India as a Global R&D Hub: Myth or Reality?

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Main Conclusion of Academic Literature

- Multinational firms locate R&D in their country of origin, close to HQ
  - Maintain secrecy, avoid free-riding
  - More easily transfer tacit knowledge

Exhibit 6: **The Innovation Top 20**

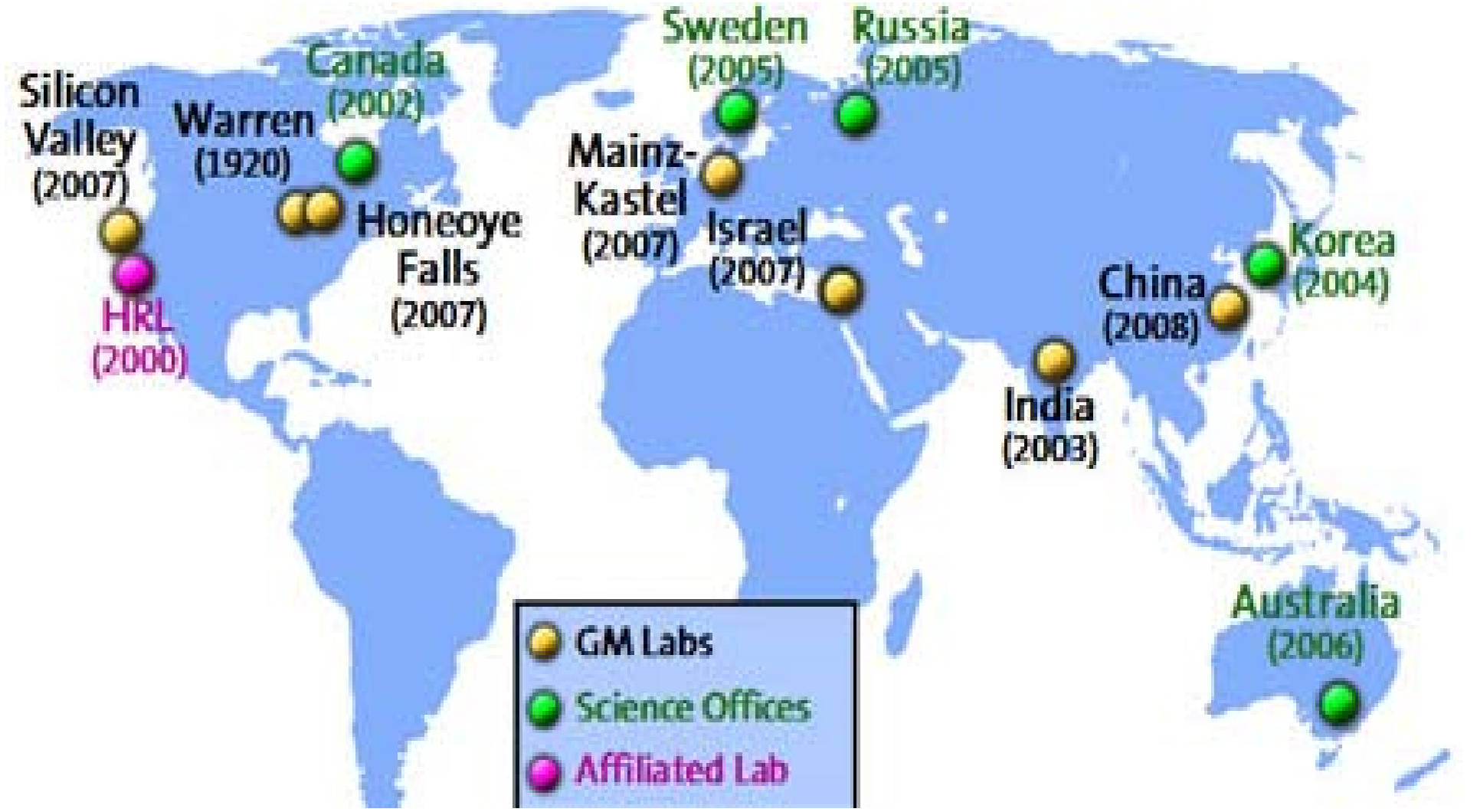
R&D spending for the top 20 companies was up 7.1 percent for 2007, for a total of US$128 billion, more than a quarter of the total spent by the Global Innovation 1000. For the second year running, Toyota was #1. R&D spending at General Motors, which rose from #6 last year to the #2 spot, was boosted by increased investment in alternative power trains.

RANK 2007	2006	COMPANY	R&D SPENDING 2007, IN US$ MILLIONS	CHANGE FROM 2006	AS A % OF SALES	HEADQUARTERS LOCATION	INDUSTRY
1	1	Toyota	$8,386	7.6%	3.6%	Japan	Auto
2	6	General Motors	$8,100	22.7%	4.5%	United States	Auto
3	2	Pfizer	$8,089	6.4%	16.7%	United States	Health Care
4	18	Nokia*	$7,727	9.0%	11.1%	Finland	Computing and Electronics
5	4	Johnson & Johnson	$7,680	7.8%	12.6%	United States	Health Care
6	3	Ford	$7,500	4.2%	4.3%	United States	Auto
7	7	Microsoft	$7,121	8.2%	13.9%	United States	Software and Internet
8	16	Roche Holding	$6,985	27.3%	18.2%	Switzerland	Health Care
9	11	Samsung	$6,536	6.3%	6.2%	South Korea	Computing and Electronics
10	8	GlaxoSmithKline	$6,476	–6.4%	14.2%	Britain	Health Care
11	14	Novartis	$6,430	20.8%	16.9%	Switzerland	Health Care
12	13	Sanofi-Aventis	$6,208	2.4%	16.2%	France	Health Care
13	10	IBM	$6,153	0.8%	6.2%	United States	Computing and Electronics
14	12	Intel	$5,755	–2.0%	15.0%	United States	Computing and Electronics
15	25	AstraZeneca	$5,162	32.3%	17.5%	Britain	Health Care
16	20	Honda	$5,142	6.5%	4.9%	Japan	Auto
17	19	Merck	$4,883	2.1%	20.2%	United States	Health Care
18	17	Matsushita	$4,850	–4.1%	6.1%	Japan	Computing and Electronics
19	15	Volkswagen**	$4,757	25.9%	3.2%	Germany	Auto
20	21	Sony	$4,553	–4.3%	5.9%	Japan	Computing and Electronics
			$128,493 TOTAL	8.0% AVG.	7.6% AVG.		

* Reflects the formation of Nokia Siemens Networks, which added Siemens's carrier-related operations and associated R&D activity.
** Excludes capital expenditures and amortization and adjusts 2006 data to reflect actual R&D spending.

Source: Booz & Company

GM's Global R&D Network



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Research on Multinational Innovation

- Recent research on multinational R&D
  - von Zedtwitz (2004, 2005)
  - UNCTAD (2005)
  - Thursby and Thursby (2006)
  - Doz et al. (2006)
  - U.S. National Research Council (2008)
  - Booz and Co (2008)

- Industry or country specific or based on old data

BusinessWeek 2008

"Old data… are fine in the academic world, which prizes the reliability and consistency of data over timeliness and where research papers take eons to wend through the peer-review process.

But the real boom in offshore R&D in Asia and Eastern Europe has occurred in the past six years, when multinationals began hiring engineers and designers by the thousands and signing major outsourcing deals with foreign engineering houses.

Visit the huge Indian labs of companies like General Electric, Texas Instruments, IBM, Cisco, and Motorola, for example, and you'll find many examples of Indian engineers developing important next-generation products for global markets. In the pharmaceutical industry, Merck, Eli Lilly, Forest Laboratories, Wyeth, Bristol-Myers Squibb and others have struck alliances to collaborate with Indian companies on major drug-discovery programs since 2005. "


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Fundamental Research Questions

- Where do multinationals locate R&D now?
  - Triad versus emerging economies?
  - Does location vary across industries?
  - Is the trend sustainable? How to make it so?
- What are multinationals doing in their new R&D centers, especially in India and China?
- How do multinationals organize and manage their new R&D centers within their global network?

Patterns in the Global Location of Multinational R&D

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In Contrast to Past Studies

- Collect recent data (2007-2008)
- Study multinationals from many countries
  vs. only a few home countries
- Study R&D location in emerging and triad countries
  vs. only emerging or triad countries

Sample

- Study world's 500 largest multinationals
- Cover wide range of (R&D intensive) industries:
  - Telecommunications, Computers/Software, Utilities/Energy, Aerospace, Pharmaceuticals
  - For now excluding Financial Services

Sampling Countries

For each multinational, we study R&D activities across subsidiaries in 21 nations:

- USA
- Canada
- UK
- Australia
- Germany
- France
- Italy
- Switzerland
- Netherlands
- Sweden
- Japan
- Korea
- China
- Taiwan
- Singapore
- India
- Ireland
- Poland
- Israel
- South Africa
- Brazil

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Method: R&D Location

- Sources: cross check
  - Company websites
  - Press reports
  - Corporate Affiliations
  - Patent filings
- Time spent (600 man-hours)
- Volume of data (1400 R&D facilities)

Sample: Fortune Global 500

Country	*No. of Fortune 500 Firms*	*% of Fortune 500 Firms*
1. U.S.	162	32.4
2. Japan	67	13.4
3. France	38	7.6
4. Germany	37	7.4
5. UK	33	6.6
6. China	24	4.8
7. Canada	16	3.2
8. Netherlands	14	2.8
9. S. Korea	14	2.8
10. Switzerlnd	13	2.6
11. Italy	10	2.0
12. Australia	8	1.6
13. India	6	1.2
14. Sweden	6	1.2
15. Taiwan	6	1.2

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Questions for Data Analysis

1. Which countries have the most total number of R&D centers?
2. Which countries “export” and attract most R&D? Which countries benefit the most?
3. What is the % of R&D done at home?
4. What is the extent of R&D to India and China across industries?
5. What are the drivers of R&D location?

1. Total R&D Centers by Country

	Total No. R&D Centers
1. U.S.	488
2. Germany	152
3. Japan	148
4. UK	109
5. China	98
6. France	84
7. India	63
8. Canada	52
9. Netherlands	35
10. S. Korea	27
10. Sweden	27
12. Brazil	26
12. Italy	26
14. Australia	24
15. Ireland	20

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2a. Which Countries “Export” Most?

	No. R&D Centers Out	*No. Fortune 500 Firms*
U.S.	253	162
Japan	113	67
France	104	38
Germany	78	37
UK	46	33
Netherlands	42	24
S. Korea	24	14
Canada	22	16
China	8	24
India	0	6

2b. Which Countries Attract Most?

Countries	*R&D Centers In*
U.S.	***223***
Germany	***79***
UK	75
China	74
India	58
Japan	43
Canada	37
France	35
Netherlands	18
S. Korea	10

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2c. Which Countries Benefit Most?

	Centers Out	*Centers In*	*Net Effect*
China	8	74	66
India	0	58	58
UK	46	75	29
Canada	22	37	15
Germany	78	79	1
S. Korea	24	10	-14
Netherlands	42	18	-24
U.S.	253	223	-30
France	104	35	-69
Japan	113	43	-70

3a. % of Multinational R&D at Home

	R&D Concentration in Home Countries
India	100%
China	74%
U.S.	51%
Japan	48%
Germany	47%
UK	43%
Canada	41%
S. Korea	41%
France	32%
Netherlands	29%

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3b. Firm Size and R&D % at Home

% R&D at home decreases as firm size increases

	Revenues $	Total No. R&D Centers	No. Countries R&D Centers	% R&D Home
Revenues $	-			
Total No. R&D Centers	.42	-		
No. Countries R&D Centers	.48	.89	-	
% R&D Home	-.38	-.69	-.75	-

4. R&D Centers: India and China by Industry

	Mean No. MNC R&D Centers in China	*Mean No. MNC R&D Centers in India*	*No. of Fortune 500 Firms in this Industry*
Network Equipment	1.60	1.00	5
Computers	.79	.57	14
Software	.67	.67	3
Electronics	.42	.26	19
Pharmaceuticals	.27	.45	11
Food Consumer Products	.21	.16	19
Telecommunications	.20	.00	21
Utilities/Energy	.07	.00	28

5. Drivers of R&D Location

Conceptual Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Economic Performance	3.2×10^{-4}[a]				-1.4×10^{-4}
Economic Growth		1.4×10^{-4}			-1.3×10^{-4}
Intellectual Property Rights			.02		.04
Scientific Capability				1.2×10^{-4}[a]	1.7×10^{-4}[a]
Constant	2.63[a]	3.45[a]	3.38[a]	2.49[a]	2.23[a]
	Pseudo R^2=.12	Pseudo R^2=.00	Pseudo R^2=.00	Pseudo R^2=.17	Pseudo R^2=.18

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Findings

Multinational R&D off-shoring:

1. Is substantial
2. Differs distinctly by country and industry
3. Increases with the size of multinationals
4. To India and China is huge
5. Is driven by science and technology PhDs

India: A Global R&D Hub?

- Increasingly an important destination for R&D
- Its current attractiveness varies across industries
- Its ongoing attractiveness will depend on its ability to produce large numbers of *high quality* PhDs


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Questions for Research and Discussion

- What are multinationals doing in their R&D centers in India? How sustainable is this phenomenon?
- How important are the Indian R&D centers within multinationals' global networks?
- Does R&D matter? What about total economic impact? What about Indian markets and consumers?
- Is India a threat to China? Are India and China threats to the West?

Thank you!

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Read the event agenda and registration details

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