

Decline of the Center: the Decentralizing Process of Knowledge Transfer of Chinese Universities from 1985-2004

Wei Hong

University of Illinois at Chicago

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Introduction

- Governments of many countries have realized the impact of academic research on industry innovation and are strengthening universities' roles in their national innovation systems.
- Channels whereby universities convey knowledge to industry:
 - Publications (Faulkner and Senker 1995; Cohen et al.2002)
 - External ties with star scientists (Zucker and Darby 1996; 2001)
 - Collaborative research (Meyer-Krahmer and Schmoch, 1998)

The Chinese Science Policy

- The Chinese government has been advocating an application-based science policy since its establishment (1949).
- Recovery from the Cultural Revolution (1978)
- Reforms in science policy:
 - Cutting government research funding (mid-1980s)
 - Institutional merge and decentralization in jurisdiction for efficiency purpose (1994)
 - National innovation congress (1999)

Results of the 1994 Reform

- 103 higher education institutions combined into 42 comprehensive ones as of 1996 (Yang, 2000)
- 612 institutions had been reduced to 250 by 2000 (Zhou et al., 2003).
- Among the 358 national universities, only 35 of them were still controlled by a central ministry (the Ministry of Education). The other 323 were administered by both the 62 central ministries they used to observe and their local governments.
- The percent of national universities dropped from 51% in 1995 to 9% in 2002 (Zhou et al., 2003).

Four Historic Periods

- Cutting points:
 - 1989: Tiananmen Square Event
 - 1994: the merging and decentralizing reform
 - 1999: national innovation congress; China joined WTO.
- 1985-1989: the economic reform had proceeded for 7 years. Universities were pushed to the market. Emergence of “Sunday engineers”.
- 1990-1994: post Tiananmen Square period. Reform regenerated in 1992.
- 1995-1999: decentralizing period.
- 2000-2004: increased university-industry collaborations; huge increase in patent application.

Data and Method

- Chinese patent data (1985-2004).
- Identify patents applied for by universities and firms as co-applicants.
- From each patent, one or more dyad composed of a higher education institution and a firm was formed.
- From each dyad, a knowledge flow record from the province where the academic sector is located to the province where the industry sector is located was created.
- According to the four historical periods defined earlier, four 30*30 matrices of geographic knowledge flow from academia to industry were constructed,

Figure 1: Knowledge transfer network of provinces and municipalities from 1985-1989

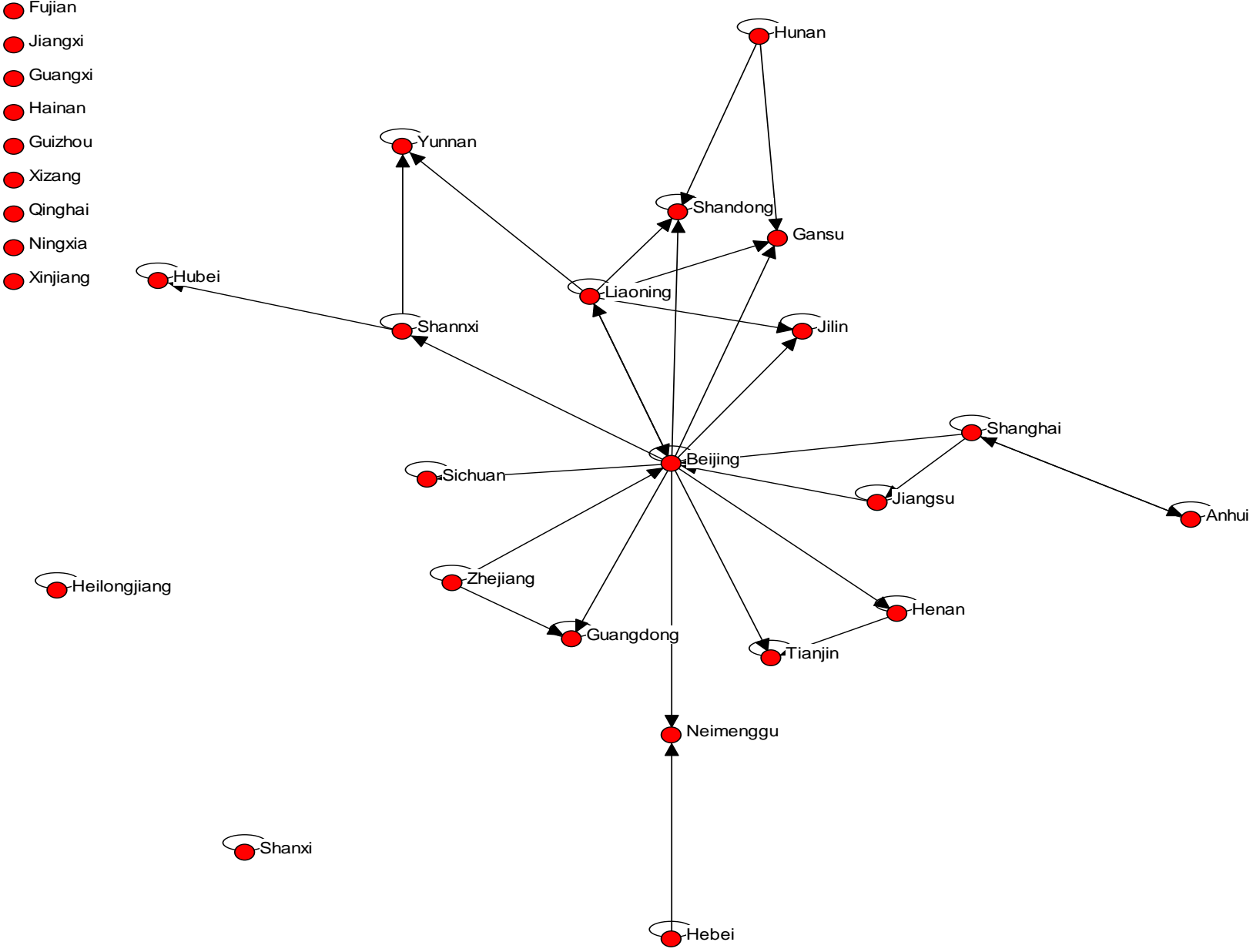


Figure 2: Knowledge transfer network of provinces and municipalities from 1990-1994

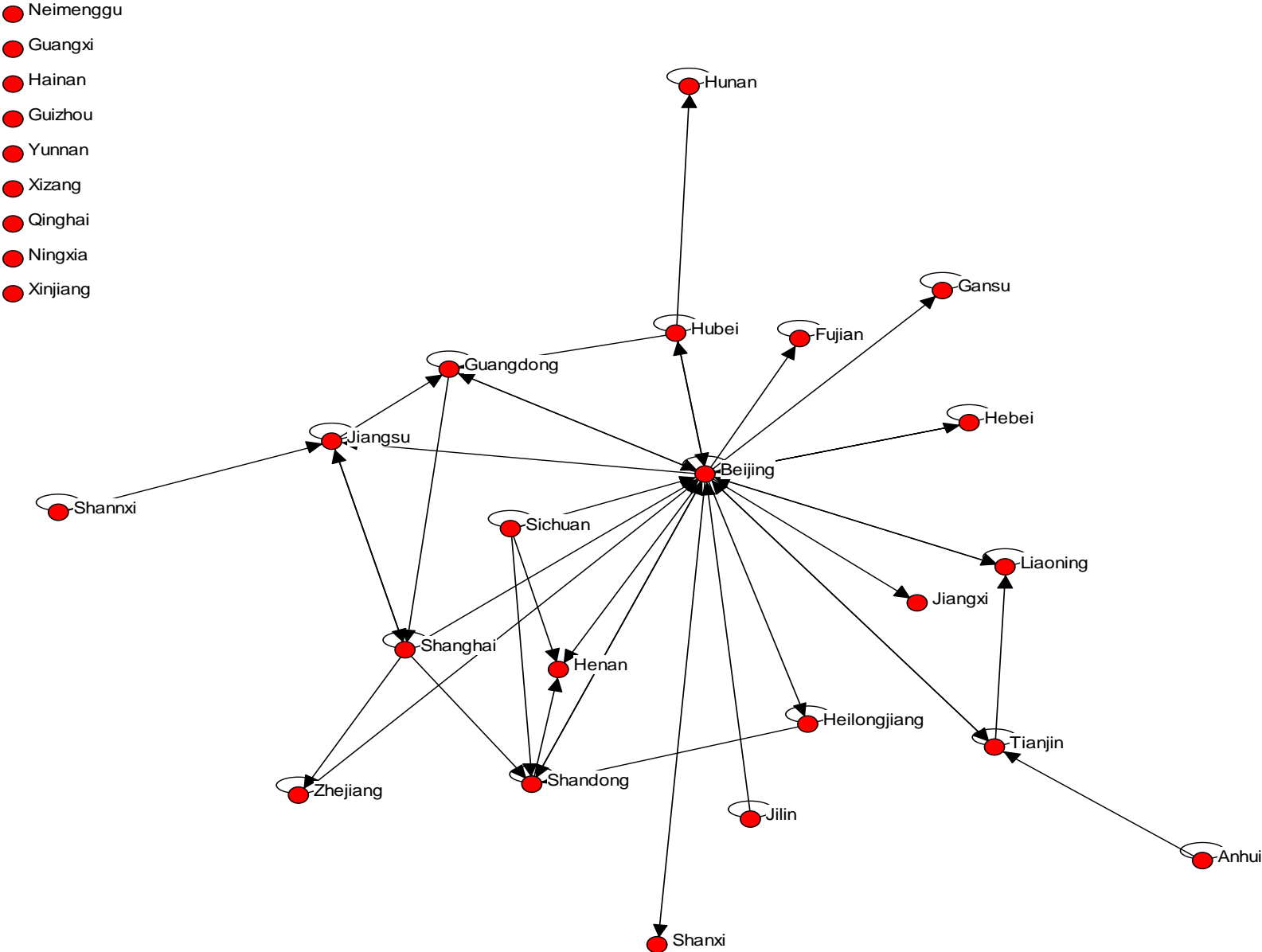


Figure 3: Knowledge transfer network of provinces and municipalities from 1995-1999

- Shanxi
- Hainan
- Guizhou
- Xizang
- Qinghai
- Ningxia
- Xinjiang

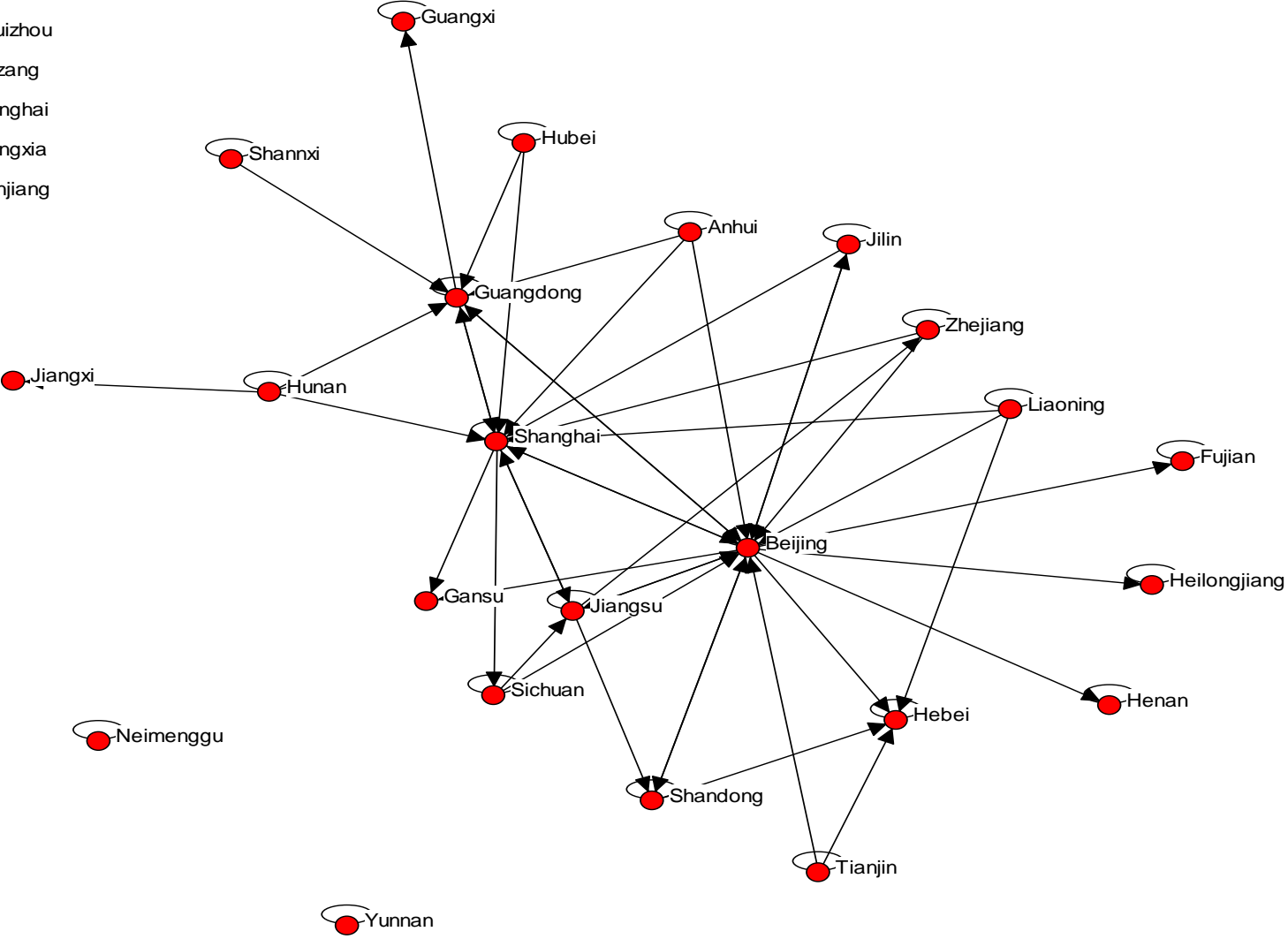


Figure 4: Knowledge transfer network of provinces and municipalities from 2000-2004

- Ningxia
- Jiangxi
- Hainan
- Xizang

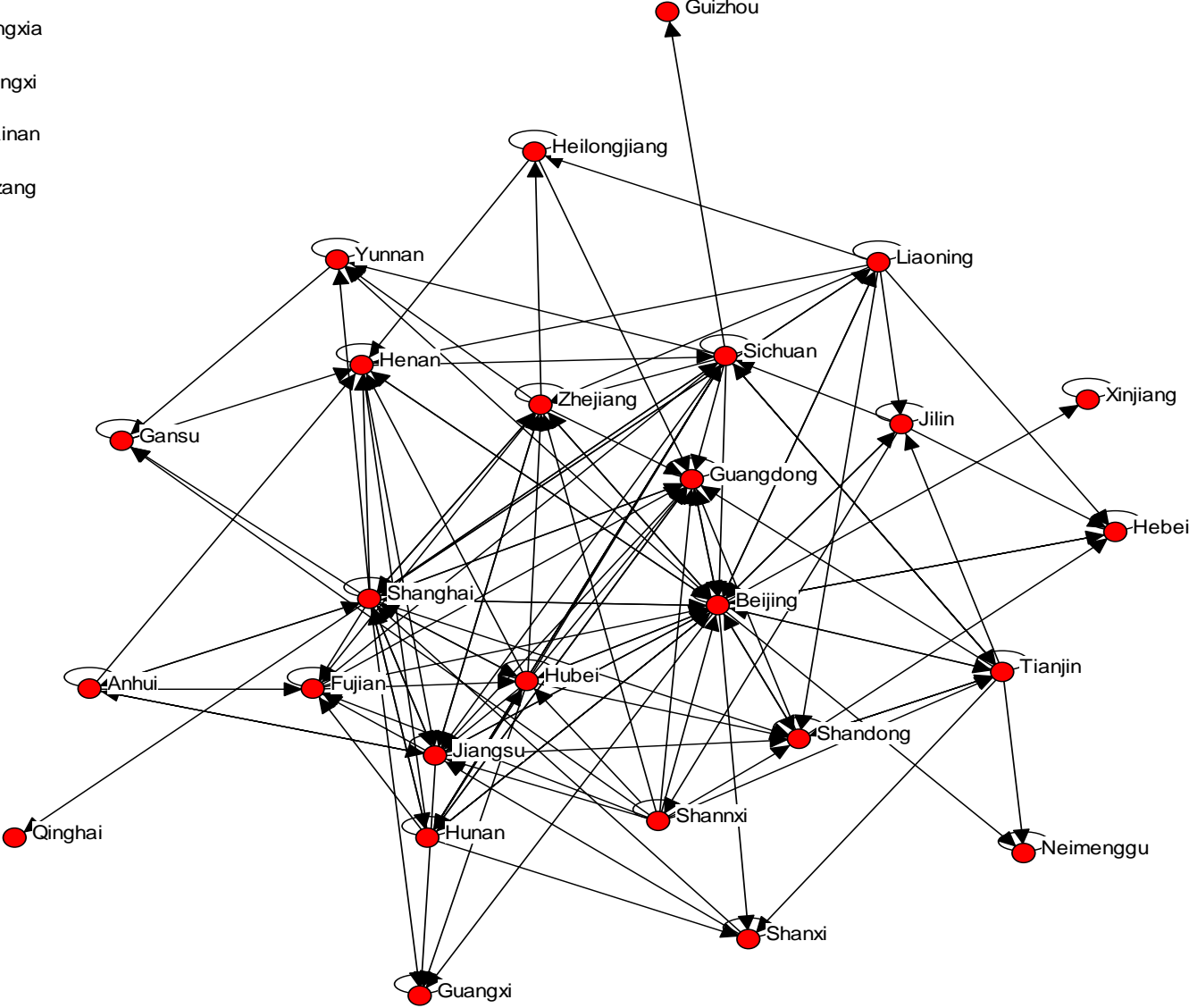


Figure5: Degree centrality of provinces and municipalities from 1985-1989

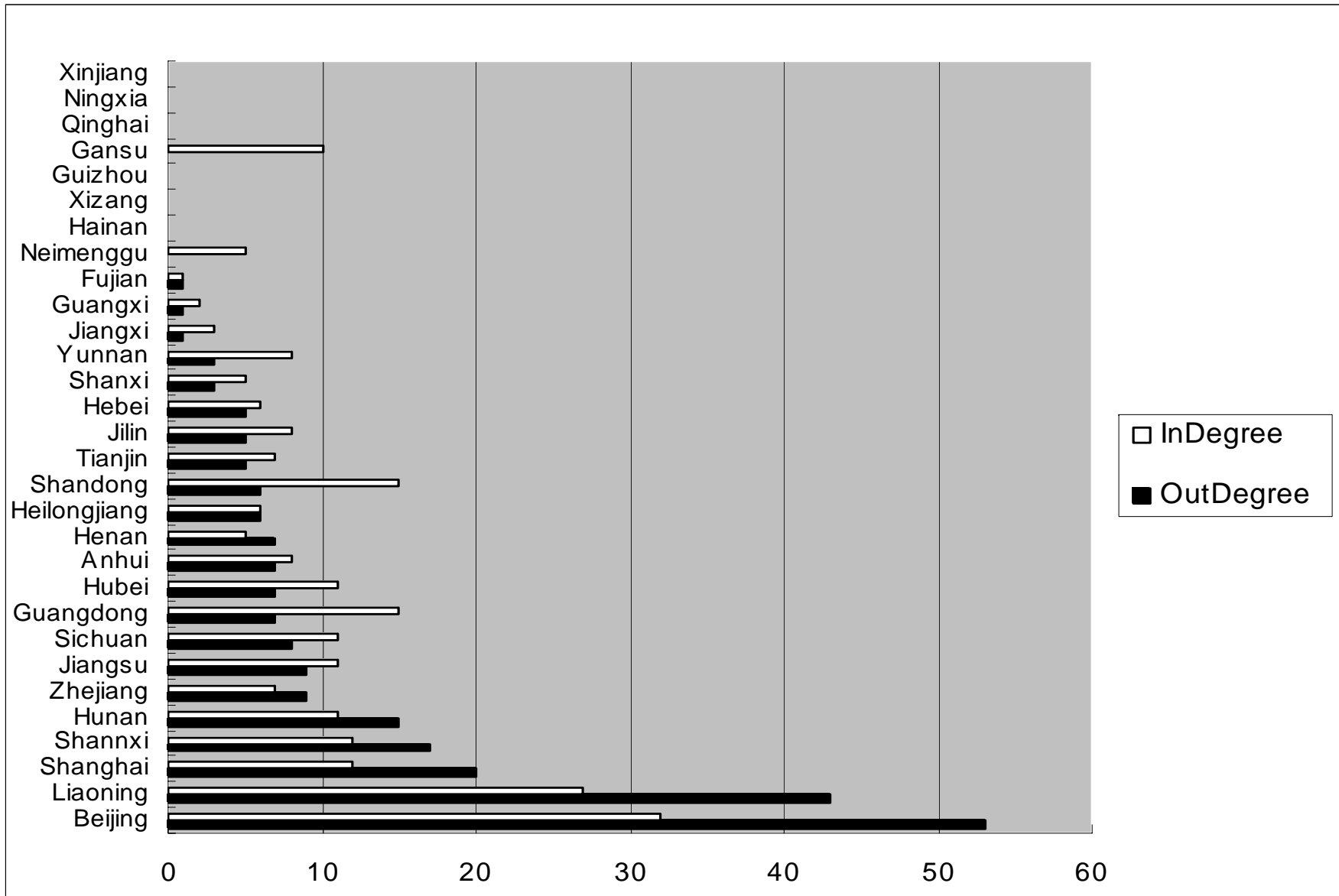


Figure 6: Degree centrality of provinces and municipalities from 1990-1994

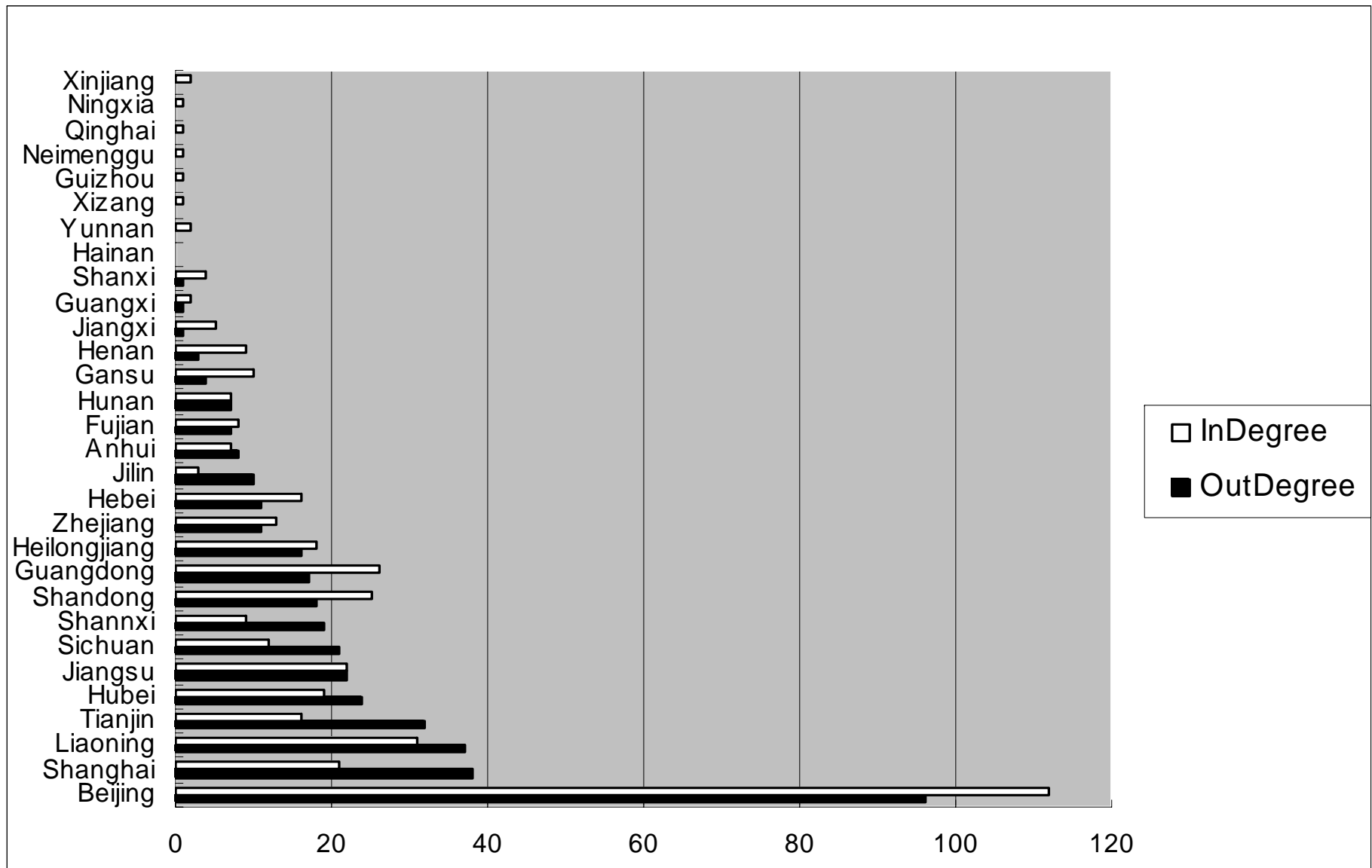


Figure 7: Degree centrality of provinces and municipalities from 1995-1999

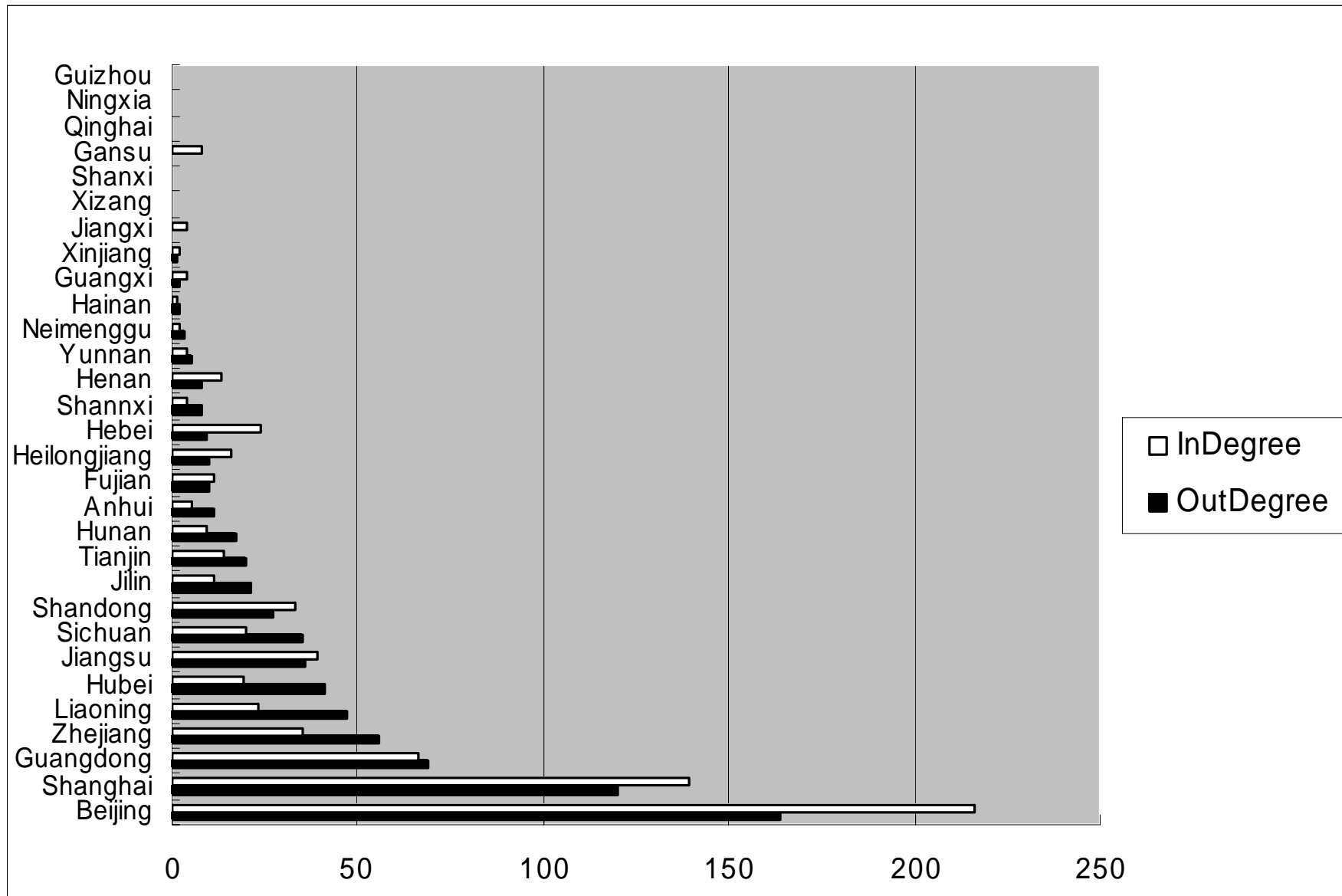


Figure 8: Degree centrality of provinces and municipalities from 2000-2004

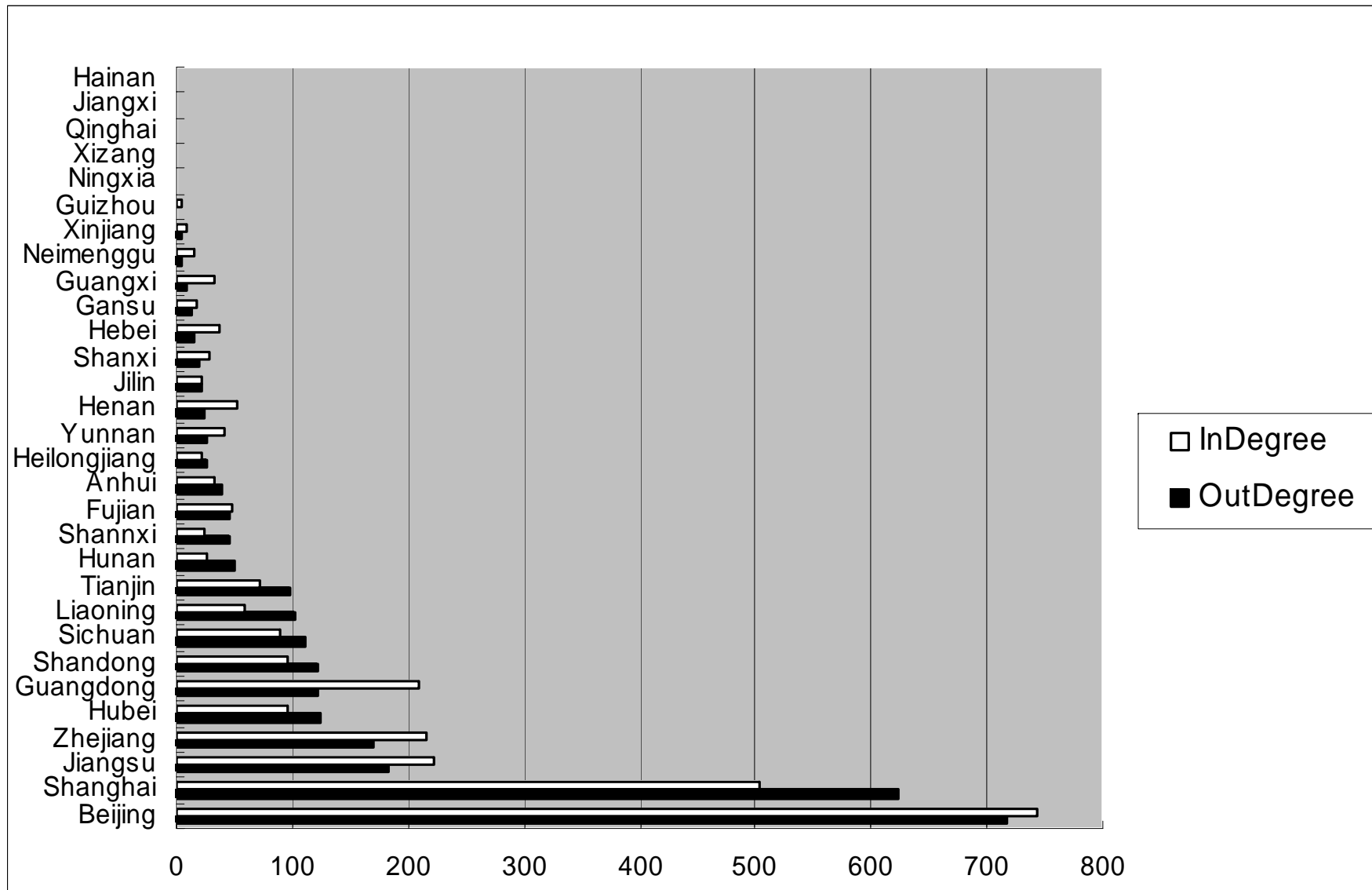


Table1: Expansiveness and attractiveness of selected provinces and municipalities from 1985-2004.

	Expansiveness				Attractiveness			
	85-89	90-94	95-99	00-04	85-89	90-94	95-99	00-04
<i>Declining Center</i>								
Beijing	70%	48%	36%	27%	50%	55%	51%	30%
<i>Exporter</i>								
Liaoning	44%	35%	60%	49%	11%	23%	17%	12%
<i>Active Generalist</i>								
Shandong	17%	50%	44%	61%	67%	64%	55%	51%
<i>Self Sustainer</i>								
Heilongjiang	17%	25%	10%	41%	17%	33%	44%	27%
<i>Importer</i>								
Guangxi	0%	0%	0%	11%	50%	50%	50%	76%
<i>Isolate</i>								
Xizang	N/A	N/A	N/A	N/A	N/A	100%	N/A	N/A

Figure 9: Categories of 30 provinces and municipalities



Figure 10: Seven blocks resulting from blockmodeling
(2000-2004)



Conclusion

- Degree centrality: regional differences in technology transfer activity.
- Expansiveness, and attractiveness: regional differences in willingness to exchange resources with outside counterparts at province level.
- Blockmodel analysis: roles of different provinces and municipalities in the national innovation system.
- Beijing: declining center.
- Overtime changes: stability, vitality, and inequality.