

Table S1 The Province List

No	Province	Year		Urbanization		GDP ('0000)		RPA		RPM		MPA		HPR		HPM		HPA	
		From	To	First year	Last year	First year	Last year	First year	Last year	First year	Last year	First year	Last year	First year	Last year	First year	Last year	First year	Last year
1	Beijing	2000	2022	3.45	7.06	2.50	19.00	0.24	0.12	0.55	0.18	0.43	0.68	0.00	0.76	0.00	0.05	0.00	0.09
2	Tianjin	2000	2022	2.57	5.71	1.62	11.79	0.19	0.25	0.31	0.18	0.59	1.40	0.00	0.84	0.00	0.86	0.00	0.21
3	Hebei	2000	2022	0.35	1.61	0.70	5.65	0.12	0.12	0.33	0.17	0.38	0.73	0.00	0.64	0.00	0.05	0.00	0.08
4	Shanxi	2000	2022	0.56	1.77	0.57	7.35	0.04	0.14	0.29	0.25	0.13	0.56	0.00	0.50	0.00	0.05	0.00	0.07
5	Neimenggu	2000	2022	0.74	2.18	0.65	9.74	0.04	0.28	1.50	0.37	0.03	0.76	0.00	0.12	0.00	0.02	0.00	0.04
6	Liaoning	2000	2022	1.30	2.70	1.12	6.84	0.09	0.07	0.37	0.16	0.23	0.46	0.00	1.59	0.00	0.08	0.00	0.12
7	Jilin	2000	2022	0.99	1.76	0.66	5.43	0.14	0.18	0.72	0.26	0.19	0.67	0.00	0.49	0.00	0.05	0.00	0.09
8	Heilongjiang	2000	2022	1.06	1.96	0.75	5.09	0.15	0.18	1.03	0.28	0.14	0.65	0.00	0.67	0.00	0.07	0.00	0.12
9	Shanghai	2000	2022	2.91	8.38	3.03	18.05	0.10	0.02	0.20	0.07	0.50	0.36	0.00	1.40	0.00	0.02	0.00	0.04
10	Jiangsu	2000	2022	0.71	2.91	1.18	14.35	0.04	0.04	0.09	0.05	0.47	0.89	0.00	2.15	0.00	0.05	0.00	0.09
11	Zhejiang	2000	2022	0.95	2.76	1.35	11.90	0.21	0.08	0.05	0.06	3.86	1.27	0.00	2.36	0.00	0.09	0.00	0.19
12	Anhui	2000	2022	0.39	1.51	0.51	7.29	0.04	0.10	0.31	0.11	0.13	0.89	0.00	1.70	0.00	0.09	0.00	0.17
13	Fujian	2000	2022	0.71	2.35	1.12	12.36	0.04	0.07	0.25	0.12	0.15	0.64	0.00	2.22	0.00	0.10	0.00	0.16
14	Jiangxi	2000	2022	0.38	1.64	0.49	6.90	0.06	0.10	0.46	0.13	0.13	0.78	0.00	1.80	0.00	0.10	0.00	0.18
15	Shandong	2000	2022	0.61	1.82	0.93	8.61	0.03	0.08	0.12	0.10	0.24	0.77	0.00	1.07	0.00	0.05	0.00	0.09
16	Henan	2000	2022	0.30	1.33	0.55	5.89	0.02	0.04	0.39	0.10	0.06	0.42	0.00	1.57	0.00	0.05	0.00	0.07
17	Hubei	2000	2022	0.68	1.83	0.61	9.04	0.04	0.05	0.24	0.09	0.15	0.63	0.00	1.50	0.00	0.05	0.00	0.08
18	Hunan	2000	2022	0.42	1.52	0.56	7.19	0.10	0.09	0.64	0.14	0.16	0.63	0.00	1.56	0.00	0.08	0.00	0.14
19	Guangdong	2000	2022	1.22	2.97	1.28	10.22	0.05	0.08	0.10	0.06	0.49	1.28	0.00	1.57	0.00	0.06	0.00	0.13
20	Guangxi	2000	2022	0.39	1.26	0.47	5.19	0.33	0.08	0.70	0.13	0.48	0.63	0.00	1.44	0.00	0.07	0.00	0.11
21	Hainan	2000	2022	0.67	1.59	0.68	6.73	0.18	0.07	0.15	0.08	1.17	0.86	0.00	4.06	0.00	0.16	0.00	0.30

22	Chongqing	2000	2022	0.55	2.44	0.64	8.90	0.02	0.06	0.18	0.12	0.11	0.55	0.00	1.77	0.00	0.07	0.00	0.11
23	Sichuan	2000	2022	0.36	1.40	0.50	6.76	0.08	0.10	0.32	0.13	0.25	0.78	0.00	0.93	0.00	0.05	0.00	0.09
24	Guizhou	2000	2022	0.31	1.21	0.28	5.19	0.69	0.10	1.60	0.11	0.43	0.88	0.00	1.53	0.00	0.08	0.00	0.15
25	Yunnan	2000	2022	0.30	1.07	0.48	6.09	0.31	0.16	0.79	0.18	0.39	0.91	0.00	0.56	0.00	0.05	0.00	0.09
26	Xizang	2000	2022	0.24	0.60	0.46	5.89	0.00	0.52	0.00	0.57	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00
27	Shanxi	2000	2022	0.48	1.78	0.50	8.30	0.08	0.21	0.56	0.24	0.15	0.87	0.00	0.48	0.00	0.05	0.00	0.10
28	Gansu	2000	2022	0.32	1.18	0.42	4.46	0.02	0.15	0.68	0.22	0.03	0.68	0.00	1.04	0.00	0.09	0.00	0.15
29	Qinghai	2000	2022	0.53	1.60	0.51	6.09	0.00	0.10	0.61	0.20	0.00	0.53	0.00	0.34	0.00	0.02	0.00	0.04
30	Ningxia	2000	2022	0.48	1.97	0.54	7.03	0.06	0.17	0.47	0.18	0.13	0.95	0.00	0.50	0.00	0.04	0.00	0.08
31	Xinjiang	2000	2022	0.53	1.38	0.74	6.97	0.04	0.13	0.39	0.24	0.09	0.53	0.00	0.27	0.00	0.02	0.00	0.04

Table S2. Compare Gompertz vs. logistic using AIC and BIC.

	Gompertz	Logstic
AIC	1927.508	1972.053
BIC	1945.786	1985.762

Table S3. Goodness-of-fit metrics and 95% confidence intervals for Gompertz parameters in Model A-C4.

Specification	Model A	Model B1	Model B2	Model C1	Model C2	Model C3	Model C4
AIC	1927.508	630.6316	1214.433	613.7	67.79813	616.8298	297.6806
BIC	1945.786	643.6616	1231.456	627.3466	77.06809	631.1487	309.9563
RMSE	0.9323502	1.237415	0.773152	0.9437251	0.370508	0.7690508	0.65083
γ [95% CI]	[8.275118, 16.12358]	[5.982569, 13.98945]	[7.210108, 18.66125]	[7.864808, 10.90522]	[1.885945, 4.929599]	[5.246623, 10.98607]	[6.97273, 15.60922]
α [95% CI]	[3.521989, 4.057136]	[2.860307, 4.44654]	[3.368571, 4.027606]	[3.346586, 4.704836]	[1.062146, 2.309389]	[3.524943, 4.586353]	[3.523046, 4.196413]
β [95% CI]	[0.085013, 0.1362793]	[0.0885089, 0.2069612]	[0.0690635, 0.1233689]	[0.1583366, 0.2444791]	[0.0091216, 0.3125543]	[0.1235044, 0.2388822]	[0.0733164, 0.1430168]

Table S4. Goodness-of-fit metrics and 95% confidence intervals for Gompertz parameters in Model D1-E4.

Specification	Model D1	Model D2	Model E1	Model E2	Model E3	Model E4
AIC	936.9168	856.7306	246.4836	666.7147	426.2054	208.3396
BIC	953.3804	870.9733	256.6991	681.995	438.5311	219.105
RMSE	0.6775924	1.247308	0.8674019	0.6468461	0.8980006	0.6180069
γ [95% CI]	[4.923228, 19.34134]	[5.471651, 17.88246]	[6.761366, 8.369012]	[0.4257977, 19.29159]	[-1.755707, 34.32965]	[-0.0269878, 27.35449]
α [95% CI]	[3.440511, 4.302474]	[3.371009, 4.821564]	[4.395303, 29.10986]	[3.260686, 4.647328]	[3.129045, 4.51852]	[3.949336, 5.004415]
β [95% CI]	[0.0804448, 0.1674774]	[0.0651997, 0.1718562]	[0.3569905, 0.6502911]	[0.081112, 0.2745837]	[0.0245554, 0.134521]	[0.0453803, 0.2071262]

Table S5. Goodness-of-fit metrics and 95% confidence intervals for Gompertz parameters in Model F1, F2, and F3.

Specification	Model F1	Model F2	Model F3
AIC	402.25	863.2757	377.4061
BIC	416.4618	878.1307	389.5016
RMSE	0.5235747	0.9990526	0.8265847
γ [95% CI]	[7.998112, 9.156932]	[4.591152, 19.68952]	[1.617146, 9.812251]
α [95% CI]	[4.977989, 6.77953]	[3.208618, 4.109805]	[2.592634, 4.265237]
β [95% CI]	[0.2836614, 0.3707766]	[0.054586, 0.1480433]	[0.042773, 0.2783135]

Figure S1. Residuals vs Fitted scatter of overall.

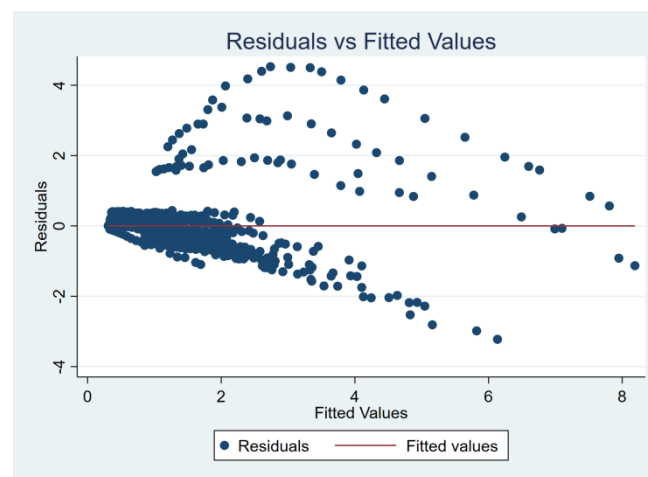


Figure S2. Normal distribution plot of residuals of overall.

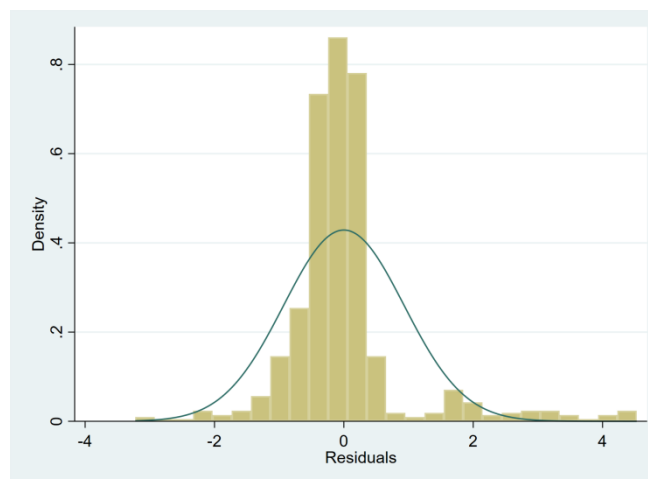


Figure S3. QQ-plot of overall.

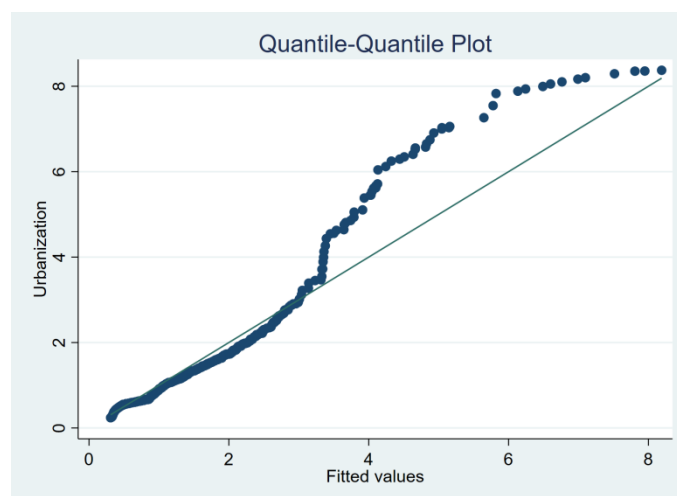


Table S6. Sensitivity of cutoffs in Model C2 and C3.

Specification	Model C2	Model C2'	Sensitivity	Model C3	Model C3'	Sensitivity
	Cutoff: 0.055 and 0.0285	Cutoff: 0.075 and 0.035		Cutoff: 0.055 and 0.0285	Cutoff: 0.075 and 0.035	
γ	3.589676*** (0.8623463)	3.203607*** (0.8100317)	low	8.11634*** (1.45738)	8.496658*** (1.381365)	low
α	1.591316*** (0.2552375)	1.541238*** (0.3719671)	low	4.055648*** (0.26952)	4.197049*** (0.2705957)	low
β	0.1489919** (0.07366440)	0.1685229*** (0.1005095)	low	0.1811933*** (0.0292972)	0.185701*** (0.0275928)	low

Table S7. Sensitivity of cutoffs in Model E2 and E3.

Specification	Model E2	Model E2'	Sensitivity	Model E3	Model E3'	Sensitivity
	Cutoff: 0.035 and 0.1751	Cutoff: 0.0345 and 0.1751		Cutoff: 0.035 and 0.1751	Cutoff: 0.0345 and 0.1751	
γ	9.858694** (4.795298)	9.463834** (4.410902)	low	16.28697* (9.134659)	17.3866* (9.85261)	low
α	3.954007*** (0.3524559)	3.926948*** (0.3355358)	low	3.823782*** (0.3517322)	3.918843 *** (0.349702)	low
β	0.1778479*** (0.0491765)	0.1820568*** (0.0493888)	low	0.0795382* (0.0278367)	0.0794684*** (0.0280782)	low

Table S8. Sensitivity of cutoffs in Model F1, F2, and F3.

Specification	Model F1	Model F1'	Model F2	Model F2'	Model F3	Model F3'	Sensitivity
	Cutoff: 0.378 and 0.676	Cutoff: 0.4 and 0.8	Cutoff: 0.378 and 0.676	Cutoff: 0.4 and 0.8	Cutoff: 0.378 and 0.676	Cutoff: 0.4 and 0.8	
γ	8.577522*** (0.2942143)	8.305611*** (0.2900962)	12.14033*** (3.836104)	12.43759*** (3.66359)	5.714699* (2.073532)	4.404829*** (1.411839)	low
α	5.878759*** (0.4573954)	7.327595*** (0.8100236)	3.659212*** (0.2289685)	3.723821*** (0.210041)	3.428936*** (0.423203)	3.167322*** (0.63274)	low
β	0.327219*** (0.0221178)	0.3630841*** (0.0274462)	0.1013147*** (0.0237451)	0.0995482*** (0.0205943)	0.1605432** (0.0595966)	0.1825** (0.0772642)	low