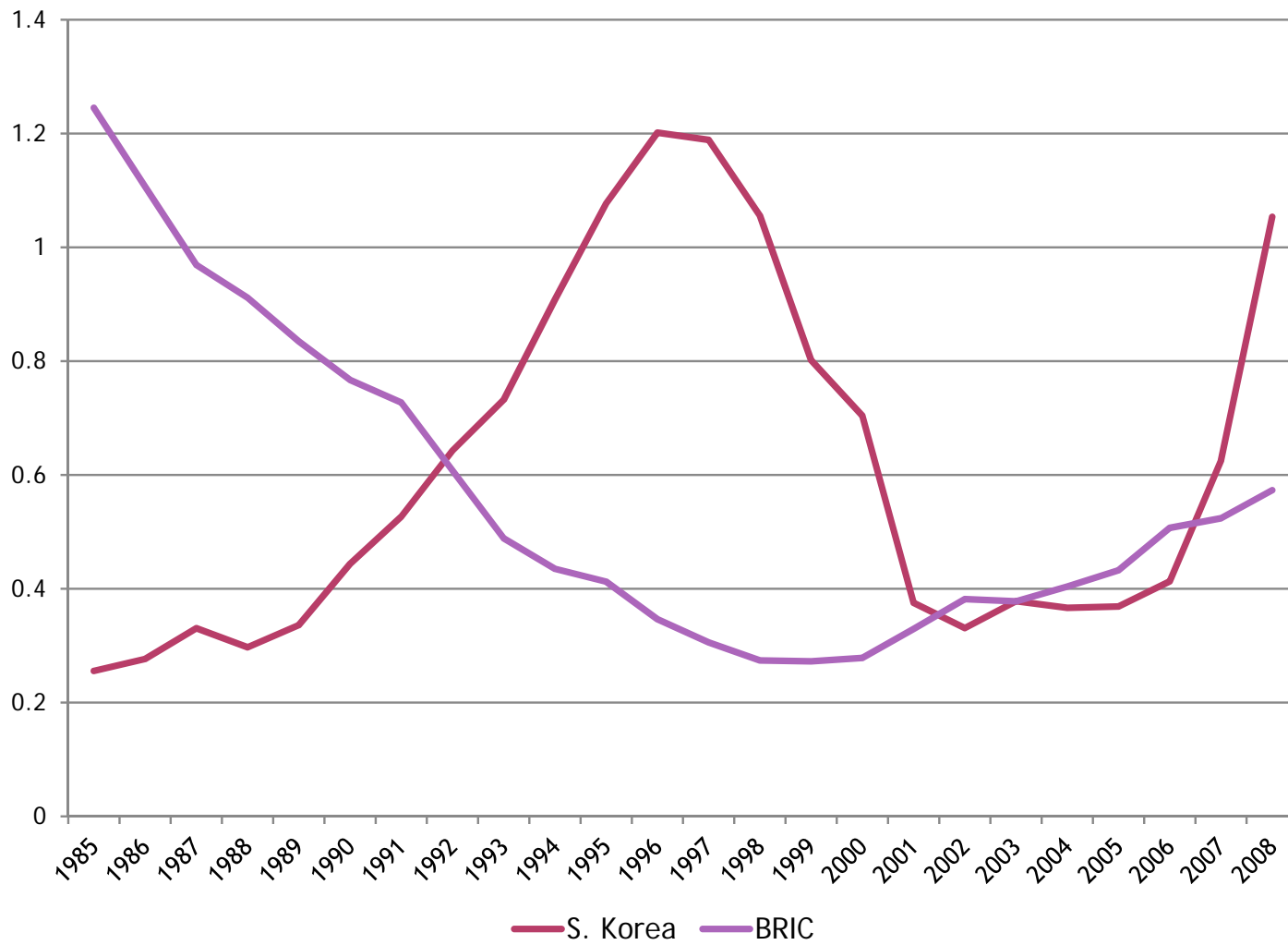
- ◉ Assessing Technological Content of Technology Transfers in Developing Countries
- ◉ Approach 1: Sector
  - FDI: IPR -> Expansions in Chemical, Service, & Information Industries. Not in electronics & computers
  - Merchandise Imports: IPR -> Pharmaceuticals, chemicals, office & telecom, precision equipment
  - Service Imports: IPR -> Communication & computers, Licensing of Intangible Assets
- ◉ Approach 2: Impact on Local R&D, Resident Patenting, and Non-Resident Patenting
  - Foreign technologies as inputs into innovation
  - Foreign technology owners filing for patent protection



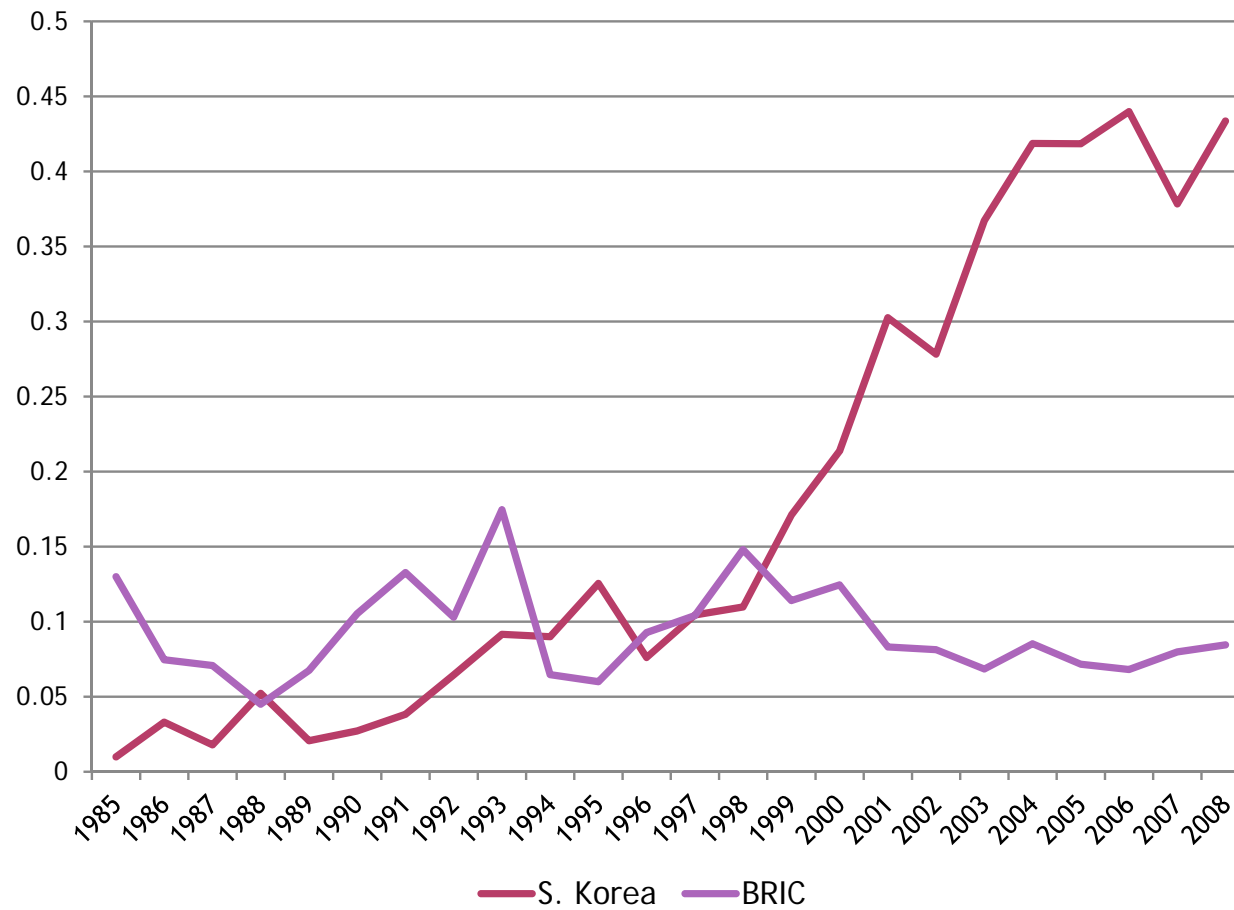
# CASE STUDIES

- ◎ Brazil, Russian, India, & China (BRIC)
  - IP Developments
  - Inward Technology Transfer
  - Local Innovation & Joint Research Ventures
- ◎ South Korea
  - Source of outward technology transfers

## RATIO of Outward FDI to Inward FDI Stock



## RATIO of Licensing Receipts to Licensing Payments (Balance of Payments)



# SUMMARY

## ◉ Technology Transfers

- Important to distinguish between overall level and composition (i.e. substitution effects)

## ◉ IPR (patent protection)

- Is one determinant of technology transfer, among others
- IP effects on Technology transfer vary by sector, level of development, imitative capacity, absorptive capacity

## ◉ Policy Relevance

- IPRs have potential to influence technological content of technology transfers
- Inward technology transfers can provide innovation inputs