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Towards a *new new* geography of innovation – the rise of Chinese innovation giants and its implications

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New geography of production

- Global production network has been evolving into a 'new geography'
- China has become the world's manufacture centre:
 - produces 70% of the world's photocopiers, 55% of its DVD players, 50% of its cameras, 30% of its air conditioners, and 25% its washing machines (Wilsdon & Keeley, 2007)
- However, the core of the value chain remains within the Triad

New geography of innovation

- MNCs are increasingly moving their R&D activities into emerging economies
 - Between 2004 and 2007, global multinationals increased their total R&D sites by 6%, 83% of those were in China and India (Jaruzelski & Dehoff, 2008)
- Foreign corporate R&D in China
 - The pioneers: Motorola (1993), Ericsson (1997), Microsoft (1998), Nokia (1988)
 - 107 autonomous R&D centres by foreign firms (2004), > 600 in 2008, >1,000 in 2010 (MOFCOM)
- The traditional wisdom: innovation and internationalisation of innovation is driven by the west and imposed on the rest

This is changing fast

- Increasing number of global R&D centres in China
- Surging overseas R&D investment by Chinese firms
 - Growth of China's spending on R&D >20% each year since 1999 (OECD, 2007)
 - To build an 'innovation-oriented society'
 - To increase R&D intensity to 2.5% by 2020 (0.7% in 1998, 1.3% in 2005)
 - among the top five countries worldwide in terms of patents and scientific citations
 - Emerging Chinese overseas direct investment (ODI) and MNCs
 - ODI \$12.3bn in 2005, 26bn in 2007, 43.3bn in 2009, 59bn in 2010 (MOFCOM, 2011)
- The rise of Chinese innovation giants

Global innovation giants – from China

- **Table 1 number of Chinese companies in the BIS R&D Scoreboard global list (2003 - 2010)**

| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|--------|------|------|------|------|------|------|------|------|
| Number | 1 | 2 | 4 | 7 | 8 | 11 | 16 | 20 |

Table 2 ‘Global’ and ‘industrial ranking’ of selected Chinese companies, 2003-10

| | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|----------------------------|--------------------|------|------|------|------|------|------|------|------|
| China Petroleum & Chemical | Global ranking | 309 | 337 | 358 | 260 | 233 | 202 | 212 | 205 |
| | Industrial ranking | 9 | 11 | 11 | 8 | 9 | 9 | 9 | 9 |
| PetroChina | Global ranking | | 219 | 202 | 185 | 162 | 148 | 108 | 80 |
| | Industrial ranking | | 7 | 6 | 6 | 5 | 5 | 2 | 1 |
| ZTE | Global ranking | | | 269 | 298 | 228 | 214 | 186 | 131 |
| | Industrial ranking | | | 54 | 62 | 46 | 41 | 40 | 24 |
| Lenovo | Global ranking | | | 931 | 356 | 333 | 324 | 391 | 403 |
| | Industrial ranking | | | 168 | 76 | 66 | 64 | 68 | 68 |

Table 2 continued

| | | | | | | | | | |
|-----------------------------|--------------------|--|--|--|------|------|------|-----|-----|
| Semiconductor manufacturing | Global ranking | | | | 701 | 657 | 705 | 735 | 528 |
| | Industrial ranking | | | | 133 | 116 | 120 | 121 | |
| CNOOC | Global ranking | | | | 963 | 1059 | 939 | 945 | 904 |
| | Industrial ranking | | | | 15 | 17 | 20 | 20 | 20 |
| TCL | Global ranking | | | | 1051 | | | | |
| | Industrial ranking | | | | 190 | | | | |
| Tencent | Global ranking | | | | | 1218 | 1110 | 864 | 583 |
| | Industrial ranking | | | | | 109 | 83 | 58 | 42 |
| China Telecom | Global ranking | | | | | 1228 | 880 | 978 | 900 |
| | Industrial ranking | | | | | 18 | 14 | 14 | 15 |

Table 2 continued

| | | | | | | | | | |
|--------------------------------|--------------------|--|--|--|--|--|------|-----|-----|
| Weichai Power | Global ranking | | | | | | 1228 | | |
| | Industrial ranking | | | | | | 81 | | |
| AviChina Industry & Technology | Global ranking | | | | | | 1339 | | |
| | Industrial ranking | | | | | | 84 | | |
| TravelSky Technology | Global ranking | | | | | | 1381 | | |
| | Industrial ranking | | | | | | 222 | | |
| China Railway Construction | Global ranking | | | | | | | 355 | 155 |
| | Industrial ranking | | | | | | | 4 | 1 |
| China Coal Energy | Global ranking | | | | | | | 519 | 465 |
| | Industrial ranking | | | | | | | 4 | 3 |

Table 2 continued

| | | | | | | | | | |
|----------------------------------|--------------------|--|--|--|--|--|--|-----|-----|
| China Communication Construction | Global ranking | | | | | | | 529 | 364 |
| | Industrial ranking | | | | | | | 9 | 5 |
| BYD | Global ranking | | | | | | | 561 | 519 |
| | Industrial ranking | | | | | | | 46 | 37 |
| China South Locomotive | Global ranking | | | | | | | 562 | 372 |
| | Industrial ranking | | | | | | | 30 | 15 |
| Dongfang Electric | Global ranking | | | | | | | 969 | 803 |
| | Industrial ranking | | | | | | | 62 | 50 |
| Dongfeng Motor | Global ranking | | | | | | | 408 | 320 |
| | Industrial ranking | | | | | | | 45 | 36 |

Table 2 continued

| | | | | | | | | | |
|--------------------------------------|--------------------|--|--|--|--|--|--|-----|-----|
| Shanghai Electric | Global ranking | | | | | | | 581 | 533 |
| | Industrial ranking | | | | | | | 31 | 32 |
| Huawei | Global ranking | | | | | | | | 70 |
| | Industrial ranking | | | | | | | | 14 |
| Metallurgical Corporation of China | Global ranking | | | | | | | | 408 |
| | Industrial ranking | | | | | | | | 18 |
| SAIC Motor | Global ranking | | | | | | | | 420 |
| | Industrial ranking | | | | | | | | 42 |
| China Railway | Global ranking | | | | | | | | 788 |
| | Industrial ranking | | | | | | | | 18 |
| Source: BIS R&D scoreboard (2003-10) | | | | | | | | | |

Table 3 Chinese innovation giants and ascending stars

| | BIS ranking 2010 | | R&D investment (2009/10) | | R&D investment per employee (2009/10) | |
|--|------------------|------------|--------------------------|---|---------------------------------------|---|
| | Global | industrial | £m | growth over average of the last 4 yrs (%) | £'000 | growth over the last average of 4 yrs (%) |
| | | | | | | |
| The giants | | | | | | |
| Oil & gas producers | | | | | | |
| PetroChina | 80 | 1 | 896.81 | 93; | 1.7 | 65 |
| Industrial average | | | 281.12 | 28.9; | 2.7 | 32 |
| Technology hardware & equipment | | | | | | |
| ZTE | 131 | 24 | 554.92 | 100; | 7.9 | 28 |
| Huawei | 70 | 14 | 1185.26 | na | 12.5 | na |
| Industrial average | | | 388.89 | 3.5; | 18.3 | -5.7 |

Table 3 continued

| Construction & Materials | | | | | | |
|--|-----|----|--------|-------|-----|------|
| China Railway Construct ion | 155 | 1 | 468.25 | NA | 2.2 | NA |
| China Commun ication Construct ion | 364 | 5 | 157.56 | 334; | 5.1 | 202 |
| Industrial average | | | 126.47 | 11.3; | 2 | 18.5 |
| Industrial engineering | | | | | | |
| China South Locomoti ve | 372 | 15 | 153.87 | NA | na | NA |
| Industrial average (63) | | | 160.78 | 13.7; | 6.4 | 12.1 |

Table 3 continued

| The ascending stars | | | | | | |
|---------------------------------|-----|----|--------|-------|------|-----------------------|
| Software & computer services | | | | | | |
| Tencent | 583 | 42 | 88.53 | 207; | 11.8 | 58 |
| Industrial average | | | 330.71 | 14.2; | 18 | 3.9 |
| Electric & electrical equipment | | | | | | |
| BYD | 519 | 37 | 102.54 | 84; | 0.6 | 21 |
| Industrial average | | | 301.96 | 9.7; | 6.8 | -5.2 |
| Industrial engineering | | | | | | |
| Dongfang Electric | 803 | 50 | 57.78 | 90; | 3 | NA (23 on last year) |
| Shanghai Electric | 533 | 32 | 98.36 | 122 | 3.4 | 143 (20 on last year) |
| Industrial average | | | 160.78 | 13.7; | 6.4 | 12.1 |

Chinese innovation giants – mere copycats or real innovators?

- China South Locomotive –
 - CRH2 300-350 km/h Electric Multi Unit; CRH380A EMU 380km/h;
 - R&D networks domestically and overseas;
 - patents (554 granted in 2009 alone)

Chinese innovation giants – mere copycats or real innovators?

- Huawei:
 - No. 4 applicant under PCT in 2010, No. 2 in 2009;
 - 49,040 patents accumulated and 17,765 granted up to Dec. 2010;
 - Leading player in LTE and many standard orgs.;
 - 20 research institutes and over 20 joint innovation centres with big Ts;
 - “More than any other, Huawei is the firm that is overturning the widely held perception that Chinese companies are merely imitators rather than innovators” (Economist, 2010)

Chinese innovation giants – mere copycats or real innovators?

- ZTE, Tencent, BYD ...

Chinese innovation giants - implications

- Commercially significant innovations (frugal innovation, architectural innovation), disrupting global competition?
- Change of global leadership and re-configuration in many industries;
- Global innovation networks led by Chinese firms – *new new* geography of innovation and new phase of internationalisation of innovation?

new phase of R&D internationalisation – Chinese R&D investment in the UK?

- Telecom:
 - ZTE innovation centre in London (10 overseas centres in near future);
 - Huawei joint innovation centre (with BT) in Ipswich
- Automotive:
 - SAIC in Longbridge and Leamington Spa
 - Changan Auto in Nottingham
 - Lifan Auto in Oxford
- Pharmaceutical/Biopharma:
 - Xiangcam in Cambridge
 - NewSummit (location)?
- Others
 - Zhuzhou imes Electric in Lincoln
 - CQME in Rochdale
 - ...

Further questions

- Opportunities for knowledge clusters in the west
 - external linkages (new knowledge though may not be technical), plugged into the Chinese innovation systems
- Implications for innovation clusters in China – upgrading
- Rationales
- Do they adopt the open innovation model?
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