中国社会科学院财经战略研究院
National Academy of Economic Strategy, CASS

UN HABITAT
FOR A BETTER URBAN FUTURE

Global Urban Competitiveness Report 2018-2019

(Abridged)

Global Value Chains: Reshaping Cities around the World

Ni Pengfei, Marco Kamiya, Shen Jianfa, Gong Weijin, et al.

National Academy of Economic Strategy, CASS (NAES, CASS)

United Nations Human Settlements Programme, UN-HABITAT

Peter J. Brain, CEO at National Institute of Economic and Industry Research, Australia

François Gipouloux, Director, National Centre for Scientific Research, France

Harold Wolman, Professor at George Washington University, USA

Stefano Mollica, President of the Italian Association for Local Development (AISLo)

Leo van den Berg, Professor at the Erasmus University Rotterdam, Netherlands

Marco Kamiya, Coordinator, Urban Economics and Finance, UN-HABITAT

Yang Rong, Interregional Adviser, UN-HABITAT

Zhang Zhenshan, Representative of UN-HABITAT to China

Shen Jianfa, Professor, Hong Kong Institute of Asia-Pacific Studies, Chinese University of Hong Kong

Zhang Ming, Lead Urban Economist, World Bank

Shen Wei, Associate Professor at ESSCA School of Management in Angers, France

Ni Pengfei, Director and Research Fellow at the City and Competitiveness Research Center, CASS

content

Chapter One Global Urban Competitiveness Ranking 2018-2019

Table 1 Annual ranking of general global urban competitiveness in 2018

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
New York-Newark	A+	United States of America	1	1	1	1
Los Angeles-Long Beach-Santa Ana	A	United States of America	0.9965	2	0.8245	5
Singapore	A	Singapore	0.9719	3	0.8487	4
London	A+	United Kingdom	0.9335	4	0.8858	3
Shenzhen	B	China	0.932	5	0.602	48
San Jose	A	United States of America	0.9312	6	0.6896	19
Munich	B+	Germany	0.9309	7	0.654	29
San Francisco-Oakland	A	United States of America	0.9289	8	0.7315	13
Tokyo	A-	Japan	0.8964	9	0.964	2
Houston	A-	United States of America	0.8836	10	0.7399	9
Hong Kong	A	China	0.8836	11	0.8084	6
Dallas-Fort Worth	A-	United States of America	0.878	12	0.6282	36
Shanghai	A-	China	0.8544	13	0.658	28
Guangzhou	B+	China	0.8501	14	0.5707	59

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Seoul	A-	Republic of Korea	0.8082	15	0.7312	14
Dublin	A-	Ireland	0.8003	16	0.6008	50
Miami	B+	United States of America	0.7984	17	0.6201	40
Boston	A-	United States of America	0.7968	18	0.774	7
Beijing	A-	China	0.7965	19	0.6644	27
Frankfurt am Main	A-	Germany	0.7965	20	0.5961	52
Chicago	A-	United States of America	0.7963	21	0.7075	16
Stockholm	B+	Sweden	0.7891	22	0.6533	30
Paris	A-	France	0.7726	23	0.7295	15
Seattle	B+	United States of America	0.7637	24	0.7451	8
Tel Aviv-Yafo	B-	Israel	0.7481	25	0.4378	182
Baltimore	B-	United States of America	0.7426	26	0.6298	35
Suzhou	C+	China	0.7398	27	0.4307	185
Philadelphia	B+	United States of America	0.7352	28	0.6812	23
Bridgeport-Stamford	B	United States of America	0.7293	29	0.5358	81
Dusseldorf	B-	Germany	0.7249	30	0.5279	87
Stuttgart	B-	Germany	0.7218	31	0.5571	67
Geneva	B	Switzerland	0.7193	32	0.5678	60
Cleveland	B-	United	0.7161	33	0.5465	74

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
		States of America				
Osaka	B-	Japan	0.7159	34	0.7371	11
Toronto	B+	Canada	0.7151	35	0.7374	10
San Diego(US)	C+	United States of America	0.7092	36	0.6845	21
Perth	B	Australia	0.7081	37	0.5633	65
Atlanta	B+	United States of America	0.7047	38	0.6862	20
Denver-Aurora	B	United States of America	0.7042	39	0.5421	79
Wuhan	C+	China	0.7036	40	0.4469	172
Detroit	B-	United States of America	0.7018	41	0.5525	70
Tianjin	B-	China	0.6996	42	0.4573	159
Vienna	B-	Austria	0.6981	43	0.6131	42
Istanbul	B	Turkey	0.698	44	0.5241	91
Nanjing	B-	China	0.6969	45	0.4994	110
Taipei	B-	China	0.6948	46	0.634	33
Hamburg	B-	Germany	0.6918	47	0.6203	39
Nashville-Davidson	B-	United States of America	0.688	48	0.3696	243
Cologne	C+	Germany	0.6845	49	0.5249	90
Doha	B-	Qatar	0.6845	50	0.5092	99
Charlotte	B-	United States of America	0.6825	51	0.532	84
Zurich	A-	Switzerland	0.6803	52	0.6831	22

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Berlin	C+	Germany	0.6799	53	0.584	54
Minneapolis-Saint Paul	A-	United States of America	0.6797	54	0.5721	58
Las Vegas	C+	United States of America	0.6774	55	0.4883	126
Austin	B-	United States of America	0.6687	56	0.6747	26
Raleigh	C+	United States of America	0.6682	57	0.6033	46
Moscow	B	Russian Federation	0.6661	58	0.6038	45
Milwaukee	C+	United States of America	0.6579	59	0.4682	146
Chengdu	C+	China	0.6576	60	0.4613	153
Richmond	C+	United States of America	0.6558	61	0.5179	94
Salt Lake City	C+	United States of America	0.6548	62	0.5595	66
Abu Dhabi	B+	United Arab Emirates	0.6523	63	0.5639	64
Orlando	C+	United States of America	0.6501	64	0.5333	83
Sydney	A-	Australia	0.6492	65	0.7325	12
Copenhagen	B	Denmark	0.6482	66	0.6306	34
Birmingham	B-	United Kingdom	0.6469	67	0.5721	57

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Dubai	B+	United Arab Emirates	0.6442	68	0.5558	68
Brussels	B	Belgium	0.6405	69	0.5482	72
Essen	C	Germany	0.6393	70	0.4948	119
Changsha	C	China	0.6391	71	0.3871	225
Hannover	C	Germany	0.6388	72	0.5278	88
Wuxi	C-	China	0.6385	73	0.3678	247
Hangzhou	C+	China	0.6382	74	0.4978	113
Columbus	B-	United States of America	0.6367	75	0.5431	76
Vancouver	B-	Canada	0.6351	76	0.6985	18
Barcelona	B-	Spain	0.6338	77	0.6265	37
Louisville	C+	United States of America	0.6298	78	0.4725	142
Baton Rouge	C+	United States of America	0.6295	79	0.4673	148
Nagoya	C+	Japan	0.6239	80	0.644	32
Manchester	C+	United Kingdom	0.6226	81	0.5749	55
Chongqing	C+	China	0.6218	82	0.4111	204
Ulsan	C	Republic of Korea	0.6198	83	0.4379	181
Calgary	B-	Canada	0.6178	84	0.61	44
Qingdao	C+	China	0.616	85	0.4926	120
Dortmund	C+	Germany	0.6154	86	0.4908	123
Oslo	A-	Norway	0.6124	87	0.6025	47
Riyadh	B-	Saudi Arabia	0.6118	88	0.4187	197

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Amsterdam	B+	Netherlands	0.6116	89	0.7013	17
Sendai	C	Japan	0.61	90	0.5646	63
Antwerp	C+	Belgium	0.6093	91	0.4587	157
Washington, D.C.	A-	United States of America	0.6014	92	0.6458	31
Foshan	C	China	0.6003	93	0.3734	242
Oklahoma City	C+	United States of America	0.5991	94	0.4677	147
Hamilton	B-	Canada	0.5989	95	0.5499	71
Kuala Lumpur	B-	Malaysia	0.5984	96	0.5234	92
Virginia Beach	C	United States of America	0.5984	97	0.4474	171
Hiroshima	C-	Japan	0.5971	98	0.4819	131
Zhengzhou	C	China	0.5964	99	0.3737	241
Phoenix-Mesa	C+	United States of America	0.595	100	0.5025	107
Ningbo	C	China	0.5937	101	0.4269	190
Melbourne	B	Australia	0.5936	102	0.6763	25
Tampa-St. Petersburg	C+	United States of America	0.5909	103	0.5427	77
Jedda	C	Saudi Arabia	0.5809	104	0.2445	478
Indianapolis	B-	United States of America	0.5809	105	0.4819	132
Bristol	C+	United Kingdom	0.5808	106	0.5557	69
Changzhou	C	China	0.5798	107	0.3451	282

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Macao	B-	China	0.5753	108	0.3836	231
Gold Coast	C	Australia	0.5752	109	0.419	196
Hague, The	C+	Netherlands	0.5751	110	0.4905	125
Cincinnati	B-	United States of America	0.573	111	0.5672	61
Montreal	B-	Canada	0.573	112	0.6802	24
Haifa	C	Israel	0.5728	113	0.4906	124
Jakarta	B-	Indonesia	0.5718	114	0.3981	217
Kansas City	C+	United States of America	0.571	115	0.4608	156
Birmingham(US)	B-	United States of America	0.5682	116	0.498	111
Hartford	C	United States of America	0.5674	117	0.4614	152
Pittsburgh	C+	United States of America	0.5672	118	0.5995	51
Provo-Orem	C	United States of America	0.5665	119	0.3363	295
San Antonio	C+	United States of America	0.5664	120	0.5036	106
Madrid	B-	Spain	0.5661	121	0.6125	43
Rome	C+	Italy	0.566	122	0.5129	96
Dongguan	C	China	0.5644	123	0.401	215
Rotterdam	C+	Netherlands	0.5634	124	0.5273	89
Dalian	C-	China	0.5605	125	0.4361	183
Kaohsiung	C	China	0.5602	126	0.4399	177

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Dresden	C	Germany	0.5581	127	0.4777	137
Ottawa-Gatineau	C+	Canada	0.5549	128	0.5289	86
Nantong	C-	China	0.5516	129	0.3868	227
Buenos Aires	C+	Argentina	0.5496	130	0.4742	140
Charleston-North Charleston	C	United States of America	0.5492	131	0.4687	145
Leipzig	C	Germany	0.548	132	0.4663	149
Bangkok	C+	Thailand	0.5475	133	0.5094	98
Hefei	C	China	0.5469	134	0.4302	187
Mexico City	B-	Mexico	0.5466	135	0.4204	193
Brisbane	C	Australia	0.5465	136	0.6195	41
Sapporo	C+	Japan	0.546	137	0.5746	56
Helsinki	B-	Finland	0.5458	138	0.6009	49
Milan	B-	Italy	0.5449	139	0.5071	100
Incheon	C	Republic of Korea	0.5445	140	0.5052	102
Providence	C+	United States of America	0.5443	141	0.5482	73
West Yorkshire	C	United Kingdom	0.5437	142	0.4492	166
Xiamen	C	China	0.5436	143	0.5008	108
Glasgow	C+	United Kingdom	0.5434	144	0.5338	82
Lille	C-	France	0.5425	145	0.4491	167
Allentown	C	United States of America	0.5424	146	0.4196	194
Worcester	C+	United States of America	0.5403	147	0.4973	116
Colorado Springs	C	United	0.5383	148	0.4515	164

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
		States of America				
Riverside-San Bernardino	C	United States of America	0.5349	149	0.3453	281
San Jose	A	Costa Rica	0.5347	150	0.4728	141
Grand Rapids	C	United States of America	0.5345	151	0.4455	173
Gothenburg	C+	Sweden	0.5345	152	0.4692	144
Liverpool	C+	United Kingdom	0.5331	153	0.5038	105
New Haven	C	United States of America	0.5323	154	0.5864	53
Edmonton	C	Canada	0.5258	155	0.5463	75
jinan	C	China	0.5237	156	0.3466	279
Changwon	C-	Republic of Korea	0.5226	157	0.4499	165
Dayton	C	United States of America	0.5205	158	0.4192	195
Quanzhou	C-	China	0.5204	159	0.3624	253
Samut Prakan	C-	Thailand	0.5202	160	0.2288	528
Knoxville	C	United States of America	0.518	161	0.4948	118
Honolulu	C+	United States of America	0.5172	162	0.5049	104
Cape Coral	C	United States of America	0.5171	163	0.3778	240
Kitakyushu-Fukuoka	C	Japan	0.5159	164	0.4781	136
Lyon	C+	France	0.5159	165	0.4963	117

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Yantai	C-	China	0.5155	166	0.3966	218
Columbia	C	United States of America	0.5155	167	0.5376	80
Zhenjiang	C-	China	0.5147	168	0.3488	276
Zhongshan	C-	China	0.5141	169	0.3965	219
Shenyang	C	China	0.5134	170	0.3619	256
Xi'an	C	China	0.5124	171	0.4055	209
Busan	C-	Republic of Korea	0.5118	172	0.4805	134
Fuzhou(FJ)	C-	China	0.5102	173	0.4018	211
Mecca	C-	Saudi Arabia	0.5076	174	0.2705	405
Santiago de Chile	C+	Chile	0.5069	175	0.4179	198
Medina	C-	Saudi Arabia	0.5065	176	0.3907	223
Akron	C	United States of America	0.5064	177	0.4387	179
Lima	C+	Peru	0.5058	178	0.3665	248
Yangzhou	C-	China	0.5055	179	0.3324	299
Auckland	C+	New Zealand	0.5036	180	0.6245	38
Adelaide	C	Australia	0.503	181	0.5654	62
Jerusalem	C-	Israel	0.5025	182	0.4855	127
Ogden	C-	United States of America	0.5014	183	0.4549	162
Gebze	C	Turkey	0.5004	184	0.3508	267
Nottingham	C-	United Kingdom	0.4986	185	0.4979	112
Bogota	C+	Colombia	0.4982	186	0.4486	168
Zhuhai	C-	China	0.4981	187	0.3869	226

City	Rating	Country	Economic competitiveness	Ranking	Sustainable competitiveness	Ranking
Delhi	C+	India	0.4973	188	0.3506	269
Bucuresti	C	Romania	0.4969	189	0.3632	251
Leicester	C	United Kingdom	0.4966	190	0.4753	138
Buffalo	C	United States of America	0.4962	191	0.4566	161
Xuzhou	C-	China	0.4955	192	0.3459	280
Omaha	C+	United States of America	0.495	193	0.4305	186
Marseille-Aix-en-Provence	C	France	0.4942	194	0.4	216
Daegu	C	Republic of Korea	0.4936	195	0.44	176
Shaoxing	C-	China	0.4923	196	0.292	359
Belfast	C	United Kingdom	0.4905	197	0.4751	139
Panama City	C	Panama	0.4897	198	0.4109	205
Dongying	C-	China	0.4895	199	0.2326	515
Valencia	C-	Spain	0.4893	200	0.4624	150

Chapter Two The Planet of Cities toward Diverse Agglomeration, Global Connection and Extensive Sharing

Ni Pengfei Marco Kamiya Shen Jianfa Li Bo Wang Yufei Xu Haidong Ma Hongfu

Preface

Agglomeration, Connection and Sharing: the History and Future of City

Cities are stable physical and social space that serves human agglomeration activities and takes shape with the force of human being on natural conditions. Cities are made up by urban population (people chose to live together and pursue opportunities for physical contacts out of rational choice), people's activities and environmental facilities (space agents and municipal government). Besides the stable location that distinguishes it from non-urban residential areas, cities have three inter-connecting characteristics of agglomeration, connection and sharing, which not only distinguishes cities from non-urban areas, but also determines the meaning, function, scale and form of the cities themselves.

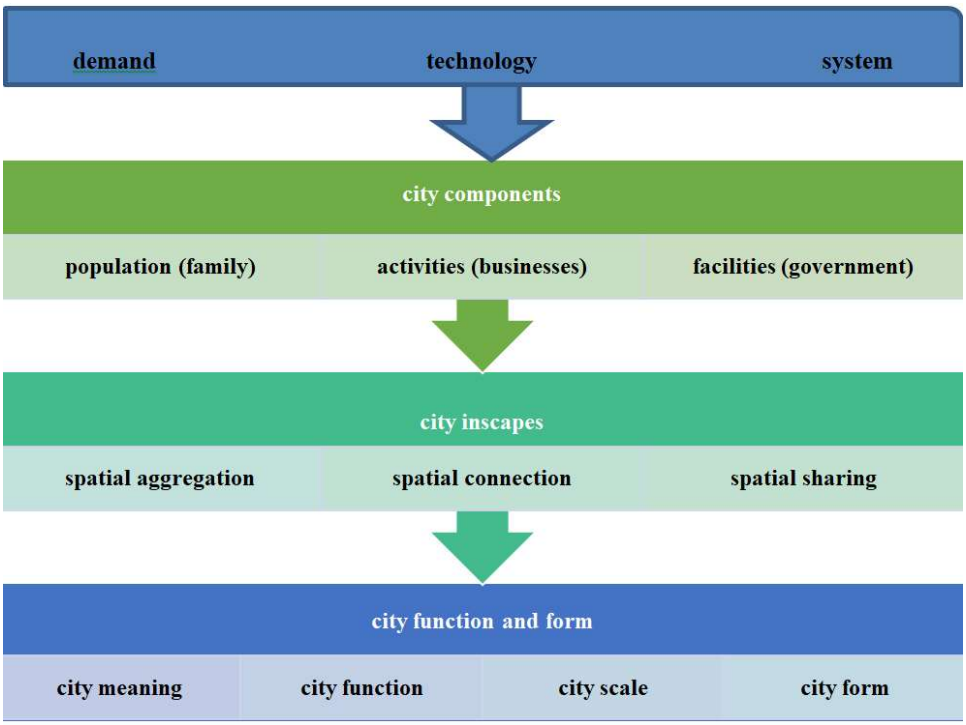


Figure 2-1 three inscapes of a city and interconnection among its components

Source: compiled by the author

2.1 Cities have become more global, networked and intelligent over the Past 40 Years

2.1.1 The non-agricultural aggregation of factors of production: tremendous changes on the city meaning

2.1.1.1 The non-agricultural aggregation of population evolves from at a lower speed to faster one, and from locally to globally

a. The non-agricultural aggregation of global population speeds up

First, the urbanization ratio grew over the recent 40 years at the speed 2.33 times faster than the 1950-70 period. (As shown in Figure 2-2)

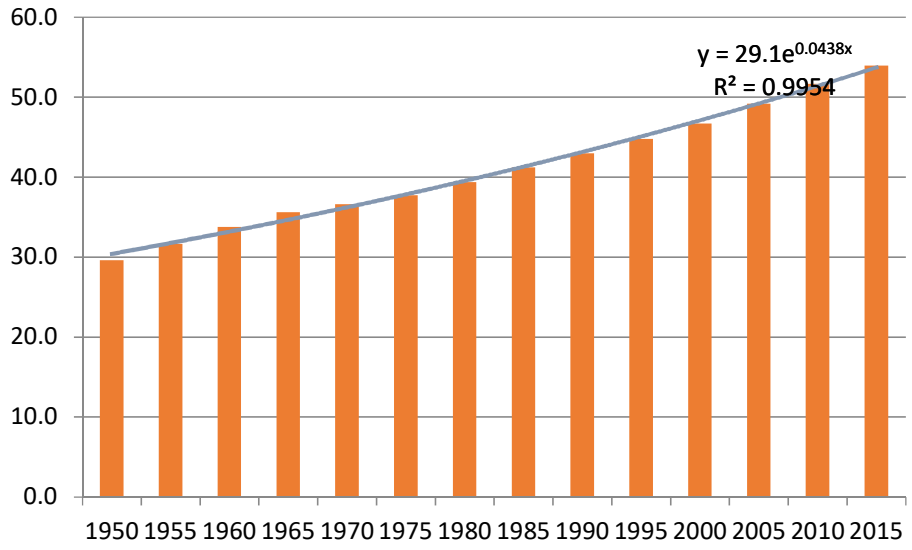


Figure 2-2 urbanization ratio across the world during 1950-2015 period

Source: compiled by the author based on statistics by the United Nations Population Division

Second, the acceleration period of urbanization in emerging economies is far shorter than that in developed economies. (As shown in Figure 2-3,2-4)

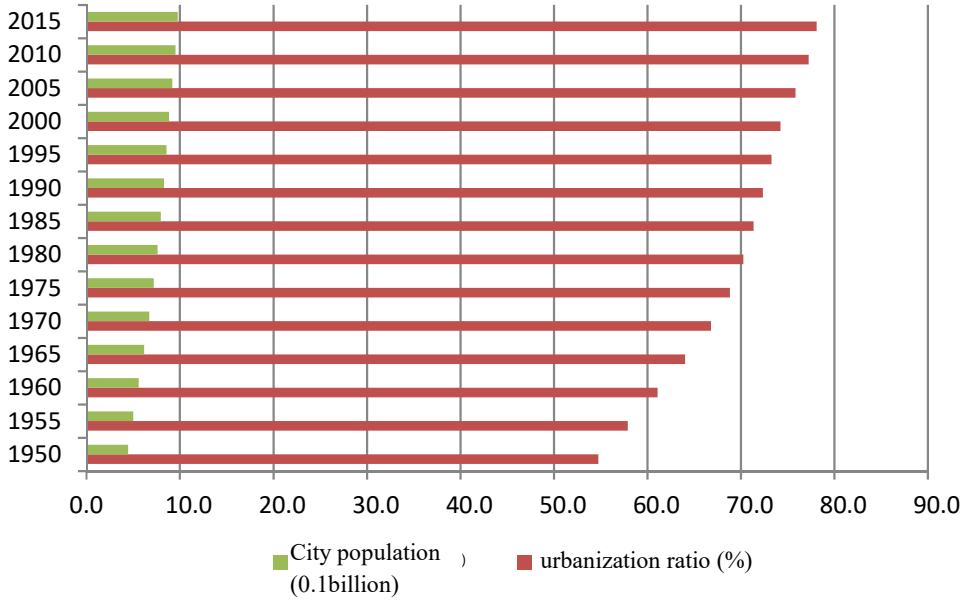


Figure 2-3 urbanization process in developed economies

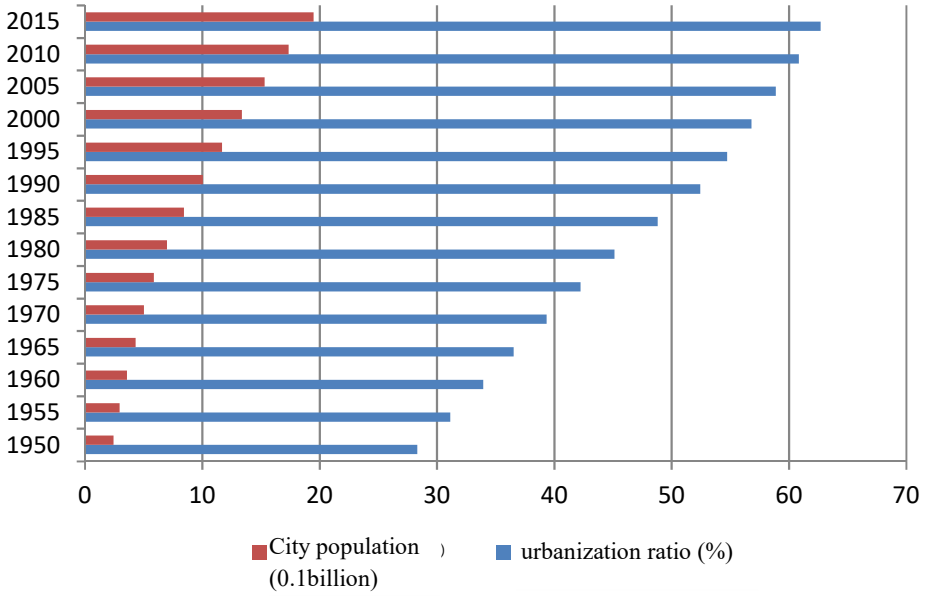


Figure 2-4 urbanization process in emerging economies

Source: compiled by the author based on statistics by the United Nations Population Division

Third, the annual gradient of urbanization ration over the recent four decades presents the shape of a flat S curve. (As shown in Figure 2-5)

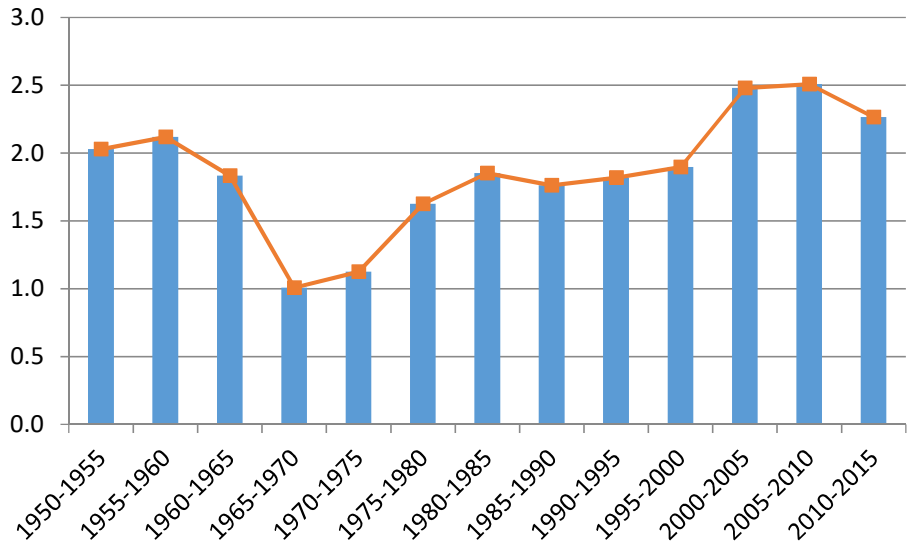


Figure 2-5 the annual gradient of urbanization ration across the world in 1950-2015

Source: compiled by the author based on statistics by the United Nations Population Division

b. The non-agricultural aggregation of emerging economies accelerates

First, the proportion of aggregated urban population in emerging economies has significantly risen over the recent four decades. (As shown in Figure 2-6)

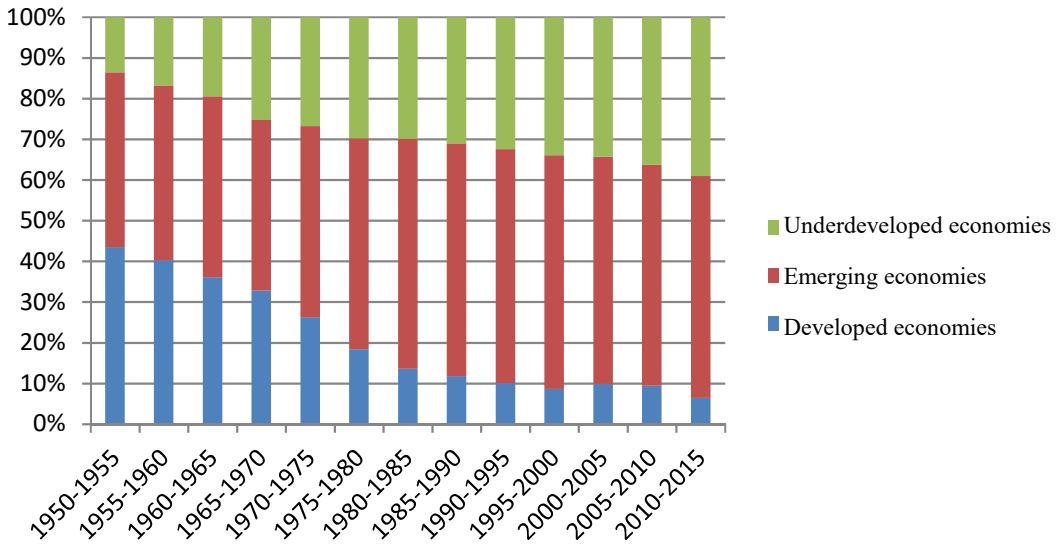


Figure 2-6 the proportions of increased urban population in developed economies, emerging economies and underdeveloped nations in 1950-2015

Second, the increased urban population in East Asia accounts for the highest proportion over the recent 40 years. (As shown in Figure 2-7,2-8)

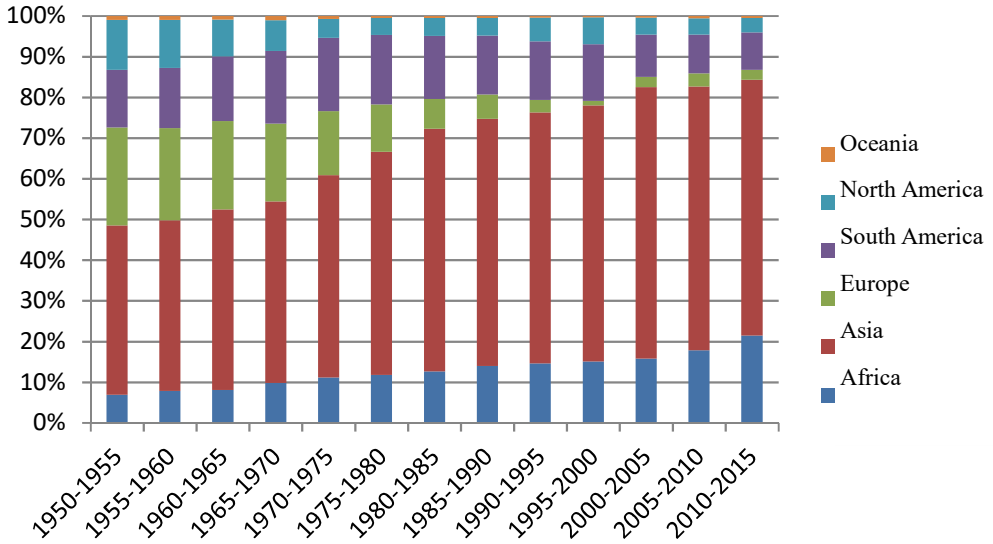


Figure 2-7 the increased population in cities by continent over the period of 1950-2015

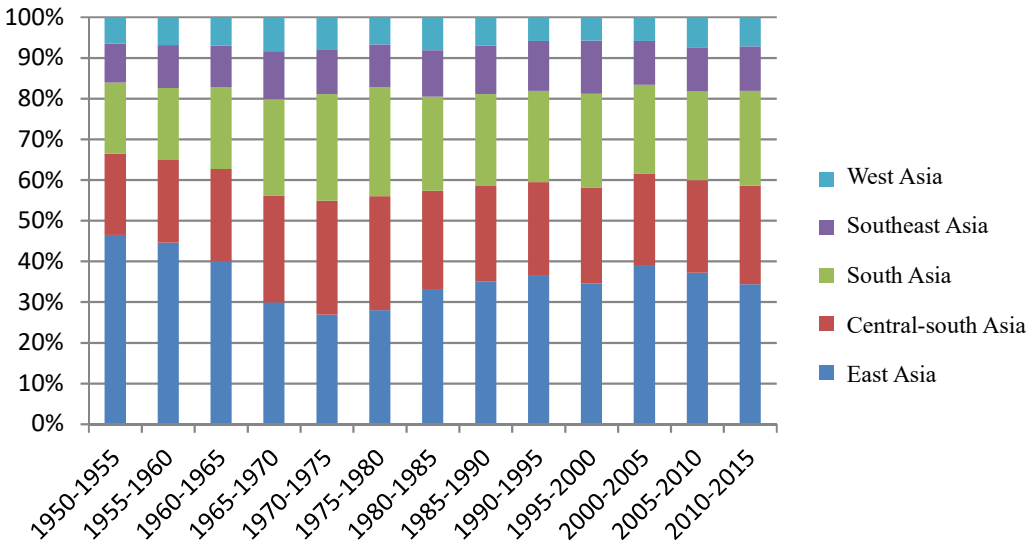


Figure 2-8 the changes of increased urban population in Asian cities in 1950-2015

Source: compiled by the author based on statistics by the United Nations Population Division

Third, emerging economies have evolved into urbanized society over the last 40 years. (As shown in Figure 2-9)

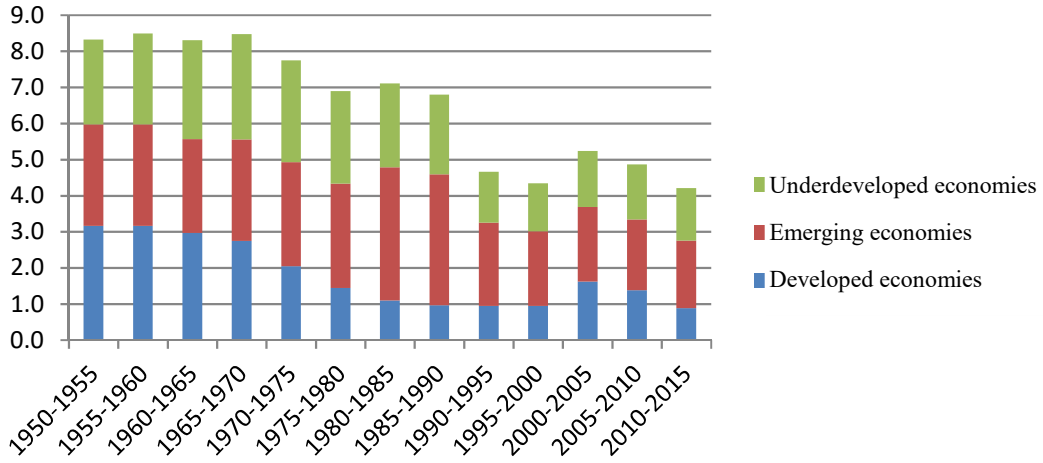


Figure 2-10 the changes of urbanization ratio in developed economies, emerging economies and underdeveloped nations in 1950-2015

Source: compiled by the author based on statistics by the United Nations Population Division

Fourth, central cities in emerging economies and South Asia and East Asia have risen rapidly. (As shown in Figure 2-11)

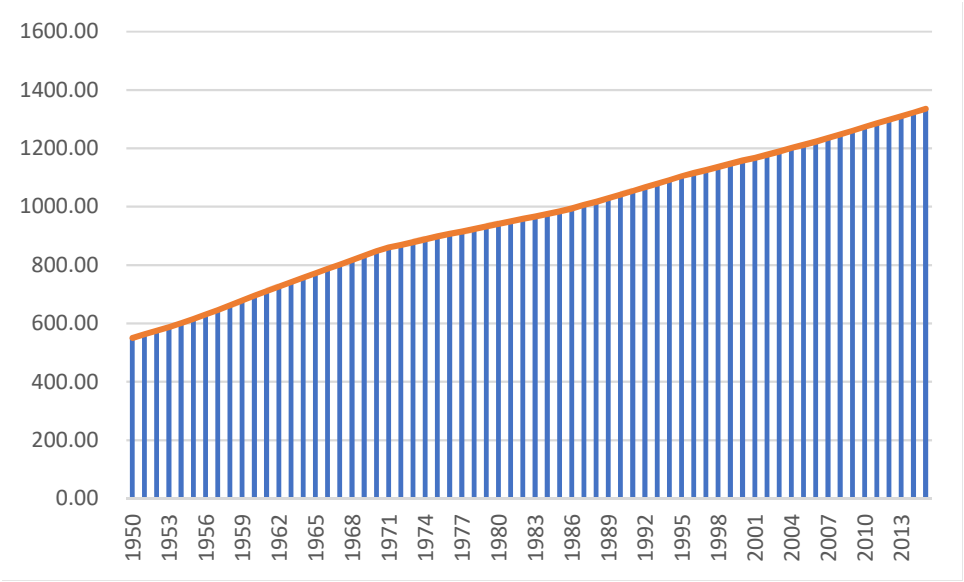


Figure 2-11 the population changing trend in developed economies in 1950-2015

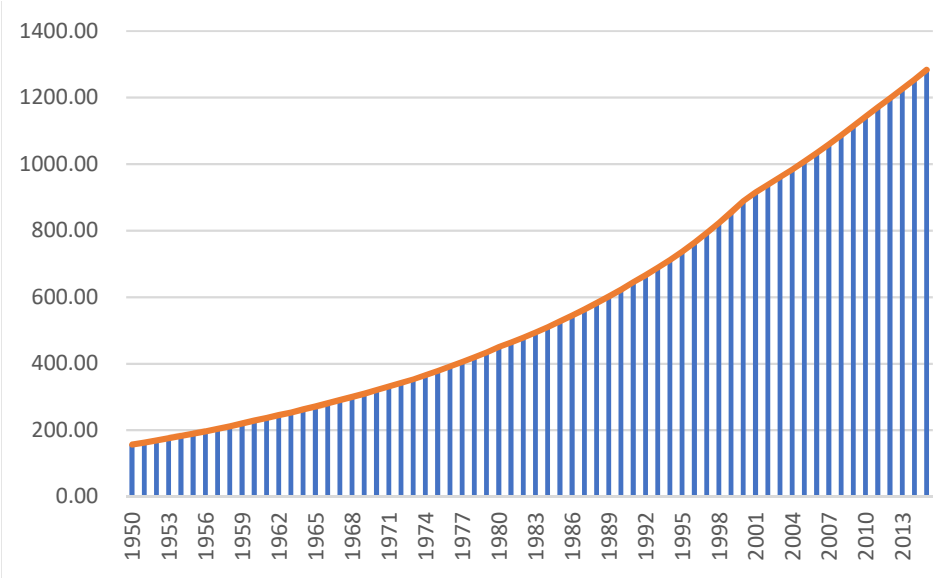


Figure 2-12 the population changing trend in emerging economies in 1950-2015

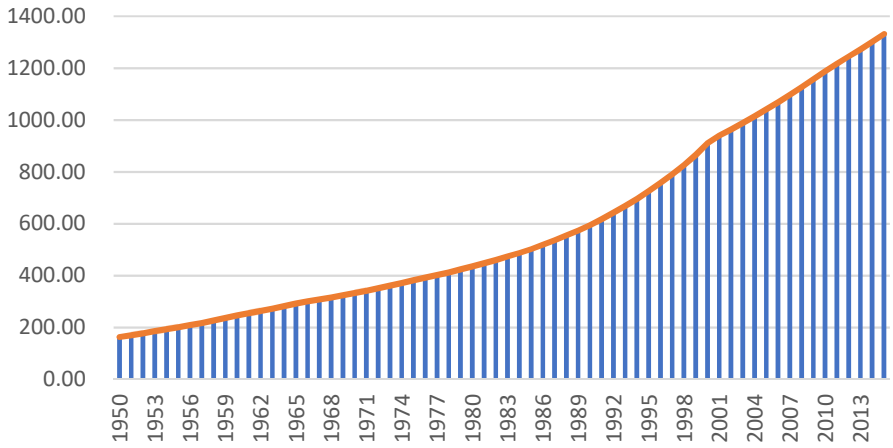
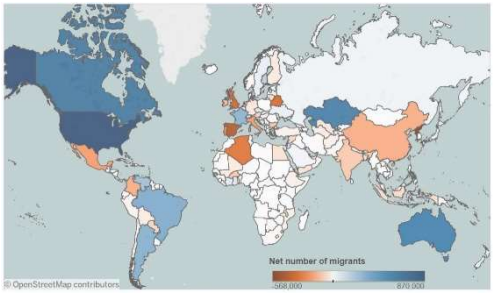


Figure 2-13 the population changing trend in emerging economies in East Asia in 1950-2015

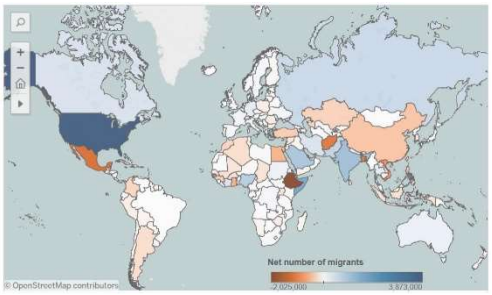
Source: compiled by the author based on statistics by the United Nations Population Division

c. The inflow of global high-end population to cities in developed nations

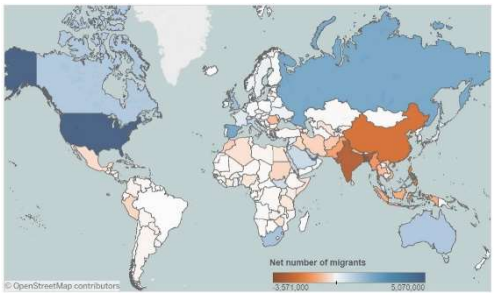
First, urban population flows to the United States. (As shown in Figure 2-18)



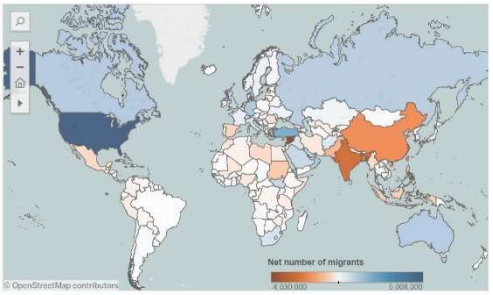
1950-1955



1975-1980



2005-2010



2010-2015

Figure 2-18 international migrants distribution

Source: statistics by the United Nations Population Division

Second, high-end population has reshaped the global city system. (As shown in Figure 2-19)

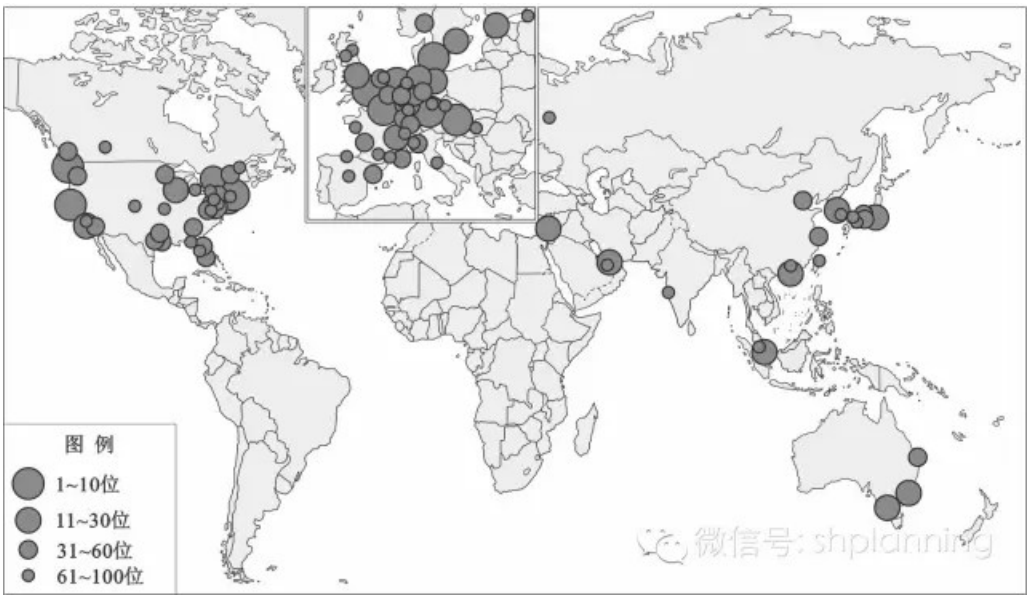


Figure 2-19 Top 100 Innovation Cities in 2014

Source: Innovation Cities Index，2014.

2.1.1.2 The Concentration of City Population Shifts from a Single Form to Diverse Forms

a. The simultaneous concentration and dispersion of city population (As shown in Figure 2-20)

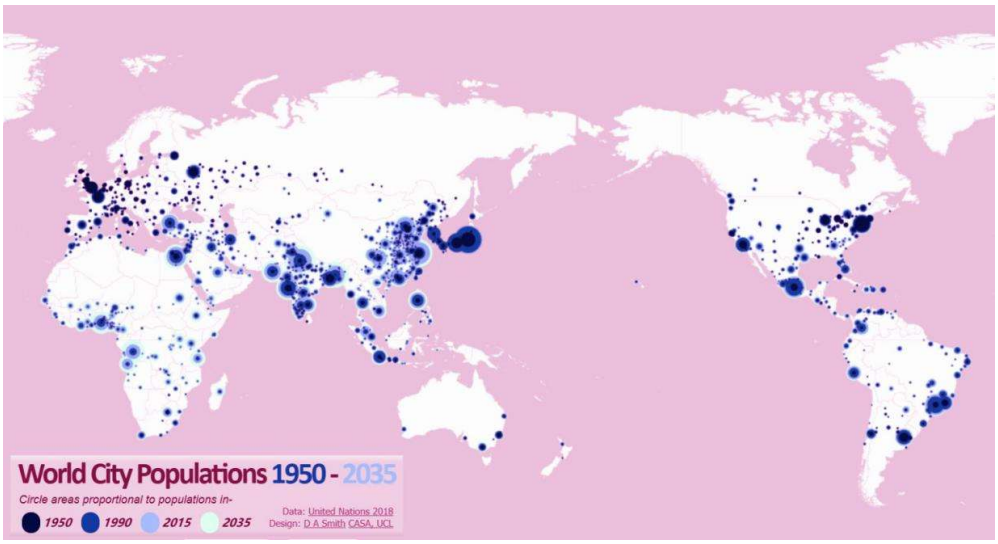


Figure 2-20 the density of world city population in 1950-2035

Source: the United Nations

b. The non-agricultural aggregation of population is carried out in both real and virtual space. (As shown in Figure 2-21, 2-23)

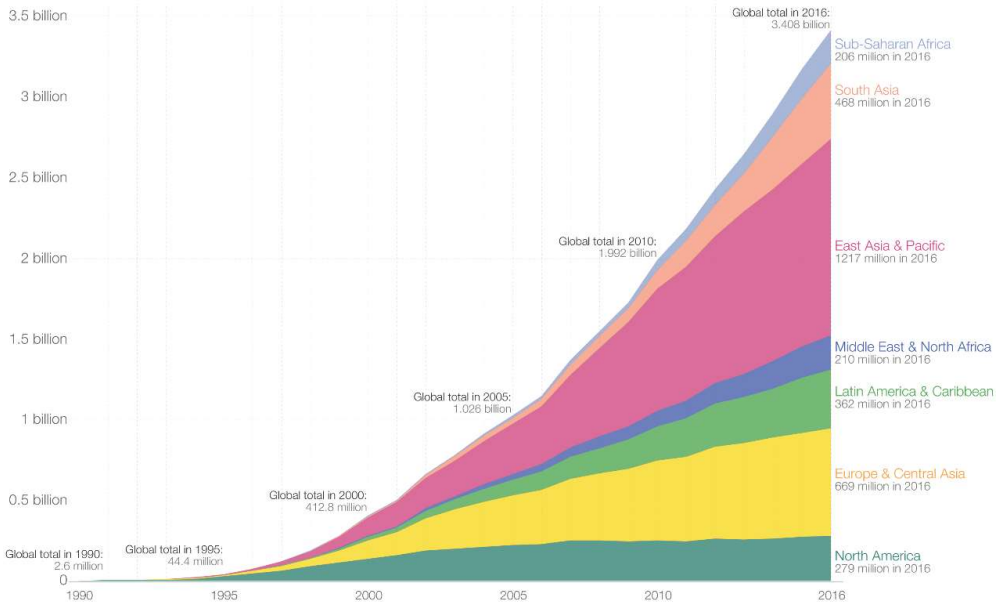


Figure 2-21 the number of Internet users in all countries and regions across the world in 1999-2016

Source: World Bank and International Telecommunication Union

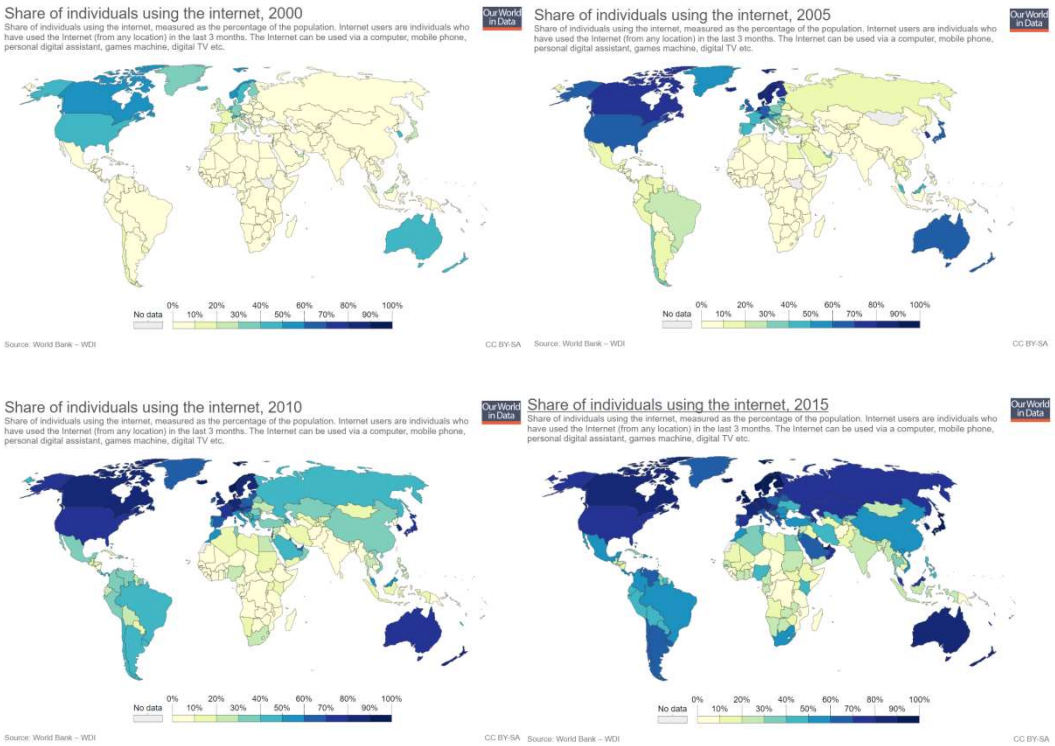


Figure 2-22 the share of individuals using the Internet in all countries and regions across the world

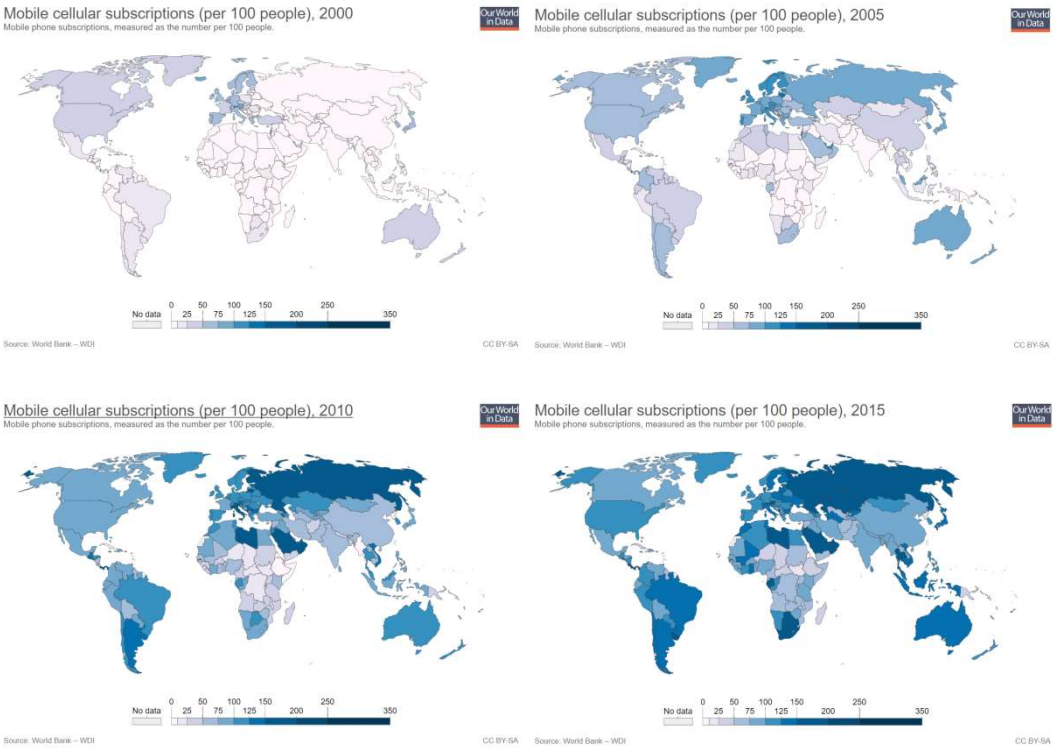


Figure 2-23 mobile cellular subscriptions in all countries and regions across the world

Photo credit: World Bank

2.1.1.3 The contents of population aggregation shift from tangible ones to intangible ones

a. In terms of consumption, spending on intangible products and services is on the rise while that on tangible goods is on decline

b. Knowledge and technological innovation contribute more and more in production

c. The growth rate of exchange and trade slows down, but exchanges and contacts become more frequent

2.1.1.4 World Cities Witness Ongoing Expanding Sizes

a. World cities increase in number，especially so in emerging market counties (see Figure 2-26)

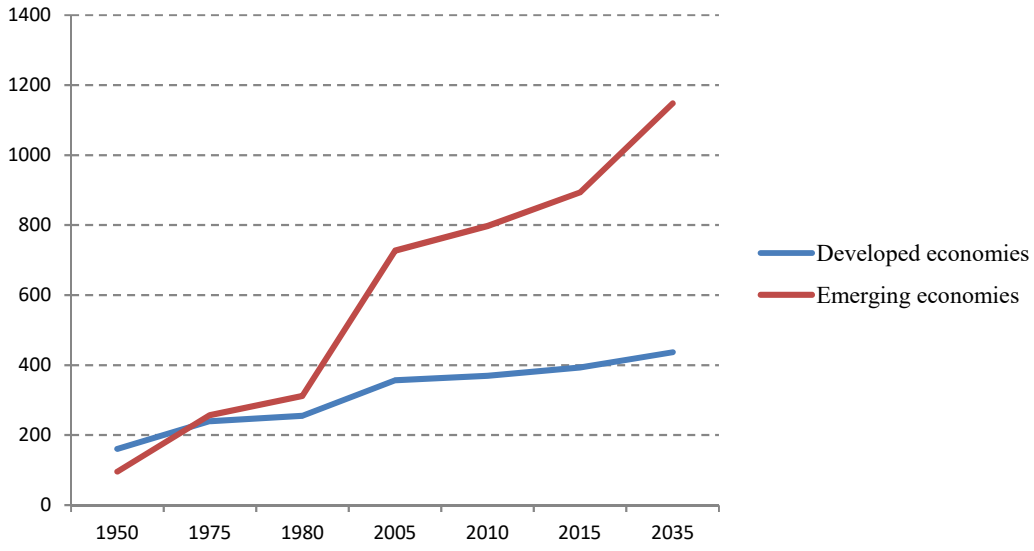


Figure 2-26 comparison of city numbers in developed economies and emerging ones

Source: compiled by the author based on statistics from the United Nations Population Division

b. The size of world cities continues to expand

From 1950 to 2015, the population share of mega-cities increased from 1.83 percent to 11.72 percent, up by 540.44 percent.

c. The change of rank-size rule for world cities (see Figure 2-27~2-34)

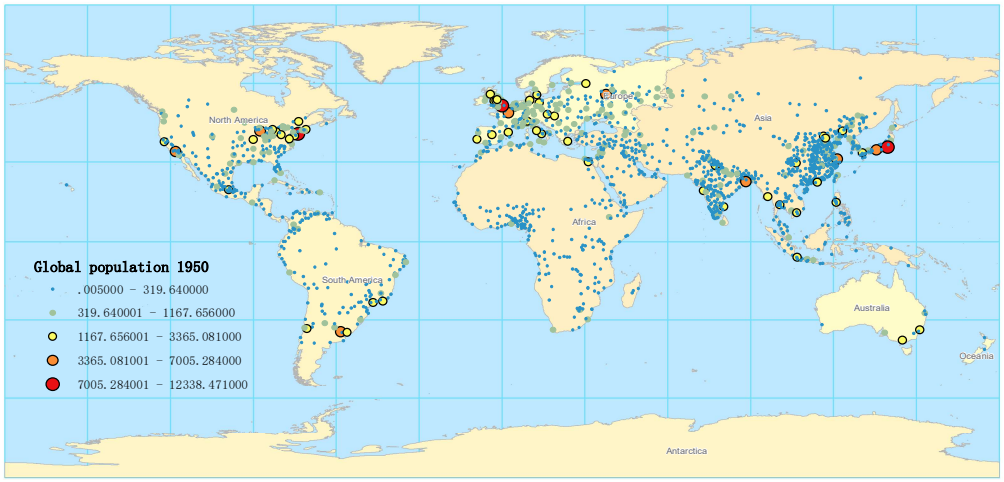


Figure 2-27 the map on world city size system in 1950 (in terms of population)

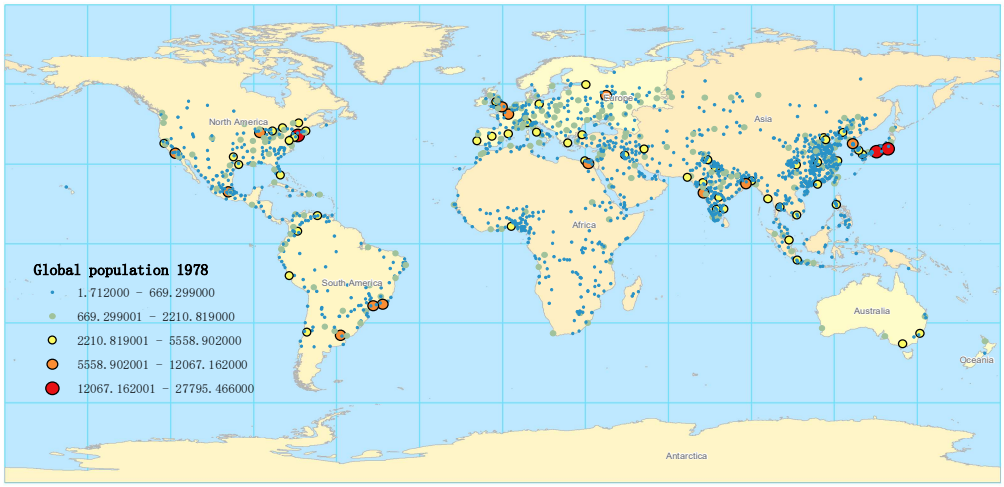


Figure 2-28 the map on world city size system in 1978 (in terms of population)

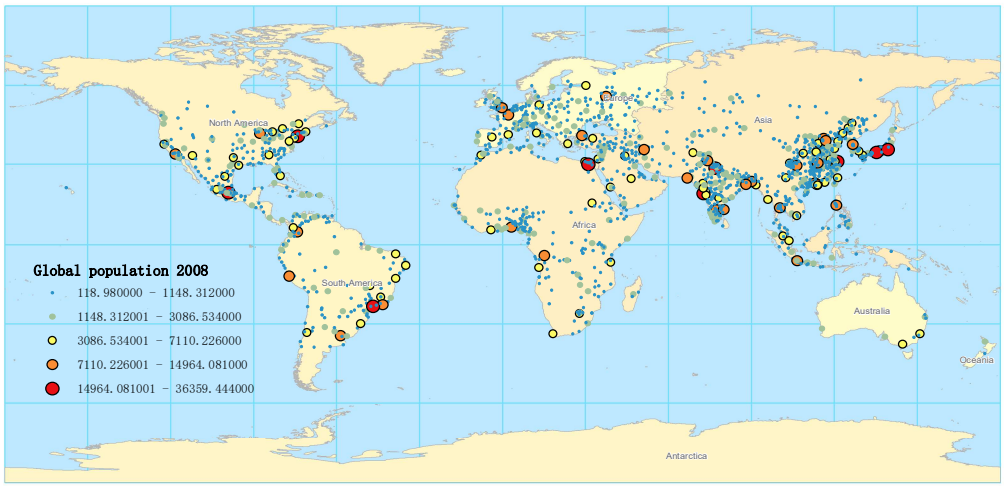


Figure 2-29 the map on world city size system in 2008 (in terms of population)

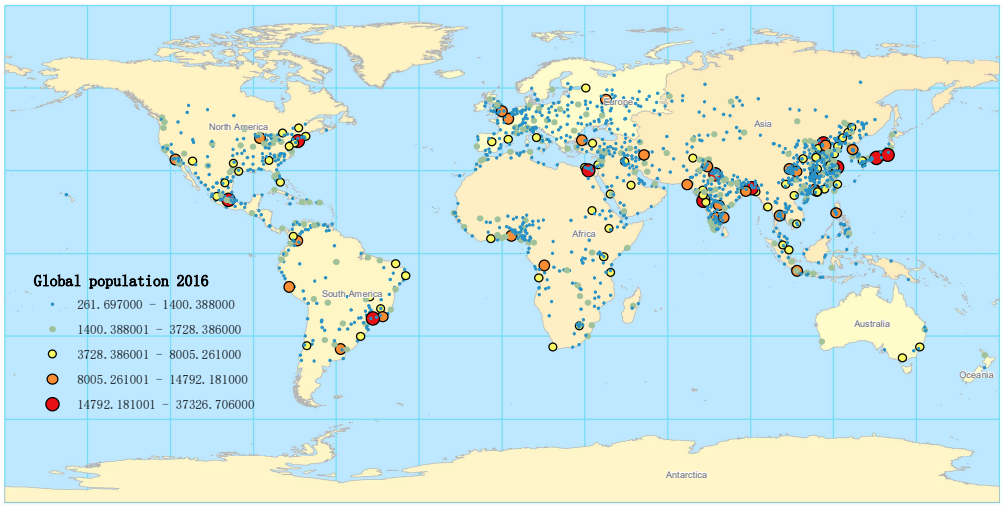


Figure 2-30 the map on world city size system in 2015 (in terms of population)

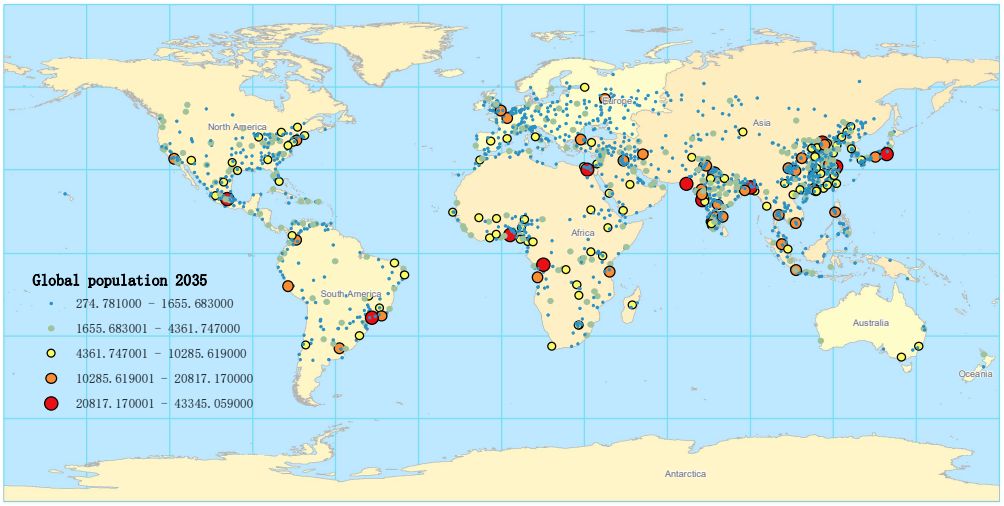


Figure 2-31 the predicated map on world city size system in 2035 (in terms of population)

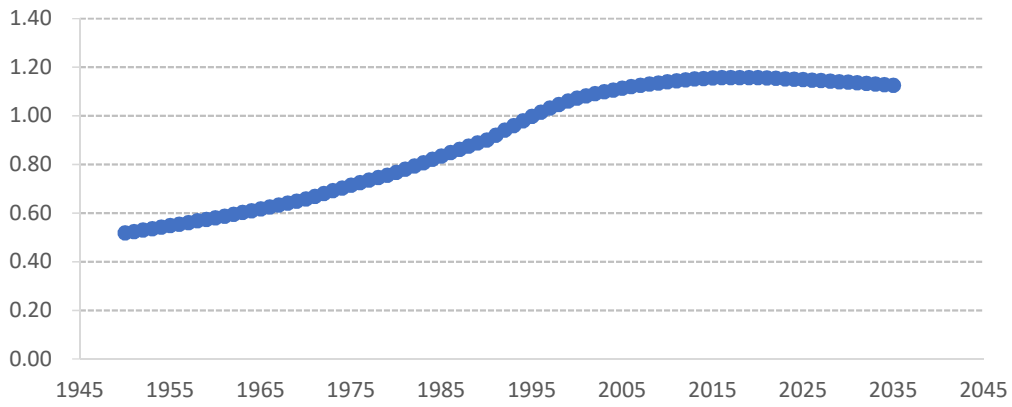


Figure 2-32 the trend of Zipf's indices of major countries in 1950-2015

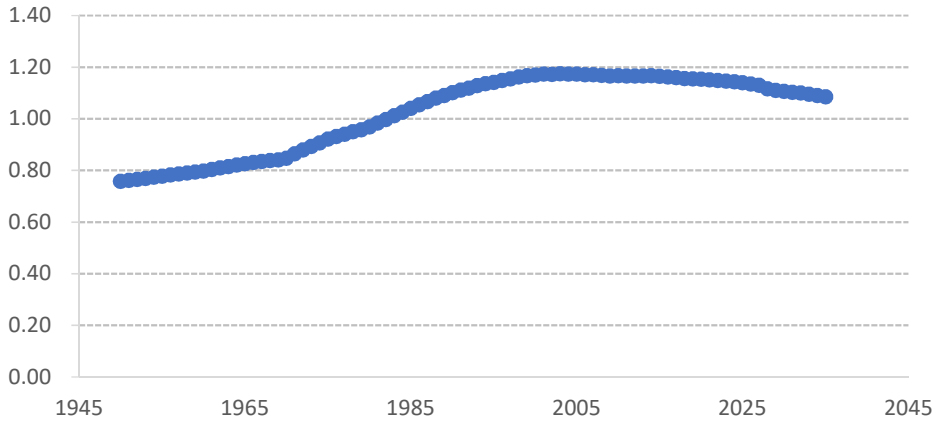


Figure 2-33 the trend of Zipf's indices of developed nations in 1950-2015

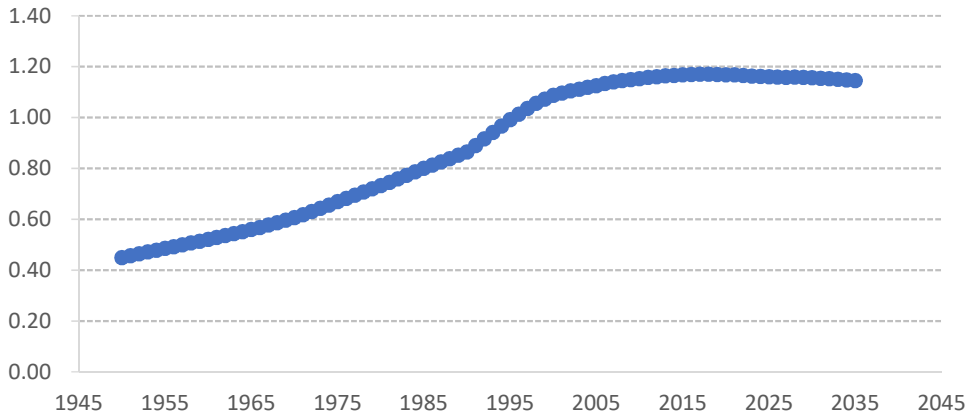


Figure 2-34 the trend of Zipf's indices of emerging economies in 1950-2015

Source: compiled by the author based on statistics from the United Nations Population Division

d. Urban agglomeration system is taking shape，with the Zipf's exponent of most urban agglomerations moving closer to 1.

2.1.1.5 Challenges Urban Population Faces

a. The co-existence of declining developed economies and rising emerging economies are rising (see Figure 2-35 and Figure 2-36).

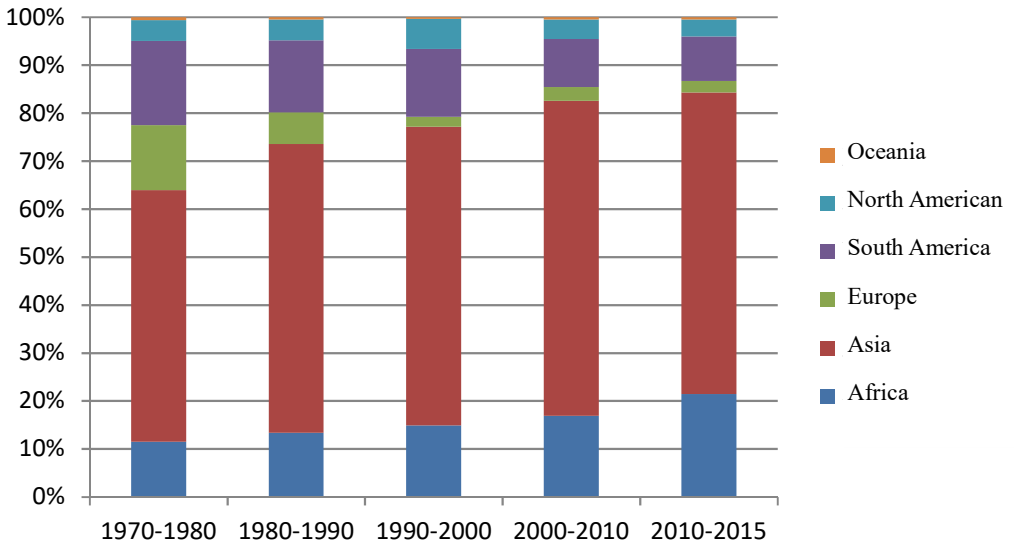


Figure 2-35 share of population growth by continent in 1970-2015

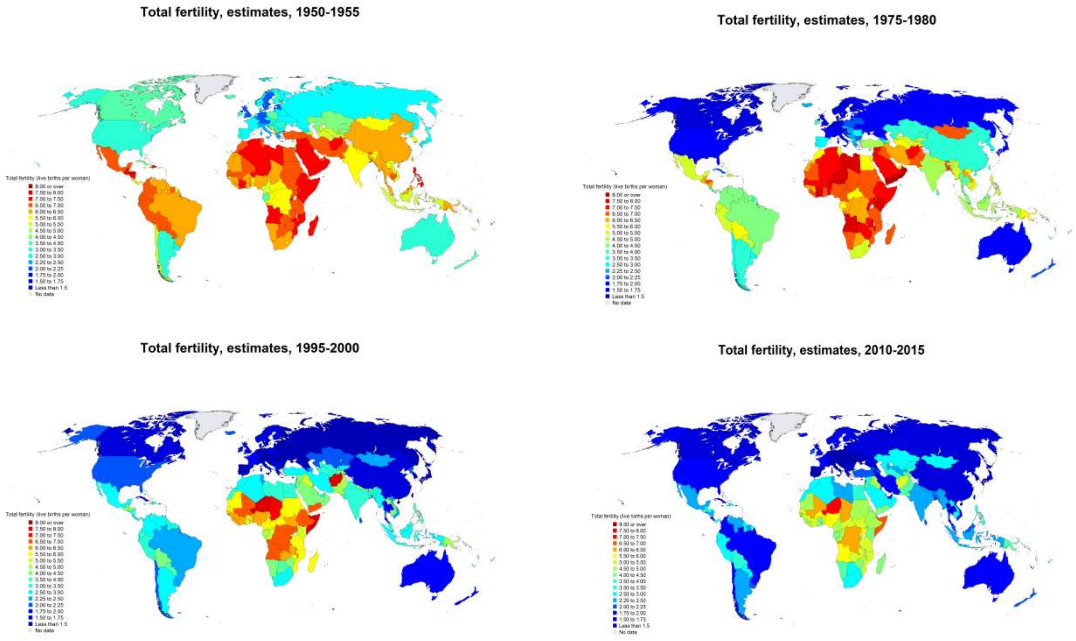


Figure 2-36 birth rate in all countries and regions in 1950-2015

Source: United Nations Population Division

b. Racial conflicts and social contradictions (see Figure 2-37)

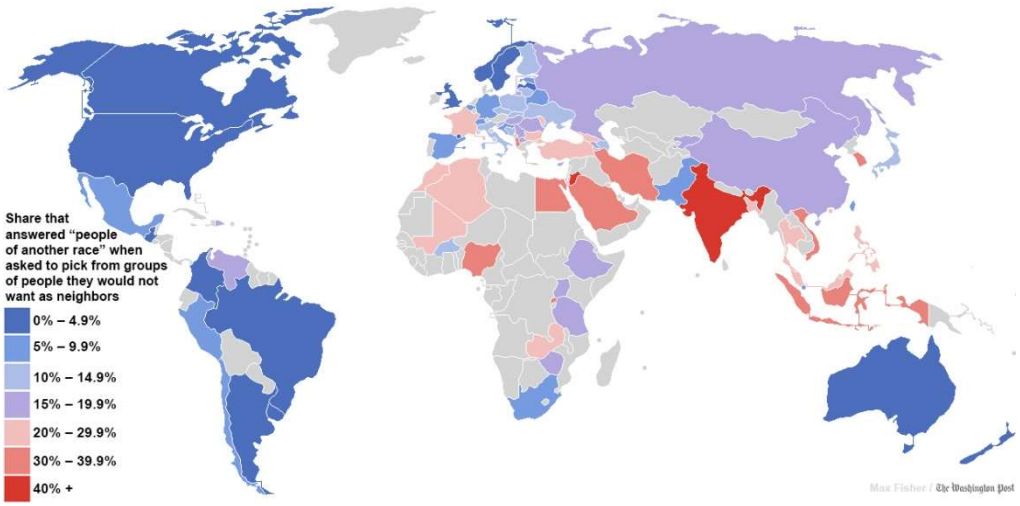


Figure 2-37 share that answered "people of another race" when asked to pick from groups of people they would not want as neighbors, a survey conducted by *the Washington Post*

Photo credit: Global Perspectives

2.1.2 Tremendous Changes on World City Functions Caused by Division of World Cities

a. Emerging industries in some cities are rising rapidly

The development of global technological industries and the rising of global technological centers (see Figure 2-38~2-40)

Figure 2-38 spatial distribution and its changes of high-tech industries in world cities in 1989-1991

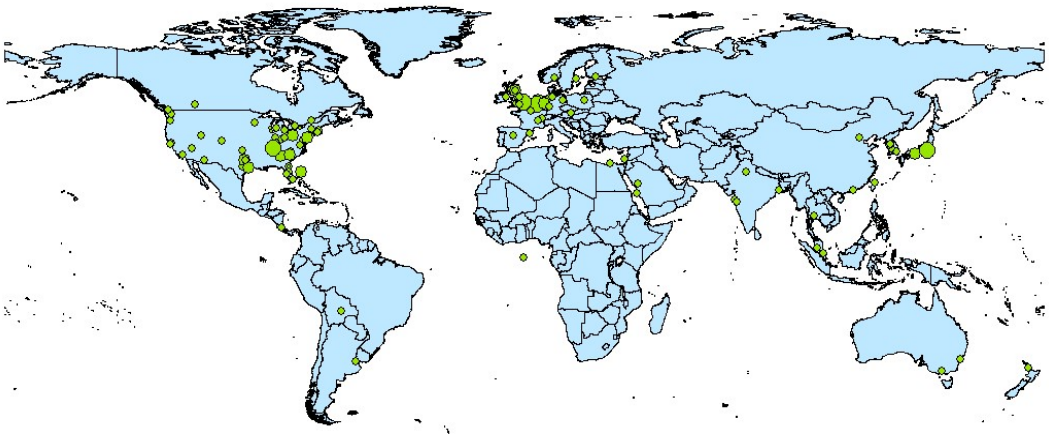


Figure 2-39 spatial distribution and its changes of high-tech industries in world cities in 1992-2008

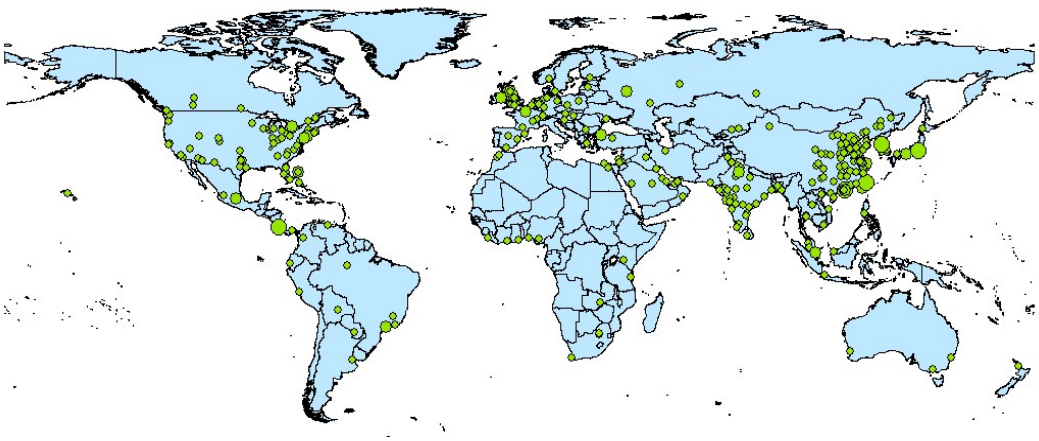


Figure 2-40 spatial distribution and its changes of high-tech industries in world cities in 2009-2017

Source: data on global public companies in 1989-2017 released by Osiris

b. The development of manufacture-related service industries and the rising of world cities (see Figure 2-41~2-43)

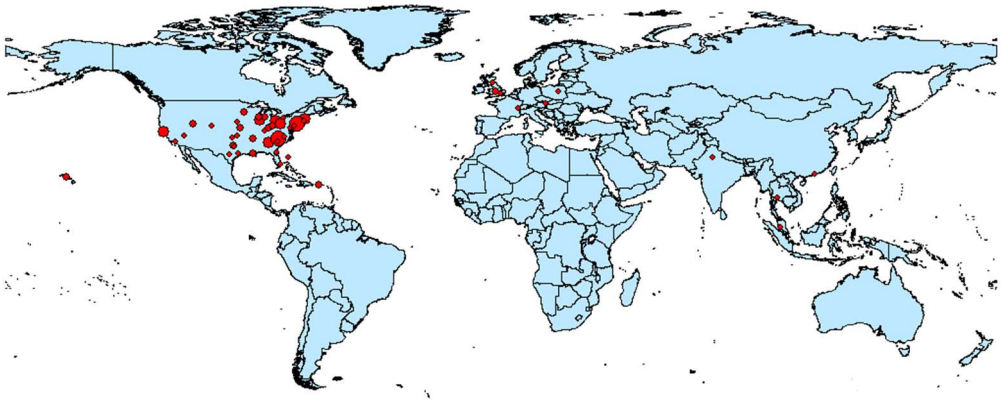


Figure 2-41 spatial distribution of public companies in the banking and financial sectors and its changes in 1989-1991

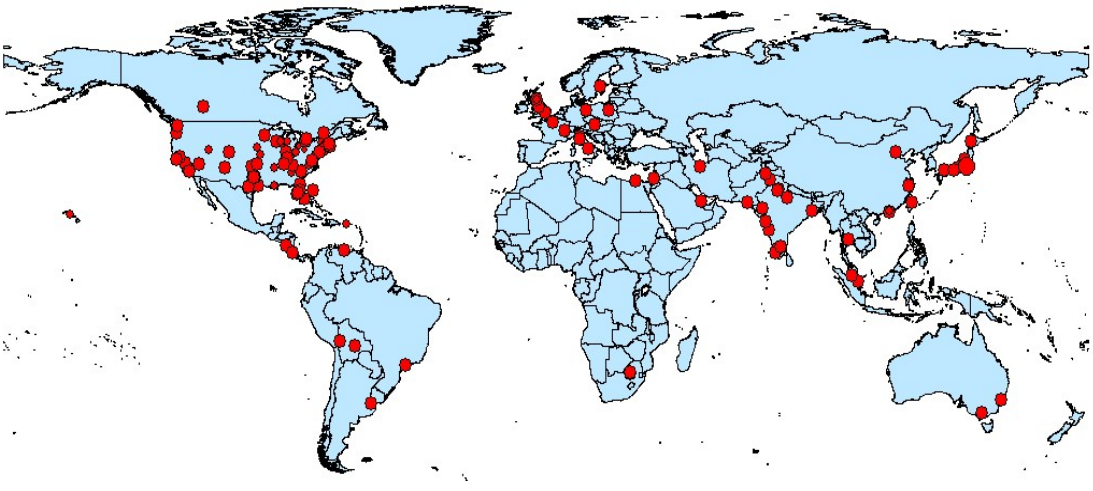


Figure 2-42 spatial distribution of public companies in the banking and financial sectors and its changes in 1992-2008

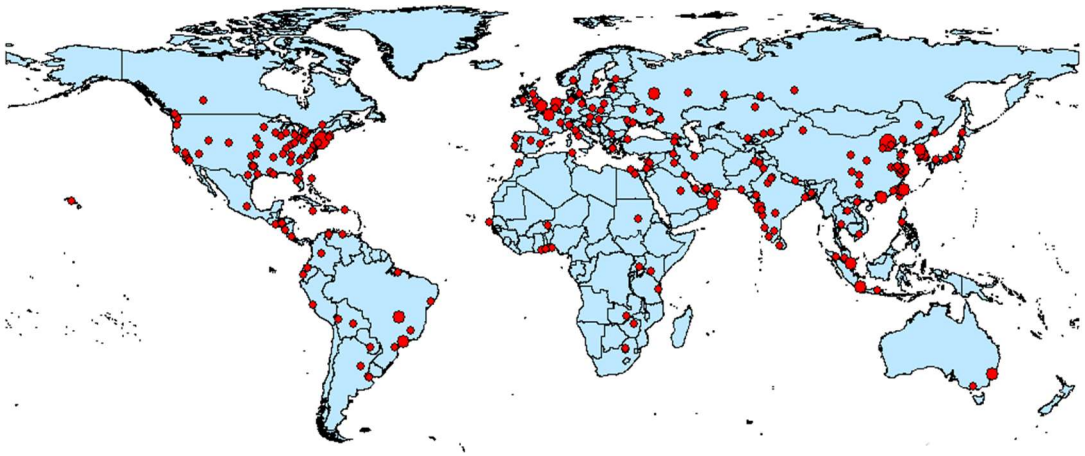


Figure 2-43 spatial distribution of public companies in the banking and financial sectors and its changes in 2009-2017

Source: data on global public companies in 1989-2017 released by Osiris

b. Global urban functions have changed significantly

First, living is always the basic function of all cities. But the fundamental functions of cities may vary in different economies. Second, the production functions of a city is being replaced by innovation. (see Figure 2-44~2-46) Third, trade and exchanges among world cities are being replaced by communication and contacts.

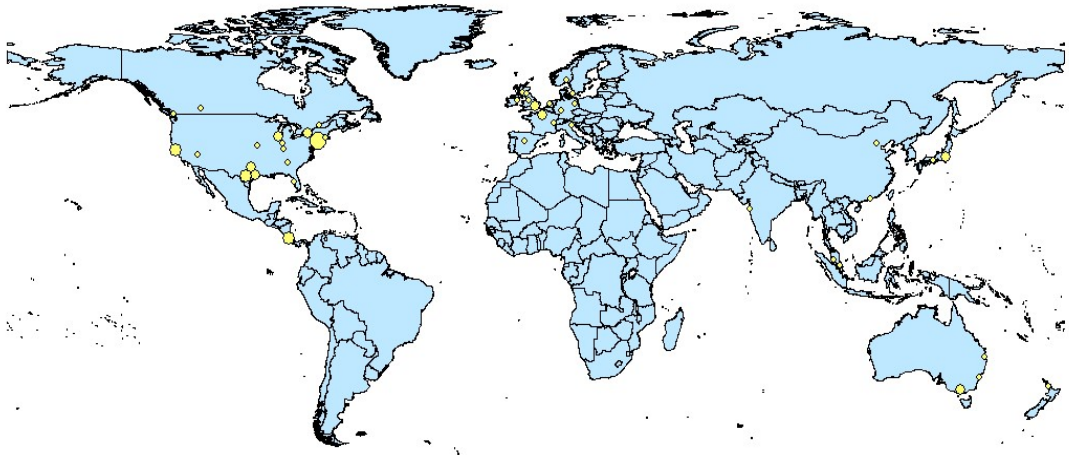


Figure 2-44 changes of knowledge-intensive industries in world cities in 1989-1991

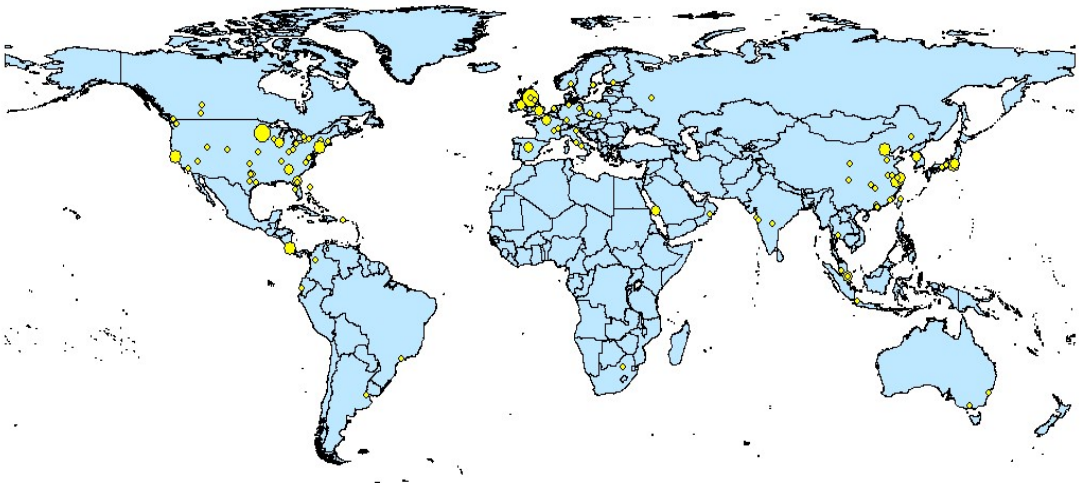


Figure 2-45 changes of knowledge-intensive industries in world cities in 1992-2008

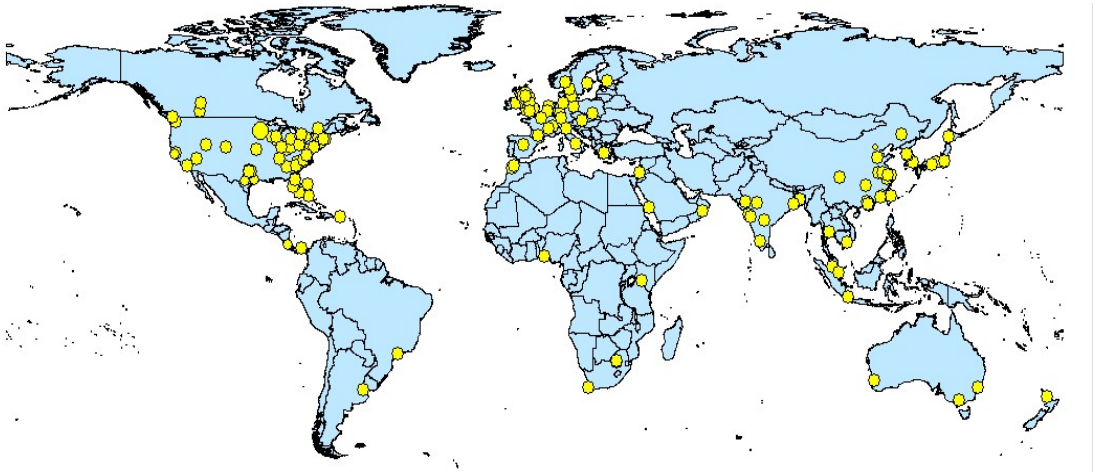


Figure 2-46 changes of knowledge-intensive industries in world cities in 2009-2017

Source: compiled based on data on global public companies released by Osiris

c. The dominant functions of world cities are deeply globalized and hierarchical

First, finance and technology services are the core and dominant functions world cities possess to exert global control and influences. (see Figure 2-47) Second, the service function of world cities become more prominent. All cities involved in globalization serve for globalization (see Figure 2-48~2-50) Third, world cities have developed leading functions that complement each other at different levels. Last, the two-center world city system has evolved into a three-center one with Europe, North America and East Asia.

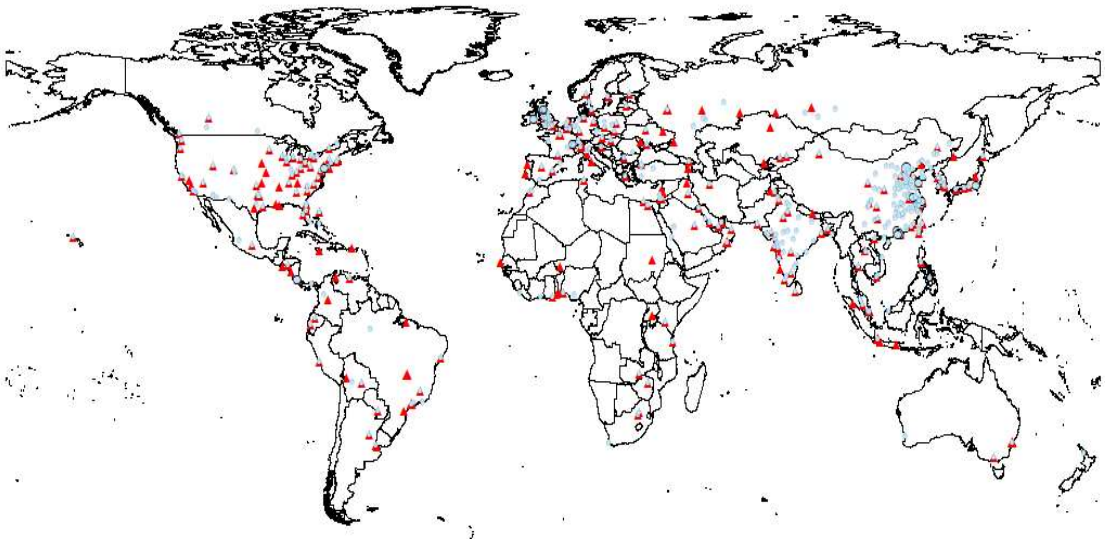


Figure 2-47 the distribution of financial and high-tech sectors in world cities

Source: compiled based on data on global public companies released by Osiris. Red triangles stand for financial sector, and blue circles stand for high-tech industries.

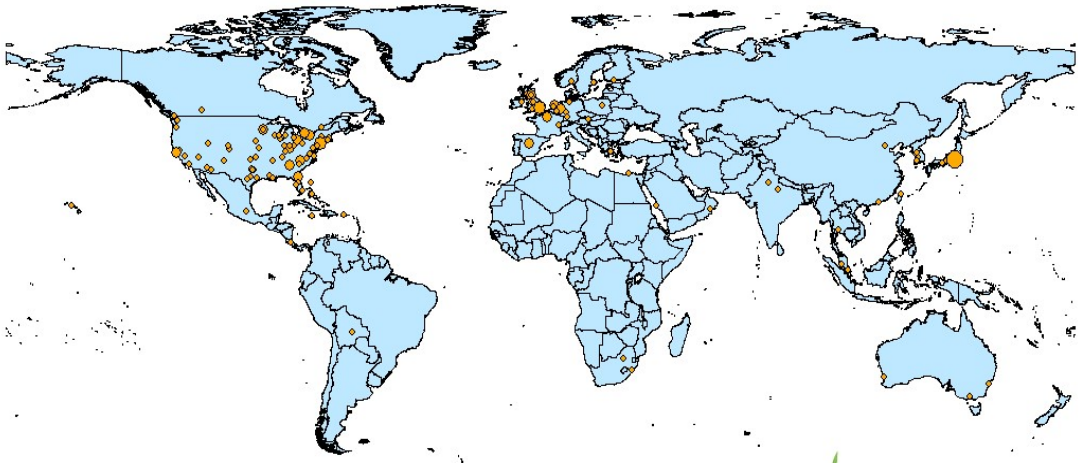


Figure 2-48 industrial service level of world cities and its changes in 1989-1991

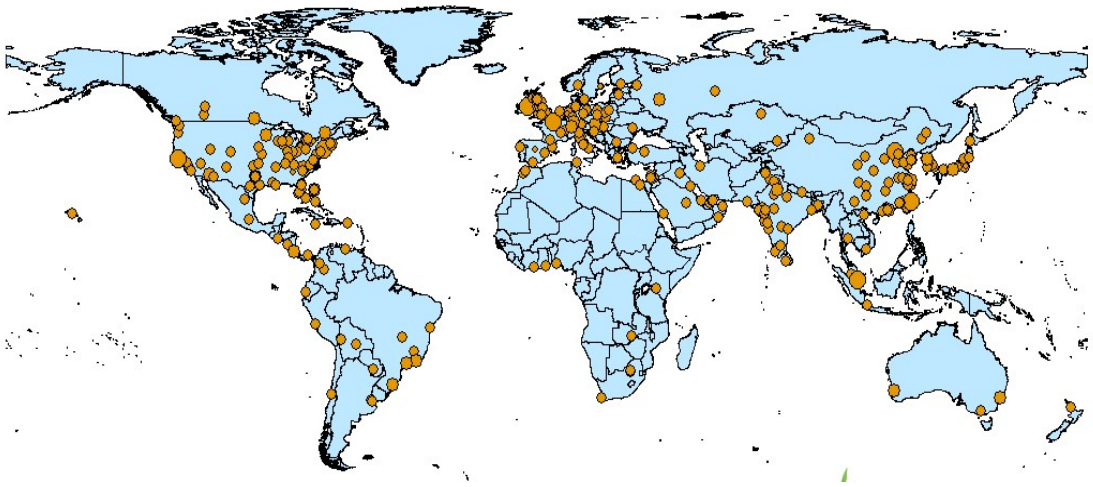


Figure 2-49 industrial service level of world cities and its changes in 1992-2008

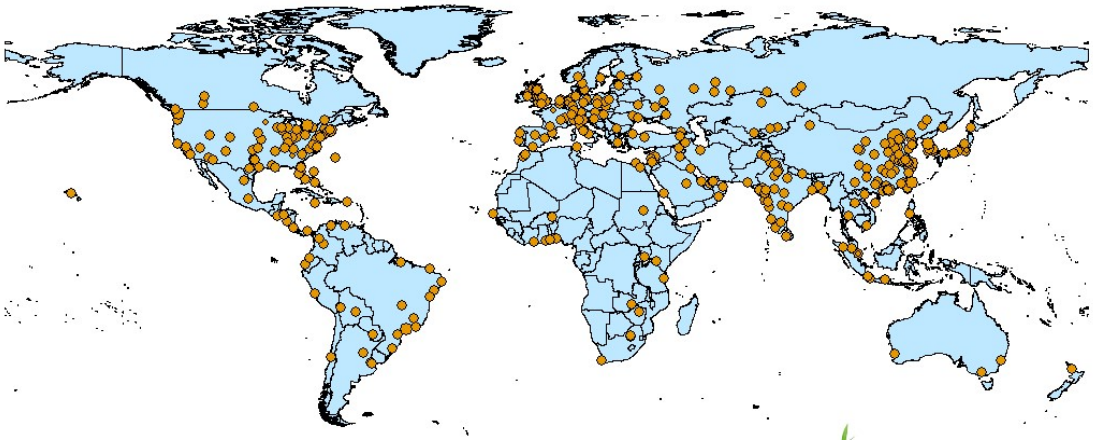


Figure 2-50 industrial service level of world cities and its changes in 2009-2017

Source: compiled based on data on global public companies in 1989-2017 released by Osiris

d．The economic and industrial development of world cities

1.Economic divide of world cities (see Figure 2-51~2-53)；**2.Economic bubble of world cities** (see Figure 2-54)；**The economic imbalance of world cities**

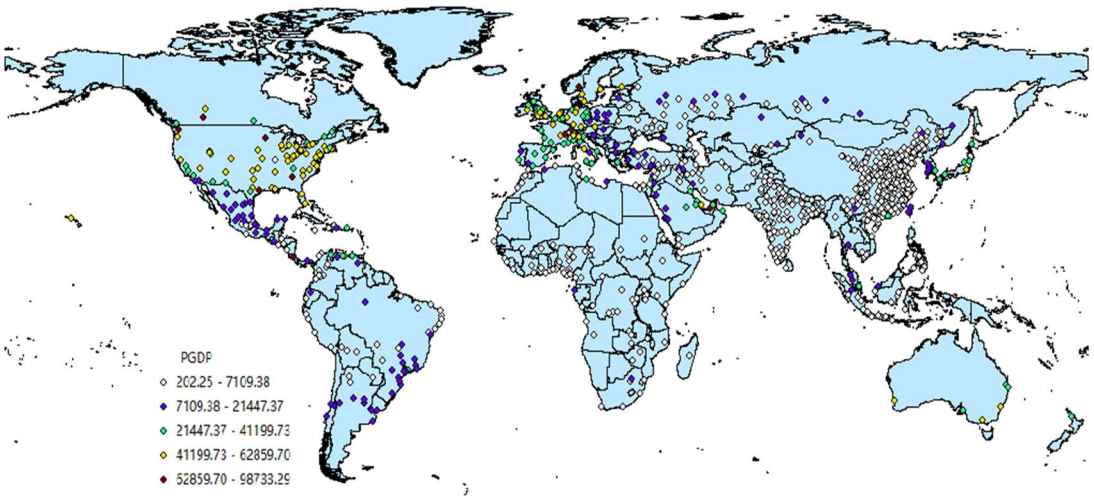


Figure 2-51 GDP per capita of world cities in 2001

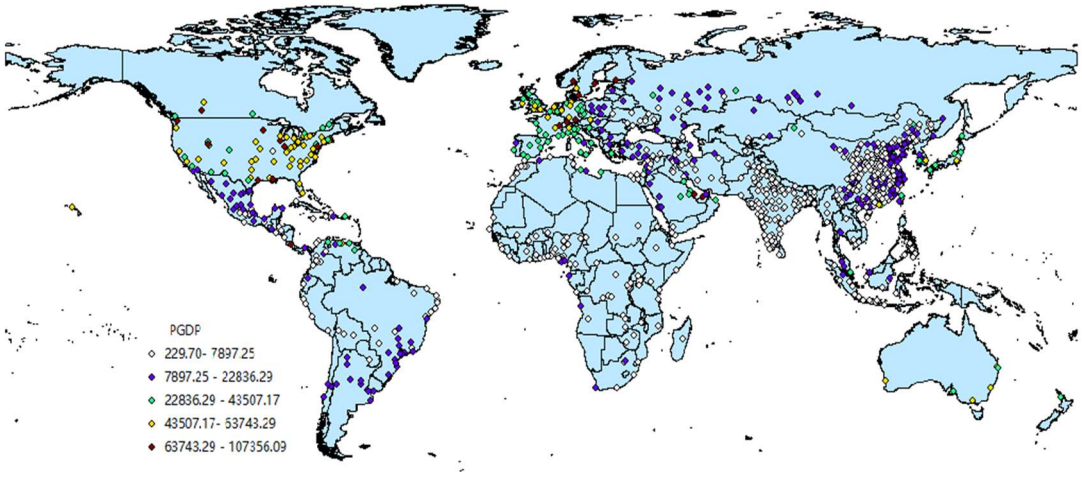


Figure 2-52 GDP per capita of world cities in 2008

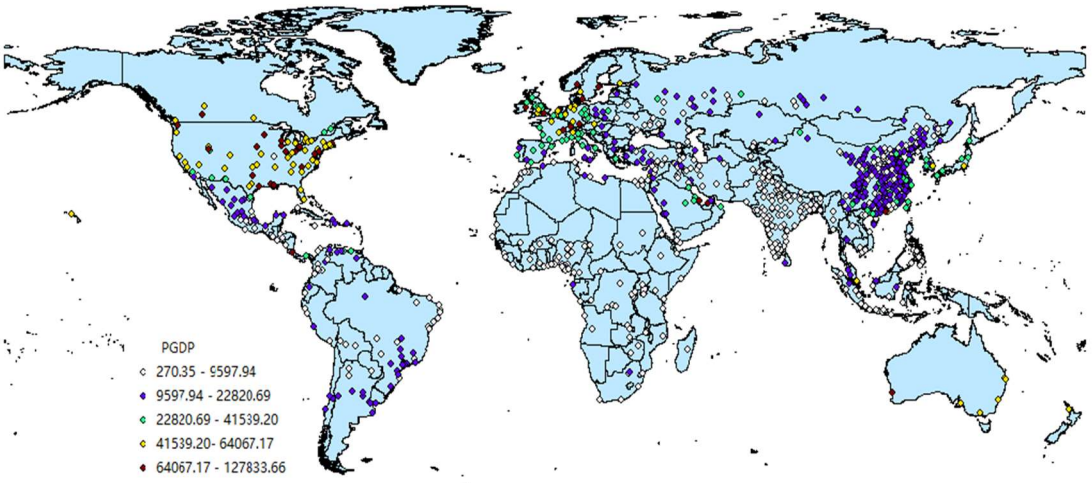


Figure 2-53 GDP per capita of world cities in 2017

Source: EIU Data Services

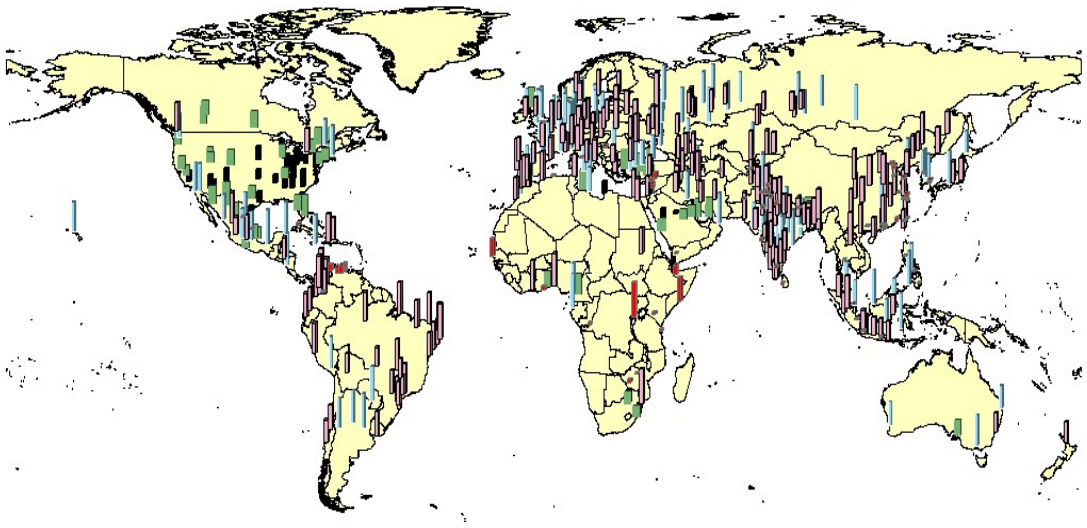


Figure 2-54 housing-price-to-income ratio in global cities

Source: the database on city competitiveness index by Chinese Academy of Social Sciences

2.1.3 Global Space Competition: A Global City Connected by Internet Infrastructure

2.1.3.1 World cities become larger, continuous and connected in physical forms

a. Isolated single-center medium-sized and small cities are evolving to connected multi-center large cities (see Figure 2-55~2-56)

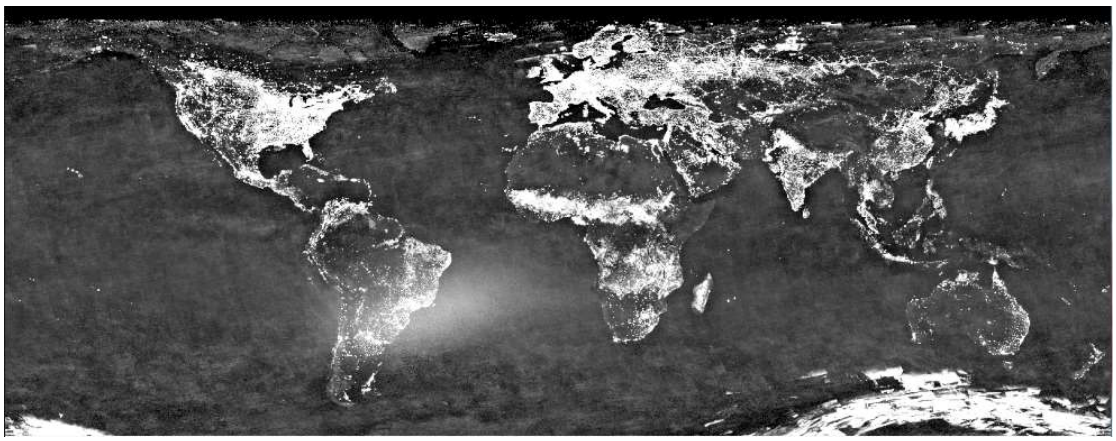


Figure 2-55 global nighttime lighting in 1992

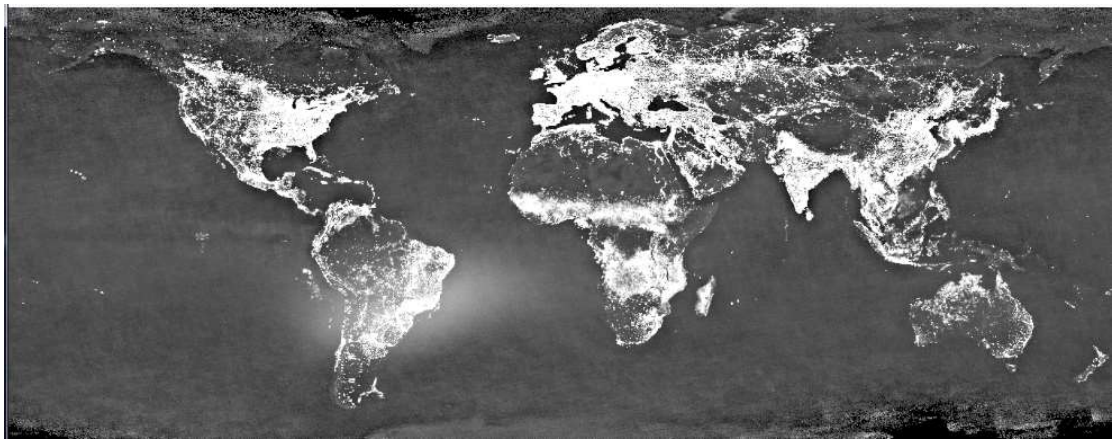


Figure 2-56 global nighttime lighting in 2012

Photo credit: NOAA data (https://www.ngdc.noaa.gov/eog/data/web_data/)

b. Urban space expands to coastal, tropical and frigid areas (see Figure 2-57~2-59)

Figure 2-57 distribution map on urban build-up area in 1984 - 1994

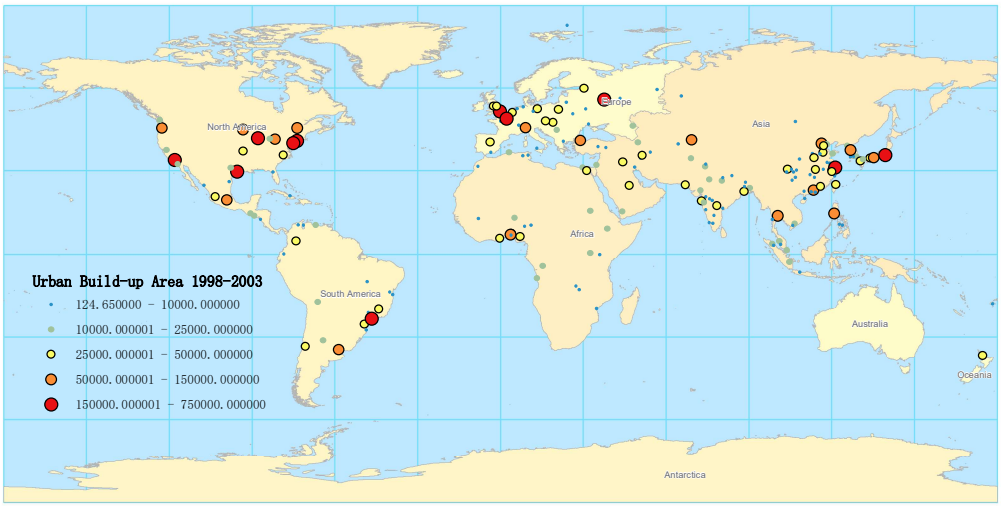


Figure 2-58 distribution map on urban build-up area in 1998 - 2003

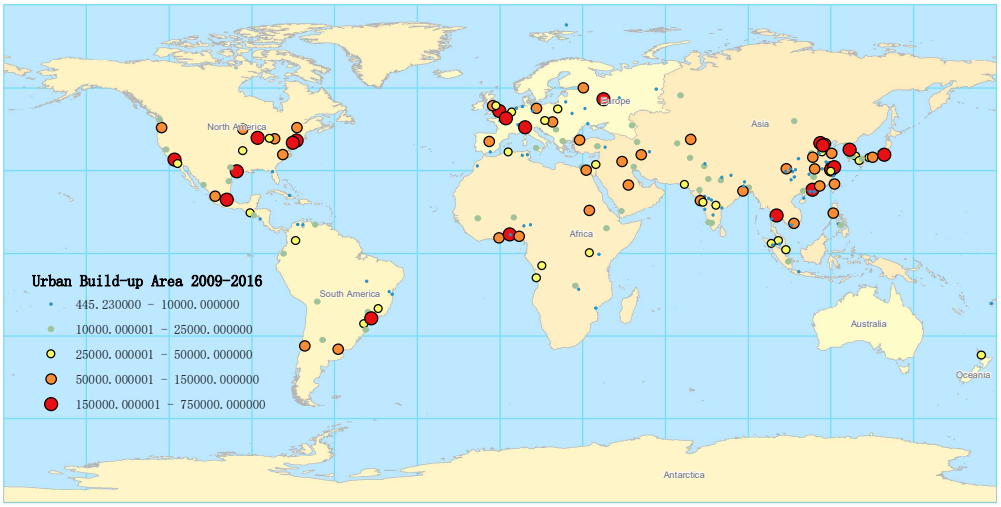


Figure 2-59 distribution map on urban build-up area in 2009 - 2016

Source: compiled by the author based on atlas of world city expansion

2.1.3.2 Infrastructure of world cities becomes connected and convenient thanks to IT application (see Figure 2-60~2-61)

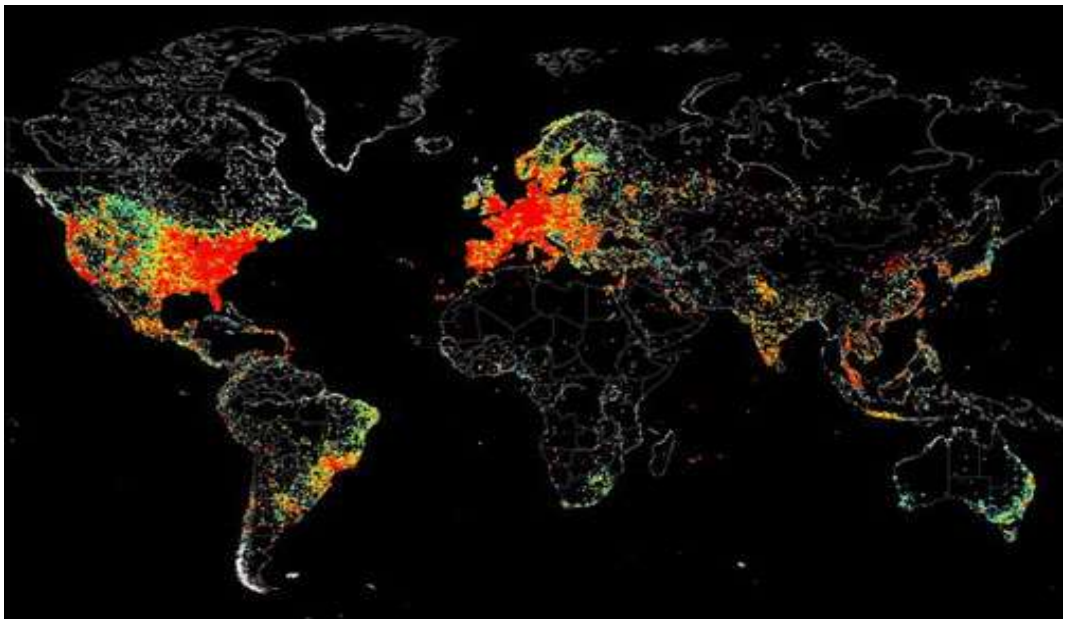


Figure 2-60 devices connected to Internet across the world

Source: Facebook (http://www.lianpula.net/)

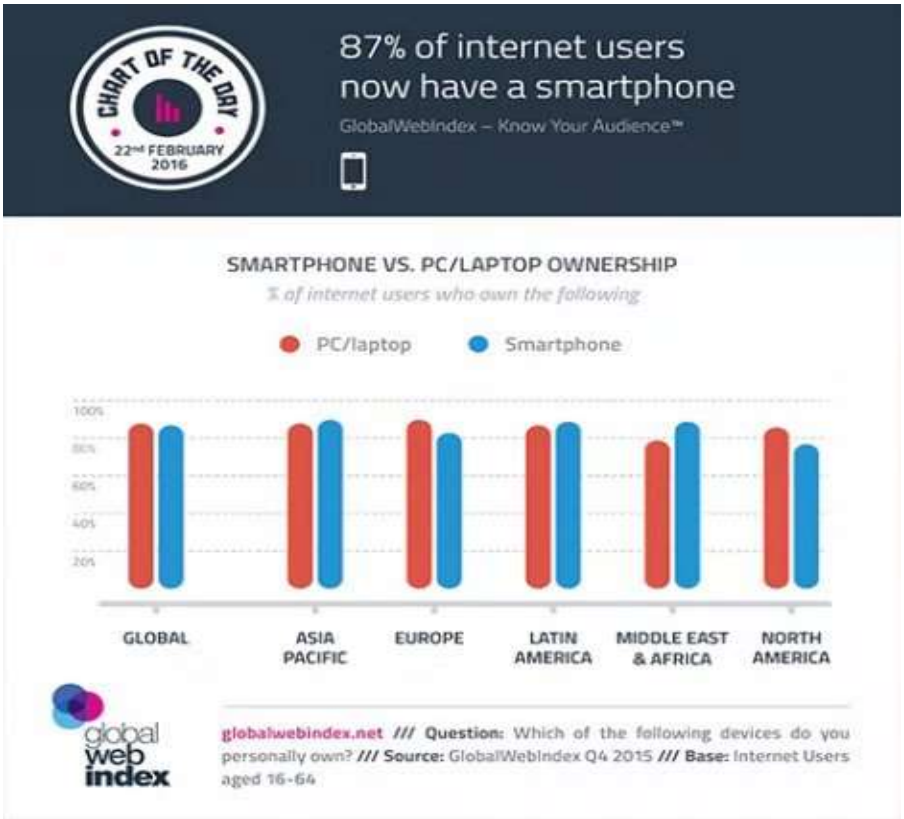


Figure 2-61 smartphone ownership among global Internet users

Source: www.techweb.com.cn

2.1.3.3 Changes in spatial pattern of urban ecology and environment

a. Rampant expansion and spread of urban space; b. Poor and mismatched urban public facilities; c. Resource consumption and ecological destruction in cities

2.2 Humanity moving towards a connected, gathering and sharing city planet over the 40 Years

2.2.1 The nature of world has changed because of the change of city status: it is a world of cities

Firstly, the nature of world has changed because of the change of city status: it is a world of cities

Cities have become the principal part of world development gradually (see Figure 2-62).

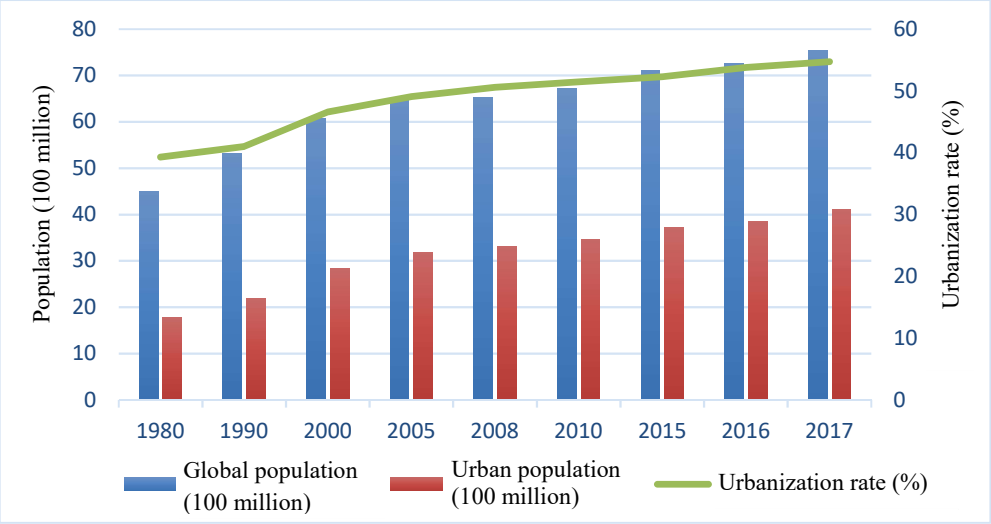


Figure 2-62 Proportion of Urban Population in Global Population

Data source: WDI Database of the World Bank, World Population Report of the United Nations

Urban economy makes up a larger and larger proportion in global economy: There are 13,810 cities covering a land area of more than one square kilometers (see Figure 2-63).

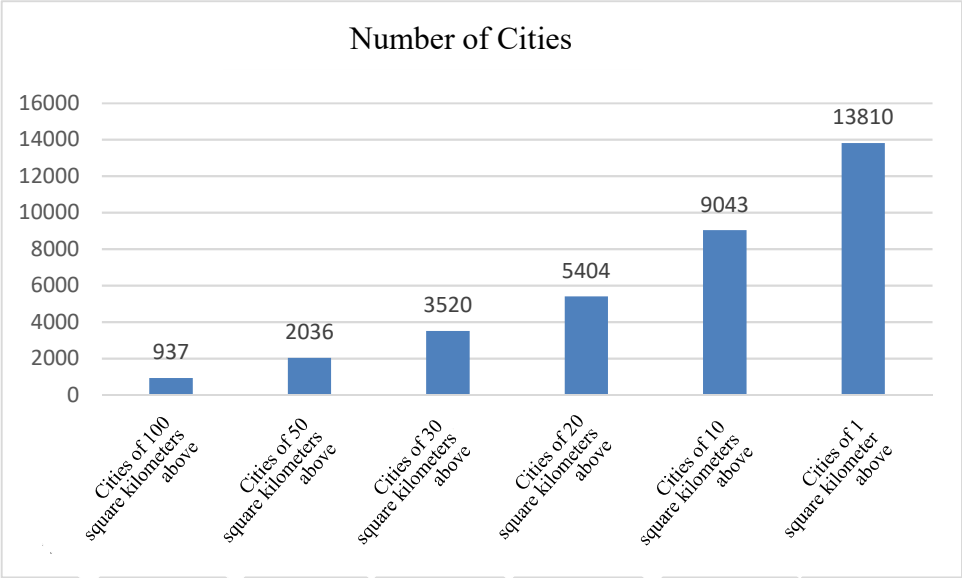


Figure 2-78 Number of Cities of Different Size in the World

Data source: collation of the data released by the project team of the international knowledge center, Chinese Academy of Engineering

Secondly, cities have become the engine of world development gradually

Medium cities have contributed to more than 50% of the global GDP growth, mega cities have contributed to 11%, and other cities and rural areas have contributed to the remaining 30%.

Thirdly, cities have become the carrier of world development gradually

Firstly, cities are the carrier of main human activities. Secondly, cities are the principal part of human infrastructure. Thirdly, cities are global infrastructure network nodes.

2.2.2 Functions of the world have changed because of the change of urban functions: the world becomes a large group

Firstly, urban functions have been modernized, and are no longer traditional ones: the content of world activities has changed. Secondly, urban functions have been professional, rather than just comprehensive: the professional division of labor in the world has changed. Thirdly, urban space has seen a local-to-global shift: the territorial division of labor of the world has changed. Fourthly, the urbanization of emerging economies has changed the global functional distribution pattern gradually.

2.2.3 The world form has changed because of the change of urban form: the world becomes a city

The spatial form of global human activities has changed because of the change of urban form in the world. (see Figure 2-65~2-66)

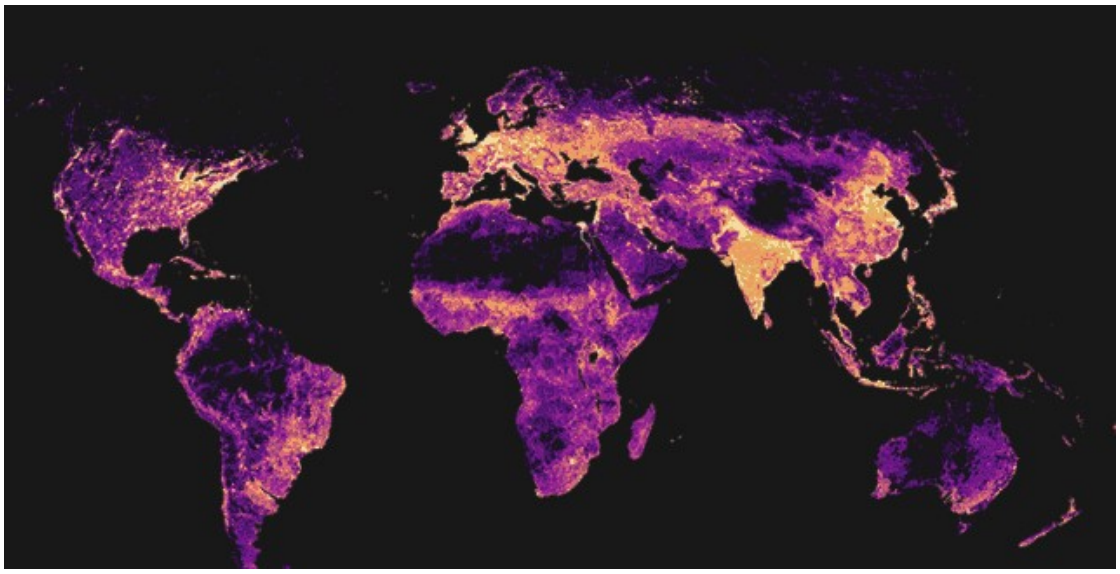


Figure 2-65 Map of Human Footprints in the World

Figure 2-66 Population Density of Urban Agglomerations in the World

Data source: Reldresal.

Secondly, global infrastructure interconnection has resulted in the densification and expansion of global infrastructure network from underground to sky. (see Figure 2-67~2-70)

Thirdly, the world is a big city.

Fourthly, the world is like a city planet.

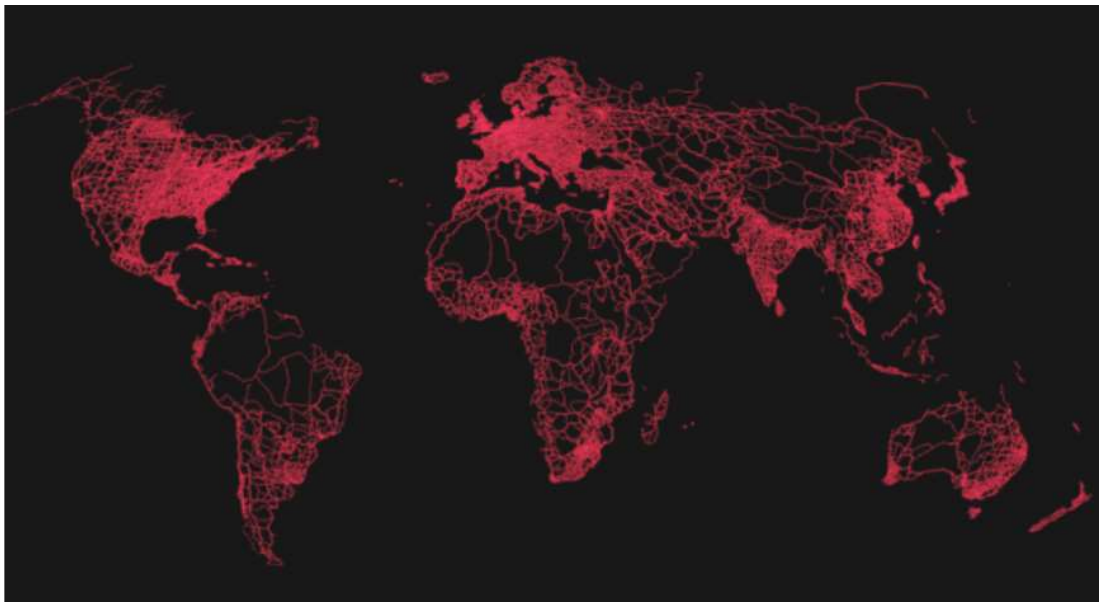


Figure 2-67 Global Road Network

Data source: Reldresal.

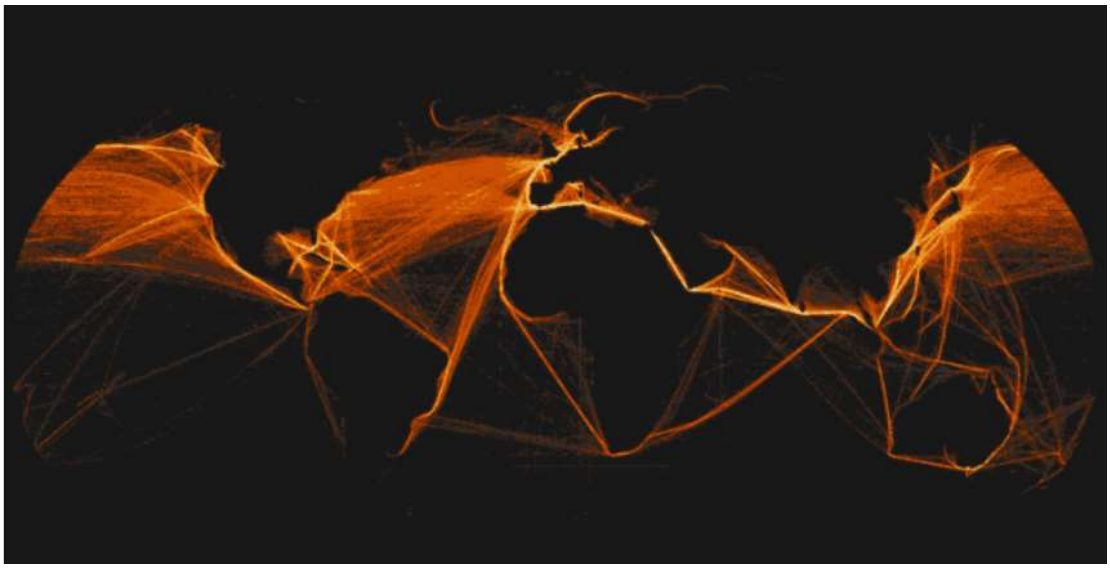


Figure 2-68 Global Shipping Routes

Data source: Reldresal.

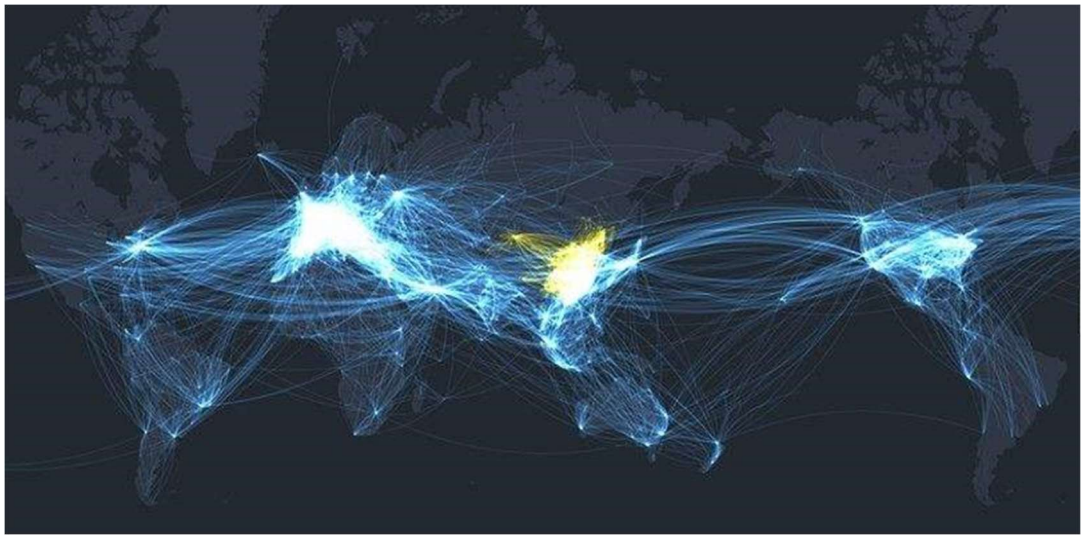


Figure 2-69 Main Air Routes in the World

Data source: Internet.

Figure 2-70 Satellite Distribution

Data source: Internet.

2.2.4 The world pattern has been reshaped by the evolution of urban pattern: the world becomes a multi-centric world under time-space compression

Firstly, urbanization of emerging economies has broken the world urban pattern gradually (see Figure 2-71~2-74)

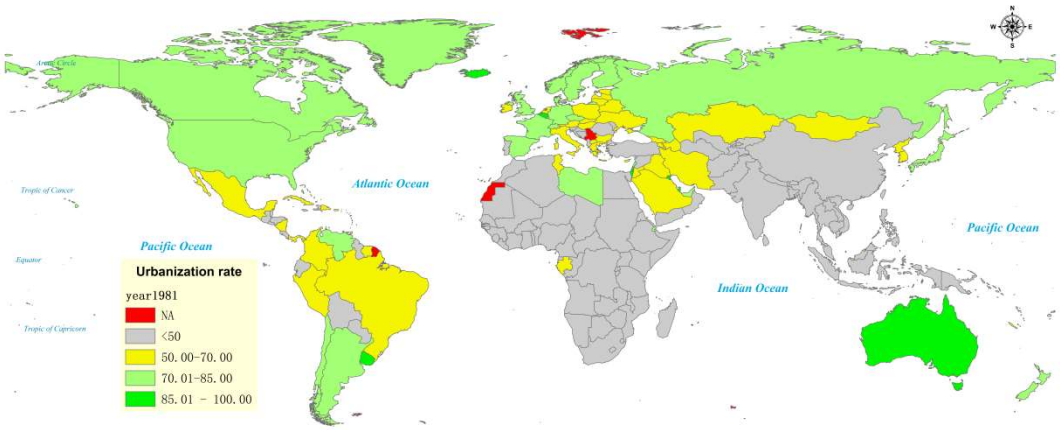


Figure 2-71 Urbanization Rate Distribution of Main Countries in the World in 1981

Note: NA means that the data is missing, the same below.

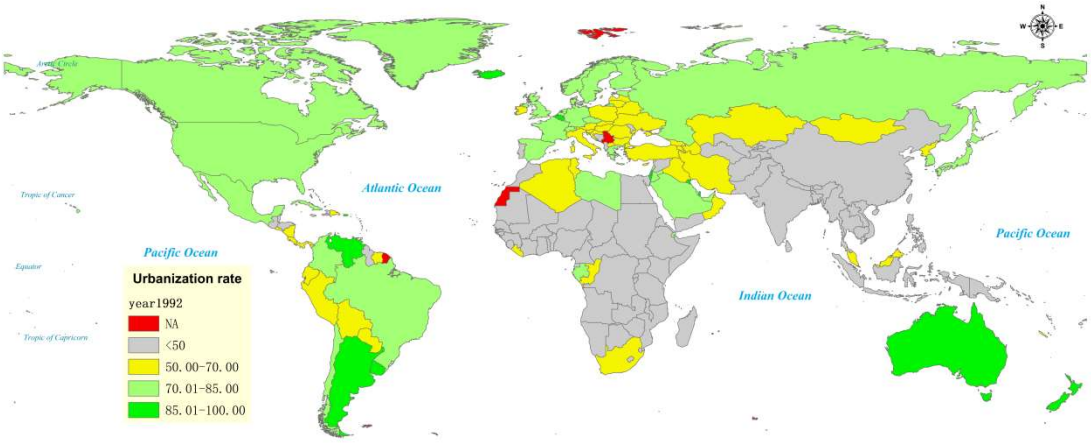


Figure 2-72 Urbanization Rate Distribution of Main Countries in the World in 1992

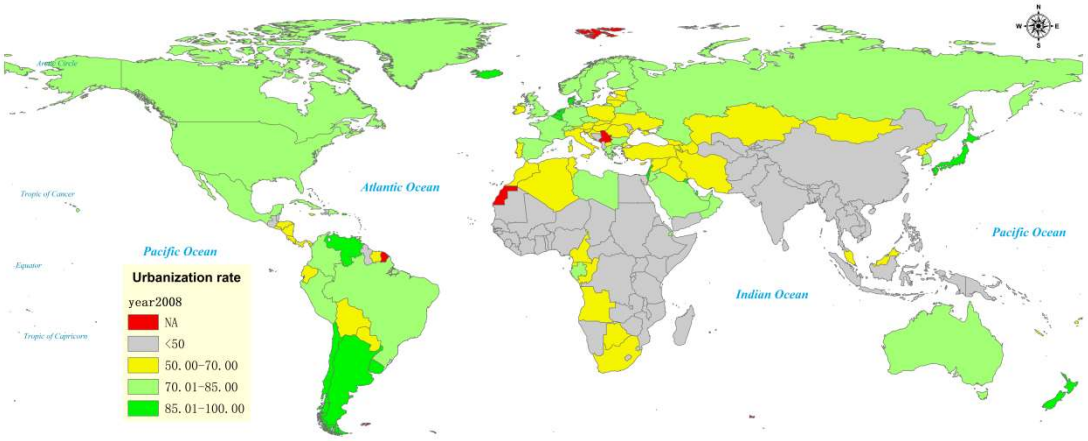


Figure 2-73 Urbanization Rate Distribution of Main Countries in the World in 2008

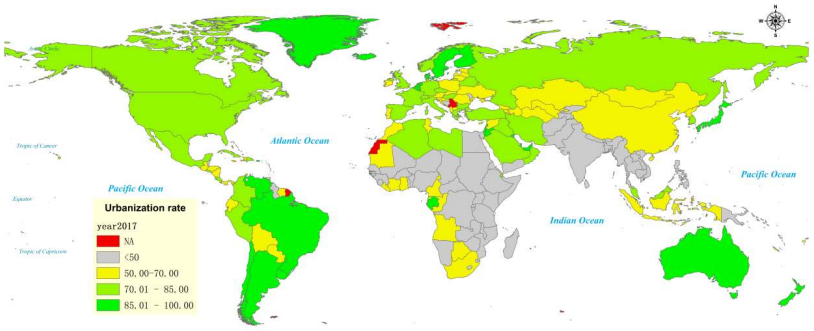


Figure 2-74 Urbanization Rate Distribution of Main Countries in the World in 2017

Data source: database of the World Bank.

Secondly, the urbanization of emerging economies has changed the global center-periphery pattern gradually

Firstly, the rise of East Asian cities has driven the rise of economy in the East Asian region. Secondly, the divergence in urban population, urban areas and economic growth in developed economies including Europe and America has given rise to economic divergence of these regions. Next, the rise of economy in East Asia has contributed to the situation of tripartite confrontation for West Europe, North America and East Asia. Last, global urban integration has given global financial and S&T cities higher capability of world control. Global divergence has become worse. (see Figure 2-75~2-76)

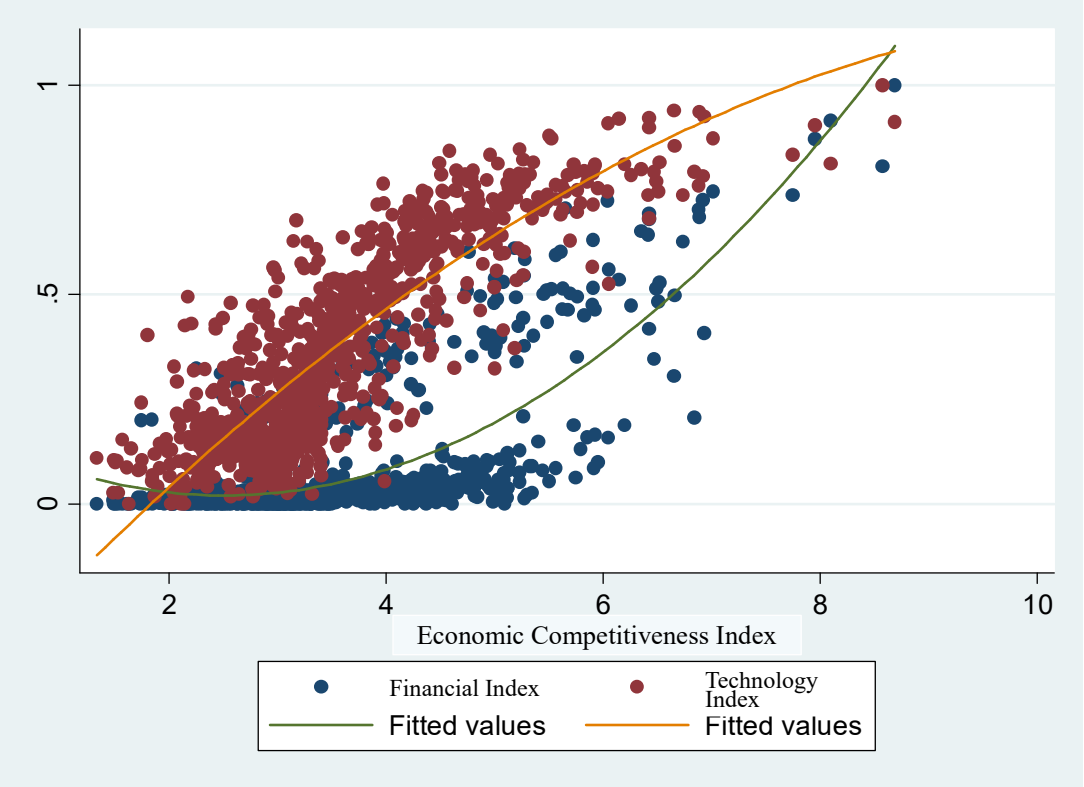


Figure 2-101 Correlations between Financial Index/Technology Index and Economic Competitiveness in Global Sample Cities

Data source: the City and Competitiveness Research Center, Chinese Academy of Social Sciences.

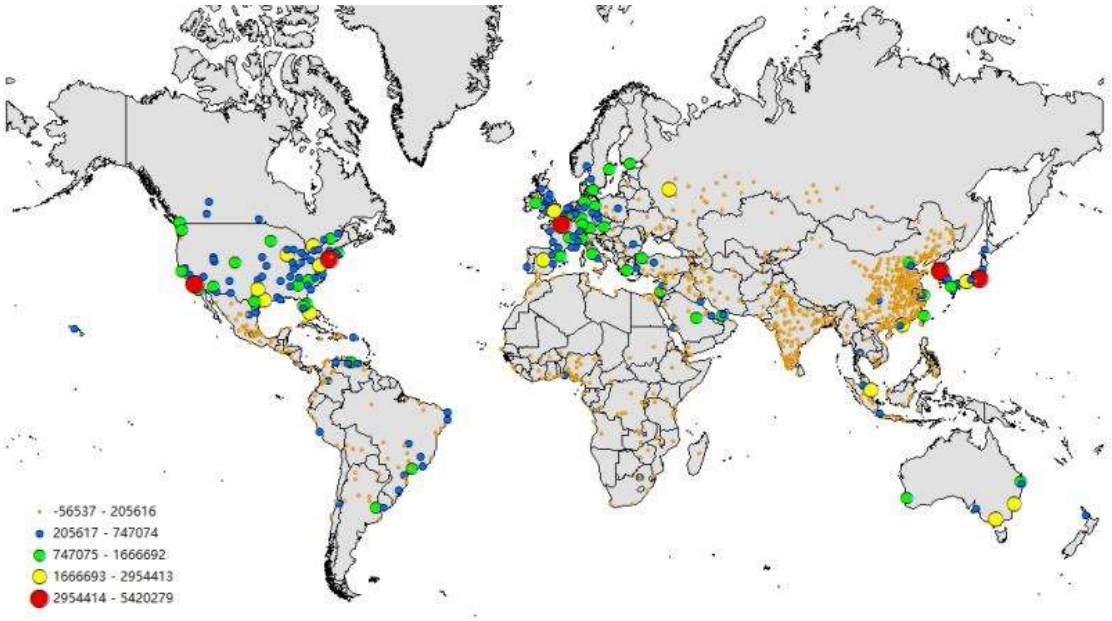


Figure 2-102 Distribution of Increment of High-income Population in Global Major Cities from 2001 to 2016

Data source: EIU database.

Thirdly, the temporal-spatial distance of global cities has formed multi-scale superposition of the world

Firstly, the age of walking. Secondly, the age of around-the-world voyage. Thirdly, the age of high-speed railways. Fourthly, the age of aviation flight. Lastly, the age of Internet. (see Figure 2-77)

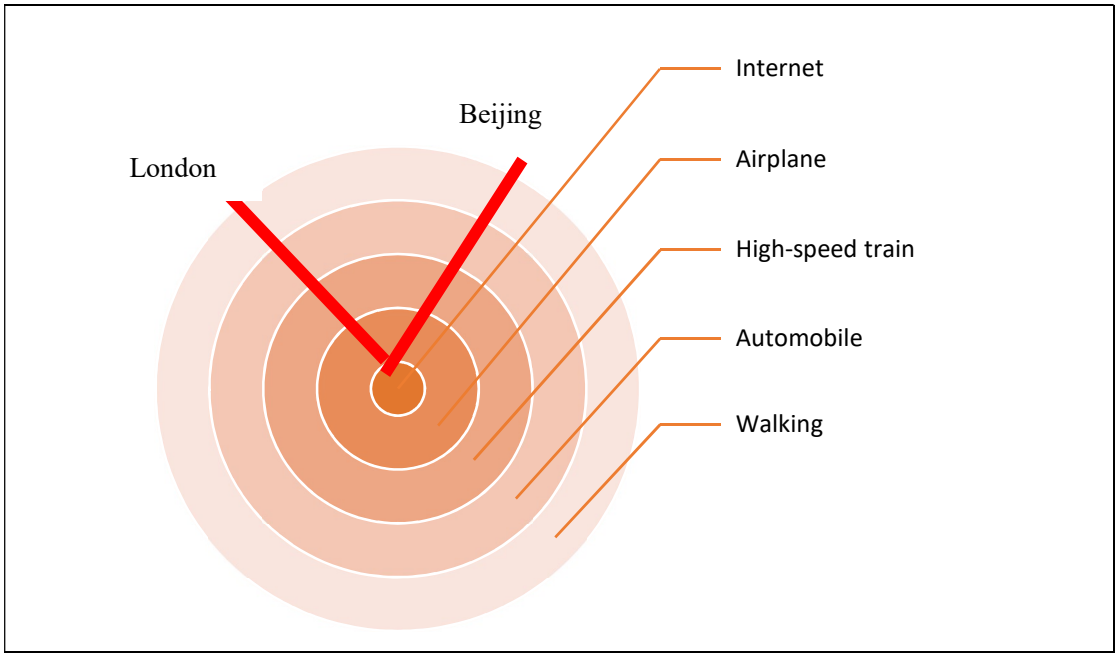


Figure 2-103 Schematic Diagram of Transportation Means Changing Temporal-spatial Distance

Data source: prepared by the author.

2.3 Market System and IT Shape the Planet of Cities Over the Past 40 Years

2.3.1 Market system: Victory and gradual deepening

2.3.1.1 Content of market system: IP protection, resource allocation and government management

2.3.1.2 Process of market system

From 1980s to the 21st century, the most countries in the world had established the market economic system. (see Figure 2-78~2-80)

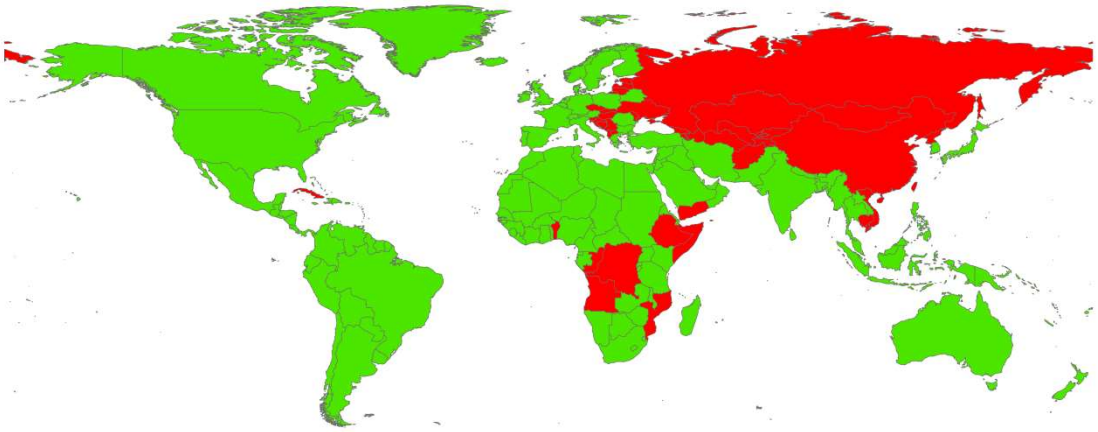


Figure 2-78 Distribution of countries adopting the system of market economy and planned economy in 1980

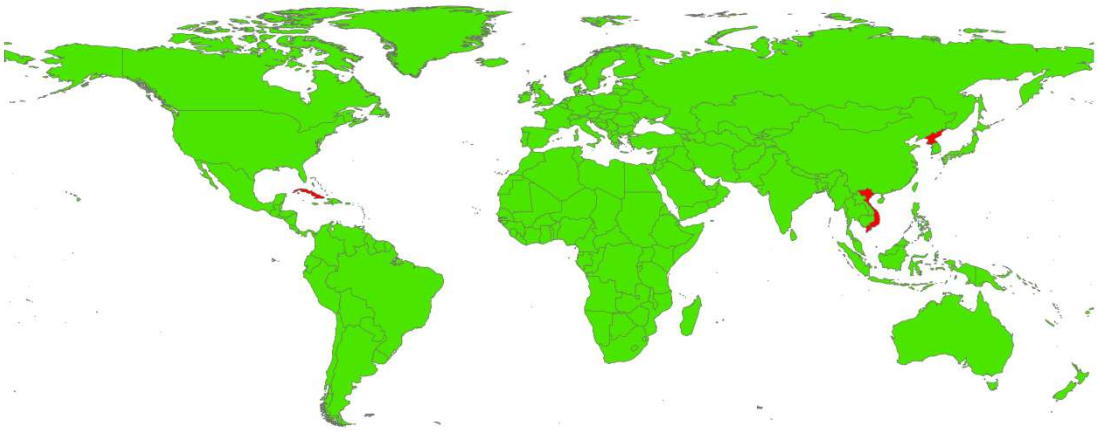


Figure 2-79 Distribution of countries adopting the system of market economy and planned economy in 1995

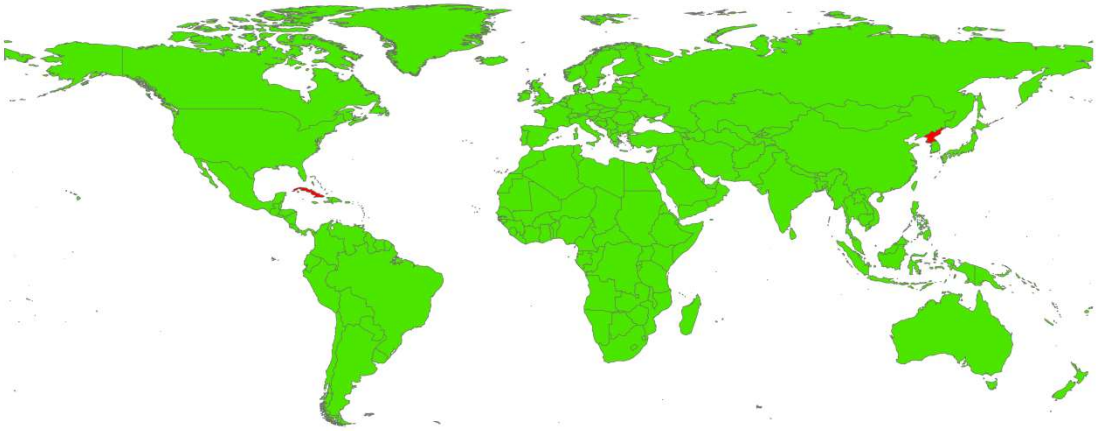


Figure 2-80 Distribution of countries adopting the system of market economy and planned economy in 2008

Note: Red represents countries of market economy and green represents countries of planned economy (similarly hereinafter).

Source: Collected by the author.

From 1980 to 2017, as the market economic system was deepened, economic freedom of the countries worldwide was all improved by a large margin. (see Figure 2-81~2-8)

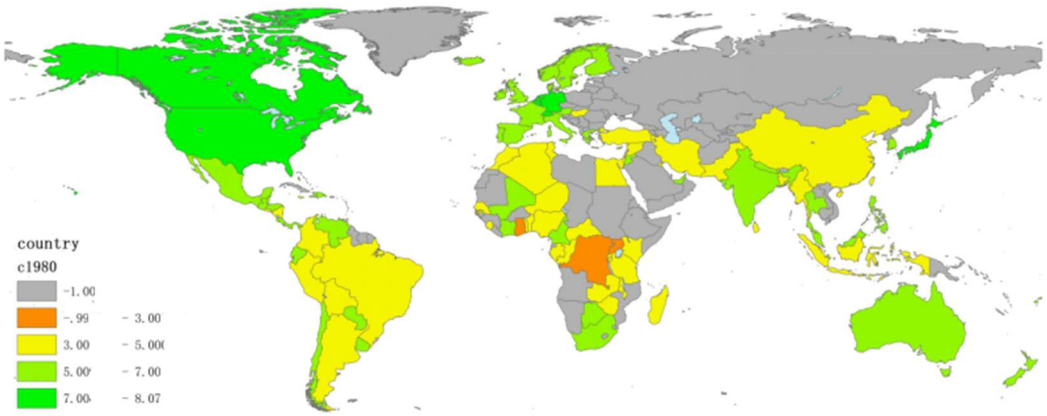


Figure 2-81 Distribution of economic freedom of the countries worldwide in 1980

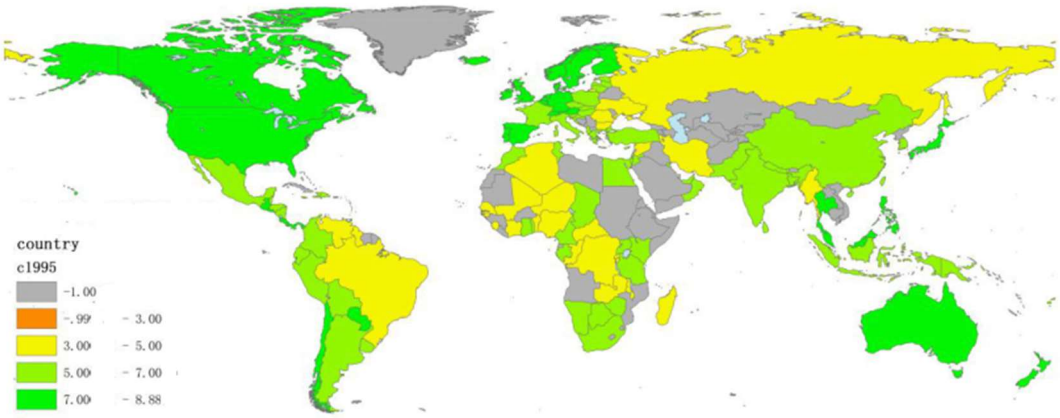


Figure 2-82 Distribution of economic freedom of the countries worldwide in 1995

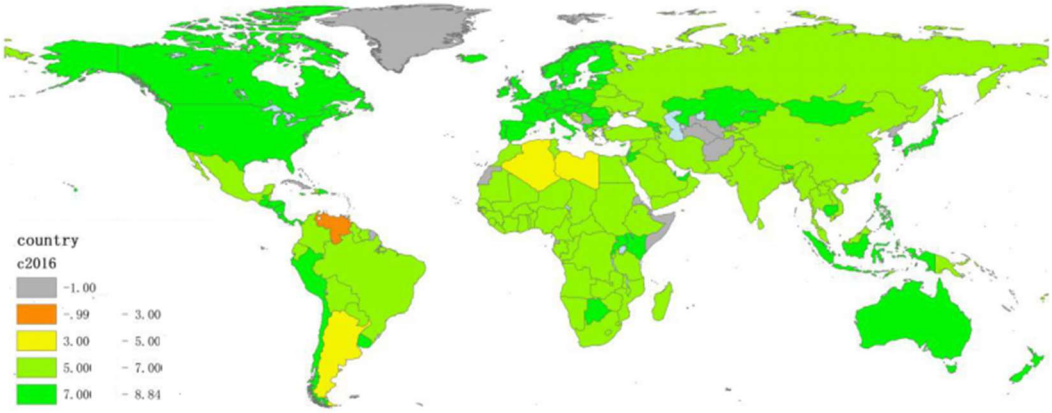


Figure 2-83 Distribution of economic freedom of the countries worldwide in 2017

Note: Grey area (-1) indicates data is missing and the value of economic freedom is null.

Source: Collected by the author.

Market economies worldwide have achieved remarkable success (Figures 2-84 and 2-85).

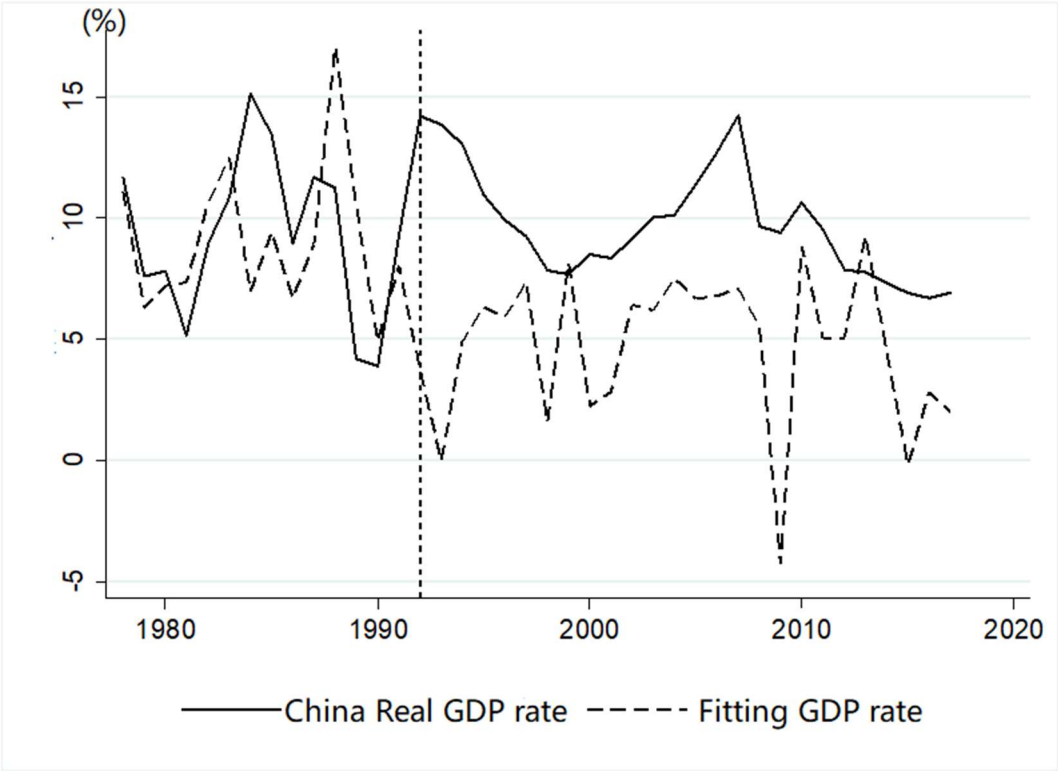


Figure 2-84 Actual and fitting economic growth rate of China

Source: Compiled by the author.

Note: Fitting economic growth rate was the result of synthesizing the economic growth of major countries in the world with the synthetic control method.

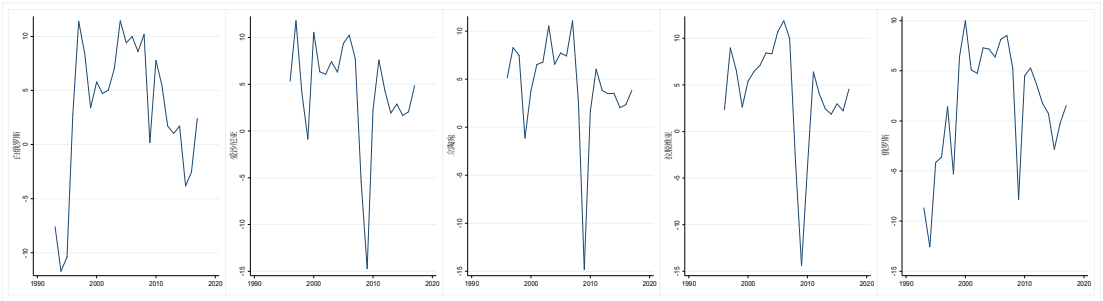


Figure 2-85 Economic growth rate of major Eastern European countries

Source: Compiled by the author according to statistics of the World Bank.

2.3.1.3 Influence of market system

ⅰ. Market system causes population aggregation and affects connotative meaning of cities，Market systems drive the movement of population to high-income, urbanized countries in Europe and North America. Within emerging economies, people are also moving to big cities in pursuit of higher income. In developed economies, populations are gradually flowing out from large cities (Figures 2-86, 2-87 and 2-88).

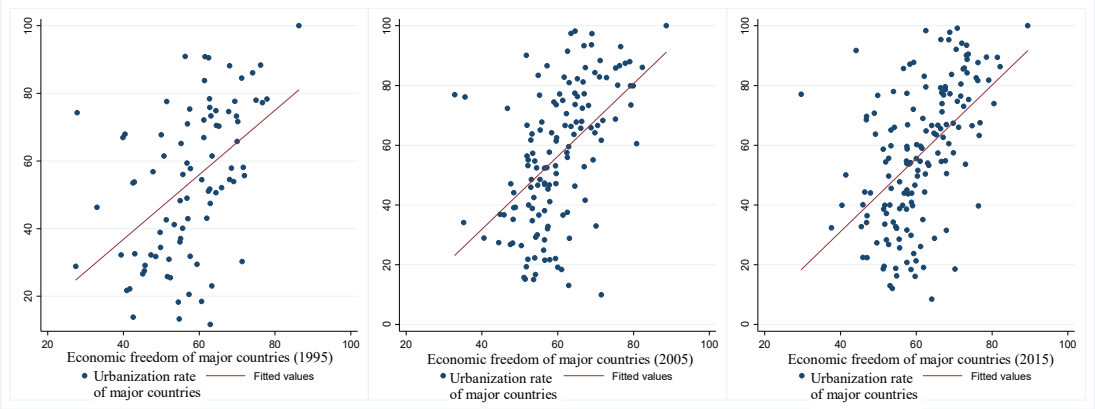


Figure 2-112 Scatter diagram of economic freedom and urbanization rate of all the countries in 1995, 2005 and 2015

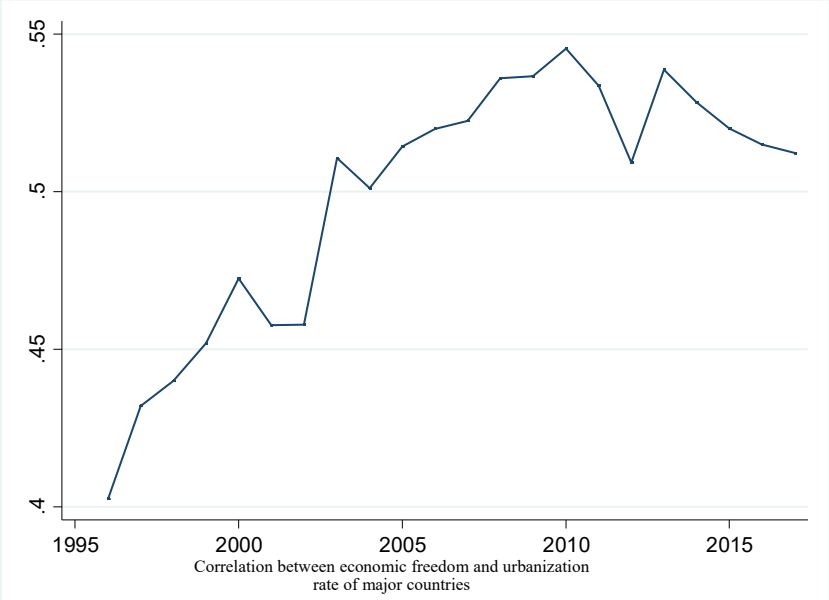
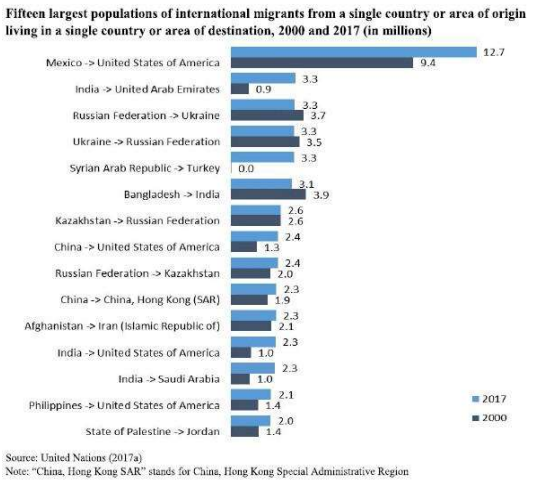


Figure 2-113 Correlation coefficient between economic freedom and urbanization rate of major countries worldwide

Source: Collected by the author.



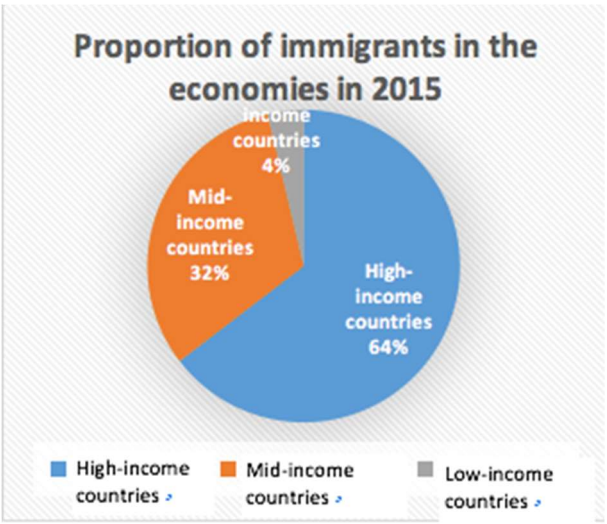


Figure 2-88 Proportion of global immigrants in the economies and global immigrant routes

Source: *International Migration Report 2017* by United Nations International Organization for Migration.

ii. Market system results in capitalization and financialization of resource elements，As a result, countries and regions that control finance lead all global economic activities (Figures 2-89 and 2-90).

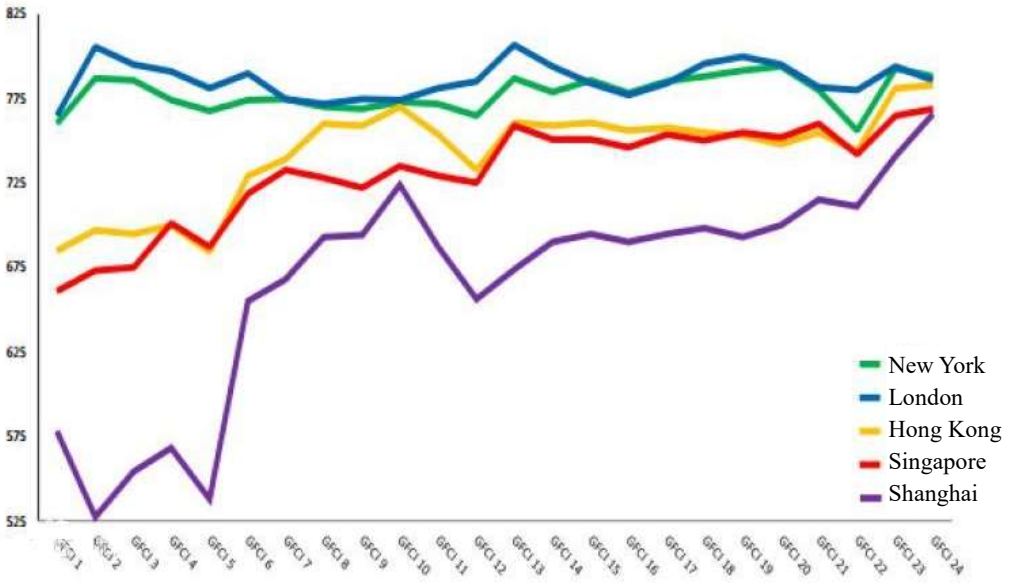


Figure 2-89 Index change of the top five cities in the Global Financial Centers Index

Source: Global Financial Centers Index Report 24.

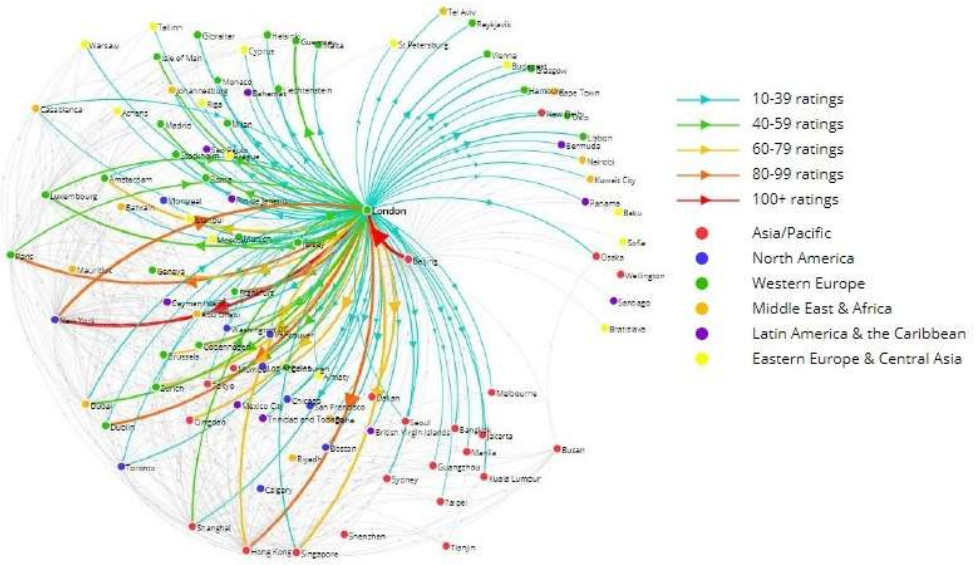


Figure 2-90 Liaison of London with other cities globally

Source: Global Financial Centers Index Report 22.

iii. Market system leads to global division of enterprises and influences functions and patterns of cities

iv. Cities participate in domestic and international competition for technology and talent, affecting the landscape of cities. To attract workers and investors, it is necessary for cities to improve infrastructure and environment (Figures 2-91 and 2-92).

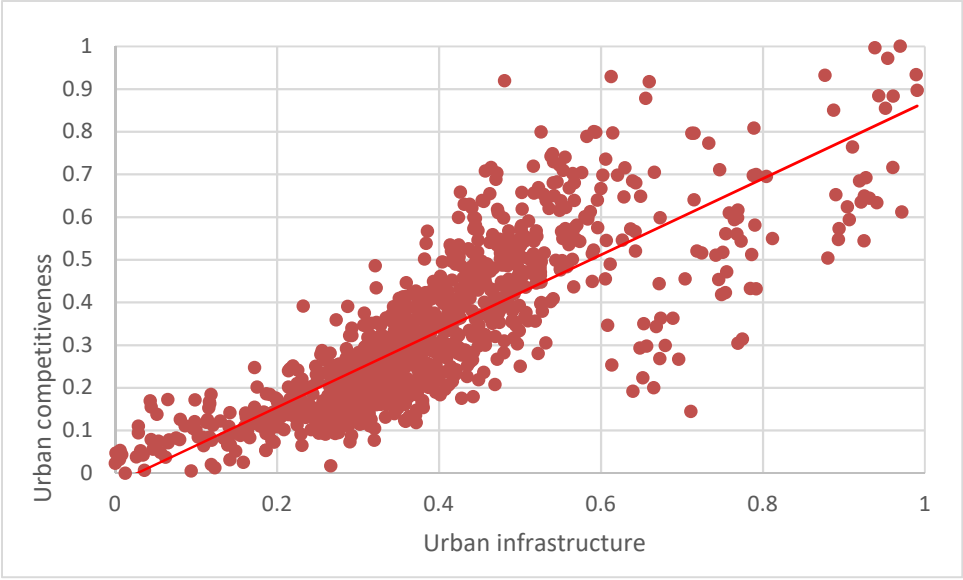


Figure 2-91 Scatter diagram of infrastructure and competitiveness of global cities

Source: CASS Center for City and Competitiveness.

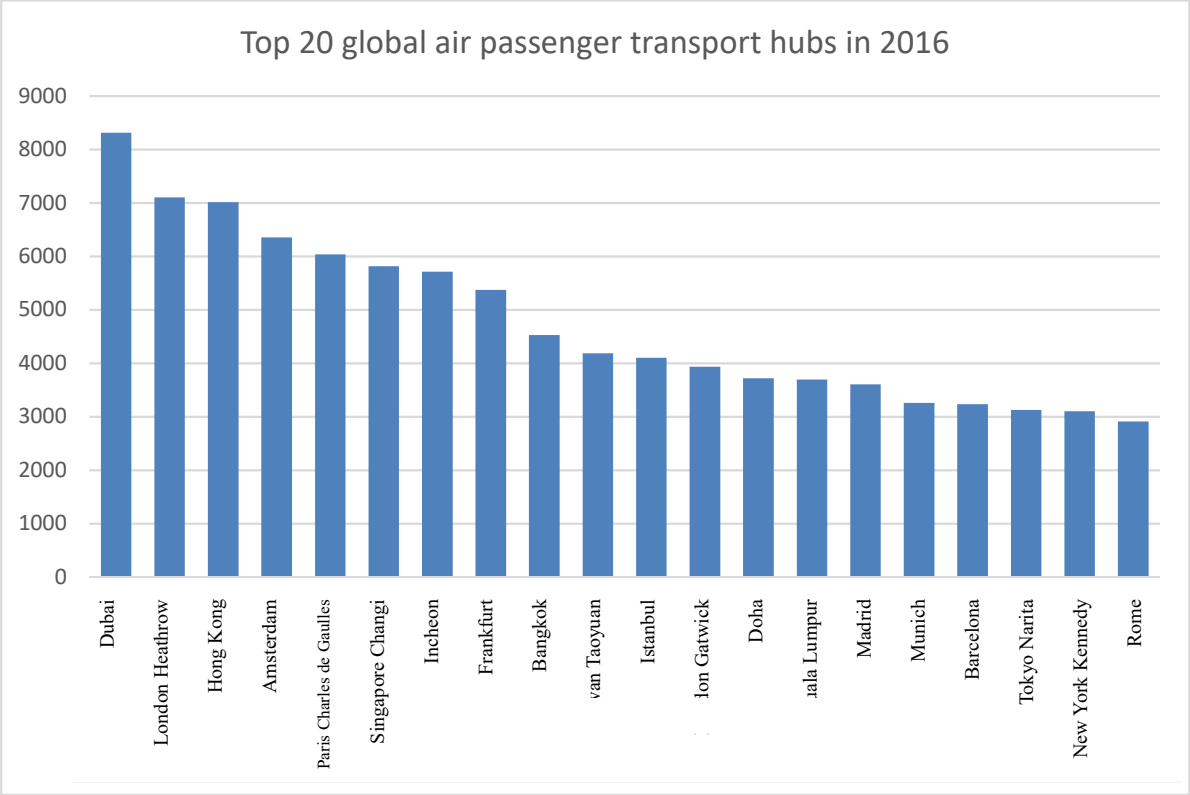


Figure 2-118 Top 20 cities as international air passenger transport hubs in 2016

Source: ACI WORLD.

2.3.2 Technical innovation: Promotion and change by information technology

2.3.2.1 Content of technological innovation，Technological innovation reshapes the definition, functions and formats of cities.

2.3.2.2 Influence of technological innovation

First, technological innovation influenced population aggregation and human activities. (see Figure 2-93)

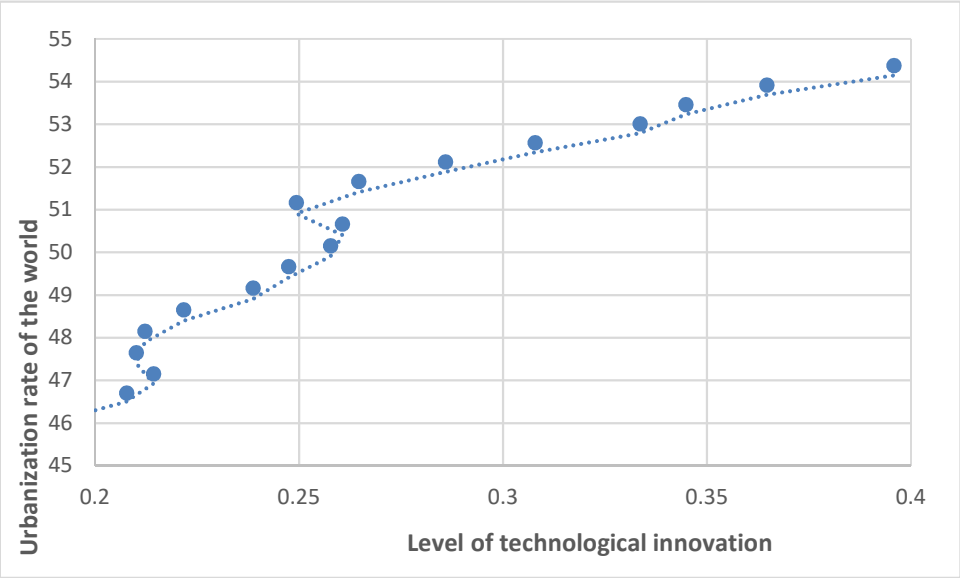


Figure 2-93 Correlation between technological innovation level and urbanization rate of the world

Source: World Bank database.

Second, industrialization of high technologies caused rise and prosperity of cities concentrated with hi-tech industries. (see Figure 2-94～2-97)

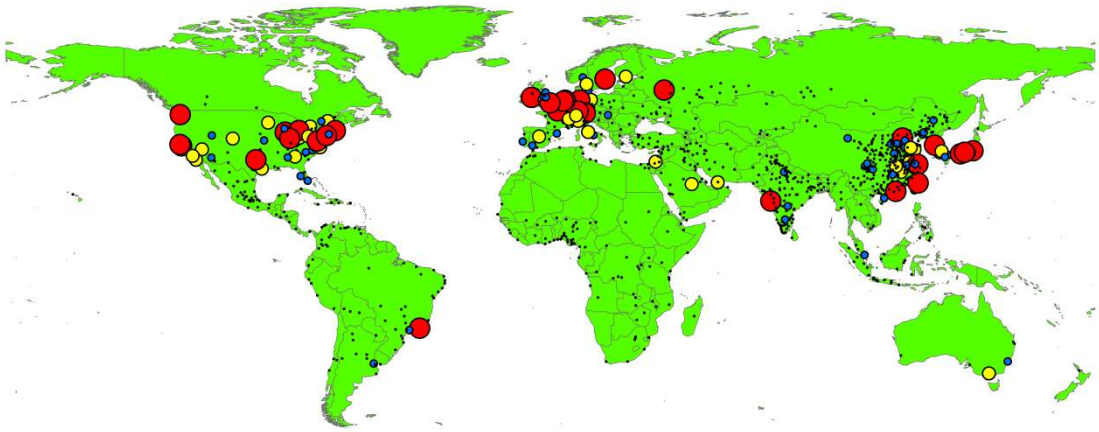


Figure 2-94 Distribution of top 50 financial enterprises globally

Source: City and competitiveness database of Chinese Academy of Social Sciences.

Figure 2-95 Distribution of top 20 cities by income of global listed financial companies in 1990

Source: Database on global listed companies.

Figure 2-96 Distribution of top 20 cities by income of global listed financial companies in 2004

Source: Database on global listed companies.

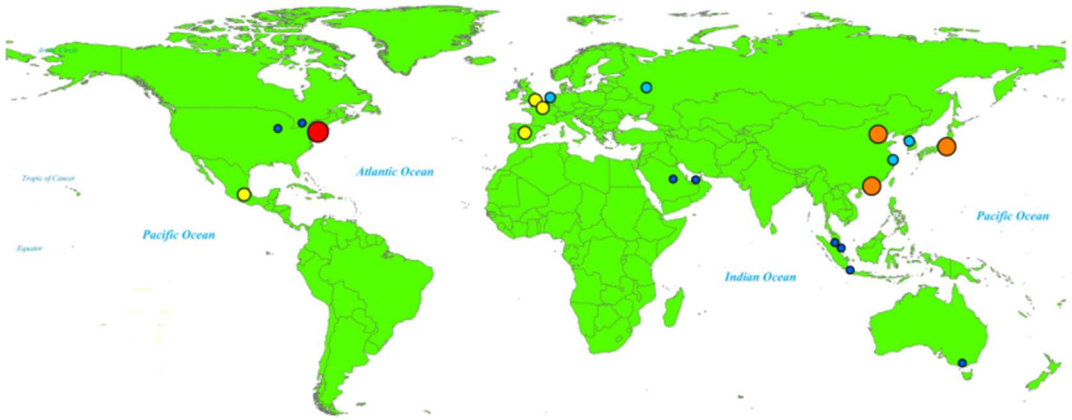


Figure 2-97 Distribution of top 20 cities by income of global listed financial companies in 2017

Source: Database on global listed companies.

Third, traffic technology expanded the spatial size within cities. (see Figure 2-98～2-100)

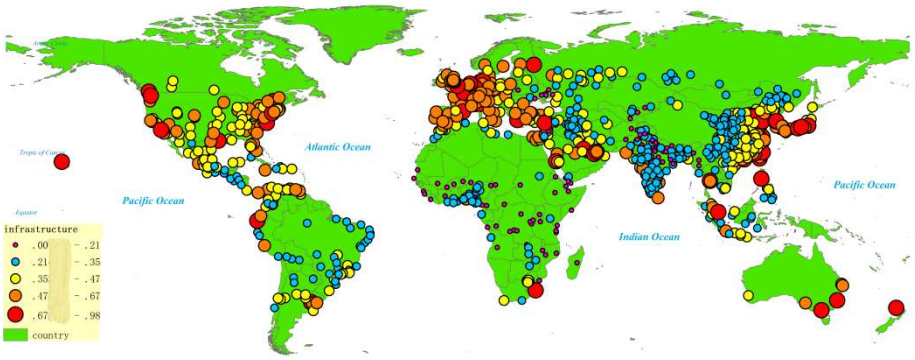


Figure 2-98 Infrastructure distribution of main cities globally

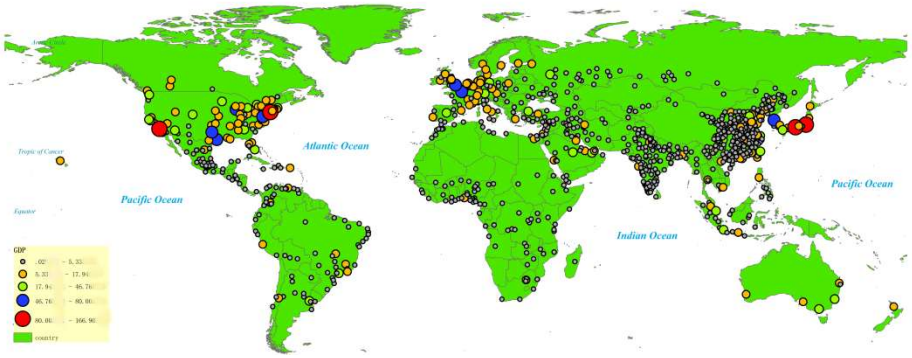


Figure 2-99 GDP distribution of main cities globally

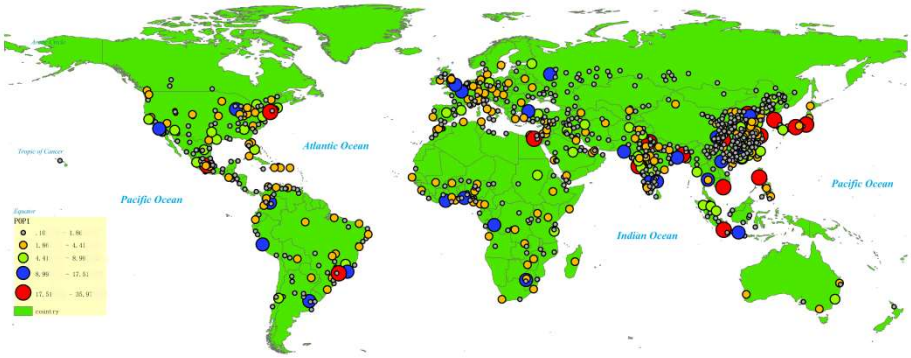


Figure 2-100 Population distribution of main cities globally

Source: City and competitiveness database of Chinese Academy of Social Sciences.

Fourth, development of information technology supported global division and dissemination of industries.，which leads to creation of global value chains (Figure 2-101).

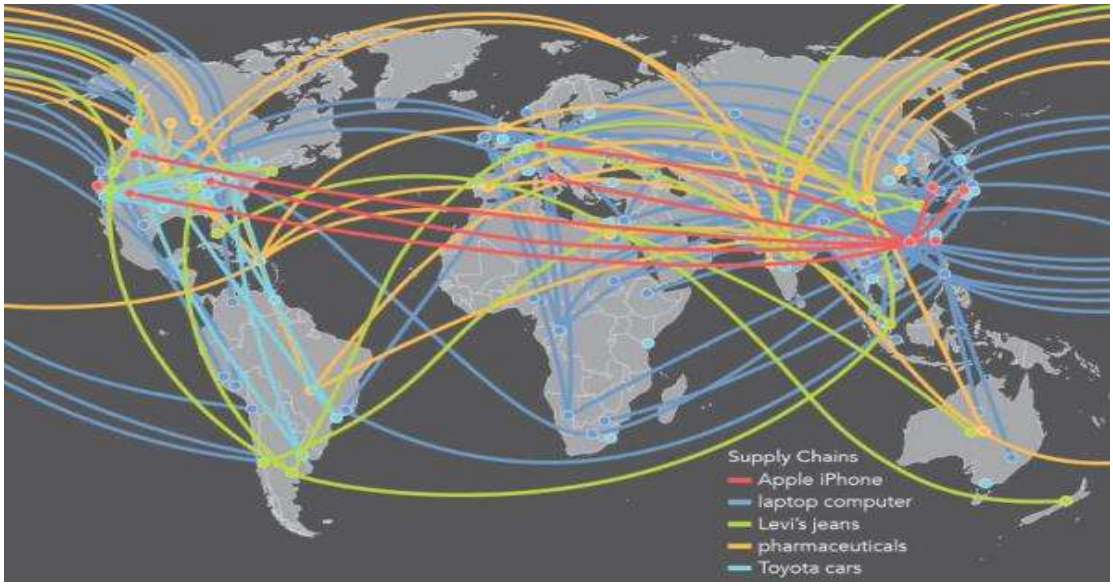


Figure 2-101 Global suppliers of mobile phones and computers

Source: Internet.

Fifth, air-conditioning technology resulted in development of cities in tropical and cold areas. (see Figure 2-102)

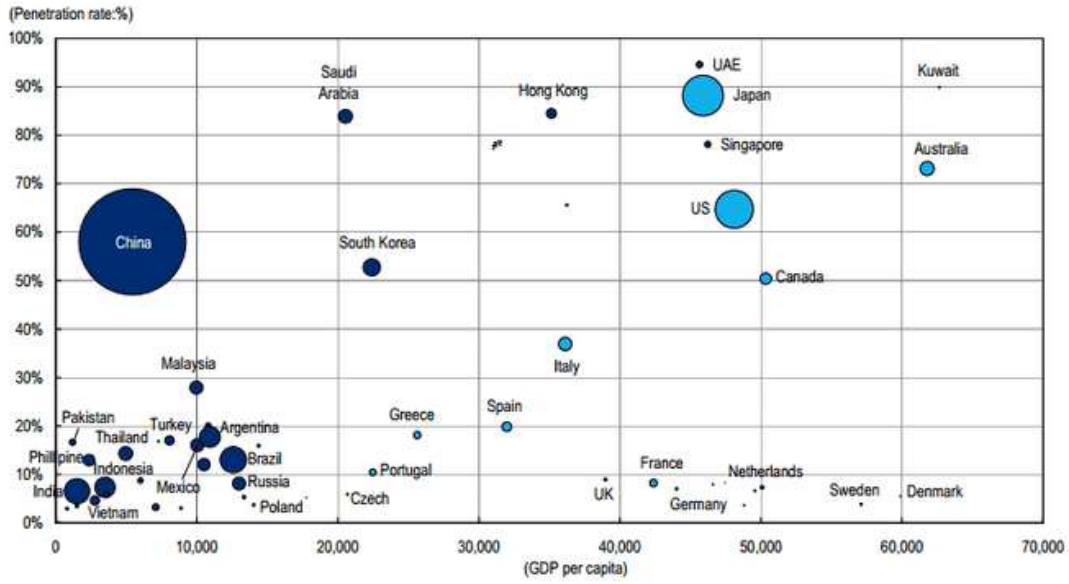


Figure 2-102 Scatter diagram of air-conditioner penetration rate and per capita GDP of major countries

Source: Internet.

Sixth, advance of medical technology expanded the population size of cities. (see Figure 2-103)

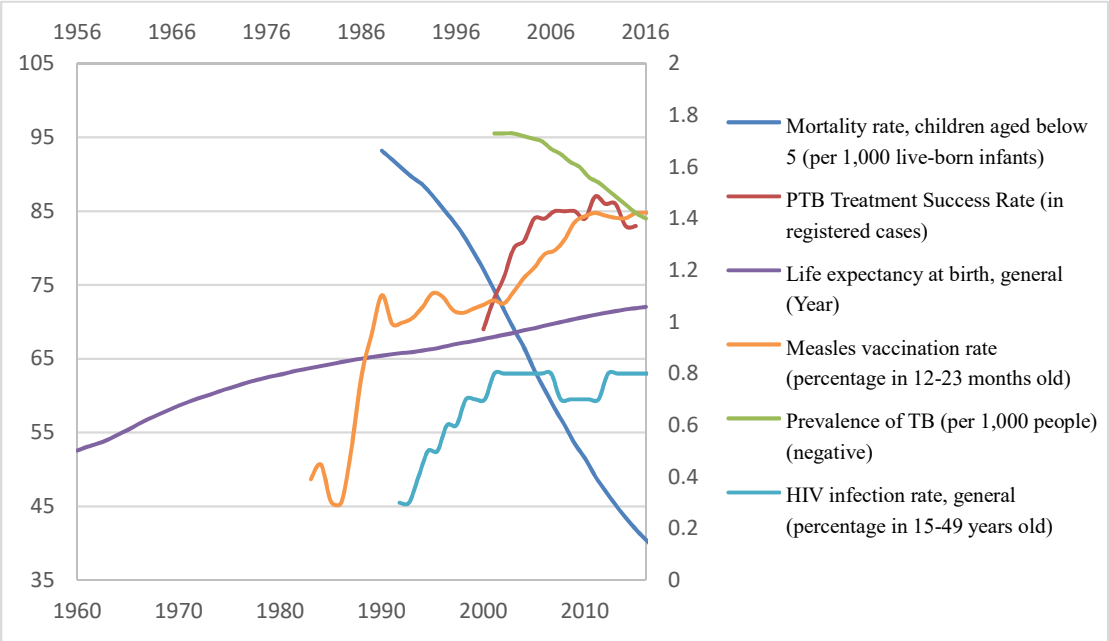


Figure 2-103 Global medical care status and life expectancy

Source: World Bank database.

Seventh, technological advance brought about differentiation among cities，making tech hubs and innovators richer while bringing unemployment and poverty to cities depending on low-end value chain activities (Figures 2-104 and 2-105 and Table 1).

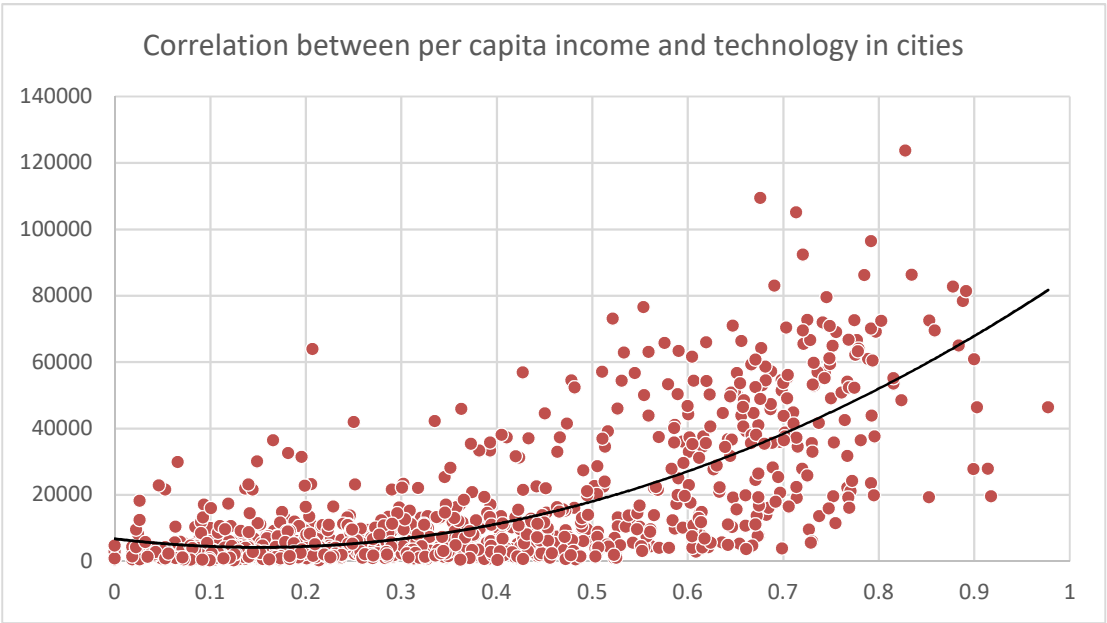


Figure 2-104 Correlation between urban per capita income and technological innovation level

Source: City and competitiveness database of Chinese Academy of Social Sciences.

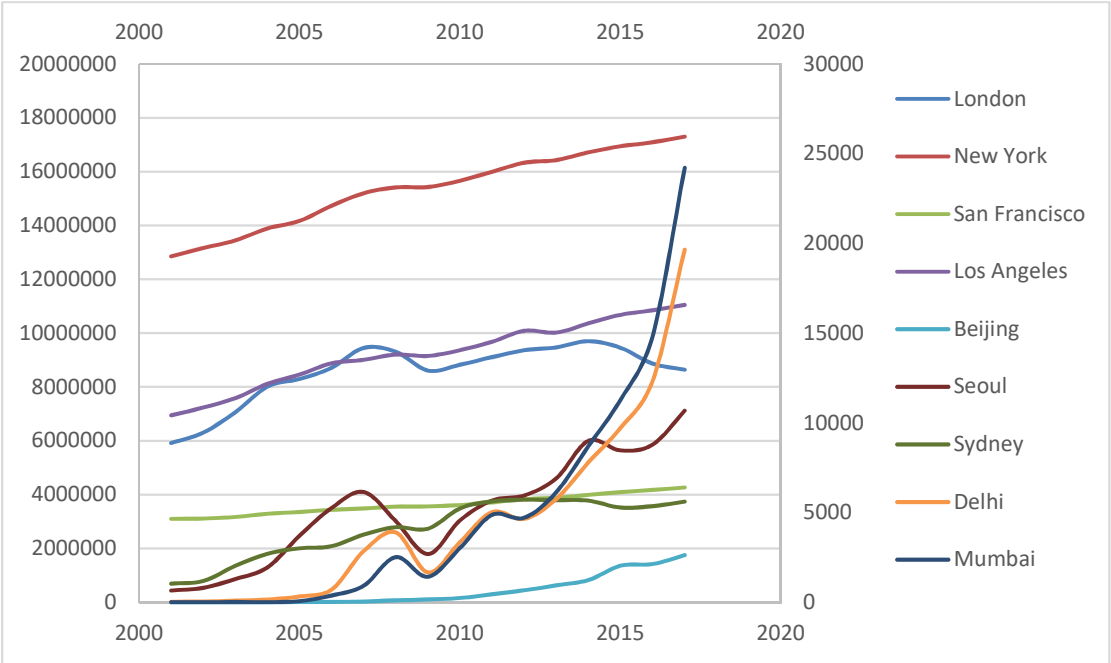


Figure 2-105 Change of high-income population in major technological center cities

Source: EIU database.

Table 1 Forbes list of top 50 people in technology business

Ranking	Name	Fortune	Industry	Ranking	Name	Fortune	Industry
1	Jeff Bezos	$112 B	Amazon	17	Ma Huateng	$45.3 B	internet media
2	Bill Gates	$90 B	Microsoft	20	Jack Ma	$39 B	e-commerce
5	Mark Zuckerberg	$71 B	Facebook	22	Steve Ballmer	$38.4 B	Microsoft
10	Larry Ellison	$58.5 B	software	39	Michael Dell	$22.7 B	Dell computers
12	Larry Page	$48.8 B	Google	44	Paul Allen	$21.7 B	Microsoft, investments
13	Sergey Brin	$47.5 B	Google				

Source: Forbes 500.

2.3.3 Global connection: Enhancement and leap forward of soft connection

2.3.3.1 Intangible products and services developed in an expedited way in the past 40 years

2.3.3.2 Global soft and hard connection and their changes

First, hard connection becomes faster and easier. (see Figure 2-106)

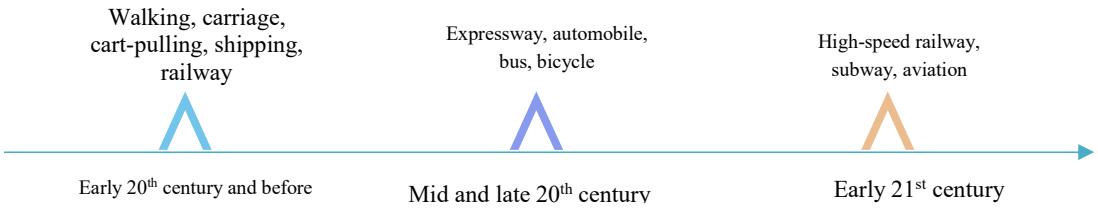


Figure 2-132 Change of hard connection

Second, soft connection has broken the restriction of time and space and have more quick, broad, diverse effects than hard connection (Figure 2-107).

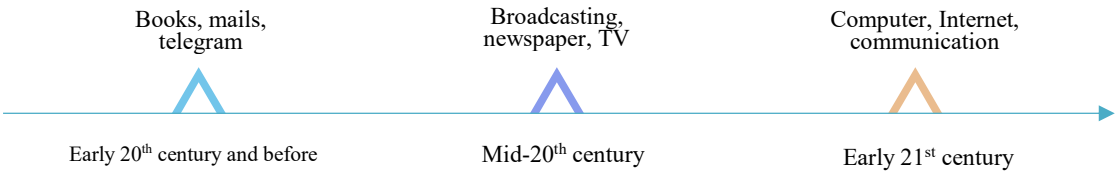


Figure 2-107 Change of soft connection

Third, both hard connection and soft connection are one-way and irreversible and their direction can only go from ancient times to today. (see Figure 2-108)

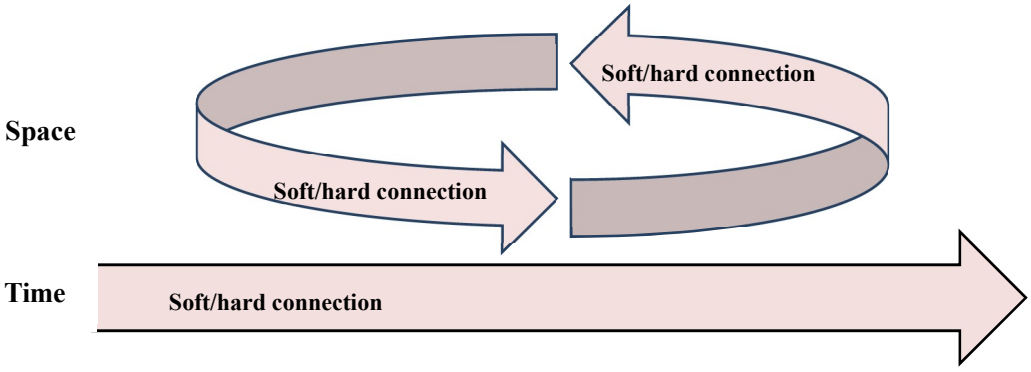


Figure 2-108 Temporality and spatiality of soft and hard connection

2.3.3.3 Impact of soft connection on global cities and their pattern

First, soft connection shortened the distance in time and space and virtual activities brought about new connotation of the cities. Second, soft connection pooled city functions and a smart planet has taken shape. Third, sharing of city products was deepened. Fourth, soft connection caused the pattern of global cities to change from the single-center pyramid structure to the multi-center hierarchical bell-shaped structure (see Table 2).

Table 2 GAWC number of alpha-level cities

Level	2000	2004	2008	2010	2012	2016
Alpha++	2	2	2	2	2	2
Alpha+	4	4	8	8	8	7
Alpha	11	11	9	18	13	19
Alpha-	16	18	22	19	22	21
Total alpha cities	33	35	41	47	45	49

Source: Information from GAWC official website.

Chapter Three Global Industry and City Evolution Patterns

Ni Pengfei Marco Kamiya Shen Jianfa Cao Qingfeng Shen Li

1. Analytical Framework

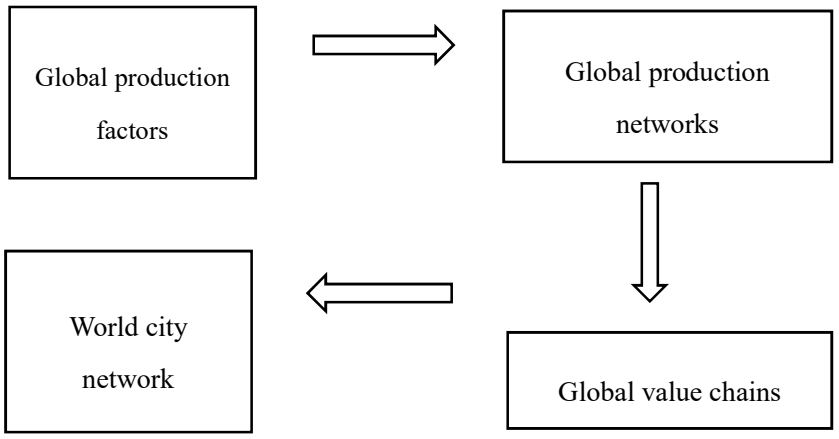


Figure 3-1 Analytical Framework

2. Empirical Analysis

(1) Evolution of GVCs and the Pattern of World Cities

1. On the one hand, the rapid development of industries across the world has led to a significant rise of global welfare. On the other hand, the evolution of global value chains has triggered a three-step evolution of the world city network: from intra-country integration of cities to global integration of countries and then to global integration of cities. In particular, the position of emerging market economies and their coastal central cities in GVCs has been rising. However, the central cities of developed countries still dominate the upstream part of GVCs. The connections between cities across the world are tightening.

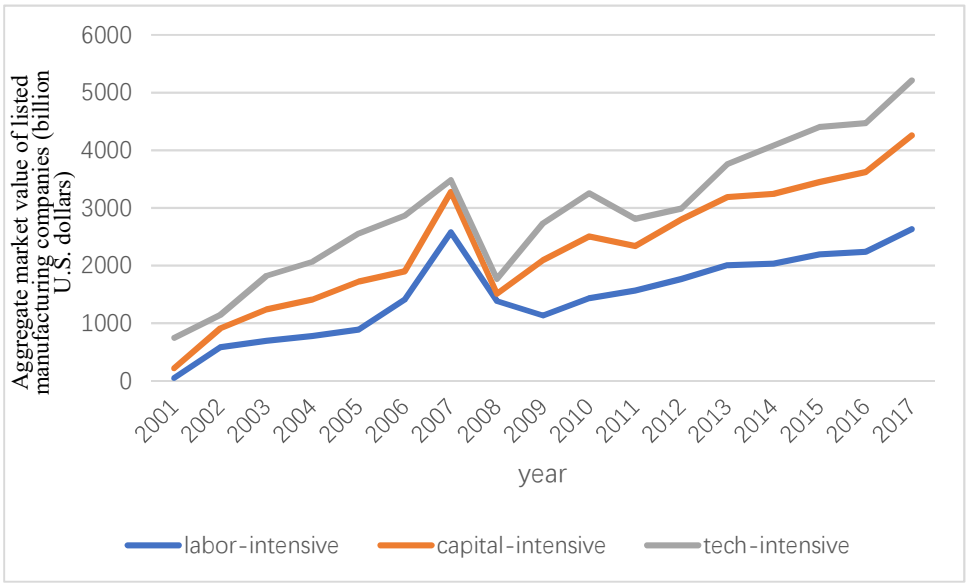


Figure 3-2 Manufacturing Market Size by Type of Manufacturing Industry

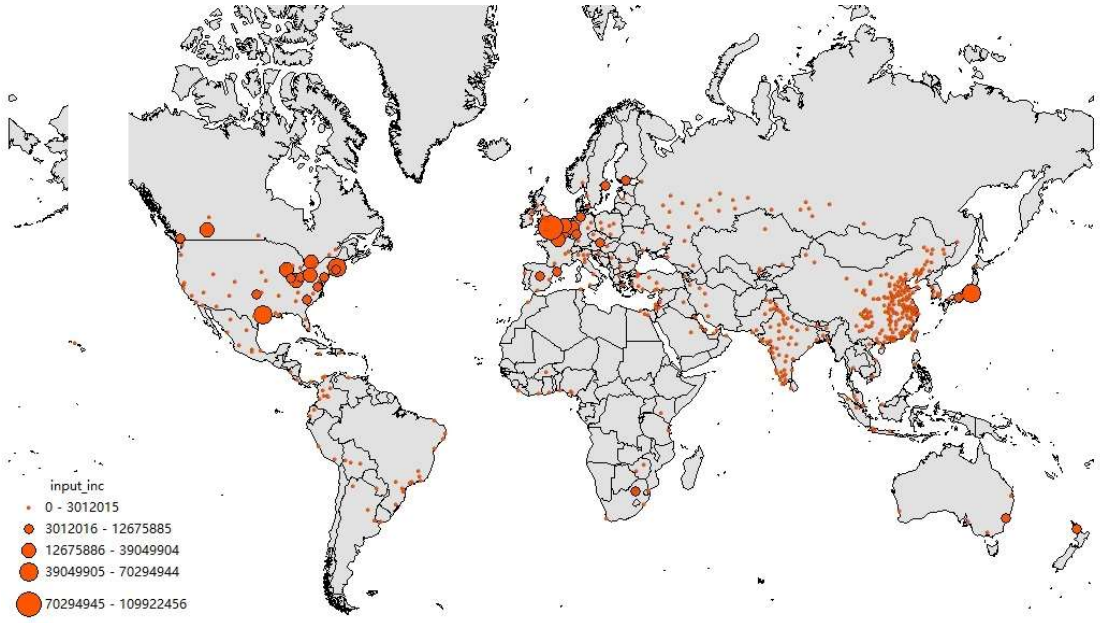


Figure 3-3 Distribution of Intermediate Goods by City based on Revenue (1989)

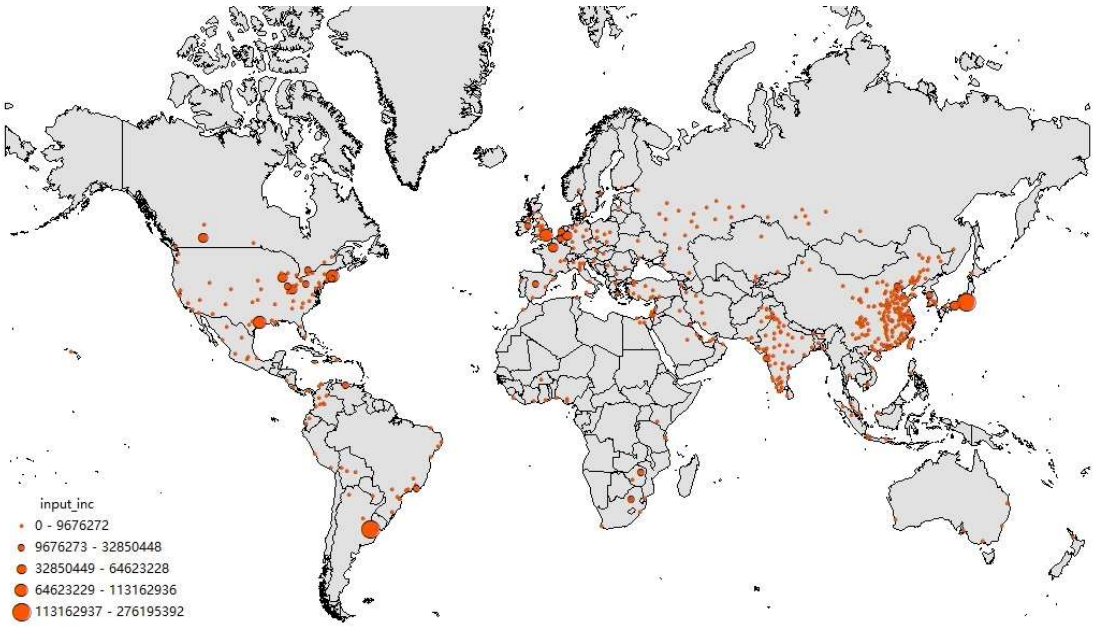


Figure 3-4 Distribution of Intermediate Goods by City based on Revenue (1999)

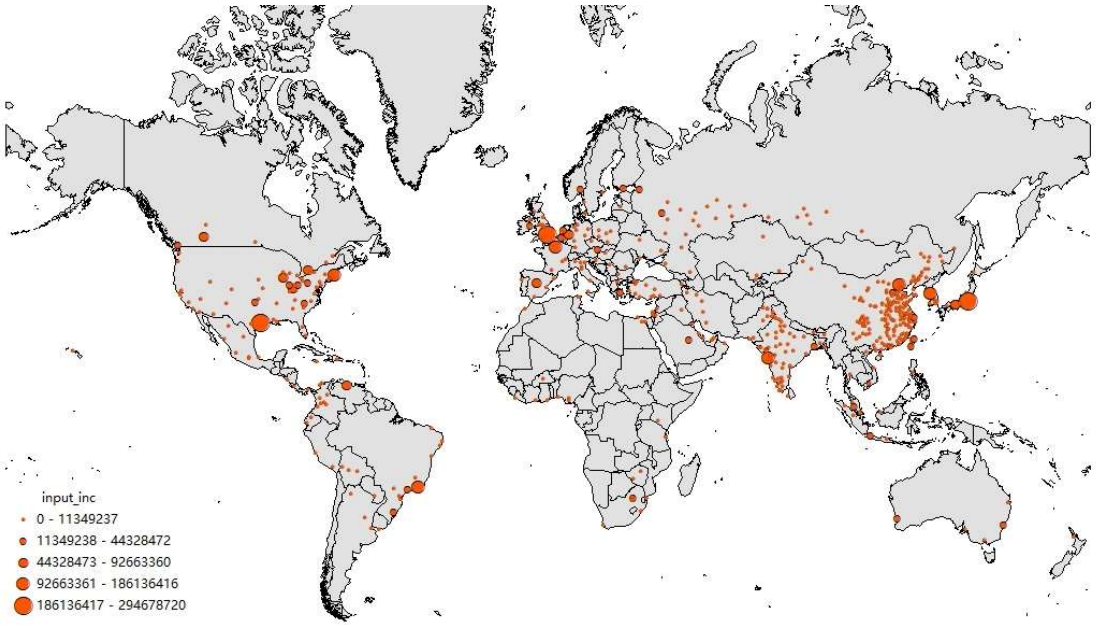


Figure 3-5 Distribution of Intermediate Goods by City based on Revenue (2009)

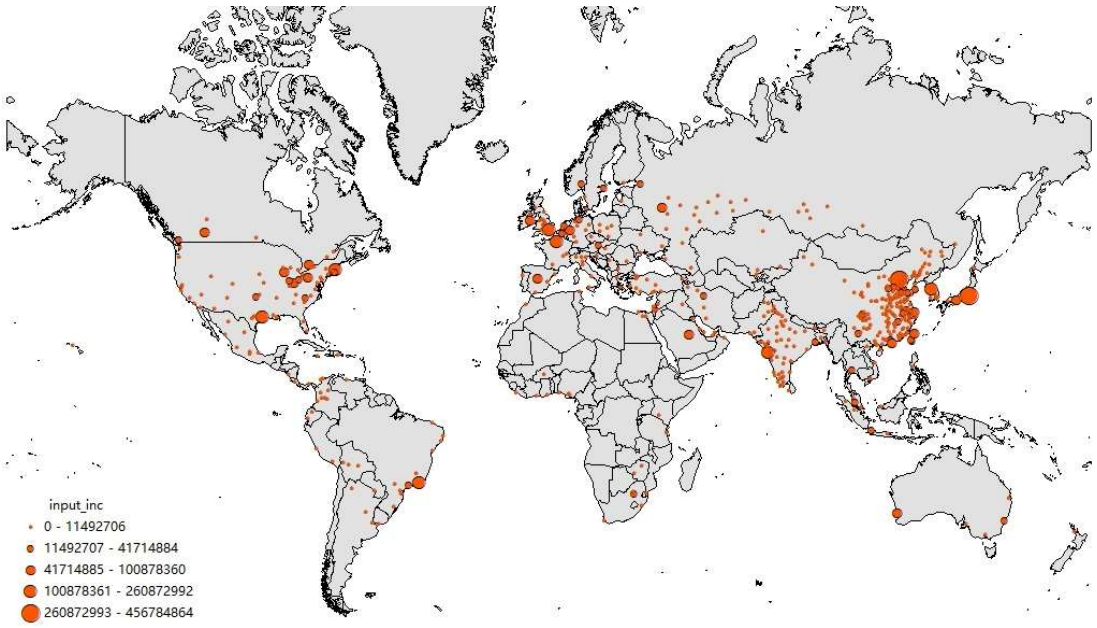


Figure 3-6 Distribution of Intermediate Goods by City based on Revenue (2017)

2. The intra-country divergence among cities in developed countries is widening. In developed countries, central cities and emerging tech hubs are thriving whereas manufacturing cities are in decline. In the meantime, the intra-country divergence within emerging market economies is also widening, with coastal cities with highly developed transportation infrastructure rapidly developing and traditional manufacturing cities with less developed transportation systems trapped in recession. As for less developed countries, urbanization is progressing slowly and the divergence is gradually widening.

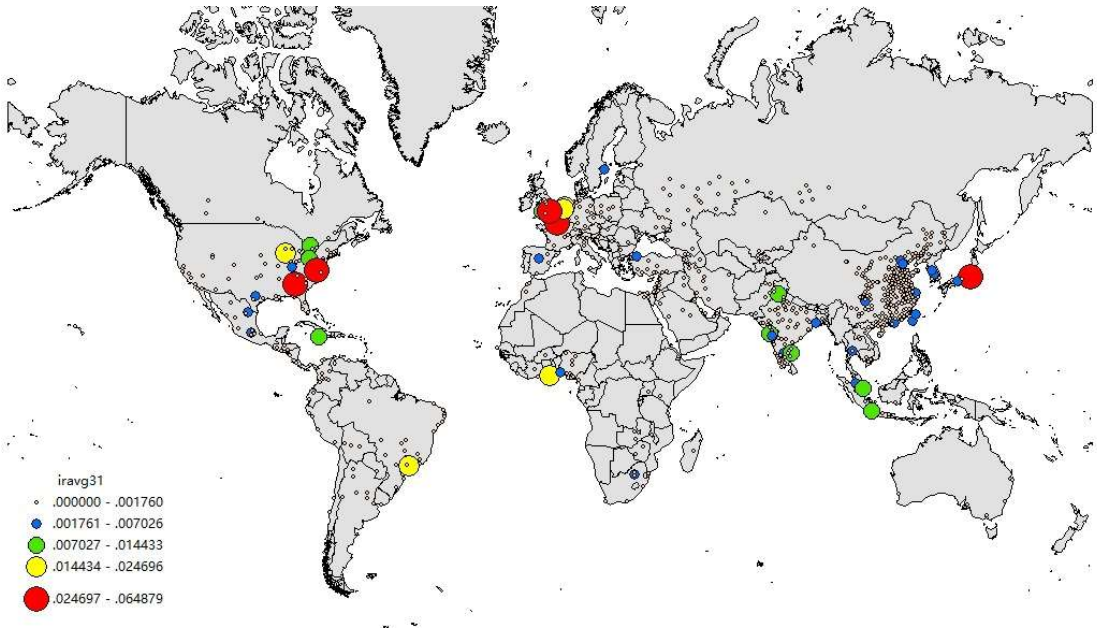


Figure 3-7 Evolution of Labor-intensive Manufacturing GVCs

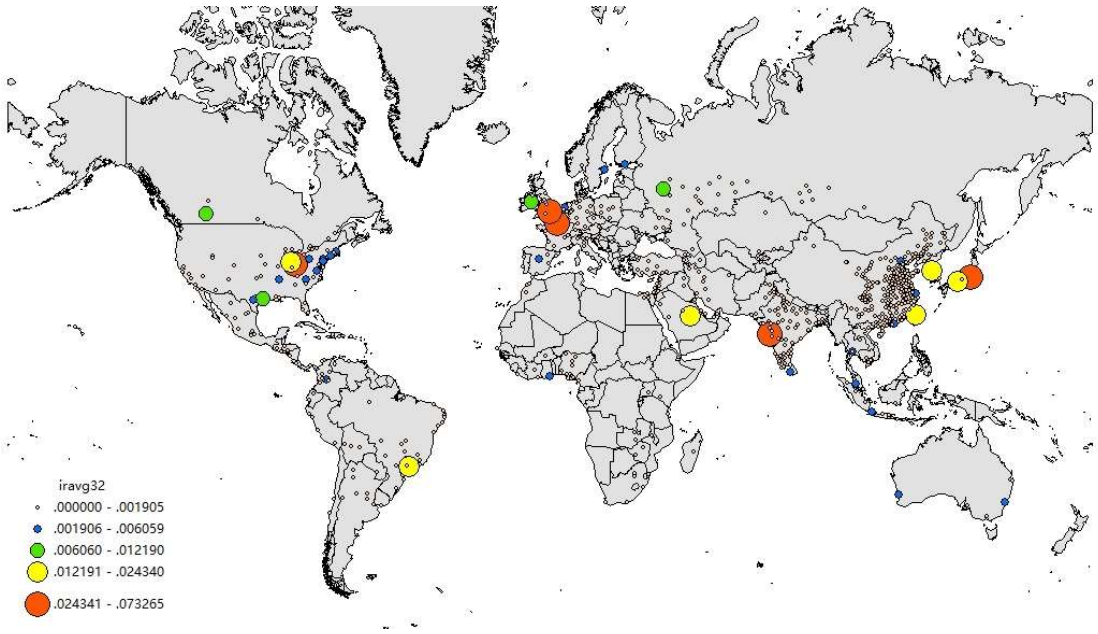


Figure 3-8 Evolution of Capital-intensive Manufacturing GVCs

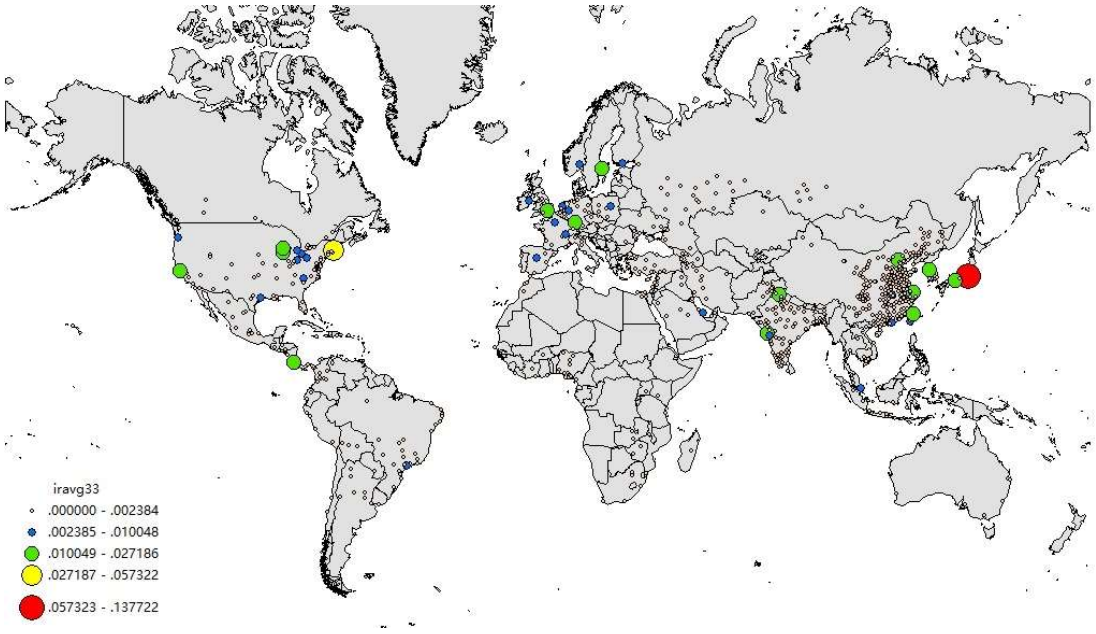


Figure 3-9 Evolution of Tech-intensive Manufacturing GVCs

(2) Global Industry Evolution Patterns

1. Specialization within GVCs can be divided into three types: regional division of labor, international division of labor, and global production networks. They drive intra-country integration of cities, integration of countries, and global integration of cities. The global industrial structure has experienced a major shift in development patterns. There has been a global shift in manufacturing from developed countries to emerging market countries, especially to the coastal central cities of emerging market countries.

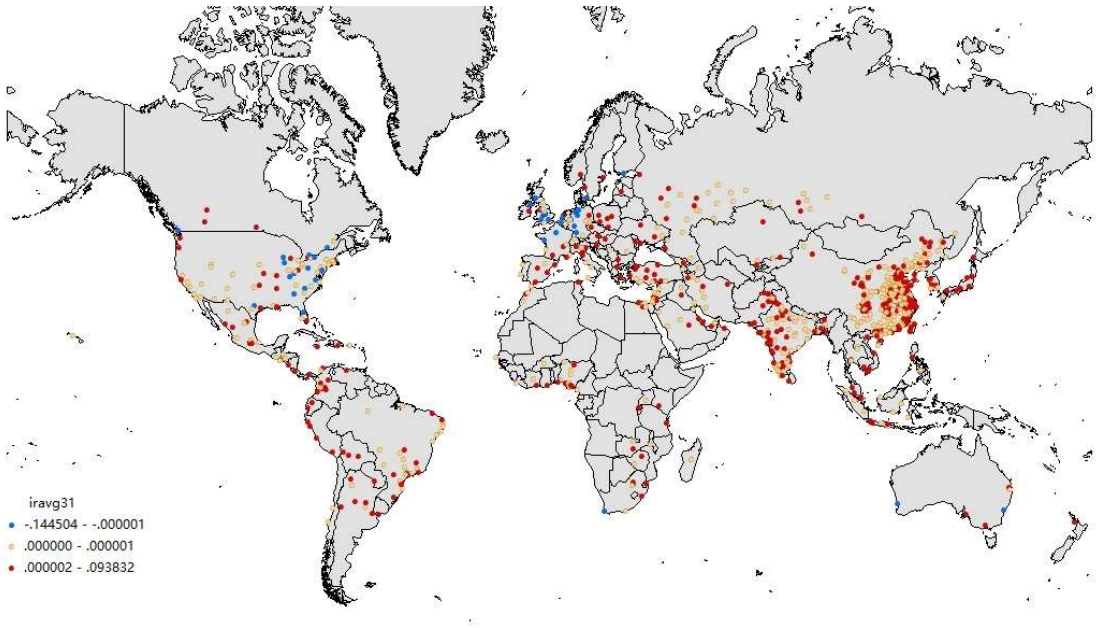


Figure 3-11 Global Development Patterns of Labor-intensive Manufacturing (1989-2017)

Source: drawn by the authors using ArcGIS.

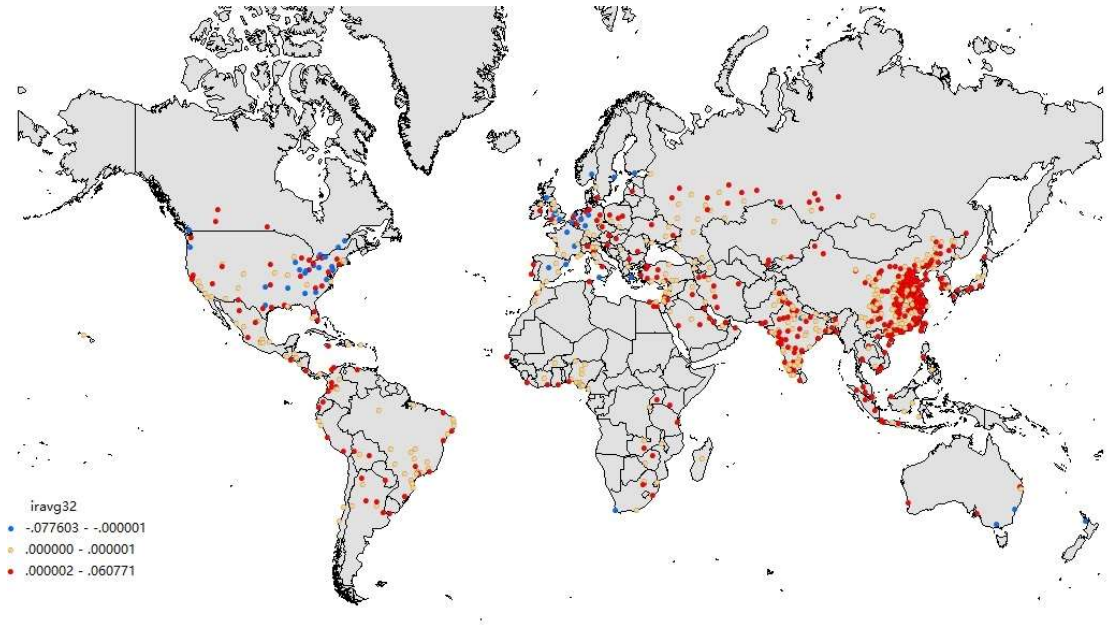


Figure 3-12 Global Development Patterns of Capital-intensive Manufacturing (1989-2017)

Source: drawn by the authors using ArcGIS.

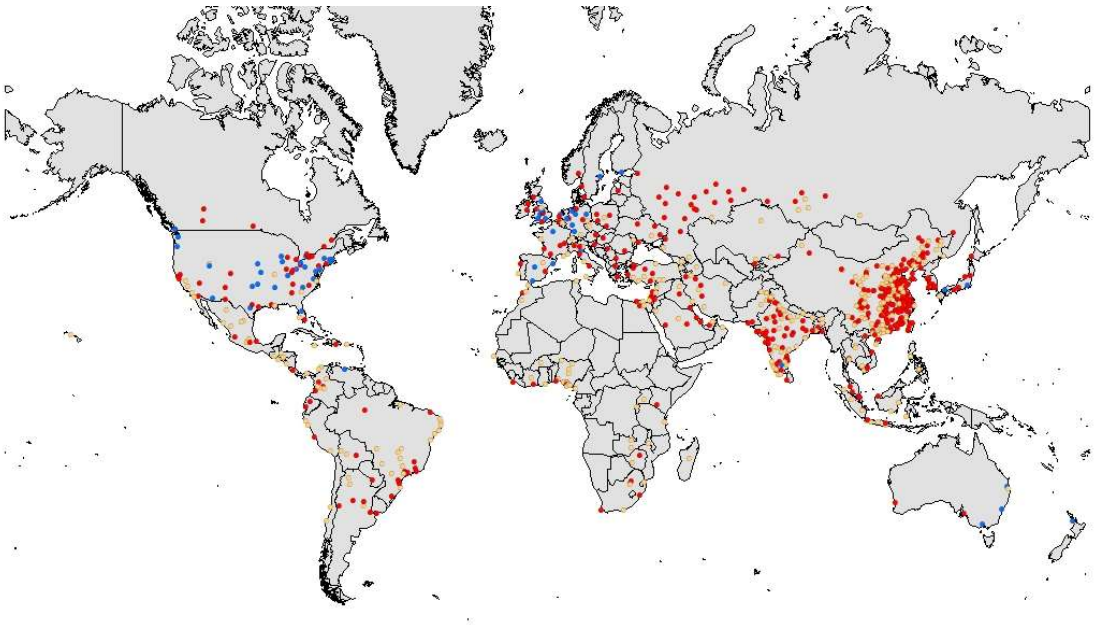


Figure 3-13 Global Development Patterns of Tech-intensive Manufacturing (1989-2017)

Source: drawn by the authors using ArcGIS.

Central cities in emerging market countries, especially coastal cities with mature transportation systems, are the top destinations of manufacturing relocation.

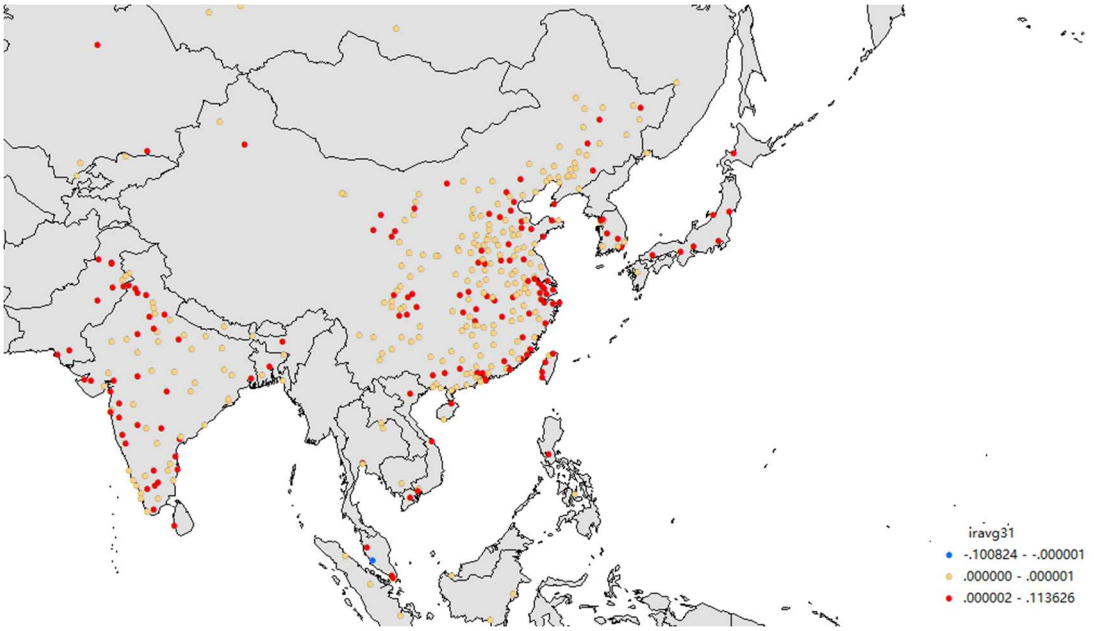


Figure 3-14 Development of Labor-intensive Manufacturing in Southeast Asia (1993-2007)

Source: drawn by the authors using ArcGIS.

There is also an internal shift of manufacturing within developed countries, mainly from central cities to peripheral and secondary cities.

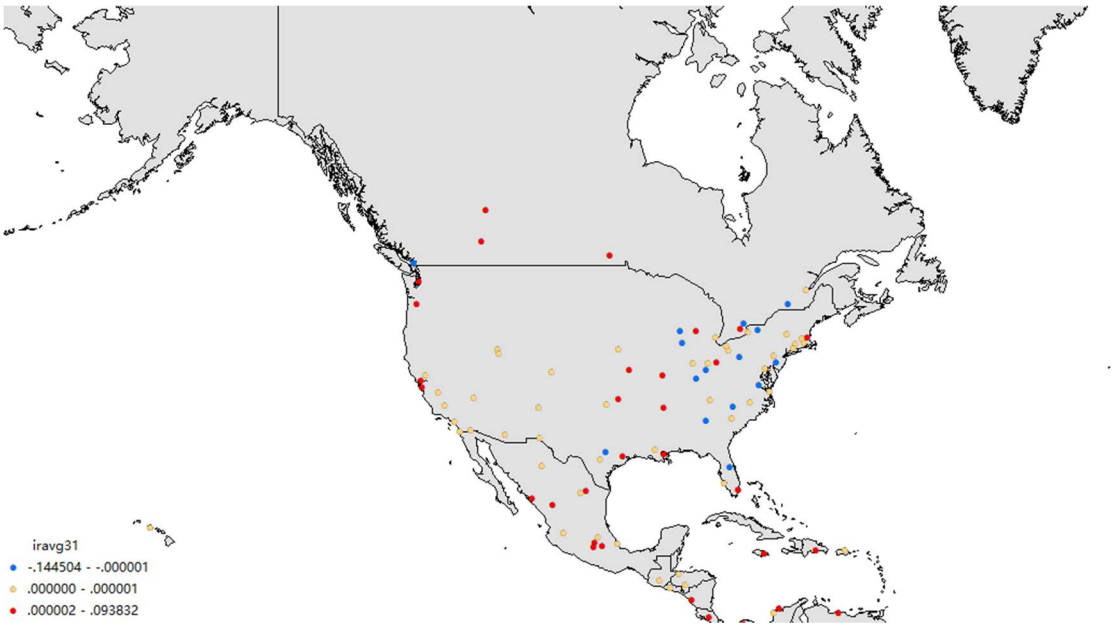


Figure 3-15 Development of Labor-intensive Manufacturing in North America (1990-2017)

Source: drawn by the authors using ArcGIS.

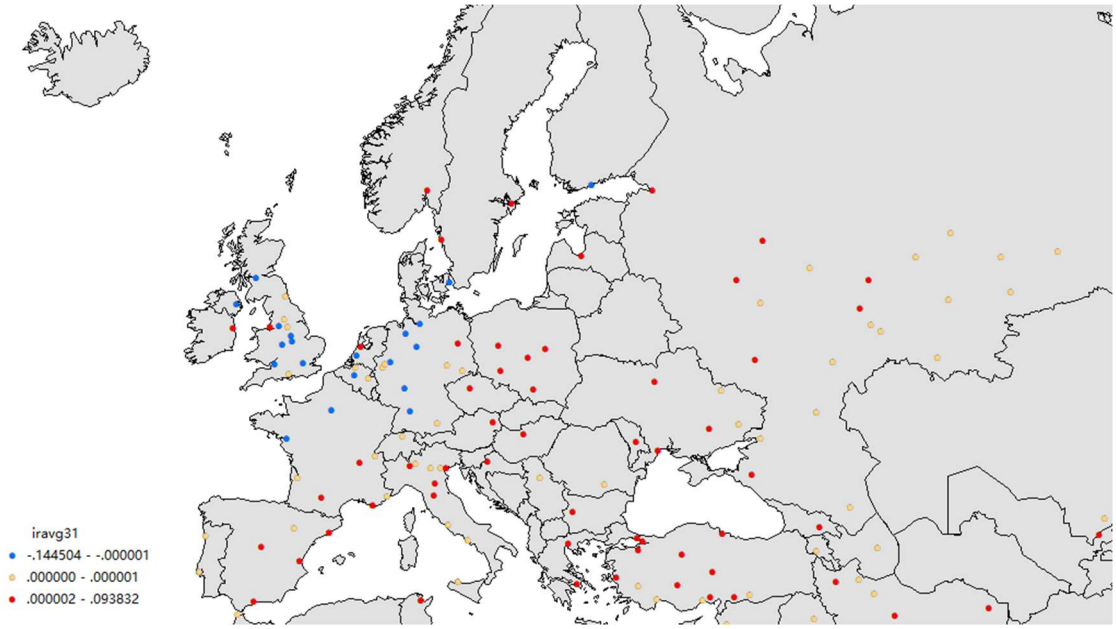


Figure 3-16 Development of Labor-intensive Manufacturing in Europe (1990-2017)

Source: drawn by the authors using ArcGIS.

After the 2008 financial crisis, some manufacturing facilities returned from emerging market countries to developed countries such as the United States.

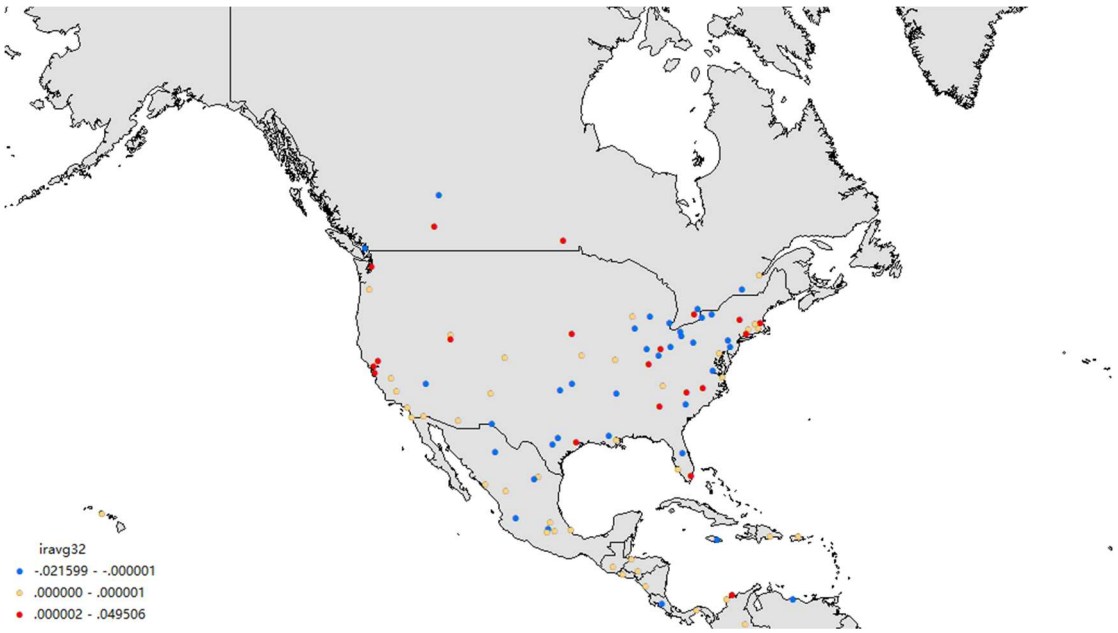


Figure 3-17 Development of capital-intensive manufacturing industries in North America (2008-2017)

Source: drawn by the authors using ArcGIS.

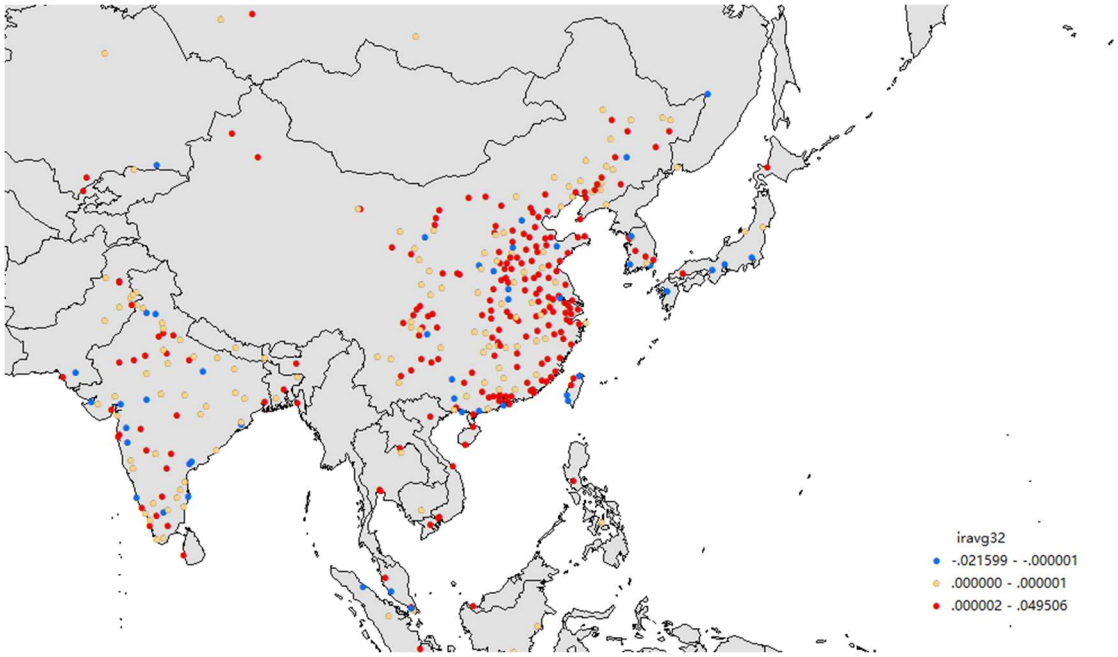


Figure 3-18 Development of Capital-intensive Manufacturing in Southeast Asia (2008-2017)

Source: drawn by the authors using ArcGIS.

2. The disparities between developed economies, emerging market economies and less developed economies in absolute terms are widening, but the relative gaps are narrowing. Overall, regional disparities across the world are narrowing. In the meantime, the intra-country or intra-region divergence between cities is widening. The internal imbalance in developed countries has deepened, with central cities and emerging tech hubs growing

rapidly while manufacturing cities trapped in a recession. Emerging market economies have also suffered the same fate, with easily accessible coastal cities in terms of transportation rising rapidly while less accessible traditional manufacturing cities trapped in a recession. Widening intra-country divergence also occurs in less developed countries.

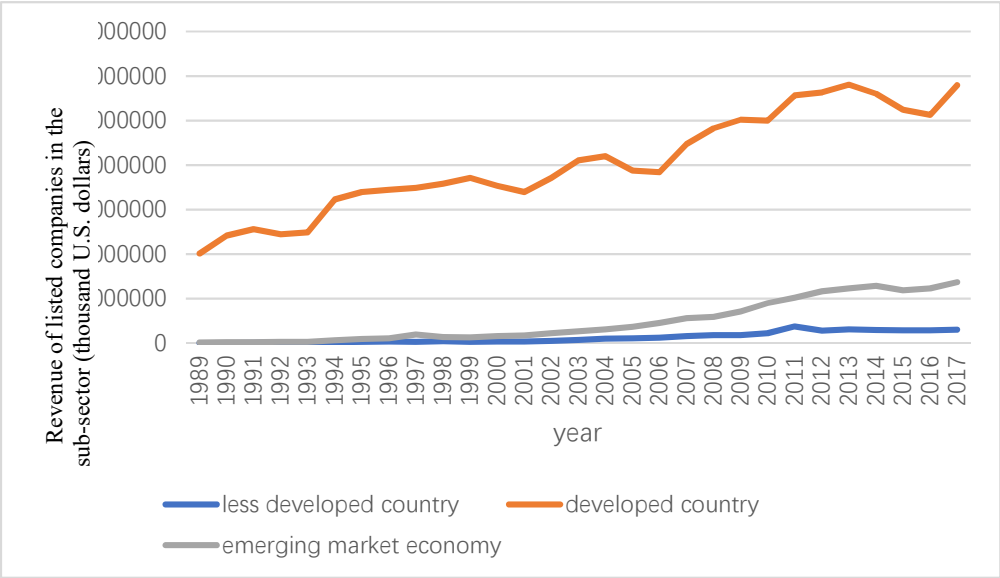


Figure 3-21 Divergence between Developed, Emerging Market and Less Developed Economies in Labor-intensive Manufacturing

Source: drawn by the authors based on revenue data from the Osiris database.

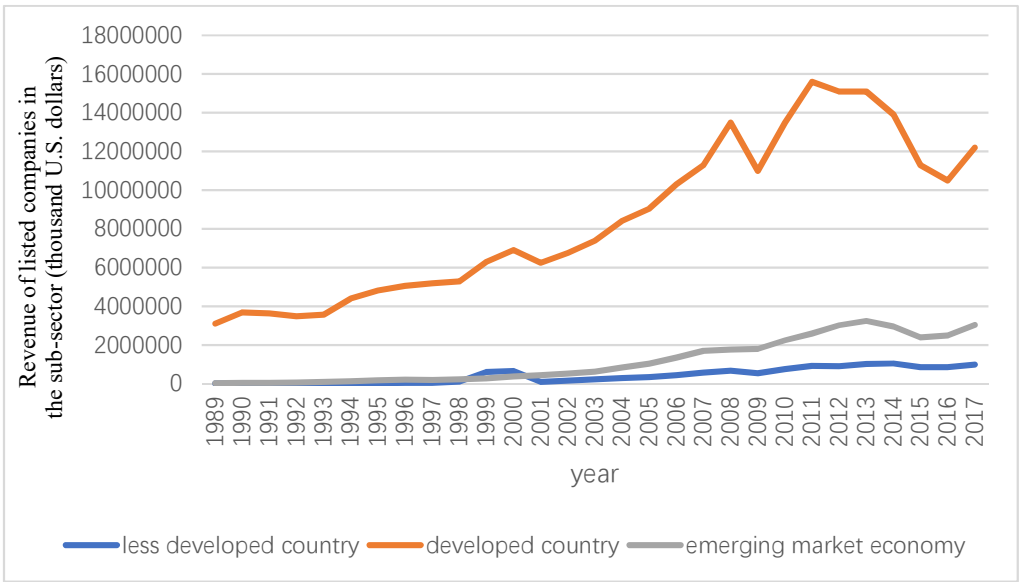


Figure 3-22 Divergence between Developed, Emerging Market and Less Developed Economies in Capital-intensive Manufacturing

Source: drawn by the authors based on revenue data from the Osiris database.

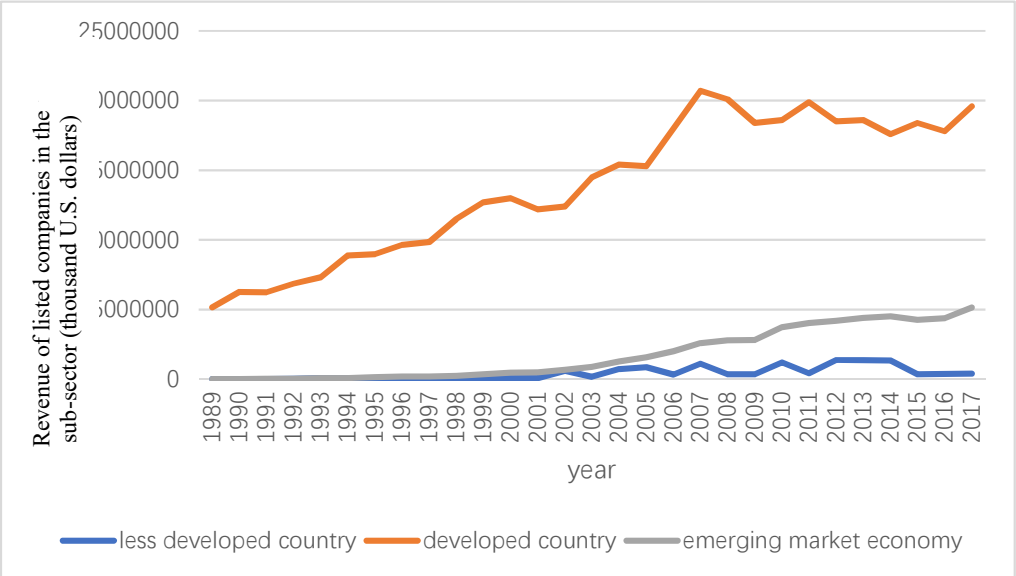


Figure 3-23 Divergence between Developed, Emerging Market and Less Developed Economies in Tech-intensive Manufacturing

Source: drawn by the authors based on revenue data from the Osiris database.

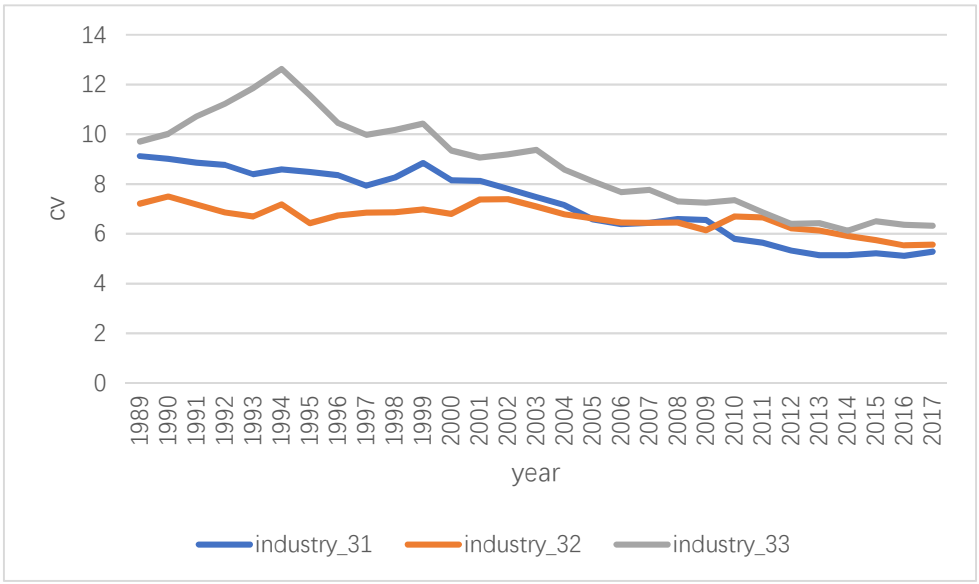


Figure 3-24 Overall Coefficient of Variation of Labor-, Capital- and Tech-intensive Manufacturing

Source: drawn by the authors based on revenue data from the Osiris database.

3. As for spatial distribution of industries, there is spatial segmentation of economic activity between countries. The spatial segmentation of labor-intensive and capital-intensive manufacturing industries has weakened, while that of technology-intensive manufacturing and the financial and insurance sector is increasing.

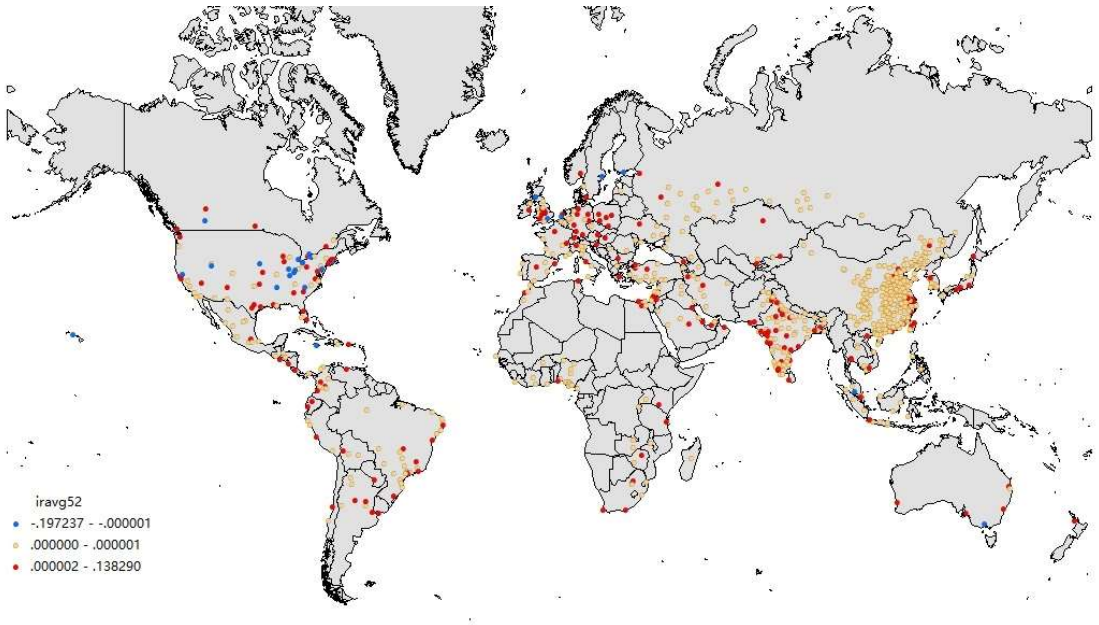


Figure 3-25 Development of Finance and Insurance

Source: drawn by the authors using ArcGIS.

Table 3-1 Moran's I Index Value of Labor-intensive Manufacturing

Year	Moran'I	Year	Moran'I	Year	Moran'I
1989	-0.007***	1999	-0.004***	2009	-0.003*
1990	-0.007***	2000	-0.005***	2010	-0.003*
1991	-0.007***	2001	-0.004***	2011	-0.003*
1992	-0.008***	2002	-0.001	2012	-0.003*
1993	-0.008***	2003	-0.001	2013	-0.003**
1994	-0.005***	2004	-0.004***	2014	-0.003**
1995	-0.004***	2005	-0.004***	2015	-0.003*
1996	-0.005***	2006	-0.004***	2016	-0.003*
1997	-0.006***	2007	-0.003**	2017	-0.002
1998	-0.004***	2008	-0.003*		

Note: ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

Table 3-2 Moran's I Index Value of Capital-intensive Manufacturing

Year	Moran'I	Year	Moran'I	Year	Moran'I
1989	-0.009***	1999	-0.005***	2009	-0.002
1990	-0.008***	2000	-0.005***	2010	-0.002
1991	-0.007***	2001	-0.003***	2011	-0.002
1992	-0.008***	2002	-0.003**	2012	-0.002
1993	-0.008***	2003	-0.003**	2013	-0.002
1994	-0.005***	2004	-0.003**	2014	-0.002
1995	-0.007***	2005	-0.003**	2015	-0.002
1996	-0.006***	2006	-0.003*	2016	-0.002
1997	-0.006***	2007	-0.002	2017	-0.002
1998	-0.005***	2008	-0.003*		

Note: ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

Table 3-3 Moran's I Index Value of Tech-intensive Manufacturing

Year	Moran'I	Year	Moran'I	Year	Moran'I
1989	-0.003**	1999	-0.002	2009	-0.002
1990	-0.002	2000	-0.002*	2010	-0.002
1991	-0.002	2001	-0.002*	2011	-0.002
1992	-0.002	2002	-0.002	2012	-0.002
1993	-0.002	2003	-0.002	2013	-0.002*
1994	-0.001	2004	-0.002	2014	-0.003**
1995	-0.002	2005	-0.002	2015	-0.003*
1996	-0.002	2006	-0.002	2016	-0.003**
1997	-0.002	2007	-0.002	2017	-0.003**
1998	-0.002	2008	-0.002		

Note: ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

Table 3-4 Moran's I Index Value of the Finance and Insurance Sector

Year	Moran'I	Year	Moran'I	Year	Moran'I
1989	-0.007***	1999	-0.005***	2009	-0.012***
1990	-0.006***	2000	-0.006***	2010	-0.011***
1991	-0.007***	2001	-0.008***	2011	-0.011***
1992	-0.004***	2002	-0.009***	2012	-0.008***
1993	-0.004***	2003	-0.011***	2013	-0.008***
1994	-0.004***	2004	-0.011***	2014	-0.012***
1995	-0.009***	2005	-0.012***	2015	-0.011***
1996	-0.008***	2006	-0.013***	2016	-0.010***
1997	-0.008***	2007	-0.011***	2017	-0.010***
1998	-0.005***	2008	-0.010***		

Note: ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

3. Empirical Analysis

1. Static analysis of the industry-driven evolution of the world city network: Manufacturing is central to the economic competitiveness of a city. If we rank tech-intensive manufacturing, capital-intensive manufacturing, and labor-intensive manufacturing based on their influence on the economic competitiveness of a city, the ranking will be tech-intensive manufacturing, capital-intensive manufacturing, and labor-intensive manufacturing with tech-intensive manufacturing having the largest influence. Among services sectors, Professional, Scientific, and Technical Services has an extremely significant influence on the position of a city in global production network.

Table 3-5 Regression Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	eco	eco	eco	eco	eco	eco	eco	eco
lntprofit31	0.152***							
	(5.47)							
lntprofit32		0.188***						
		(6.66)						
lntprofit33			0.214***					
			(6.60)					

lntprofit51				0.091**				
				(2.25)				
lntprofit52					0.092*			
					(1.96)			
lntprofit53						0.171***		
						(3.00)		
lntprofit54							0.210***	
							(4.17)	
lntprofit61								0.193**
								(2.26)
N	281	373	324	178	144	183	166	32
adj. R^2	0.779	0.763	0.790	0.756	0.816	0.716	0.724	0.823

Note: Data are shown with standard error in parentheses and ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

2. Dynamic analysis of the industry-driven evolution of the world city network: Manufacturing is central to the economic competitiveness of a city. Among the three manufacturing sub-sectors, tech-intensive manufacturing has the largest influence on the economic competitiveness of a city. Among services sectors, Real Estate Rental and Leasing has the largest influence on the position of a city in global production network.

Table 3-7 Regression Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	gravg	gravg	gravg	gravg	gravg	gravg	gravg	gravg
iravg31	0.485**	0.455**	0.267**	0.248***	0.271***	0.167***	0.167***	0.159***
	(2.07)	(1.99)	(2.58)	(2.58)	(2.69)	(3.01)	(3.12)	(3.08)
iravg32		0.182**	0.090	0.070	0.072	0.081	0.082	0.077
		(2.40)	(1.50)	(1.26)	(1.30)	(1.50)	(1.45)	(1.42)
iravg33			0.497***	0.419***	0.416***	0.357***	0.357***	0.377***
			(4.58)	(3.49)	(3.50)	(3.20)	(3.20)	(3.04)
iravg51				0.144	0.140	0.057	0.059	0.056
				(1.51)	(1.48)	(0.56)	(0.60)	(0.55)
iravg52					-0.088**	-0.055*	-0.057	-0.057

					(-2.18)	(-1.70)	(-1.63)	(-1.55)
iravg53						0.369*	0.370*	0.358*
						(1.74)	(1.66)	(1.67)
iravg54							-0.007	0.001
							(-0.08)	(0.01)
iravg61								-0.068
								(-0.90)
N	744	744	744	744	744	744	744	744
adj. R^2	0.234	0.266	0.463	0.474	0.481	0.580	0.579	0.583

Note: Data are shown with standard error in parentheses and ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

3. Impact of the clustering of production factors on industry relocation: Labor resources are crucial to the manufacturing sector, especially labor-intensive manufacturing; financial resources play a particularly important role in industrial development, especially in the development of services sectors; third, human capital is especially crucial for tech-intensive manufacturing, Information and Professional, Scientific and Technical Services.

Table 3-9 Regression Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	lnmanufactincm	lnincome31	lnincome32	lnincome33	lnincome51	lnincome53	lnincome54	lnincome61
hr	0.076***	-0.008	0.035***	0.100***	0.165***	0.137***	0.170***	0.026***
	(8.11)	(-1.03)	(4.15)	(11.86)	(22.80)	(19.85)	(23.89)	(3.84)
labor	0.261***	0.329***	0.296***	0.304***	0.282***	0.292***	0.223***	0.204***
	(30.14)	(37.26)	(33.21)	(33.62)	(31.37)	(30.29)	(22.27)	(15.58)
fr	0.186***	0.309***	0.228***	0.206***	0.385***	0.423***	0.406***	0.280***
	(22.88)	(32.71)	(25.06)	(22.71)	(37.46)	(40.52)	(36.90)	(18.49)
N	12068	12068	12068	12068	12068	12068	12068	12068
R^2	0.180	0.301	0.221	0.242	0.438	0.473	0.407	0.186

Note: Data are shown with standard error in parentheses and ***, **, and * mean statistical significance at 1%, 5%, and 10%, respectively.

Chapter Four Global Urban Economic Competitiveness Report 2018

Wang Haibo Liu Xiaonan

Since the financial crisis in 2008, economic competitiveness of worldwide cities has been improved significantly on the whole: The overall level has been continuously improved, and the overall gap has been gradually narrowed. From 2008 to 2018, GDP of 1,007 sample cities increases from USD28.65 trillion to USD44.2 trillion US dollars. The average of Competitiveness Index increases from 0.307 to 0.325, while coefficient of variation decreases from 0.641 to 0.572. From the perspective of factors contributing to economic competitiveness, Local Demand, Infrastructure and Technological Innovation are key factors in the economic competitiveness of worldwide cities. Specifically, three key points are explained as follows:

Firstly, cities in the Northern Hemisphere continuously take the lead in terms of competitiveness, and the competitiveness of Asian cities has been improved significantly. According to intercontinental distribution of the top 100 competitive cities in the world, the best performers are North America, Asia and Europe, where 39, 33 and 26 cities respectively rank among top 100, including most of the top 100 cities in the world. Economic competitiveness of Asian cities are significantly improved, while their internal differences narrow. From 2008 to 2018, the average of Competitiveness Index rises from 0.252 to 0.291, with an increase of 0.039. the coefficient of variation falls from 0.628 to 0.557, with a decrease of 0.071.

Secondly, the four major Bay Areas turns into important engines for city development all over the world. The top ten urban agglomerations provide important support for the global city system. Among the four major Bay Areas in the world, San Francisco Bay Area has the highest level of competitiveness, and the Guangdong-Hong Kong-Macao Bay Area starts late and is developing rapidly. The average of economic competitiveness index of these four major Bay Areas is significantly higher than that of worldwide sample cities. This indicates that these Bay Areas have a high level of competitiveness and act as important engines for global city development. Among the top ten urban agglomerations, except for Mumbai Urban Agglomeration, the average of competitiveness index of other urban agglomerations is higher than that of worldwide sample cities, which highlights the clustering development advantages of urban agglomerations.

Thirdly, Coupling Coordination Degree is a key contributing factor for competitiveness of cities. Coupling Coordination Degree refers to the degree of integrity, comprehensiveness and internal developmental coordination strength of economic competitiveness components of cities. As revealed by benchmark regression analysis of economic competitiveness and coupling coordination degree, it is found that with the gradual increase of explanatory variables, significance level of coupling coordination degree correlated to economic competitiveness is as same as that of other

explanatory variables. Economic Competitiveness Index and coupling coordination degree is correlated under significance level of 1%. There is a significant positive correlation between coupling coordination degree and economic competitiveness. Promoting the balanced development of various factors in worldwide sample cities is an important solution to improving the competitiveness of cities.

4.1 Global urban economic competitiveness: an annual review

4.1.1 Overall pattern: the economic competitiveness of European and American cities takes the lead, while urban performance in China is a highlight

The overall score for the level of global urban economic competitiveness is relatively low. The global urban economic competitiveness index is weighted by two indexes, the increment of global urban GDP for 5 consecutive years and the urban GDP per square kilometer of land. The larger the index, the stronger the urban economic competitiveness is. From statistical data, the gross GDP of 1,007 cities in the world in 2018 is about USD 44.2 trillion, accounting for 58.5% of the gross GDP in the world, which is USD 75.6 trillion.

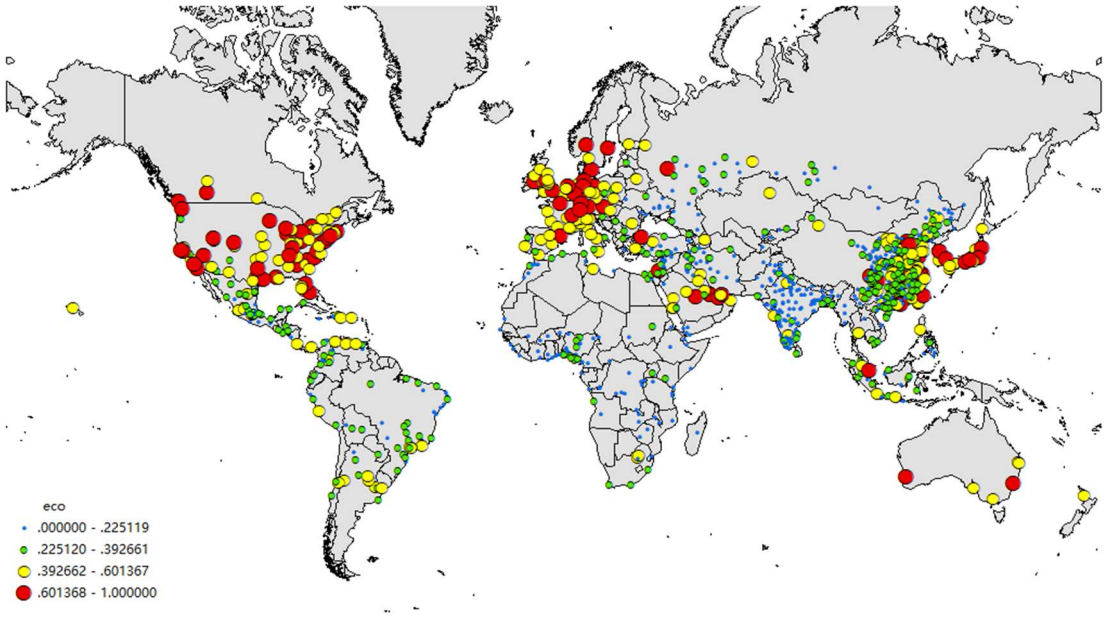


Figure 4-1 Distribution of global urban economic competitiveness in 2018

Source: Global urban competitiveness database of CASS.

Table 4-1 The world's top 20 cities in terms of economic competitiveness in 2018

Year	Number of samples	Average	Median	Standard deviation	Variable coefficient	Gini coefficient	Theil index
2018	1007	0.325	0.286	0.186	0.572	0.315	0.158

Source: Global urban competitiveness database of CASS.

Among the top ten cities, the cities in the United States dominate, while Chinese cities are rising steadily. Shenzhen enters the global top 5 for the first time.

Table 4-2 World's top ten cities in economic competitiveness ranking 2018

Ranking	City	Country	Continent	Score
1	New York	United States	North America	1
2	Los Angeles	United States	North America	0.997
3	Singapore	Singapore	Asia	0.972
4	London	United Kingdom	Europe	0.933
5	Shenzhen	China	Asia	0.932
6	San Jose	United States	North America	0.931
7	Munich	Germany	North America	0.931
8	San Francisco	United States	Europe	0.929
9	Tokyo	Japan	Asia	0.896
10	Houston	United States	North America	0.884

Source: Global urban competitiveness database of CASS.

4.1.2 Historical comparison: Asian urban competitiveness keeps rising, while its internal differences drop

The level of global urban economic competitiveness keeps improving, and the overall differences drop year by year.

Table 4-3 Statistical characteristics of global urban economic competitiveness in past years

Year	Average value	Median	Standard deviation	Coefficient of variation
2008	0.307	0.242	0.197	0.641
2009	0.297	0.238	0.192	0.648
2010	0.306	0.251	0.194	0.635
2011	0.308	0.251	0.191	0.619
2012	0.311	0.267	0.185	0.596
2013	0.314	0.271	0.186	0.591
2014	0.312	0.271	0.184	0.591
2015	0.323	0.282	0.187	0.581
2016	0.321	0.279	0.187	0.585
2017	0.338	0.294	0.193	0.571
2018	0.325	0.286	0.186	0.572

Source: Global urban competitiveness database of CASS.

The level of urban economic competitiveness keeps rising in Asia. The ranking of cities of all continents have no changes on the whole. The gaps among cities of Asia from those in Europe and North America in economic competitiveness have been narrowed.

Table 4-4 The average values of regional samples of urban economic competitiveness in different years

Year	Asia	Europe	North America	South America	Africa	Oceania
2008	0.252	0.452	0.502	0.294	0.167	0.586
2009	0.249	0.426	0.483	0.278	0.158	0.565
2010	0.259	0.437	0.482	0.292	0.165	0.574
2011	0.261	0.433	0.497	0.288	0.167	0.562
2012	0.273	0.417	0.477	0.303	0.169	0.578
2013	0.279	0.416	0.471	0.305	0.168	0.588
2014	0.280	0.405	0.467	0.300	0.166	0.583
2015	0.287	0.426	0.483	0.313	0.174	0.595
2016	0.286	0.420	0.481	0.308	0.172	0.584
2017	0.302	0.439	0.511	0.320	0.180	0.606
2018	0.291	0.422	0.494	0.307	0.173	0.583

Source: Global urban competitiveness database of CASS.

The number of top cities has kept increasing in China. In 2008, 6 Chinese cities were ranked among the world's top 100; after the "Subprime Crisis", 18 Chinese cities became the world's top 100.

Table 4-5 Historical changes in the number of cities in different countries rated by urban economic competitiveness

Year	China	Russia	the United Kingdom	France	the United States	Germany	Italy	Japan	Canada
2008	9	1	6	1	37	10	2	5	4
2009	12	1	5	1	35	10	1	5	4
2010	12	1	4	1	35	10	1	5	4
2011	12	1	3	1	39	10	1	6	3
2012	18	1	3	1	34	9		6	3
2013	19	1	3	1	34	9		5	3
2014	21	1	3	1	34	8		5	3
2015	19	1	3	1	34	10		5	3
2016	20	1	3	1	34	10		4	3
2017	18	1	3	1	36	10		4	3
2018	18	1	3	1	35	10		5	4

Source: Global urban competitiveness database of CASS.

4.1.3 Individual indexes: the indexes of local demands, infrastructure, and technology innovation are critical factors affecting global urban economic competitiveness

From the results of regression, it is discovered that all individual indexes have positive effect on economic competitiveness. The order of individual indexes in terms of their correlation of explanatory variable and explained variable starting from the highest correlation is as follows: local demand index, infrastructure index, technology innovation index, business cost index, institutional cost index, global connection index, industrial system index, financial service index, social environment index and human capital index.

Table 4-6 The results of regression analysis of global economic competitiveness and explanatory indexes

Explanatory index	Coefficient	t value
Financial service index	0.030	1.41
Technology innovation index	0.168***	9.79
Industrial system index	0.042	0.82
Human capital index	0.017	0.46
Local demand index	0.850***	20.65
Business cost index	0.078***	6.02
Institutional cost index	0.052**	2.53
Global connection index	0.050**	2.19
Infrastructure index	**0.248*****	11.00
Social environment index	**0.026**	1.60
Constant term	**-0.148*****	-9.78
Sample size	1007	-

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Global urban competitiveness database of CASS.

4.2 Comparative analysis of urban competitiveness in China and the United States

The urban economic competitiveness of the United States is better on the whole. The average economic competitiveness score of Chinese cities is lower than that of the U.S. cities, but the average coefficient of variation, Theil index, skewness and kurtosis of Chinese cities are higher than those of the United States.

Table 4-7 Analysis of the indexes of economic competitiveness of cities in China and the United States

Scope	Number of samples	Average value	Median	Standard deviation	Variance	Coefficient of variation	Theil index	Gini coefficient	Skewness	Kurtosis
China	**292**	**0.33**	**0.29**	**0.15**	**0.02**	**0.45**	**0.09**	**0.24**	**1.3**	**5.12**
the United States	**75**	**0.6**	**0.57**	**0.15**	**0.02**	**0.24**	**0.03**	**0.13**	**0.64**	**3.27**

Source: Global urban competitiveness database of CASS.

Table 4-8 Comparison of the economic competitiveness of the top ten cities in China and the United States

Top ten cities in China	General index	General ranking	Top ten cities in the United States	General index	General ranking
Shenzhen	0.93	5	New York	1	1
Hong Kong	0.88	11	Los Angeles	1	2
Shanghai	0.85	13	San Jose	0.93	6
Guangzhou	0.85	14	San Francisco	0.93	8
Beijing	0.8	19	Houston	0.88	10
Suzhou	0.74	27	Dallas	0.88	12
Wuhan	0.7	40	Miami	0.8	17
Tianjin	0.7	42	Boston	0.8	18
Nanjing	0.7	45	Chicago	0.8	21
Taipei	0.7	46	Seattle	0.76	24
Average value	0.79	—	Average value	0.88	—
Median	0.77	—	Median	0.88	—
Standard deviation	0.09	—	Standard deviation	0.09	—
Variance	0.01	—	Variance	0.01	—
Coefficient of variation	0.11	—	Coefficient of variation	0.1	—

Source: Global urban competitiveness database of CASS.

4.3 Contrastive analysis of the competitiveness of North America, West Europe, and East Asia: The three global economic centers all perform well in urban competitiveness, and the scores of East Asian cities are rising rapidly

4.3.1 Current pattern: Cities in North America take the lead, and the most competitive cities are concentrated in the top trio regions

Cities in North America have the highest level of economic competitiveness, and the most competitive cities are concentrated in the top trio regions.

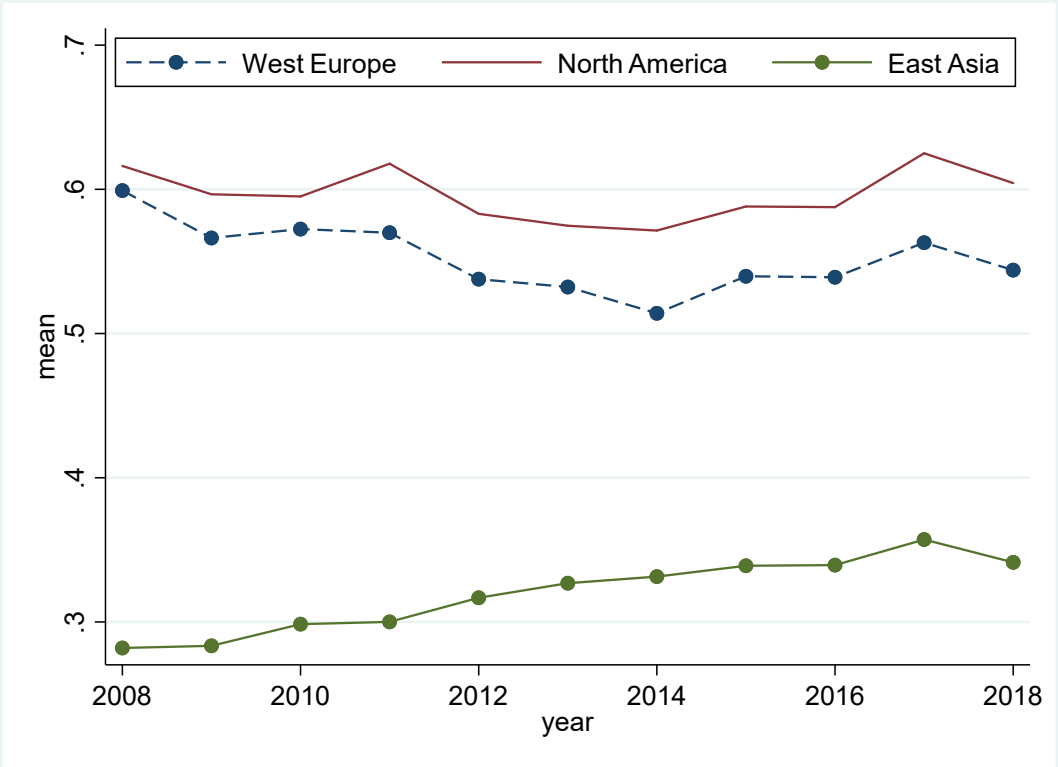
Table 4-9 Economic competitiveness of North America, West Europe and East Asia in 2018

Sample region	Sample number	Average value	Median	Standard deviation	Peak value	Least value	Coefficient of variation	Number of the world's top 100 cities
North America	75	0.604	0.573	0.147	1	0.326	0.244	35
West Europe	71	0.544	0.543	0.139	0.933	0.145	0.256	25
East Asia	311	0.341	0.300	0.157	0.932	0.089	0.460	24

Source: Global urban competitiveness database of CASS.

4.3.2 Historical comparison: urban competitiveness in East Asia is rapidly rising, while its internal differences are dropping

Figure 4-2 Trend of changes in the average value of economic competitiveness index in West Europe, North America and East Asia over the past years



Source: Global urban competitiveness database of CASS.

4.4 Comparative analysis of the competitiveness of the four major bay areas : The San Francisco Bay area is most competitive whereas the Guangdong-Hong Kong-Macau bay area scores lowest in economic competitiveness

Table 4-10 Statistical description of the four major bay areas in the world

Sample	Number of samples	Average value	Median	Standard deviation	Peak value	Least value	Coefficient of variation
Tokyo bay area	1	0.896	0.896	.	0.896	0.896	.
San Francisco bay area	2	0.924	0.924	0.007	0.929	0.919	0.008
the Guangzhou-Hong Kong-Macao Greater bay area	11	0.591	0.564	0.212	0.932	0.334	0.358
New York bay area	3	0.754	0.729	0.235	1.000	0.532	0.311

Source: Global urban competitiveness database of CASS.

The Tokyo bay area and the San Francisco bay area take turn to lead, and the Guangzhou-Hong Kong-Macao Greater bay area rises rapidly

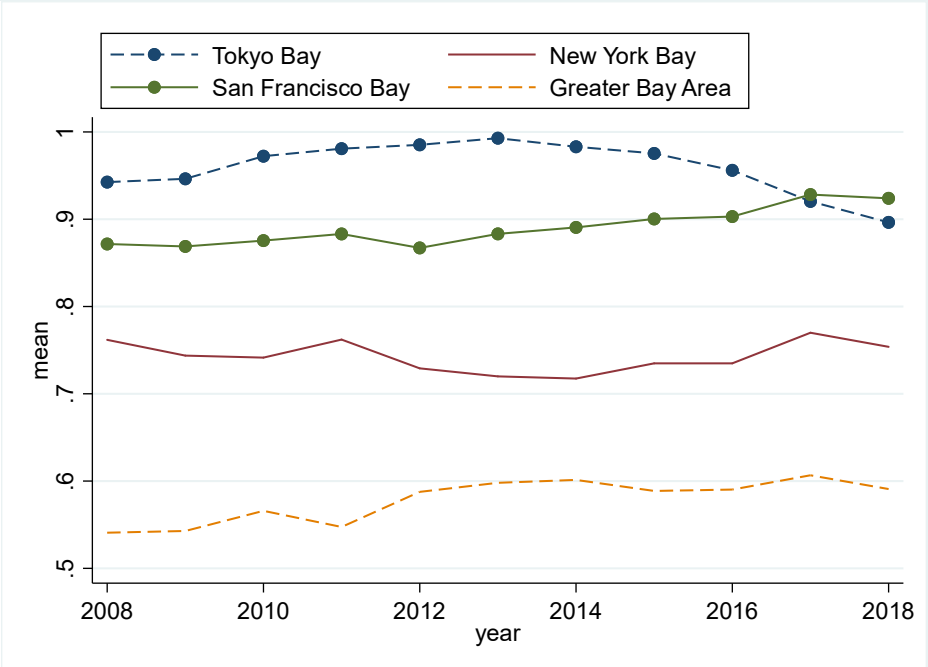


Figure 4-3 Historical trend of the average value of economic competitiveness of sample cities from the world's famous bay areas

Source: Global urban competitiveness database of CASS.

4.5 Comparative analysis of the competitiveness of the ten major urban agglomerations: the urban agglomerations in developed countries take the lead

The urban agglomerations in developed countries have a higher level of economic competitiveness, while the urban agglomerations in developing countries have greater internal differences. Successful urban agglomerations in the world, such as the northeastern urban agglomeration of the United States, the London-Liverpool metropolitan regions and the Seoul metropolitan area, play an important role in promoting the economic and social development not only in the cities themselves but also the whole country. Based on data availability and length of the paper, Tab. 4-24 presents the statistical description of the sustainable competitiveness in cities of ten urban agglomerations in the world. The Seoul metropolitan area includes 2 cities, Inchon and Seoul, the northeastern urban agglomeration of the United States includes 11 cities such as New York, the western urban agglomeration of the United States includes 13 cities such as Chicago, and the northern Californian urban agglomeration includes 3 cities such as San Francisco, the Bombay metropolis includes 4 cities such as Bombay, the London-Liverpool metropolitan regions include 8 cities such as London, the Yangtze River Delta urban agglomeration includes 26 cities such as Shanghai, the Pearl River Delta urban agglomeration includes 13 cities such as Guangzhou, the Netherlands-Belgium urban agglomeration includes 6 cities such as Amsterdam, and the Rhein–Ruhr urban agglomeration includes 4 cities such as Hamburg.

Table 4-4 The statistical characteristics of economic competitiveness in the world's ten major urban agglomerations in 2018

Sample city	Sample size	Average value	Average value ranking	Median	Standard deviation	Peak value	Least value	Coefficient of variation	Coefficient of variation Ranking
Seoul national	2	0.676	3	0.676	0.186	0.808	0.544	0.276	6
Northeastern United States	11	0.682	2	0.656	0.138	1	0.532	0.203	4
Midwest United States	13	0.623	5	0.63	0.087	0.799	0.506	0.139	3

Northern California	3	0.776	1	0.919	0.256	0.929	0.481	0.33	8
Bombay metropolis	4	0.26	10	0.22	0.137	0.445	0.153	0.529	10
London-Liverpool	8	0.599	6	0.557	0.148	0.933	0.481	0.247	5
the Yangtze River Delta	26	0.483	8	0.468	0.155	0.854	0.225	0.322	7
the Pearl River Delta	13	0.454	9	0.414	0.239	0.932	0.204	0.526	9
Netherlands-Belgium	6	0.577	7	0.592	0.062	0.641	0.464	0.108	2
Rhein - Ruhr	4	0.676	3	0.688	0.042	0.711	0.615	0.062	1

Source: Global urban competitiveness database of CASS.

4.6 Comparative analysis of the top 20 cities in economic competitiveness: China and the United States dominate the world's top 20 cities in economic competitiveness

The world's top 20 cities in economic competitiveness create more wealth with a smaller population. The gross GDP of the world's top 20 cities in economic competitiveness amounts to about USD 10.98 trillion, accounting for 25% of the total GDP of the 1,007 cities, and for about 15% of the global GDP. This shows that the top 20 cities play a pivotal role in global economic activities. In terms of population, the total population of the world's top 20 cities is about 230 million, accounting for 10% of the total population of the 1,007 sample cities, and about 3% of the world's total population.

The world's top 20 cities in economic competitiveness are not evenly distributed. Of the top 20 cities in economic competitiveness ranking, 8 cities are in North America (8 in North America 8, 8 cities are in Asia (7 in East Asia), 4 cities are in Europe (3 in West Europe), while no city in Oceania, Africa or South America is rated among the top 20. These 20 cities are mainly in developed countries, with a few in developing ones. Most cities are in the United States (8), China (5) and Germany (2); Singapore, Japan, Ireland, the United Kingdom and South Korea each has one city listed.

Table 4-12 The world's top 20 cities in economic competitiveness in 2018

Ranking	City	Economic competitiveness	Ranking	City	Economic competitiveness
1	New York	1	11	Hong Kong	0.884
2	Los Angeles	0.997	12	Dallas	0.878
3	Singapore	0.972	13	Shanghai	0.854

4	London	0.933	14	Guangzhou	0.850
5	Shenzhen	0.932	15	Seoul	0.808
6	San Jose	0.931	16	Dublin	0.800
7	Munich	0.931	17	Miami	0.798
8	San Francisco	0.929	18	Boston	0.797
9	Tokyo	0.896	19	Beijing	0.797
10	Houston	0.884	20	Frankfurt	0.796

Source: Global urban competitiveness database of CASS.

4.7 Analysis of the coupling coordination degree of the elements of economic competitiveness

To verify that the coupling coordination degree of cities is a critical element for urban competitiveness, Tab. 4-35 presents the benchmark regression analysis of economic competitiveness and the coupling coordination degree. Regression (1) indicates the regression results of the coupling coordination degree with the economic competitiveness index alone; regressions (2)-(5) indicate the regression results of the coupling coordination degree with the economic competitiveness index with the addition of other control variables. From the results of benchmark regression analysis, it can be concluded that with the gradual increase of explanatory variables, the coupling coordination degree and other explanatory variables are consistent with the significance level of economic competitiveness, which indicates that the regression results are viable. In the (1)-(5) regression analysis, the economic competitiveness index and the coupling coordination degree are both correlated at a significance level of 1%, and there is significant positive correlation between the coupling coordination degree and economic competitiveness.

Table 4-13 Benchmark regression analysis of economic competitiveness and the coupling coordination degree

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	eco2	eco2	eco2	eco2	eco2
Coupling coordination degree	0.487***	0.370***	0.138***	0.045***	0.042***
	(22.02)	(15.79)	(7.53)	(3.12)	(2.93)
Financial service		0.377***	0.165***	0.045**	0.041*
		(11.09)	(6.50)	(1.99)	(1.83)
Technology innovation			0.536***	0.206***	0.198***
			(30.87)	(12.06)	(11.56)
Industrial systems				0.151***	0.163***
				(4.13)	(4.45)

Local demand				0.990***	1.005***
				(25.04)	(25.35)
Business cost				0.096***	0.085***
				(7.21)	(6.14)
Institutional cost				0.055**	0.051**
				(2.57)	(2.35)
Social environment					0.052***
					(3.15)
_cons	0.101***	0.125***	0.052***	-0.131***	-0.142***
	(9.02)	(11.52)	(6.37)	(-10.58)	(-11.08)
N	1007	1007	1007	1007	1007
adj. R2	0.325	0.398	0.691	0.839	0.840

The values in parenthesis are t values; *, **, and *** respectively show the confidence level of 0.1, 0.05 and 0.01.

Chapter Five: Global Sustainable Competitiveness of Cities

Gong Weijin Li Qihang

5.1 Cities with respectively strong and weak sustainable competitiveness are clearly distributed in a large portion in the middle and a small portion at both ends, and sustainable competitiveness of Asian cities constantly enhances.

The cities with respectively strong and weak sustainable competitiveness are clearly distributed in a large portion in the middle and a small portion at both ends, and sustainable competitiveness of Asian cities constantly enhances. To be specific, there are few top global cities in Western Europe and North America, and the level of sustainable competitiveness of these cities declines rapidly. There are also few cities wit particularly low level of sustainable competitiveness in South Africa and other countries, and the level of sustainable competitiveness of these cities also declines rapidly.

5.1.1 The level of economic development is highly positively correlated with the overall manifestation of sustainable competitiveness of cities.

Through the analysis of various indicators of sustainable competitiveness, the countries, the urban agglomerations and the top 20 cities, it is found that the level and growth rate of economic development always dominate in cities. The level and development direction of various types of sustainable competitiveness depend on economic development. In the foreseeable future, the impacts of economic development on sustainable competitiveness of cities will be further enhanced. Approaches to improving sustainable competitiveness through development and making competitiveness grow in conjunction with the economy are main tasks for the future city system.

5.1.2 High-level equilibrium is the best goal and path to enhance sustainable competitiveness of cities

According to the empirical data, it can be found that the development of cities with the highest sustainable competitiveness is under more equilibrium state, but the polarization between cities with relatively great sustainability is severe, especially the gaps are obviously wide in terms of multiple indicators. The ways to achieve improvement of sustainable competitiveness of cities and equilibrium with surrounding cities and the possibilities to accelerate the improvement of overall competitiveness of city system and achieve synergetic evolution are important topics for future research in the field of sustainable competitiveness of cities.

5.1.3 Technological Innovation and Human Capital Potential have the greatest impacts, and magnify the positive effects by means of direct effect, indirect effect and feedback effect.

Magnifying effect of cities on the factor inputs through spillover effect and feedback effect for the second-order and higher-order neighboring cities can not be ignored, which is also one of the important sources to improve the level of sustainable competitiveness of cities. According to the estimation results of GNS Model in empirical analysis, without regard to spillover effect and feedback effect between cities, elasticity values of "Economic Vitality" and "Technological Innovation" for the improvement of sustainable competitiveness of cities are 9.5% and 13.8%, respectively, which are 16.9% and 19%, respectively, with an increase of 77.89% and 37.68% with consideration to spillover effect and feedback effect between cities. Similarly, such factors as "Social Inclusion" and "Global Connections" also have positive spillover effect and feedback effect. Therefore, approaches to transforming the spatial spillover effect and feedback effect of factor inputs into the driving force for the improvement of sustainable competitiveness of cities are important paths for cities to enhance their sustainable competitiveness.

5.2 Global Ranking of Cities by Sustainable Competitiveness 2018

5.2.1 Overview

5.2.1.1 Global Ranking 2018: The number of cities perform extremely well or poorly in sustainable competitiveness indicators is small; the majority of cities are performing just so-so.

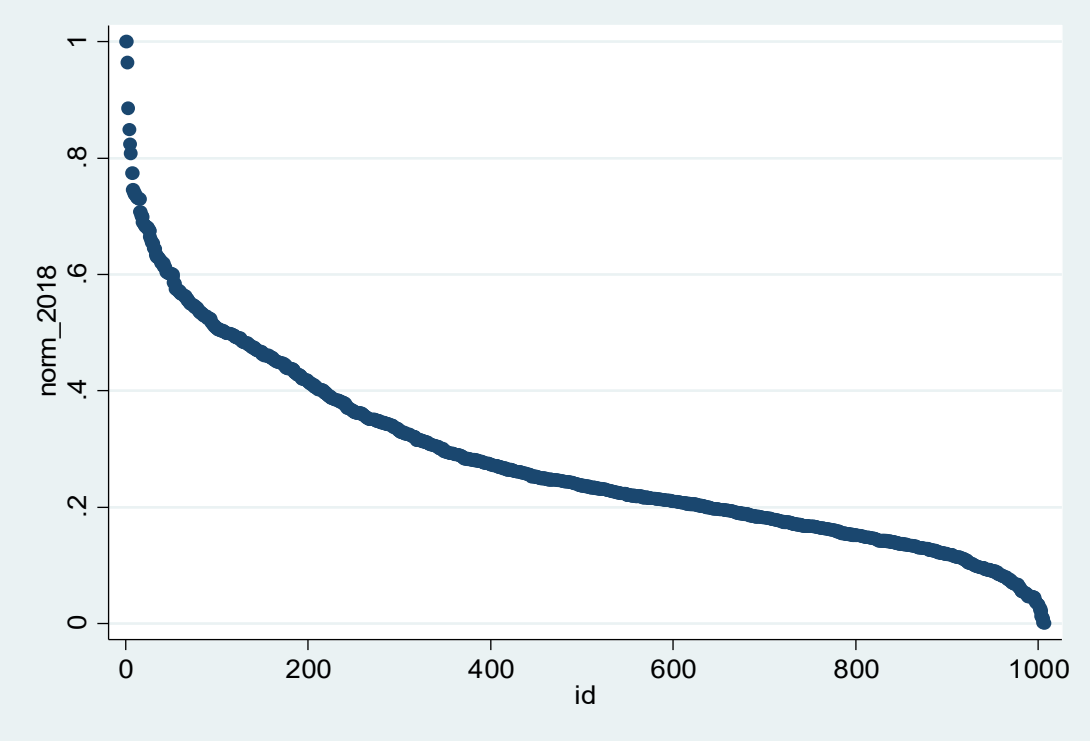


Figure 5-1 Sustainable Competitiveness Scores of 1,007 Cities (2008)

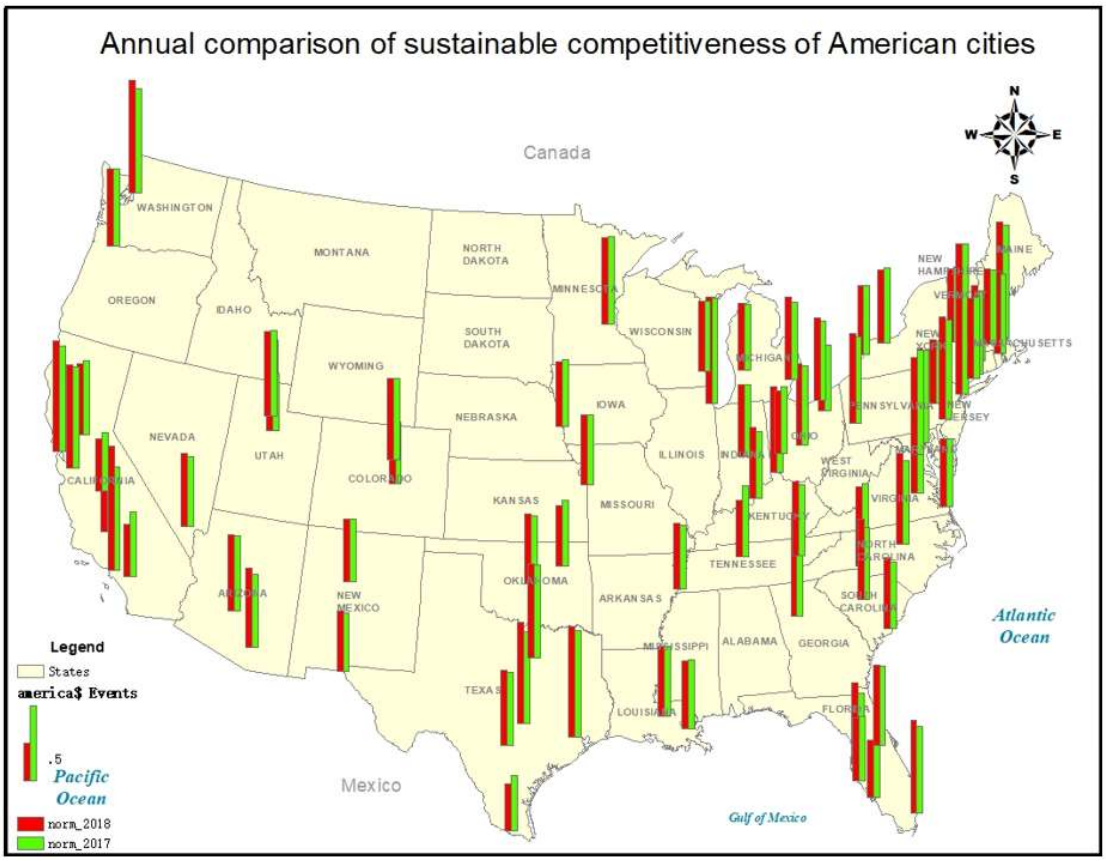


Figure 5-2 Annual Comparison of Sustainable Competitiveness of American cities

5.2.2 Chinese Cities vs American Cities: There are notable disparities between Chinese and American cities in sustainable competitiveness. The number of American cities performing well in sustainable competitiveness indicators are far larger than the number of such Chinese cities. However, the internal divergence between American cities is widening whereas the development of Chinese cities is overall more coordinated.

5.2.2.1 Chinese Cities vs American Cities: Overall, American cities perform better than Chinese cities in sustainable competitiveness, but the gap is closing.

5.2.2.2 Dynamics in sustainable competitiveness of American cities: The divergence between American cities in sustainable competitiveness is widening, and the overall competitiveness of American cities is declining

In 2018, the overall sustainable competitiveness of American cities is still high, but the disparities between American cities is widening. Compared to Chinese cities, the overall competitiveness of American cities is declining.

5.2.2.2 Dynamics in sustainable competitiveness of Chinese cities: The divergence between Chinese cities in sustainable competitiveness is closing, and their overall competitiveness is rising.

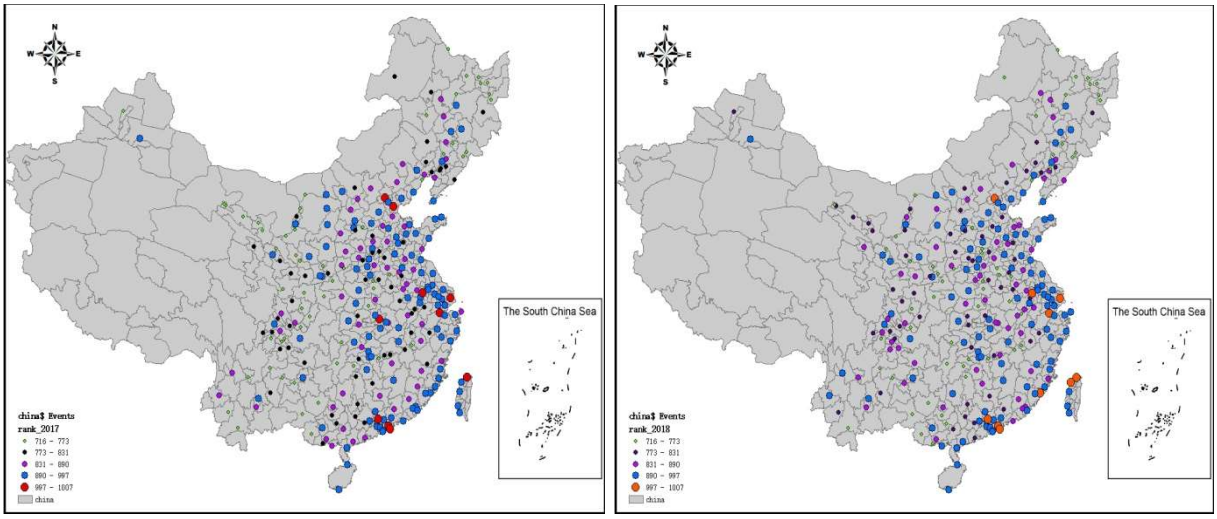


Figure 5-3 Comparison of the Annual Sustainable Competitiveness Scores of Chinese Cities for 2017 and 2018

Compared with 2017, the disparities in sustainable competitiveness between Chinese cities in 2018 has narrowed significantly, and the growth of sustainable competitiveness of Chinese cities is faster compared to American cities.

5.2.3 The world's three major economic centers: contrary to Western Europe and North America, East Asia's economic level is low, the difference is large, and the promotion is fast.

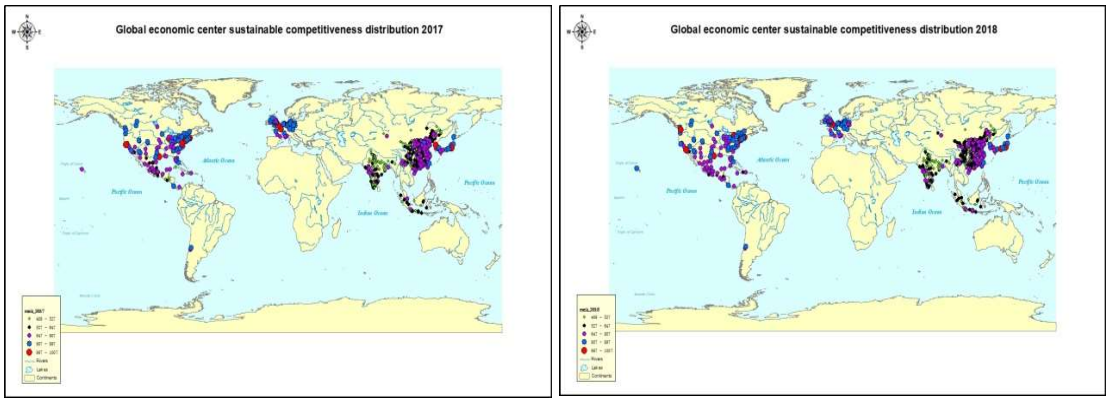


Figure 5-4 Comparison of the Distribution of Sustainable Competitiveness of the Three Global Economic Centers in 2017 and 2018

As can be seen from Figure 5-4, the divergence between the three global economic centers, namely West Europe, North America, and East Asia, is severe.

5.2.4 Sustainable competitiveness of the four bay areas: The Tokyo bay area is the most competitive. The Guangdong-Hong Kong-Macau bay area scores lowest in sustainable competitiveness but is catching up with the three mature bay areas.

In a word, the Guangdong-Hong Kong-Macau bay area is behind the New York bay area in both overall sustainable competitiveness and coordinated internal development. Figure 5-2-11 compares sustainable competitiveness of cities in the four bay areas

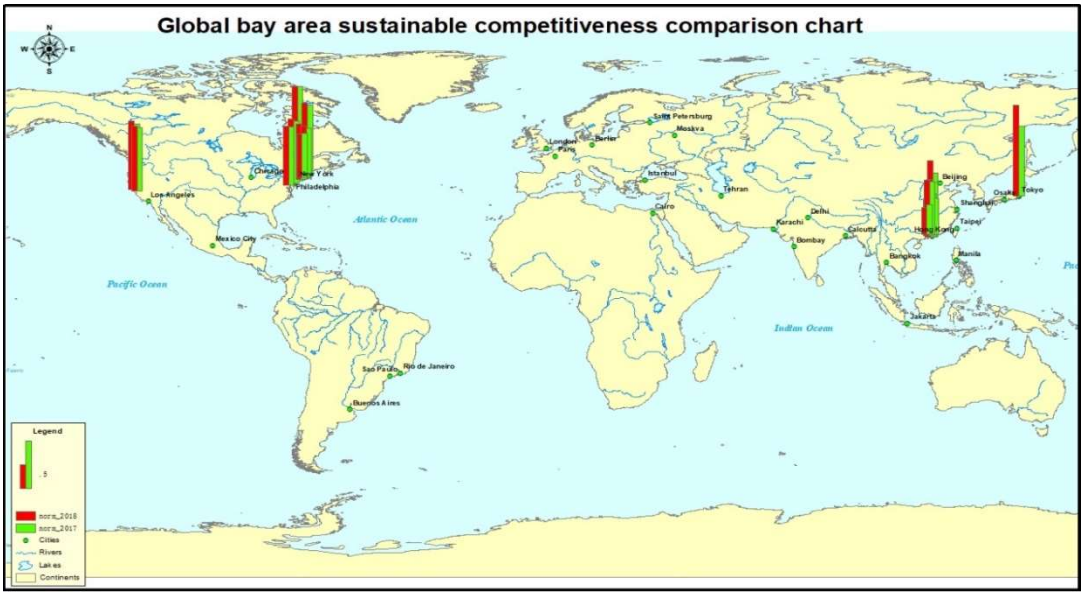


Figure 5-5 Comparison of Sustainable Competitiveness of the World's Largest Four Bay Areas in 2017 and 2018

5.2.5 10 urban clusters in the world: the northeastern region has the best urban clusters, a few mature urban clusters are stable, and most polarized urban agglomerations face long-term challenges.

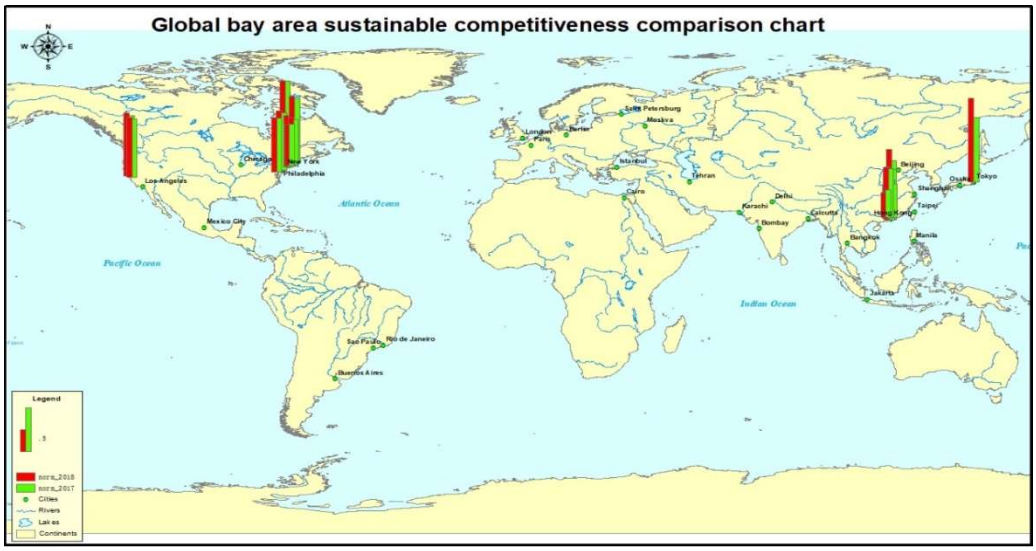


Figure 5-6 Comparison of Sustainable Competitiveness of the World's Largest Four Bay Areas

in 2017 and 2018

The comparative analysis of the 2017 and 2018 results show that, although clusters in Western Europe and North America score relatively high, the growth of their scores have declined, with some cities in the Midwest Megalopolis of the U.S. having the largest decline. The average scores of the clusters in East Asia and South Asia are relatively low but are growing, but the polarization within the clusters is significant.

5.2.6 Globe Top 20: leading the world in sustainable competitiveness with technology and human capital as the largest two driving forces

According to the latest ranking, the global top 20 cities by sustainable competitiveness are New York, Tokyo, London, Singapore, Los Angeles, Hong Kong, Boston, Seattle, Houston, Toronto, Osaka, San Francisco, Seoul, Paris, Chicago, Amsterdam, Vancouver, San Jose and Atlanta.

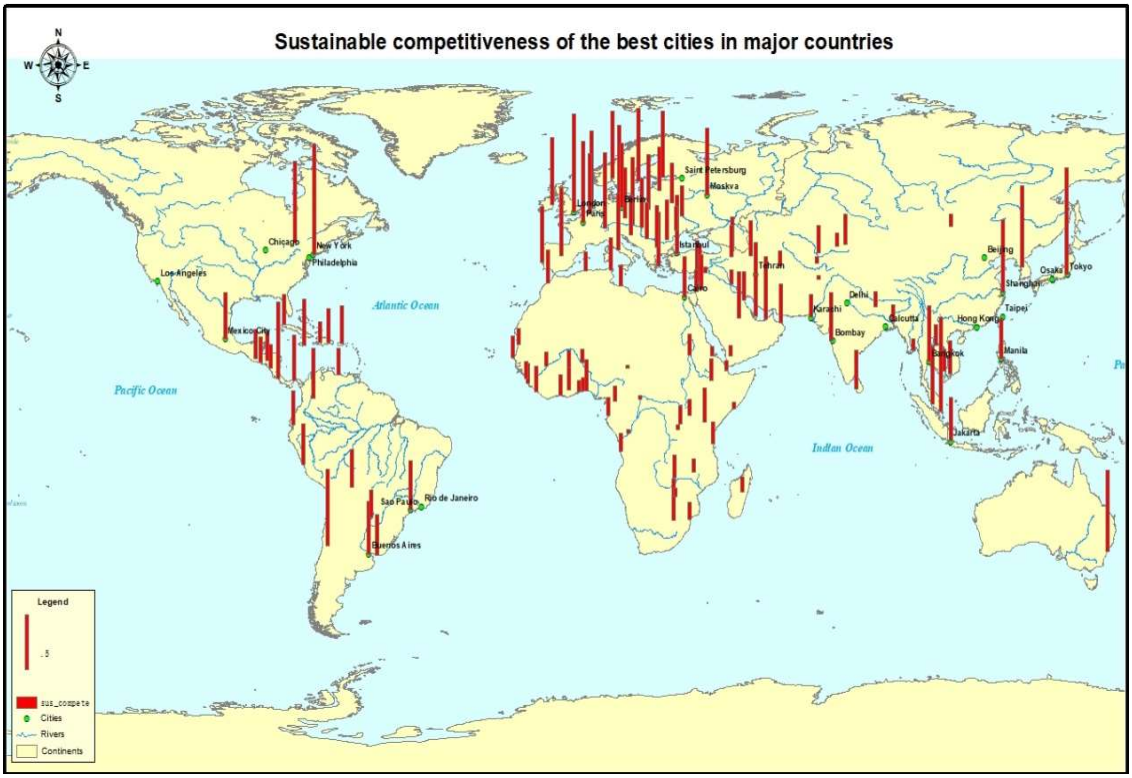


Figure 5-7 Sustainable Competitiveness Scores of Highest Ranking Cities of Each of the 135 Sample Countries

5.2.7 The largest cities in the world's major countries: the competitiveness of the largest cities is intensifying, and the strength and competitiveness of the country determine the sustainable competitiveness of the largest cities.

Figure 5-8 shows the sustainable competitiveness scores of the highest ranking cities of each of the 135 countries. As can be seen from Figure 5-2-18, Western Europe has the largest number of cities with high global sustainable competitiveness scores, followed by East Asia and North America. South Asian cities score significantly lower than East Asian cities. The overall sustainable competitiveness of cities in South America, Africa, West Asia and Oceania is significantly lower than other regions.

5.3 Environmental Quality Index Analysis: Environmental Negative Impacts in Urban Clusters

5.3.1 Overall pattern: environmental endowment and the Kuznets curve together determine the quality of urban environment

There are positive correlations between region and geographical factors and the performance of cities in the quality of environment index (Figure 5-3-1). The correlation between region and the quality of environment of cities is reflected in the fact that cities in Europe and America perform significantly better than Asian and African cities in quality of environment. The correlation between geographical factors and the quality of environment of cities is mainly reflected in the impact of ocean and forest on urban environment.

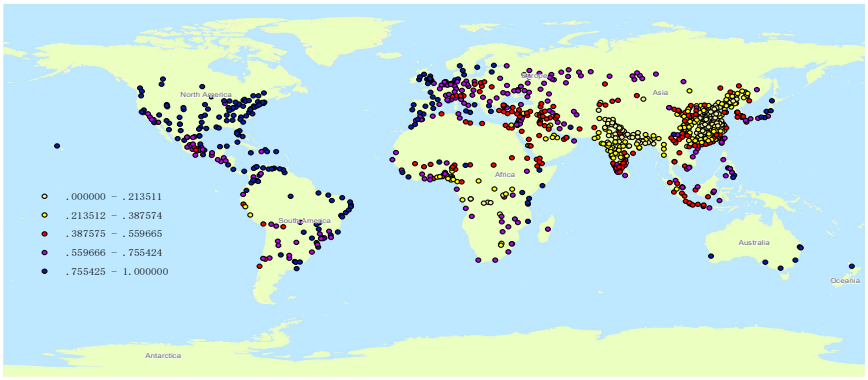


Figure 5-8 Global Distribution of Cities with Good Environment

5.3.2 Global Top 20: Coastal Cities and Cities Exhibiting Moderate Economic Growth

Among the global top 20 cities by environmental quality, coastal cities perform exceptionally well. Honolulu, Auckland and Gold Coast rank in the top three and six cities in Oceania are among the top ten. Most of the global top 20 cities are located in Oceania and the Americas. Seven out of the global top 20 cities are Australian cities.

5.3.3 Comparison of Countries: Wide Disparities between Chinese and American Cities in Quality of Environment

Overall, the U.S. performs much better than China in quality of environment. The average ecological environment score of the U.S. cities is three times that of the Chinese cities. Honolulu is ranked NO.1 by quality of environment. The highest-ranking Chinese city is Lijiang at the 127th place. The coefficient of variation of Chinese cities is 0.550, about five times that of the United States.

5.3.4 Urban cluster pattern: urban clusters bring negative environmental impact

The pattern of environmental quality scores of urban clusters is basically consistent with that of countries. The majority of urban clusters in developed countries in Europe and America score high whereas urban clusters in China and India perform poorly in quality of environment. Furthermore, the core-periphery disparities in urban clusters in Europe and America are small. By contrast, the overall environmental quality of Chinese and Indian urban clusters is low, and none of the cities in Chinese and Indian urban clusters have entered the global top 100. In addition, there is a wide internal divergence between cities in Chinese and Indian urban clusters.

5.4 Social inclusion index analysis: Western Europe's East Asian inclusion index leads, culture and tradition determine the level of tolerance

5.4.1 Overall pattern: Western Europe and East Asia perform best in inclusiveness

Europe and East Asia perform best in social inclusiveness, followed by Oceania. The divergence between European and East Asian cities in inclusiveness is small. Most Eurasian cities, especially China, Japan and Western European countries, perform well in inclusiveness. However, Central Asian cities perform poorly in inclusiveness.

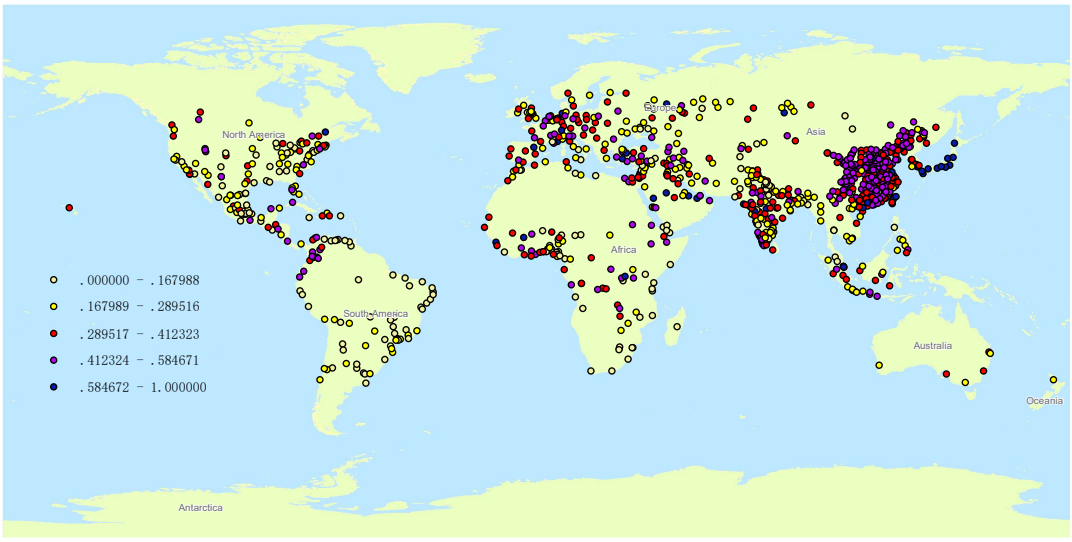


Figure 5-9 Global Distribution of Inclusive Cities

5.4.2 Global Top 20: East Asian cities lead the world in inclusiveness

Asia accounts for 16 seats in the global top 20 cities by inclusiveness. Most of the global top 20 cities by inclusiveness are located in China and Japan. In terms of numerical values, the social inclusion index gap between the top 20 cities is not large, and the index is around 0.7-0.8.

5.4.3 Comparison between Countries Cultural Different Lead to Disparities in Inclusiveness in China and Chinese

Under the values of the East and the West, there is a big gap between Chinese and American social inclusion. China is located in East Asia and is deeply influenced by Confucian culture. Confucian culture advocates “harmony and wealth” and pays more attention to social inclusion. The mainstream social values in the United States are mostly biased towards individualism. Economic development relies on market competition and appears to be incompatible with economic level and social management in terms of social inclusion.

5.4.4 Comparison of Urban Clusters：Agglomeration Leads to a Decrease in Inclusiveness

Take typical urban agglomerations for example. The social inclusion index of urban agglomerations is basically consistent with the pattern at the national level. In addition, the cities with the highest social inclusion index within the urban agglomeration are not central cities, such as China's three major urban agglomerations, the Midwest and Northeastern urban agglomerations, the London-Liverpool urban agglomeration in the UK, and the Bangalore urban agglomeration in India.

5.5 Analysis of the Science and Technology Innovation Index: The strength of the emerging cities in developed and emerging economies is dazzling

5.5.1 Overall Pattern: There is a divergence in innovation in geographical and political terms between developed and developing countries

From the intercontinental distribution of the top 100 global cities in the S&T index, the best performers are North America, Asia and Europe. 37, 30 and 29 cities respectively entered the top 100 globally. Geographically, the number of cities entering the top 100 cities is concentrated in the northern hemisphere. Although Oceania has the highest proportion of the world's top 100 cities, the sample cities are few, and four cities have entered the top 100, ranking relatively low. In summary, in terms of science and technology, the geographical gap between the North and the South is wide.

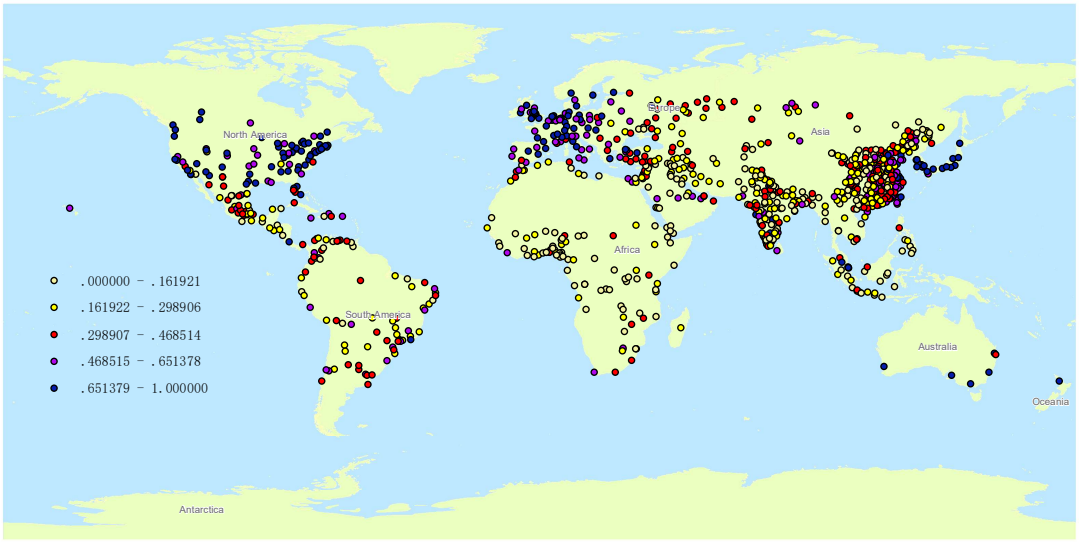


Figure 5-10 Global Distribution of Technological Innovation

5.5.2 Global Top 20: Emerging Cities

Global technological innovation activity is highly concentrated in a few cities. According to estimates, in the 2017 global science and technology innovation index rankings, Tokyo, Beijing and Seoul ranked in the top three. Among the top 20 cities, North American cities occupy 9 seats, Asia has 7 seats, Europe has 4 seats, South America, Oceania and Africa have no cities to enter the world's top 20.

5.5.3 Comparison between Countries: China and U.S.

Comparing the data of China-US Science and Technology Innovation Index, it is not difficult to find that the United States is about twice as large as China in terms of the number of the top 100 and the overall average. For example, the average value of China's science and technology innovation index is 0.361, while the US science and technology innovation index is 0.664. In contrast, China and the United States have large differences, and China is in a weak position in terms of technological innovation.

5.6 Global Connectivity: Geographical Location and Economic Position Decide Global Connectivity

5.6.1 Overall Pattern: Most Highest-Ranking Cities in Global Connectivity are Located in Developed Countries

In terms of global contacts, cities in developed countries still dominate global contacts and exchanges, but cities in emerging market countries represented by China have grown rapidly and have begun to lead the world and become an important part of global communication.

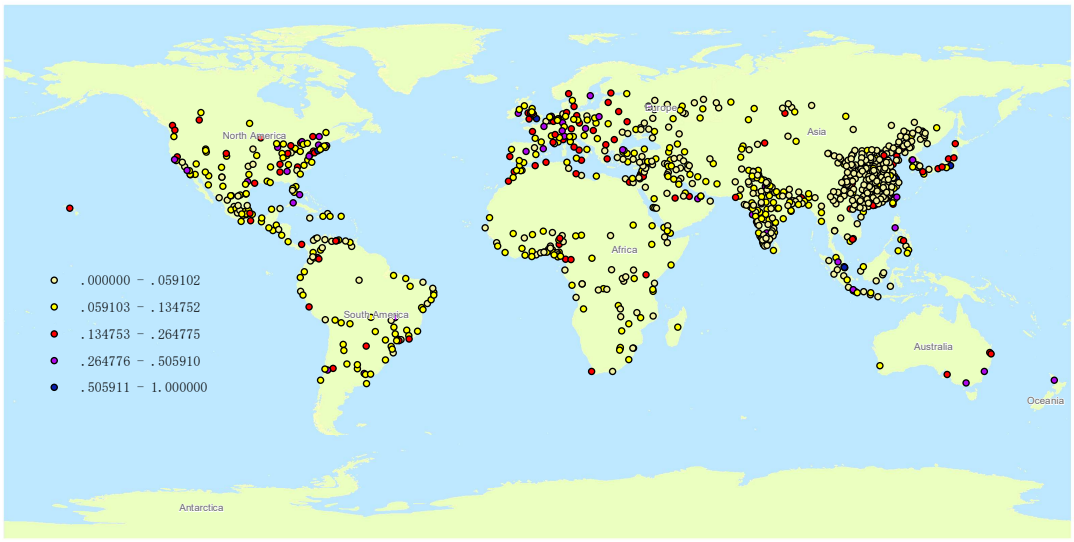


Figure 5-11 Global Connectivity Scores of Cities Worldwide

In the comparison of the global contact index between European and American cities and other countries in the world, the peak of the global contact index of European and American cities is located on the left side of other cities in the world, indicating that it is superior to other countries in global relations, but overall, The gap between European and American cities and other parts of the world is small, and the advantages of Europe and the United States are not obvious.

5.6.2 Global Top 20: Global Centers in both Geographical and Economic Terms

The world's top ten cities in terms of global connectivity are: New York, London, Hong Kong, Beijing, Singapore, Shanghai, Paris, Tokyo, Paris, Moscow, and Chicago. The top 20 cities are located in East Asia, the Middle East, Western Europe, North America, and Oceania. They are the economic and cultural centers of different continents. Three of the eight Asian cities are Chinese cities, indicating that in recent years, the global links between China and China have been continuously strengthened, showing a trend of catching up with developed countries in Europe and America.

5.6.3 Comparison between Countries: China and the United States Lead the World in Global Connectivity

The United States and China accounts for the largest share of the global top 100 cities by global connectivity. Four U.S. cities and three Chinese rank in the top 20. Overall, the G7's global contact index is significantly higher than the BRICS countries. The differences between the G7 countries in Germany, Italy, Japan and Canada are small, and the global links between China and the BRICS cities are quite different.

5.6.4 Comparison between Urban Clusters

The top three urban agglomerations are from the United States, the United Kingdom, and Germany, respectively, the northeastern US urban agglomeration, the London Liverpool urban agglomeration, and the Northern California urban agglomeration. It is from the Pearl River Delta urban agglomerations of China and Brazil, the Yangtze River Delta urban agglomerations, and the Seoul national urban agglomerations.

5.7 Analysis of Human Capital Potential Index: Talent Flow Direction Determines the Potential Pattern of Human Capital in Global Cities

5.7.1 Overall Pattern: Developed Countries Lead in Human Capital and Immigration Policy Decides Human Capital Potential

From a global perspective, the global human capital potential index presents two levels of geographical distribution and quantity differentiation. The cities with high human capital potential are mainly located in Europe and the United States, and Asian cities are trending later.

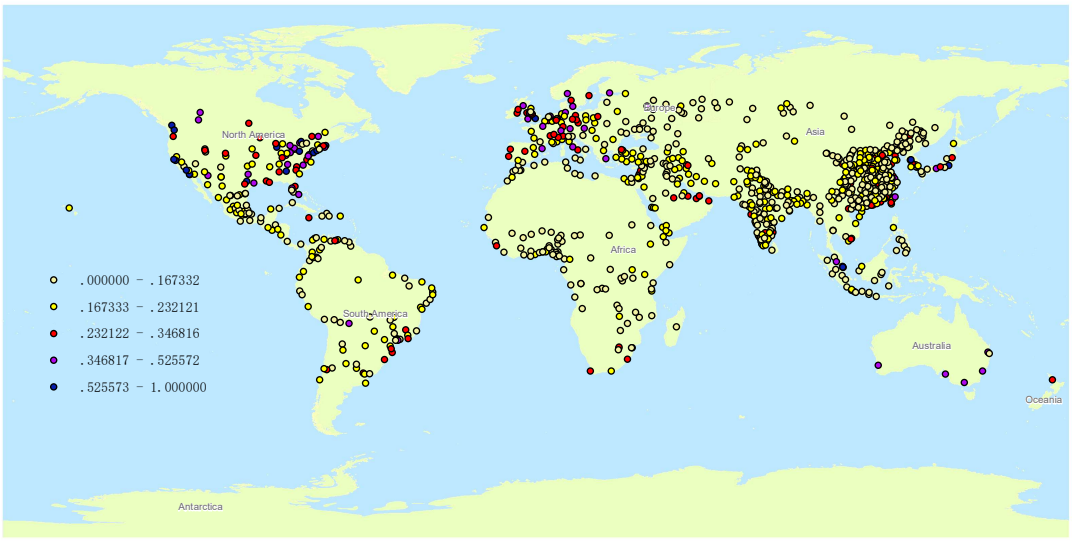


Figure 5-12 Global Distribution of Human Capital

5.7.2 Global Top 20 Cities: Concentrated in the United States

The top ten cities in terms of global urban human capital potential are: New York, Tokyo, Los Angeles, London, Boston, Chicago, Philadelphia, Seattle, San Jose, and Toronto. Among them, the top 20 cities are all located in 14 in North America, and all 13 cities are from the United States. This shows that in the performance of human capital in global cities, the competitiveness of American cities is obvious, and the performance of urban human capital in other regions is better. There was some improvement in the previous year.

5.7.3 Comparison between Countries: American Cities Dominant the Human Capital Ranking and Central European Cities Have Seen a Rise in Human Capital Scores

From the perspective of the global pattern, in the top 100 cities with global human capital potential, the US cities occupy 29 seats alone. Compared with other continents, they have an absolute advantage in terms of quantity. In addition to the United States, China has entered the human capital potential of global cities. There are also more than one hundred cities, occupying 16 seats. However, from the perspective of data observations, the differences between China and the United States are large.

5.7.4 Comparison between Urban Clusters: Urban Clusters Increase the Advantage of Leaders

From the perspective of the average human capital, the top three urban agglomerations are from the United States and the United Kingdom, namely the northeastern US urban agglomeration, the London-Liverpool urban cluster and the Midwestern urban agglomeration. The three lower ranked urban agglomerations are The Yangtze River Delta urban agglomeration, the Mumbai urban agglomeration, and the Seoul national urban agglomeration. From the perspective of the number of human capital entering the world's 100 cities, the number of cities in the United States and China entering the world is more than 100. The urban agglomerations of other countries have entered the world's 100 cities.

5.8 Infrastructure: GDP and Demand Decide the Development of Infrastructure

5.8.1 Overall Pattern: Correlation between Economic Growth and Infrastructure Development

In the world's infrastructure rankings, Europe, Asia and Asia have an absolute advantage, with high infrastructure potential index, small coefficient of variation, and high ranking. The rest of the developing countries have large urban infrastructure factors and the overall level of the region is poor. From the 2017 infrastructure map, it is obvious that the cities with better infrastructure construction are mostly located on the east coast of Asia, the east and west coasts of North America, and most of the European continent, while Africa has few distributions.

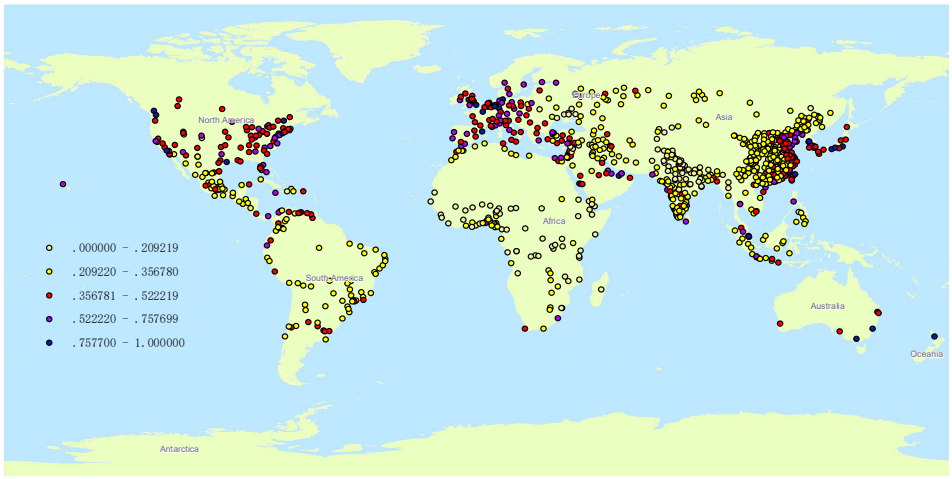


Figure 5-13 Global Distribution of Urban Infrastructure

5.8.2 Global Top 20: Shared Use of Infrastructure

Among the top 20 countries in the global infrastructure, Asian countries account for nearly half of the country. European and American countries showed a downward trend with only 9 seats. In the top ten cities, Japan and China each have two seats. From this point of view, Japan and

China attach importance to the construction of urban infrastructure in the development, and the government attaches great importance to this sector.

5.8.3 Comparison between Countries: China Balances the U.S. in Infrastructure Density

China and the United Stated have almost the same infrastructure density. Although the United States has a slightly higher overall urban infrastructure index than China, China's best infrastructure cities are ranked higher in the world than the United States, and there are more cities in the world's top 100 cities, reflecting the importance China attaches to infrastructure in recent years. And gradually develop towards the international high-level countries.

5.8.4 Comparison between Urban Clusters: Urban Clusters in China are Catching up with Developed Countries in Infrastructure Development

China's major urban agglomerations, the Yangtze River Delta urban agglomeration, the Pearl River Delta urban agglomeration and the Beijing-Tianjin-Hebei urban agglomerations are no different from those in Europe and the United States. The average value of infrastructure is similar to that of European and American countries, but the coefficient of variation is still higher than that of European and American countries. Except for China, the infrastructure construction of urban agglomerations in developing countries is relatively poor, and there are no cities that have entered the top 100.

5.9 Econometric analysis of global cities' sustainable competitiveness: technological innovation and human capital potential have the greatest impact, and positive effects are amplified through direct, indirect and feedback effects.

5.9.1 Construction of the Empirical Model and Selection of Variables

The empirical model of sustainable competitiveness of Cities is expressed as

$$sus\_compete = \delta W \times sus\_compete + \alpha \iota_n + X\beta + WX\theta + u$$
$$u = \lambda Wu + \varepsilon$$

Where $sus\_compete$ denotes the level of sustainable competitiveness of a city; X is an explanatory variable matrix that affects the sustainable competitiveness of the city, including economic vitality (economic), environmental quality (environ), social inclusiveness (society), technological innovation (tech), global connectivity (connect), government management (govern), human capital (psacp) and infrastructure (infrastru):

$$X = (economic, environ, society, tech, connect, govern, psacp, \inf rastru)' .$$

Data used in this study come from the database of the City and Competitiveness Research Center, Chinese Academy of Social Sciences.

5.9.2 Optimal Model: General Netting Spatial Model (GNS)

The analysis results of the stepwise regression method are shown in Table 5-9-1.

Table 5-9-1 Stepwise Regression Results of Sustainable Competitiveness of Cities Worldwide

	OLS	SAR	SEM	SLX	SDM	SDEM	SAC	GNS
constant	-0.129***	0.028*	-0.202***	-0.057**	-0.012	-0.076**	-0.030**	-0.007
	（-9.102）	（1.675）	（-12.15）	（-2.065）	（-0.492）	（-2.228）	（-1.252）	（-0.277）
economic	0.129***	0.099***	0.096***	0.946***	0.091***	0.097***	0.097***	0.091***
	（17.584）	（14.341）	（14.056）	（12.753）	（13.513）	（14.411）	（13.961）	（13.428）
environ	0.090***	0.067***	0.061***	0.042***	0.045***	0.047***	0.065***	0.045***
	（27.198）	（20.302）	（12.865）	（7.301）	（8.542）	（8.945）	（15.466）	（8.632）
Society	0.069***	0.065***	0.076***	0.078***	0.078***	0.078***	0.075***	0.078***
	（14.982）	（15.581）	（16.332）	（15.465）	（16.938）	（17.390）	（16.294）	（16.693）
Tech	0.147***	0.137***	0.134***	0.138***	0.135***	0.138***	0.138***	0.135***
	（32.923）	（33.833）	（35.071）	（33.145）	（35.787）	（35.266）	（35.267）	（35.545）
Connect	0.032***	0.031***	0.025***	0.029***	0.027***	0.029***	0.028***	0.026***
	（10.825）	（11.436）	（10.190）	（10.415）	（10.728）	（10.825）	（11.007）	（10.573）
Govern	0.085***	0.064***	0.063***	0.056***	0.056***	0.061***	0.062***	0.056***
	（10.402）	（8.524）	（7.620）	（6.160）	（6.816）	（7.559）	（7.777）	（6.665）
Psacp	0.169***	0.166***	0.159***	0.156***	0.155***	0.156***	0.167***	0.155***
	（19.619）	（21.430）	（21.898）	（19.564）	（21.353）	（20.531）	（22.275）	（21.328）
infrastru	0.056***	0.045***	0.094***	0.089***	0.096***	0.087***	0.073***	0.096***
	（7.486）	（6.527）	（11.403）	（9.467）	（11.148）	（10.557）	（9.268）	（11.152）
W × economic	--	--	--	0.067***	-0.012	0.071***	--	-0.024
				（4.329）	（-0.798）	（4.093）		（-1.415）
W × environ	--	--	--	0.060***	0.006	0.057***	--	-0.001
				（7.429）	（0.735）	（6.352）		（-0.147）
W × Society	--	--	--	-0.004	-0.035***	0.003	--	-0.042***
				（-0.509）	（-4.331）	（0.387）		（-4.645）
W × Tech	--	--	--	0.035***	-0.048***	0.028***	--	-0.059***
				（3.562）	（-4.430）	（2.769）		（-4.264）
W × Connect	--	--	--	0.021***	0.003	0.016**	--	0.001
				（3.063）	（0.467）	（2.348）		（0.048）
W × Govern	--	--	--	0.050***	-0.010	0.025	--	-0.015
				（2.858）	（-0.642）	（1.317）		（-0.943）

W × Psacp	--	--	--	0.005 （0.254）	-0.091*** （-5.097）	-0.002 （-0.112）	--	-0.103*** （-5.267）
W × infrastru	--	--	--	-0.094 （-5.930）	-0.114*** （-0.785）	-0.097*** （-5.288）	--	-0.115*** （-8.166）
ρ	--	0.236*** （14.659）	--	--	0.539*** （13.567）	--	0.152*** （7.559）	0.613*** （9.032）
λ	--	--	0.762*** （27.858）	--	--	0.525*** （12.409）	0.522*** （11.627）	-0.124 （-1.110）
R^2	0.934	0.946	0.953	0.946	0.955	0.954	0.951	0.956
$adj-R^2$	0.933	0.945	0.952	0.945	0.954	0.953	0.950	0.955
σ^2	0.008	0.006	0.005	0.006	0.005	0.005	0.006	0.005
Durbin-Watson	2.132	--	--	2.165	--	--	--	--
Log-likelihood	532.103	1134.448	1150.305	639.432	1207.382	1198.229	1164.782	1207.958
LM-SAR	199.777*** [0.000]	--	--	--	--	--	--	--
Robust LM-SAR	110.628*** [0.000]	--	--	--	--	--	--	--
LM-SEM	170.236*** [0.000]	--	--	--	--	--	--	--
Robust LM-SEM	81.084*** [0.000]	--	--	--	--	--	--	--

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively, and the t-statistics for parameter estimation are enclosed in parentheses.

5.9.3 Direct and Indirect Effects: Feedback Effects on Factors

Table 5-9-3 Direct, Indirect and Overall Effect of Cities on Sustainable Competitiveness

	SAR	SEM	SLX	SDM	SDEM	SAC	GNS
				Direct Effect			
economic	0.099*** （14.937）	0.096*** （14.056）	-0.057** （-2.065）	0.095*** （13.562）	-0.076** （-2.228）	0.097*** （14.617）	0.095*** （13.710）
environ	0.068*** （21.702）	0.061*** （12.865）	0.946*** （12.753）	0.048*** （9.265）	0.097*** （14.411）	0.065*** （15.832）	0.048*** （9.905）
Society	0.066*** （15.941）	0.076*** （16.332）	0.042*** （7.301）	0.076*** （17.180）	0.047*** （8.945）	0.075*** （16.509）	0.079*** （16.973）

Tech	0.139*** （33.187）	0.134*** （35.071）	0.078*** （15.465）	0.138*** （35.966）	0.078*** （17.390）	0.138*** （35.423）	0.138*** （32.974）
Connect	0.031*** （11.388）	0.025*** （10.190）	0.138*** （33.145）	0.028*** （11.038）	0.138*** （35.266）	0.028*** （11.233）	0.029*** （10.566）
Govern	0.065*** （8.653）	0.063*** （7.620）	0.029*** （10.415）	0.058*** （7.388）	0.029*** （10.825）	0.063*** （7.721）	0.057*** （7.120）
Psacp	0.167*** （22.510）	0.159*** （21.898）	0.056*** （6.160）	0.154*** （20.426）	0.061*** （7.559）	0.168*** （22.427）	0.154*** （20.163）
infrastru	0.045*** （7.051）	0.094*** （11.403）	0.156*** （19.564）	0.090*** （10.861）	0.156*** （20.531）	0.073*** （9.461）	0.089*** （10.888）
				Indirect Effect			
economic	0.029*** （10.835）	--	--	0.075*** （2.723）	--	0.017*** （6.583）	0.076** （2.429）
environ	0.020*** （12.278）	--	--	0.064*** （5.955）	--	0.012*** （6.818）	0.065*** （5.405）
Society	0.019*** （9.774）	--	--	0.014 （0.958）	--	0.013*** （6.075）	0.017 （0.953）
Tech	0.041*** （11.271）	--	--	0.052*** （2.869）	--	0.024*** （6.43）	0.058** （2.550）
Connect	0.009*** （8.301）	--	--	0.036** （2.685）	--	0.005*** （5.425）	0.042** （2.486）
Govern	0.019*** （7.484）	--	--	0.041 （1.407）	--	0.011*** （5.164）	0.046 （1.336）
Psacp	0.049*** （10.007）	--	--	-0.016 （-0.466）	--	0.029*** （6.139）	-0.022 （-0.513）
infrastru	0.013*** （6.262）	--	--	-0.127*** （-5.025）	--	0.012*** （5.789）	-0.009*** （-4.669）
				Total Effect			
economic	0.129*** （15.725）	--	--	0.169*** （5.852）	--	0.114*** （14.911）	0.171*** （5.199）
environ	0.088*** （23.668）	--	--	0.112*** （12.467）	--	0.077*** （16.535）	0.114*** （10.812）
Society	0.085***	--	--	0.092***	--	0.088***	0.096***

	（15.709）			（12.467）	（15.364）	（5.286）
Tech	0.179*** （29.759）	--	--	0.190*** （9.839）	0.163*** （27.055）	0.196*** （8.133）
Connect	0.040*** （11.249）	--	--	0.065*** （4.446）	0.033*** （10.595）	0.070*** （3.924）
Govern	0.084*** （8.763）	--	--	0.099*** （3.364）	0.074*** （7.695）	0.103*** （3.024）
Psacp	0.217*** （20.271）	--	--	0.138*** （3.749）	0.197*** （19.141）	0.132*** （2.967）
infrastru	0.058*** （7.085）	--	--	-0037 （-1.510）	0.086*** （9.532）	0.080* （1.721）

Note: ***, **, and * denote statistical significance at 1%, 5%, and 10%, respectively, and the t-statistics for parameter estimation are enclosed in parentheses.

Appendix

Editors and Authors (in no particular order)

Ni Pengfei, male, acquired his Ph.D. in Economics from Nankai University and currently serves as Director of the City and Competitiveness Research Center, CASS, assistant to the President, research fellow, and doctoral advisor at NAES, CASS. He won the 11th Sun Yefang Economic Science Award. His research interests include national competitiveness, urban competitiveness, urban economics and real estate economics.

Marco Kamiya, male, is head of the Urban Economy and Finance Branch of UN-Habitat and has published Economic Foundations for Sustainable Urbanization and Finance for City Leaders handbook (with other authors). His research interests include municipal finance, the economics of urban expansion, and local infrastructure investment policy.

Shen Jianfa, male, research fellow at Chinese University of Hong Kong.

Peter Kresl, male, is a professor at Bucknell University and conducts research on urban economics, competitiveness and world city networks.

Oswaldo Molina, male, research fellow at Universidad del Pacífico, Peru

Li Bo, male, is an instructor at Tianjin University of Technology and has a doctoral degree in economics. His research interests include urban and regional economics.

Li Qihang, male, is an associate professor at Shandong University of Finance and Economics, and has a doctoral degree in economics. His research interests include industry economics, regional economics and microeconometrics

Liu Xiaonan, female, is a Ph.D. candidate at the Graduate School of Chinese Academy of Social Sciences and conducts research on urban and real estate finance.

Wang Yufei, female, is a lecturer at the School of Economics and Management, Beijing University of Posts and Telecommunications and has a doctoral degree in management. Her research interests include urban and regional economics.

Gong Weijin, male, is postdoctoral research fellow at NAES, CASS. His research interests include real estate economics, coordinated regional development and regional distribution of poverty.

Ma Hongfu, male, is a lecturer at Tianjin University of Finance and Economics

and has a doctoral degree in economics. His research interests include regional and urban economics.

Shen Li, male, is a Ph.D. candidate in Finance at the Graduate School of the Chinese Academy of Social Sciences. His research interests include urban and real estate finance.

Cao Qingfeng, male, is a lecturer at Tianjin University of Finance and Economics. His research interests include urban and regional economics.

Wang Haibo, male, is a postdoctoral research fellow at NAES, CASS. His research interests include urban competitiveness and real estate economics.

Xu Haidong, male, is a Ph.D. candidate in Finance at the Graduate School of the Chinese Academy of Social Sciences. His research interests include urban and real estate finance.