



# **The Research of R&D Internationalization Based on Chinese Current S&T Statistics**

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# OUTLINE

- **Aspects to analyze R&D Internationalization**
- **To analyze R&D Internationalization from:**
  - **Through the Indicator of Funds Input**
  - **By International Cooperation Exchange for S&T Projects**
  - **On the Internationalization of R&D Output**
- **Conclusion**

# R&D Internationalization



- R&D internationalization refers to that the organizations engaging in R&D activities overseas, in the form of directly establishing overseas R&D organizations, overseas mergers and acquisitions and establishing international technology alliances, and thus changes the model in which R&D activities are carried out simply in a native country.

# R&D Internationalization



- R&D internationalization includes the global allocation of R&D resources and the international diffusion of R&D achievements. In terms of the flows of R&D resources and achievements, it includes the outflow from host country to overseas as well as the inflow from foreign countries to home country.



# **Analysis Part One**

## **Analysis on R&D Internationalization through the Indicator of Funds Input**

# Structural Analysis on the Intramural R&D Expenditures for Research Institutions



- **Table-1 Structure of intramural R&D expenditures in China's Research**

**Institutions by sources 2004 (%)**

	<b>Government Grant</b>	<b>Funds from enterprise</b>	<b>From Abroad</b>	<b>Other funds</b>
<b>Nationwide</b>	<b>79.75</b>	<b>5.19</b>	<b>0.61</b>	<b>14.45</b>
<b>Eastern region</b>	<b>80.35</b>	<b>5.20</b>	<b>0.84</b>	<b>13.60</b>
<b>Middle region</b>	<b>73.52</b>	<b>10.57</b>	<b>0.20</b>	<b>15.72</b>
<b>Western region</b>	<b>81.51</b>	<b>2.08</b>	<b>0.17</b>	<b>16.24</b>

# Structural Analysis on the Intramural R&D Expenditures for Research Institutions



- The table-1 can reflect the average level of foreign fund utilization in China's research institutions, and the situation in which the level of foreign fund utilization is high in eastern region and low in western region. The percentage of foreign funds to the total intramural R&D expenditures is as high as 1% in Beijing, Shanghai and Guangdong, higher than national and regional levels. The foreign funds used in Beijing's research institutions account for 53.79% of the total foreign funds from the total intramural R&D expenditures.

# Structural Analysis on the Intramural R&D Expenditures for Research Institutions



- **Table-2 Structure of intramural R&D expenditures in China's Local Research Institutions by sources 2004 (%)**

	<b>Government Grant</b>	<b>Funds from enterprise</b>	<b>From Abroad</b>	<b>Other funds</b>
<b>Nationwide</b>	<b>72.86</b>	<b>5.16</b>	<b>1.08</b>	<b>20.90</b>
<b>Eastern region</b>	<b>69.99</b>	<b>4.51</b>	<b>1.38</b>	<b>24.11</b>
<b>Middle region</b>	<b>73.85</b>	<b>5.02</b>	<b>0.83</b>	<b>20.29</b>
<b>Western region</b>	<b>79.67</b>	<b>7.07</b>	<b>0.52</b>	<b>12.74</b>

# Structural Analysis on the Intramural R& Expenditures for Research Institutions

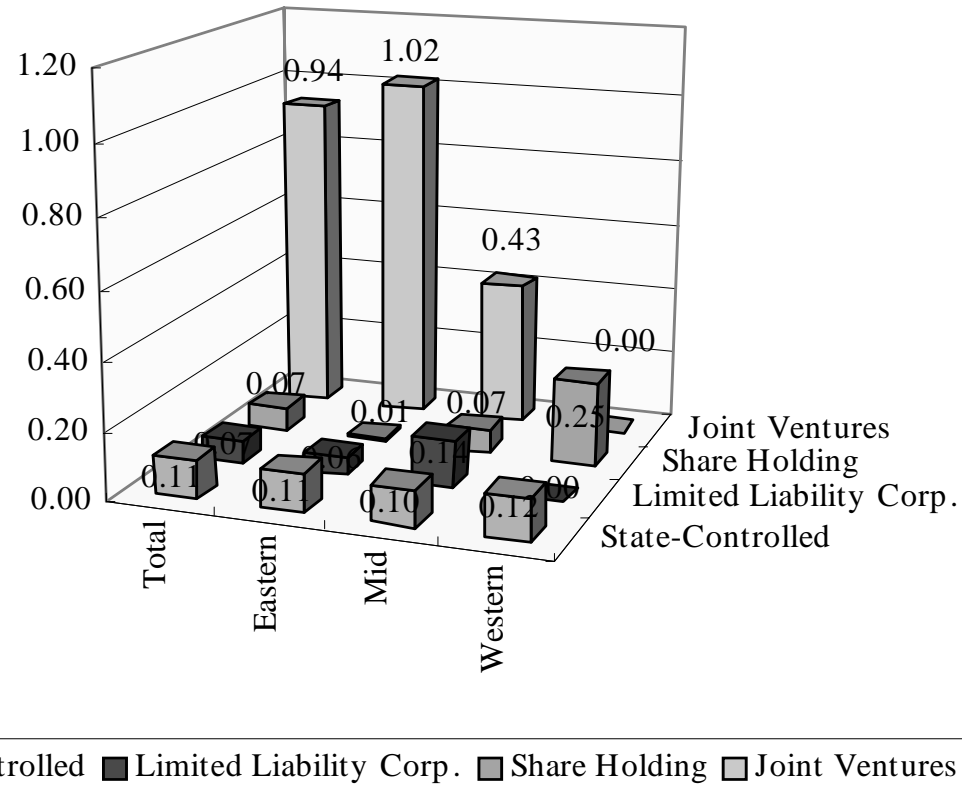


- From table-2, we can see that the percentage of the foreign funds used in local research institutions is slightly higher than that in Table-1, and one of the reasons is that the denominator of the comparison is relatively small. Moreover, we found that the local research institutions in Beijing and Shanghai are the major clients using foreign funds, with their used foreign funds exceeding 50% of the total foreign funds.

# Structural Analysis on the Foreign Funds Obtained for Industrial Enterprises' S&T



## Activities



- Figure-1: Percentage of foreign funds obtained for S&T activities of industrial enterprises above designated size (with annual sales over RMB 5 million) in the sequence of regions and types registered (%)

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# Structural Analysis on the Funds Obtained for Industrial Enterprises' S&T Activities



- In terms of total foreign funds utilized, the foreign funds used in the industrial enterprises above designated size in eastern regions account for 86.20% of the total. Guangdong is the province with the most foreign funds utilized, accounting for 30.69% of the total, the next is Jiangsu, accounting for 16.32% of the total, and Beijing ranks third, accounting for 10.78% of the total.



# **Analysis Part Two**

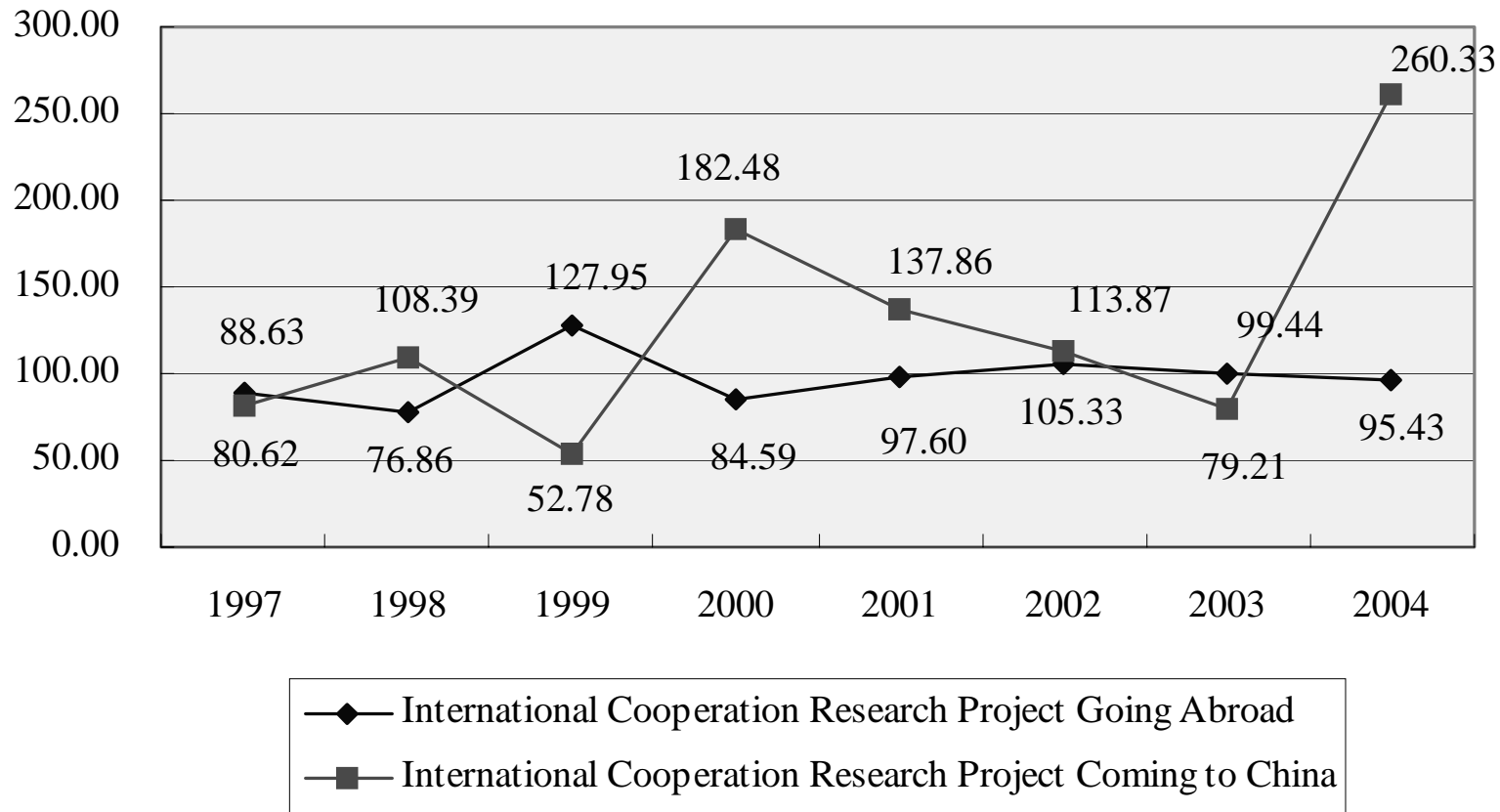
## **Study on the R&D Internationalization by International Cooperation Exchange for S&T Projects**

# Growth Rate of International Cooperation Exchange for S&T



- Due to limited information, in our research of cooperation exchange for R&D activities, we use S&T projects instead of R&D projects, and make a hypothesis that the S&T projects are R&D projects, although the data of S&T projects is larger than R&D projects, we can use it to see the trend of R&D internationalization in cooperation project.

# Growth Rate of International Cooperation Exchange for S&T



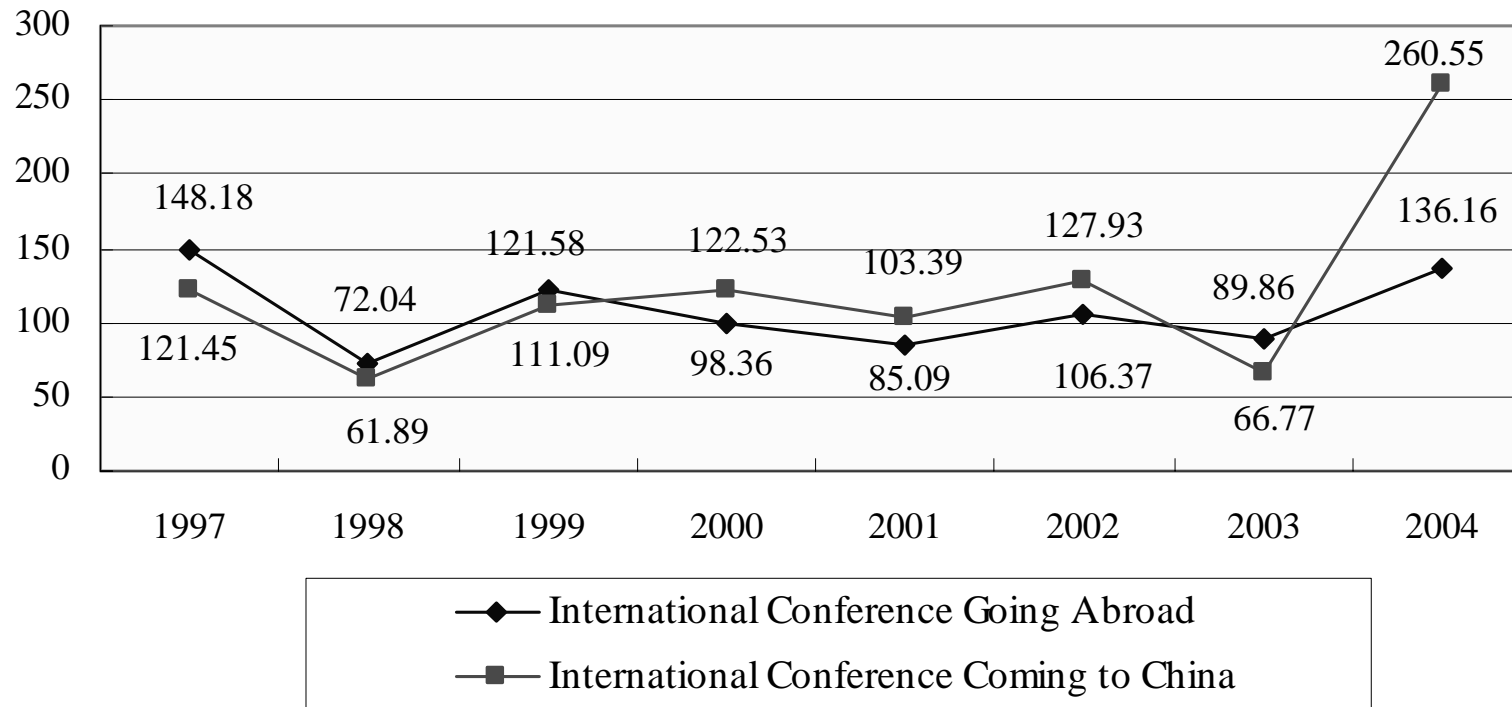
• **Figure-2: Growth rate of cooperative research projects for S&T projects**

# Growth Rate of International Cooperation Exchange for S&T



- The participation of overseas international conferences and the sponsorship of domestic international conferences can also reflect R&D internationalization.

# Growth Rate of International Cooperation Exchange for S&T



- **Figure-3: Growth rate of international conference participation at home and abroad (%)**

# Growth Rate of International Cooperation Exchange for S&T



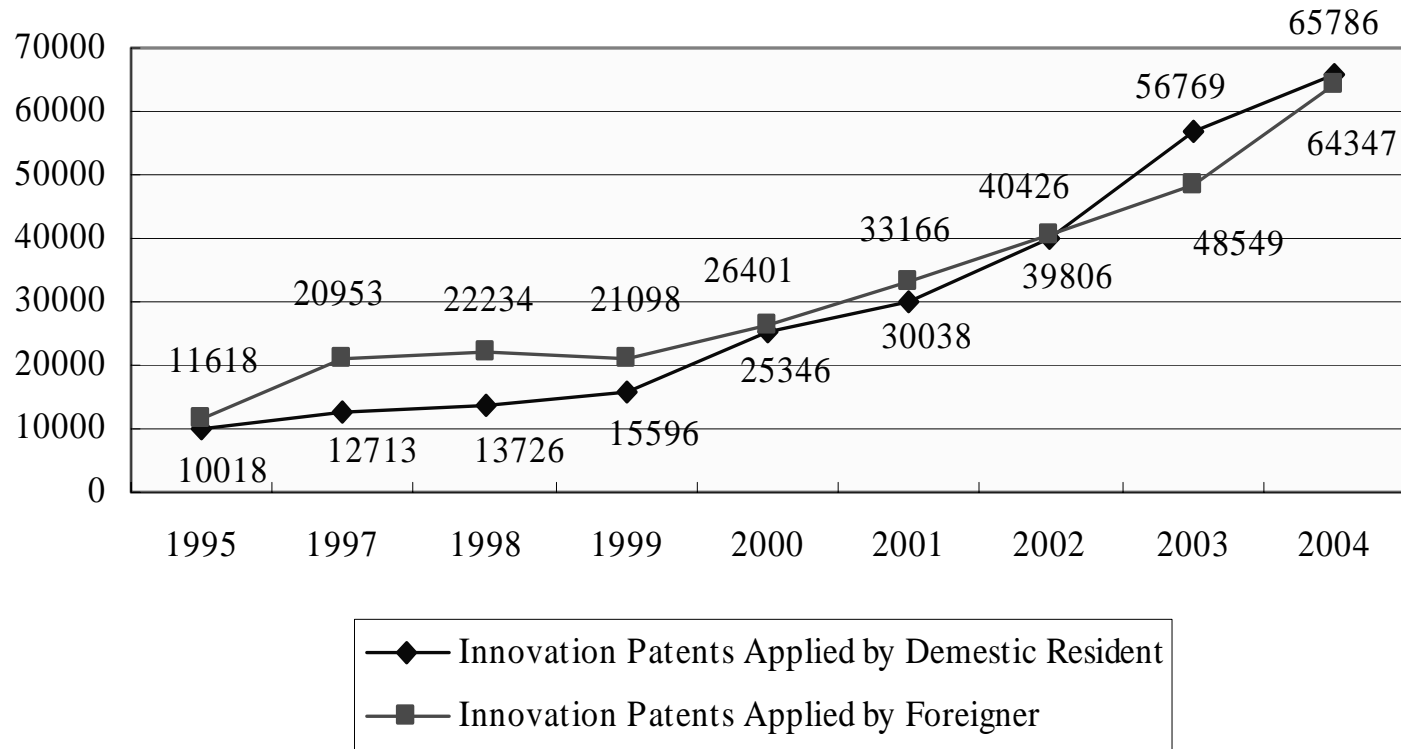
- Figure-2 and Figure-3 can also describe such a fact: with the increasingly high status of China in international affairs, the rapid development of domestic economy and the stability of the society are attracting more and more talents in science and technology to China to engage in the cooperation in S&T projects and hold international conference for academic communication in China.



# **Analysis Part Three**

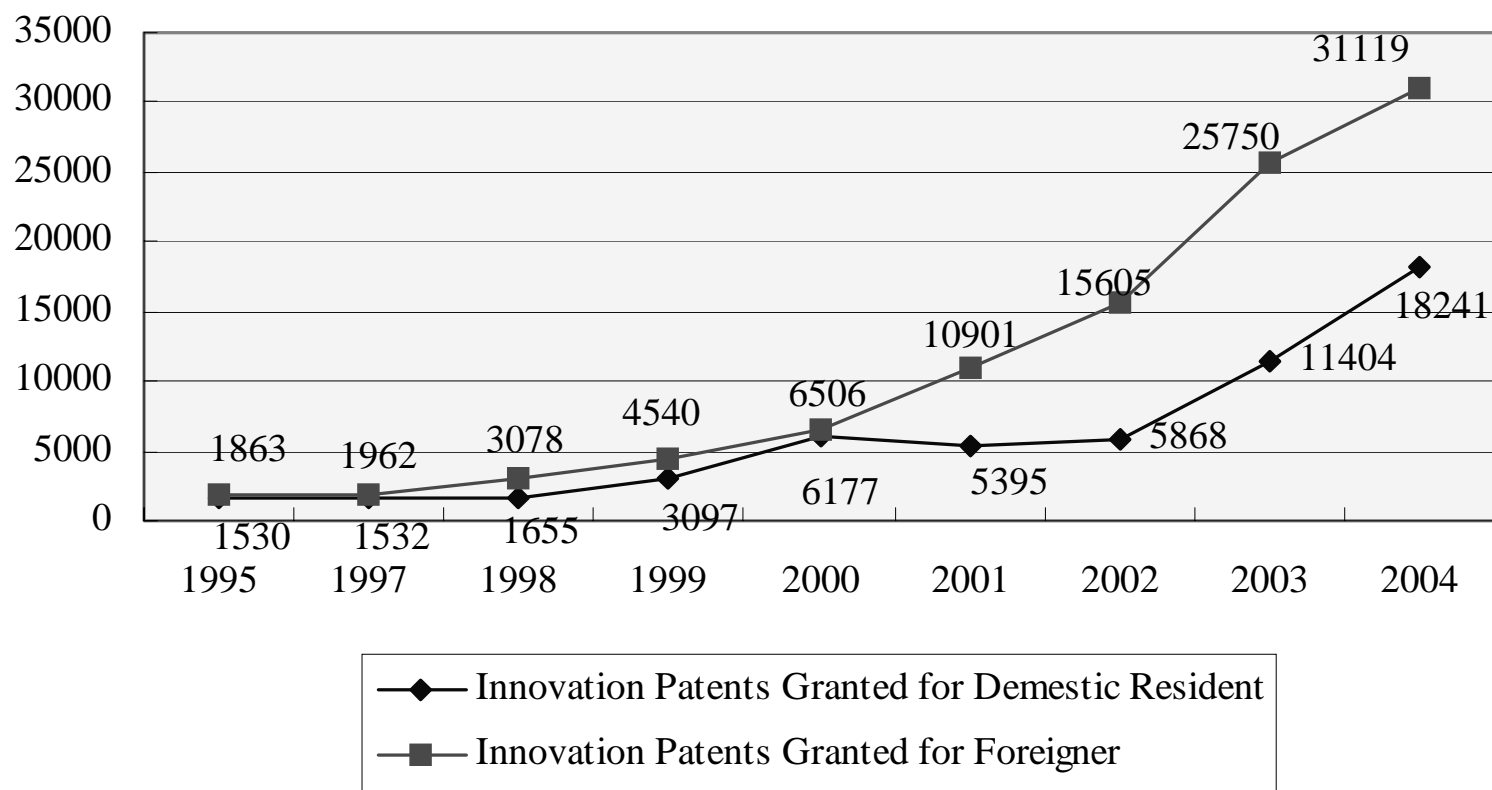
## **Analysis on the Internationalization of R&D Output**

# Analysis on Received and Granted Invention Patents



- **Figure-4: Tendency of change in invention patent applied by domestic resident or foreigner (Unit: piece)**

# Analysis on Received and Granted Invention Patents



- **Figure-5: Tendency of change in invention patents granted by domestic resident or foreigner (unit: piece)**

# Analysis on Received and Granted Invention Patents



- In 2004, in terms of countries (regions), the countries with more granted invention patents are Japan (12490 pieces), the United States (6538 pieces), Germany (2948 pieces) and Korea (2248 piece) respectively. The total invention patents granted in these countries accounts for 77.84% of the total.

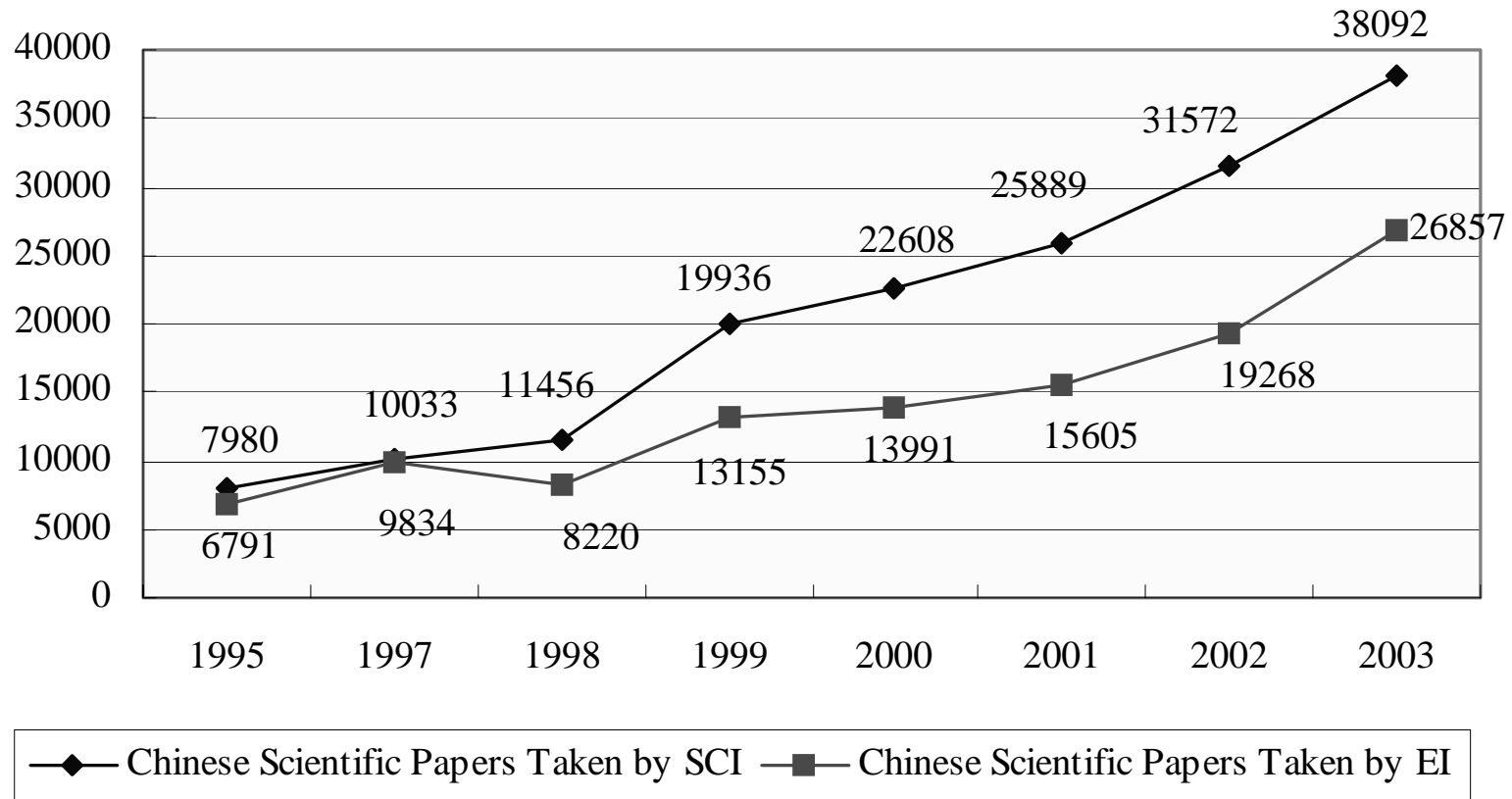
# Analysis on the Situation of Scientific Papers Published and Cited



- **Table-3: Situation of China's technological papers entered into SCI from 1998 to 2002 and cited in 2003**

	1998	1999	2000	2001	2002	Average
<b>Proportion of the cited scientific papers taken by SCI (%)</b>	35	38	43	45	35	39
<b>Average times of citations (time)</b>	0.75	0.87	1.03	1.09	0.78	0.91

# Analysis on the Situation of Scientific Papers Published and Cite.



• **Figure-6: Numbers of Chinese scientific papers taken by major foreign referencing system (unit: piece)**

# Analysis on the Situation of Scientific Papers Published and Cited



- Although the number of China's scientific papers that have been taken and cited in SCI is increasing year by year, the average level of the proportion of the cited papers is close to 40%, and the average times of citations from the taken papers are 0.91 times.

# Analysis on the Contracts of Foreign Technologies



- **Table-4: Technology Contracts Imported by regions 2004 (unit: USD 10000)**

	<b>Contracts (item)</b>	<b>Contract value</b>	<b>Technology cost</b>	<b>Equipment cost</b>
<b>Nationwide</b>	<b>8605</b>	<b>1385558</b>	<b>962528</b>	<b>423145</b>
<b>Eastern regions</b>	<b>7319</b>	<b>918765</b>	<b>755047</b>	<b>163720</b>
<b>Middle regions</b>	<b>494</b>	<b>94168</b>	<b>78625</b>	<b>15543</b>
<b>Western regions</b>	<b>565</b>	<b>62733</b>	<b>45771</b>	<b>17076</b>

# Analysis on the Contracts of Foreign Technologies



- In 2004, according to the technology contracts imported by industry, there are 5040 contracts in manufacture industry, accounting for 58.57% of the total technology contract imported, and accounting for 63.10% of the total contract values.

# Analysis on the contracts of foreign technologies



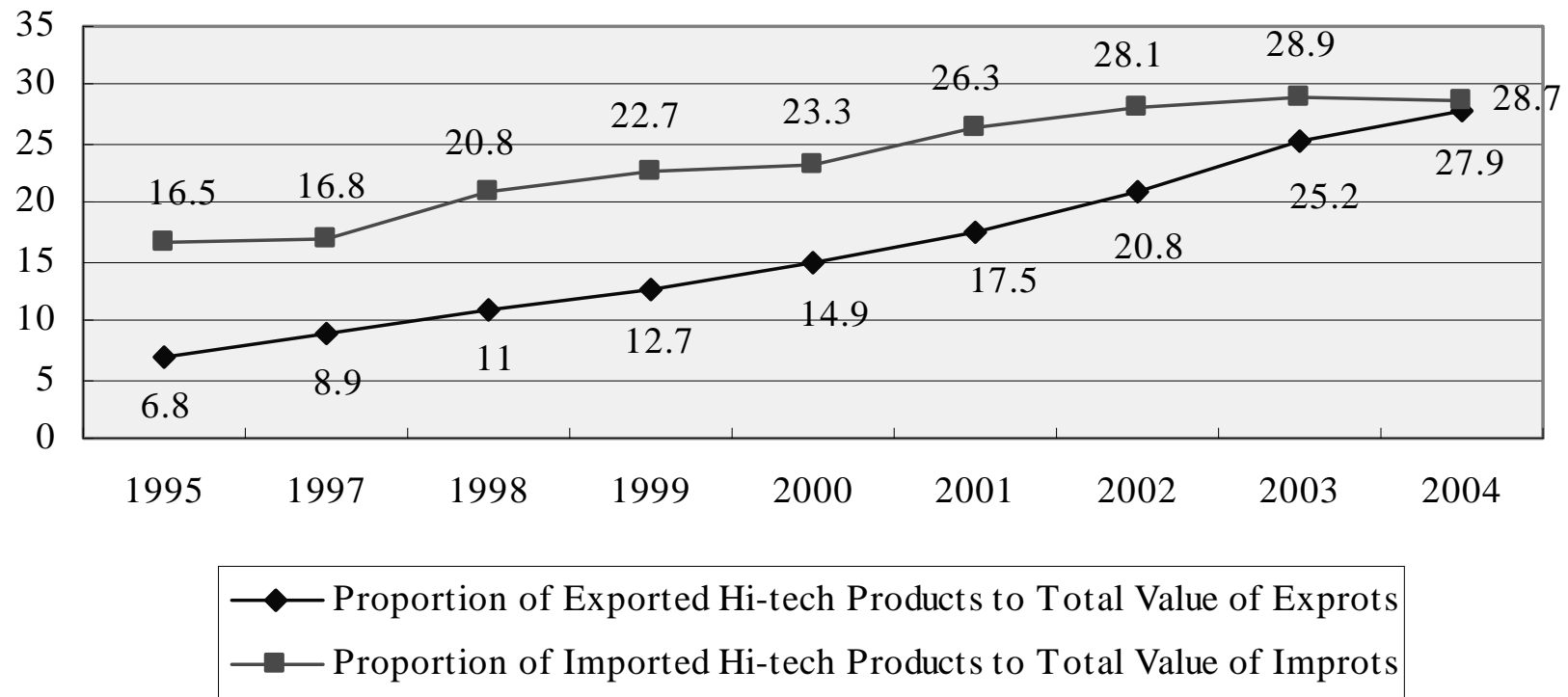
- According to the contract type of import, there are 5256 contracts in technology consultation and service, accounting for 60.76% of the total contracts, and accounting for 24.98% of total contract values.
- In the light of the contract value, the industry of technology license and transfer contract for proprietary technology accounts for 30% of the total value at first. Secondly, the industry of complete sets of equipment, key equipment and production line accounts for 27% of the total value.

# Analysis on the Contracts of Foreign Technologies



- The technology contracts imported by countries or regions:
  - There are 2219 technology contracts from Japan, accounting for 25.78% of the total number, with the average cost at \$ 1.324 million per technology contract.
  - The next is 1287 contracts from America, accounting for 14.96% of the total number, with average contract cost at \$ 2.2697 million per technology contract.
  - The third are 1066 contracts from Hong Kong, accounting for 12.39% of the total number, with the average contract value at \$ 0.6356 million per technology contract.

# Analysis on the Import and Export of Hi-tech Products



• **Figure-7: Proportion of imported and exported hi-tech products to the total values (Unit: %)**

# Comparing the Ratios of Import to Export between Countries



- **Table-5: Ratios of imports to exports of hi-tech products in some countries**

	<b>Canada</b>	<b>France</b>	<b>Germany</b>	<b>Italy</b>	<b>Japan</b>	<b>Britain</b>	<b>America</b>	<b>China</b>
<b>1995</b>	<b>0.6</b>	<b>1.19</b>	<b>1.02</b>	<b>0.78</b>	<b>2.26</b>	<b>1.02</b>	<b>0.85</b>	<b>0.64</b>
<b>1998</b>	<b>0.67</b>	<b>1.21</b>	<b>0.97</b>	<b>0.86</b>	<b>1.87</b>	<b>1.05</b>	<b>1.06</b>	<b>0.70</b>
<b>1999</b>	<b>0.65</b>	<b>1.19</b>	<b>1</b>	<b>0.62</b>	<b>1.75</b>	<b>1</b>	<b>1</b>	<b>0.66</b>
<b>2000</b>	<b>0.78</b>	<b>1.13</b>	<b>0.97</b>	<b>0.66</b>	<b>1.7</b>	<b>0.91</b>	<b>0.92</b>	<b>0.70</b>

# Comparing the Ratios of Import to Export between Countries



- From 1995 to 2004, the ratio of imports to exports for hi-tech products in China has reached from 0.64 to 1.03.
- The ratio of imports to exports for hi-tech products is the result from R&D internationalization.



# Conclusion

- We can use Chinese current S&T statistics to do the research of R&D internationalization in certain degree, and can find some trends.
- To improve the research, we need more data resources from different countries and different international organizations.
- We are very happy to see more and more researchers are engaging in the project of R&D internationalization, we can communicate with them and improve our study continuously.



# Thanks