

Appendix

Table A1 Prefectural-level divisions in China's five urban agglomerations

Urban agglomerations	Prefectural-level divisions
Beijing-Tianjin-Hebei Urban Agglomeration (BTH) (13 cities)	Beijing, Tianjin, Shijiazhuang, Tangshan, Qinhuangdao, Handan, Xingtai, Baoding, Zhangjiakou, Chengde, Cangzhou, Langfang, Hengshui
Yangtze River Delta Urban Agglomeration (YRD) (26 cities)	Shanghai, Nanjing, Wuxi, Changzhou, Suzhou, Nantong, Yancheng, Yangzhou, Zhenjiang, Taizhou (泰州市), Hangzhou, Ningbo, Jiaxing, Huzhou, Shaoxing, Jinhua, Zhoushan, Taizhou (台州市), Hefei, Wuhu, Maanshan, Tongling, Anqing, Chuzhou, Chizhou, Xuancheng
Pearl River Delta Urban Agglomeration (PRD) (9 cities)	Guangzhou, Shenzhen, Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, Zhaoqing
Chengdu-Chongqing Urban Agglomeration (CYA) (16 cities)	Chongqing, Chengdu, Zigong, Luzhou, Deyang, Mianyang, Suining, Neijiang, Leshan, Nanchong, Meishan, Yibin, Guang'an, Dazhou, Ya'an, Ziyang
Urban Agglomeration in Middle Reaches of the Yangtze River (MYR) (28 cities)	Nanchang, Jiujiang, Jingdezhen, Yingtan, Xinyu, Yichun, Pingxiang, Shangrao, Fuzhou, Ji'an, Wuhan, Huangshi, Ezhou, Huanggang, Xiaogan, Xianning, Xiangfan, Yichang, Jingzhou, Jingmen, Changsha, Zhuzhou, Xiangtan, Yueyang, Yiyang, Changde, Hengyang, Loudi

Notes: Three county-level cities (Xiantao, Qianjiang, Tianmen) in MYR are not included because of data limitation

Table A2 Descriptive statistics of BTH during 2003–2016

Variables	Sample	Mean	SD	Min.	Max.
<i>lnnoindex</i>	182	0.88	1.911	-1.897	6.967
<i>lnpopulation</i>	182	6.492	0.461	5.611	7.217
<i>lnGDP</i>	182	16.028	0.859	14.670	18.172
<i>lnland</i>	182	9.574	0.518	8.761	10.59
<i>lnFDI</i>	182	10.691	1.518	7.042	14.941
<i>indstru</i>	182	1.435	1.310	-1.705	7.316
<i>govfiscal</i>	182	0.011	0.013	0.001	0.066
<i>lnscihc</i>	182	0.079	1.463	-1.560	4.234
<i>lninternet</i>	182	4.246	1.289	1.126	10.696
<i>lnroad</i>	182	2.517	0.321	1.723	3.123

Table A3 Descriptive statistics of YRD during 2003–2016

Variables	Sample	Mean	SD	Min	Max
<i>lnnoindex</i>	364	1.056	2.185	-4.605	6.294
<i>lnpopulation</i>	364	5.982	0.655	4.261	7.279
<i>lnGDP</i>	364	15.896	0.981	13.535	18.281
<i>lnland</i>	364	8.786	0.673	7.015	9.739
<i>lnFDI</i>	364	11.311	1.448	7.199	14.431
<i>indstru</i>	364	1.136	1.058	-2.143	4.852
<i>govfiscal</i>	364	0.026	0.020	0.000	0.126
<i>lnscihc</i>	364	-0.416	1.199	-2.996	3.240
<i>lninternet</i>	364	3.986	1.346	0.432	8.846
<i>lnroad</i>	364	2.542	0.465	0.652	3.571

Table A4 Descriptive statistics of PRD during 2003–2016

Variables	Sample	Mean	SD	Min	Max
<i>lninnoindex</i>	126	1.497	2.120	-2.207	6.543
<i>lnpopulation</i>	126	5.642	0.605	4.407	6.768
<i>lnGDP</i>	126	16.316	0.841	15.059	17.770
<i>lnland</i>	126	8.399	0.816	7.413	9.646
<i>lnFDI</i>	126	11.963	0.730	10.52	13.420
<i>indstru</i>	126	0.966	1.122	-2.489	4.682
<i>govfiscal</i>	126	0.029	0.021	0.002	0.096
<i>lnscihc</i>	126	-0.381	1.304	-2.120	2.848
<i>lninternet</i>	126	4.553	0.936	1.929	6.641
<i>lnroad</i>	126	2.848	0.702	1.261	4.304

Table A5 Descriptive statistics of CYA during 2003–2016

Variables	Sample	Mean	SD	Min.	Max
<i>lninnoindex</i>	224	-0.329	1.788	-3.912	5.025
<i>lnpopulation</i>	224	6.241	0.638	5.028	8.129
<i>lnGDP</i>	224	15.088	0.820	13.812	17.375
<i>lnland</i>	224	9.290	0.695	8.383	11.325
<i>lnFDI</i>	224	8.589	2.022	3.219	13.941
<i>indstru</i>	224	1.416	1.334	-2.754	6.565
<i>govfiscal</i>	224	0.007	0.006	0.000	0.029
<i>lnscihc</i>	224	-1.019	1.416	-2.996	2.853
<i>lninternet</i>	224	3.124	1.376	-0.609	7.336
<i>lnroad</i>	224	1.620	0.540	0.000	2.639

Table A6 Descriptive statistics of MYR during 2003–2016

Variables	Sample	Mean	SD	Min.	Max.
<i>lninnoindex</i>	392	-0.321	1.588	-3.219	4.974
<i>lnpopulation</i>	392	5.967	0.583	4.647	6.730
<i>lnGDP</i>	392	15.162	0.667	13.589	17.136
<i>lnland</i>	392	9.218	0.695	7.316	10.141
<i>lnFDI</i>	392	10.118	1.141	6.999	13.656
<i>indstru</i>	392	1.265	1.129	-1.422	5.649
<i>govfiscal</i>	392	0.010	0.011	0.001	0.163
<i>lnscihc</i>	392	-0.849	0.983	-2.303	2.088
<i>lninternet</i>	392	3.143	1.053	0.091	6.192
<i>lnroad</i>	392	2.245	0.496	0.647	3.367

Table A7 Decomposition results of drivers of city technological innovation capacity

UA	BTH		YRD		PRD		CYA		MYR	
	W_{Econ} (1)	W_{Inno} (2)	W_{Econ} (3)	W_{Inno} (4)	W_{Inno} (5)	W_{Econ} (6)	W_{Inno} (7)	W_{Econ} (8)	W_{Inno} (9)	
Direct										
lnGDP	0.482*** (0.155)	-0.454*** (0.153)	-0.596** (0.175)	-0.507*** (0.169)	0.251 (0.248)	-1.095*** (0.311)	-1.071*** (0.305)	0.043 (0.173)	-0.017 (0.170)	
lnpopulation	0.821 (0.701)	0.791 (0.695)	0.448 (0.501)	0.311 (0.493)	-0.240 (0.180)	0.538 (1.191)	0.395 (1.170)	-1.944*** (0.700)	-2.090*** (0.683)	
lnland	0.345 (0.502)	0.215 (0.484)	0.104 (0.368)	0.199 (0.363)	-5.575* (3.346)	0.439 (1.400)	0.594 (1.377)	-2.764** (1.348)	-2.458* (1.312)	
lnFDI	-0.002 (0.038)	0.001 (0.038)	-0.026 (0.034)	-0.049 (0.033)	-0.234** (0.113)	-0.017 (0.021)	-0.019 (0.021)	-0.066* (0.038)	-0.068* (0.037)	
indstru	0.000 (0.011)	0.000 (0.017)	0.035** (0.017)	0.040** (0.017)	-0.067** (0.031)	-0.011 (0.017)	-0.012 (0.017)	-0.032* (0.017)	-0.033* (0.017)	
govfiscal	15.818*** (2.737)	16.990*** (2.562)	12.515*** (1.593)	12.174*** (1.557)	5.496** (2.338)	10.100** (4.553)	9.489** (4.428)	2.196 (1.365)	2.140 (1.324)	
lnscihc	-0.017 (0.076)	-0.013 (0.076)	0.112 (0.070)	0.074 (0.068)	0.290*** (0.096)	0.028 (0.072)	0.035 (0.071)	0.067 (0.051)	0.071 (0.049)	
lninternet	-0.015 (0.019)	-0.014 (0.019)	0.133** (0.059)	0.153*** (0.059)	-0.024 (0.089)	-0.104*** (0.037)	-0.100*** (0.026)	-0.110*** (0.039)	-0.120*** (0.038)	
lnroad	-0.068 (0.101)	-0.080 (0.100)	0.378*** (0.060)	0.392*** (0.060)	0.097 (0.131)	0.165** (0.071)	0.172** (0.070)	0.162*** (0.060)	0.174*** (0.058)	
Indirect										
lnGDP	-0.084 (0.086)	0.005 (0.093)	-0.173* (0.092)	0.063 (0.063)	0.014 (0.054)	0.090 (0.158)	0.145 (0.156)	-0.003 (0.016)	0.004 (0.039)	
lnpopulation	0.140 (0.192)	-0.021 (0.192)	0.133 (0.161)	-0.042 (0.092)	-0.020 (0.047)	-0.046 (0.199)	-0.039 (0.237)	0.090 (0.169)	0.466** (0.228)	
lnland	0.066 (0.136)	-0.016 (0.103)	0.024 (0.109)	-0.022 (0.067)	-0.504 (1.083)	-0.040 (0.235)	0.102 (0.299)	0.125 (0.250)	0.532 (0.329)	
lnFDI	-0.001 (0.009)	-0.001 (0.008)	-0.007 (0.010)	0.006 (0.008)	-0.022 (0.044)	0.002 (0.004)	0.003 (0.005)	0.003 (0.006)	0.015 (0.010)	
indstru	0.000 (0.002)	-0.000 (0.002)	0.010 (0.006)	-0.005 (0.005)	-0.005 (0.011)	0.001 (0.003)	0.002 (0.004)	0.001 (0.003)	0.007 (0.005)	
govfiscal	2.484 (2.269)	-0.448 (3.225)	3.551** (1.469)	-1.517 (1.395)	0.513 (1.017)	-0.899 (1.545)	-1.298 (1.509)	-0.093 (0.214)	-0.466 (0.326)	
lnscihc	-0.003 (0.016)	-0.001 (0.014)	0.032 (0.025)	-0.009 (0.015)	0.027 (0.050)	-0.002 (0.013)	-0.006 (0.016)	-0.003 (0.007)	-0.016 (0.013)	
lninternet	-0.002 (0.005)	0.001 (0.004)	0.038 (0.023)	-0.020 (0.020)	-0.002 (0.019)	0.009 (0.015)	0.014 (0.015)	0.006 (0.009)	0.027** (0.013)	
lnroad	-0.010 (0.025)	0.003 (0.024)	0.106** (0.043)	-0.050 (0.050)	0.012 (0.030)	-0.015 (0.026)	-0.025 (0.028)	-0.007 (0.014)	-0.039** (0.019)	
Total										
lnGDP	-0.566*** (0.211)	-0.448 (0.194)	-0.768*** (0.250)	-0.444*** (0.161)	0.265 (0.268)	-1.005*** (0.334)	-0.926*** (0.322)	0.039 (0.166)	-0.013 (0.133)	
lnpopulation	0.962 (0.829)	0.771 (0.690)	0.581 (0.650)	0.269 (0.427)	-0.260 (0.198)	0.492 (1.085)	0.356 (1.008)	-1.853*** (0.686)	-1.623*** (0.535)	
lnland	0.412 (0.607)	0.198 (0.483)	0.129 (0.471)	0.177 (0.318)	-6.079 (3.857)	0.399 (1.274)	0.492 (1.175)	-2.639** (1.321)	-1.926* (1.062)	
lnFDI	-0.003 (0.045)	0.000 (0.037)	-0.033 (0.043)	-0.043 (0.029)	-0.256* (0.134)	-0.015 (0.019)	-0.016 (0.018)	-0.064* (0.037)	-0.053* (0.029)	
indstru	0.000 (0.013)	0.000 (0.011)	0.045** (0.022)	0.035** (0.015)	-0.073** (0.034)	-0.010 (0.016)	-0.010 (0.014)	-0.031* (0.017)	-0.026* (0.013)	
govfiscal	18.302*** (3.468)	16.542*** (4.134)	16.066*** (2.623)	10.657*** (1.933)	6.009** (2.846)	9.201** (4.346)	8.191** (4.155)	2.103 (1.347)	1.674 (1.064)	
lnscihc	-0.020 (0.087)	-0.013 (0.074)	0.144 (0.092)	0.065 (0.061)	0.316*** (0.119)	0.026 (0.066)	0.029 (0.061)	0.064 (0.049)	0.055 (0.038)	
lninternet	-0.018 (0.023)	-0.014 (0.019)	0.171** (0.078)	0.134** (0.054)	-0.026 (0.101)	-0.095*** (0.037)	-0.086** (0.035)	-0.104*** (0.038)	-0.093*** (0.030)	
lnroad	-0.078 (0.119)	-0.078 (0.100)	0.485*** (0.086)	0.342*** (0.064)	0.109 (0.148)	0.150** (0.068)	0.147** (0.061)	0.155*** (0.059)	0.135*** (0.046)	

Notes: 1) The robust standard errors are in parentheses; * $P < 0.1$, ** $P < 0.05$, *** $P < 0.01$. 2) The regression results based on economic distance matrix are not included in the sample of Pearl River Delta Urban Agglomeration (PRD) since it failed to pass the spatial autocorrelation significance tests under economic distance matrix