

Spatiotemporal dynamics of city-level WEEE generation from different sources in China

1 Definition of study area and prefecture

1.1 The list of cities

The list of 301 cities and their locations can be seen in Table S1.

Table S1 List of cities.

Code	City	Administrative division level	Province (city belongs to)	Code	City	Administrative division level	Province (city belongs to)
1101	Beijing	Municipality	-	4104	Pingdingshan	Prefectural-level city	Henan
1201	Tianjin	Municipality	-	4105	Anyang	Prefectural-level city	Henan
1301	Shijiazhuang	Prefectural-level city	Hebei	4106	Hebi	Prefectural-level city	Henan
1302	Tangshan	Prefectural-level city	Hebei	4107	Xinxiang	Prefectural-level city	Henan
1303	Qinhuangdao	Prefectural-level city	Hebei	4108	Jiaozuo	Prefectural-level city	Henan
1304	Handan	Prefectural-level city	Hebei	4109	Puyang	Prefectural-level city	Henan
1305	Xingtai	Prefectural-level city	Hebei	4110	Xuchang	Prefectural-level city	Henan
1306	Baoding	Prefectural-level city	Hebei	4111	Luohe	Prefectural-level city	Henan
1307	Zhangjiakou	Prefectural-level city	Hebei	4112	Sanmenxia	Prefectural-level city	Henan
1308	Chengde	Prefectural-level city	Hebei	4113	Nanyang	Prefectural-level city	Henan
1309	Cangzhou	Prefectural-level city	Hebei	4114	Shangqiu	Prefectural-level city	Henan
1310	Langfang	Prefectural-level city	Hebei	4115	Xinyang	Prefectural-level city	Henan
1311	Hengshui	Prefectural-level city	Hebei	4116	Zhoukou	Prefectural-level city	Henan
1401	Taiyuan	Prefectural-level city	Shanxi	4117	Zhumadian	Prefectural-level city	Henan
1402	Datong	Prefectural-level city	Shanxi	4201	Wuhan	Prefectural-level city	Hubei
1403	Yangquan	Prefectural-level city	Shanxi	4202	Huangshi	Prefectural-level city	Hubei
1404	Changzhi	Prefectural-level city	Shanxi	4203	Shiyan	Prefectural-level city	Hubei
1405	Jincheng	Prefectural-level city	Shanxi	4205	Yichang	Prefectural-level city	Hubei
1406	Shuozhou	Prefectural-level city	Shanxi	4206	Xiangyang	Prefectural-level city	Hubei
1407	Jinzhong	Prefectural-level city	Shanxi	4207	Ezhou	Prefectural-level city	Hubei
1408	Yuncheng	Prefectural-level city	Shanxi	4208	Jingmen	Prefectural-level city	Hubei
1409	Xinzhou	Prefectural-level city	Shanxi	4209	Xiaogan	Prefectural-level city	Hubei
1410	Linfen	Prefectural-level city	Shanxi	4210	Jingzhou	Prefectural-level city	Hubei
1411	Lvliang	Prefectural-level city	Shanxi	4211	Huanggang	Prefectural-level city	Hubei

1501	Hohhot	Prefectural-level city	Inner Mongolia	4212	Xianning	Prefectural-level city	Hubei
1502	Baotou	Prefectural-level city	Inner Mongolia	4213	Suizhou	Prefectural-level city	Hubei
1503	Wuhai	Prefectural-level city	Inner Mongolia	4230	HB-other	Defined by this research	Hubei
1504	Chifeng	Prefectural-level city	Inner Mongolia	4301	Changsha	Prefectural-level city	Hunan
1505	Tongliao	Prefectural-level city	Inner Mongolia	4302	Zhuzhou	Prefectural-level city	Hunan
1506	Ordos	Prefectural-level city	Inner Mongolia	4303	Xiangtan	Prefectural-level city	Hunan
1507	Hulunbuir	Prefectural-level city	Inner Mongolia	4304	Hengyang	Prefectural-level city	Hunan
1508	Bayannur	Prefectural-level city	Inner Mongolia	4305	Shaoyang	Prefectural-level city	Hunan
1509	Ulanqab	Prefectural-level city	Inner Mongolia	4306	Yueyang	Prefectural-level city	Hunan
1530	NMG-other	Defined by this research	Inner Mongolia	4307	Changde	Prefectural-level city	Hunan
2101	Shenyang	Prefectural-level city	Liaoning	4308	Zhangjiajie	Prefectural-level city	Hunan
2102	Dalian	Prefectural-level city	Liaoning	4309	Yiyang	Prefectural-level city	Hunan
2103	Anshan	Prefectural-level city	Liaoning	4310	Chenzhou	Prefectural-level city	Hunan
2104	Fushun	Prefectural-level city	Liaoning	4311	Yongzhou	Prefectural-level city	Hunan
2105	Benxi	Prefectural-level city	Liaoning	4312	Huaihua	Prefectural-level city	Hunan
2106	Dandong	Prefectural-level city	Liaoning	4313	Loudi	Prefectural-level city	Hunan
2107	Jinzhou	Prefectural-level city	Liaoning	4331	HN-other	Defined by this research	Hunan
2108	Yingkou	Prefectural-level city	Liaoning	4401	Guangzhou	Prefectural-level city	Guangdong
2109	Fuxin	Prefectural-level city	Liaoning	4402	Shaoguan	Prefectural-level city	Guangdong
2110	Liaoyang	Prefectural-level city	Liaoning	4403	Shenzhen	Prefectural-level city	Guangdong
2111	Panjin	Prefectural-level city	Liaoning	4404	Zhuhai	Prefectural-level city	Guangdong
2112	Tieling	Prefectural-level city	Liaoning	4405	Shantou	Prefectural-level city	Guangdong
2113	Chaoyang	Prefectural-level city	Liaoning	4406	Foshan	Prefectural-level city	Guangdong
2114	Huludao	Prefectural-level city	Liaoning	4407	Jiangmen	Prefectural-level city	Guangdong
2201	Changchun	Prefectural-level city	Jilin	4408	Zhanjiang	Prefectural-level city	Guangdong
2202	Jilin	Prefectural-level city	Jilin	4409	Maoming	Prefectural-level city	Guangdong
2203	Siping	Prefectural-level city	Jilin	4412	Zhaoqing	Prefectural-level city	Guangdong
2204	Liaoyuan	Prefectural-level city	Jilin	4413	Huizhou	Prefectural-level city	Guangdong
2205	Tonghua	Prefectural-level city	Jilin	4414	Meizhou	Prefectural-level city	Guangdong
2206	Baishan	Prefectural-level city	Jilin	4415	Shanwei	Prefectural-level city	Guangdong
2207	Songyuan	Prefectural-level city	Jilin	4416	Heyuan	Prefectural-level city	Guangdong
2208	Baicheng	Prefectural-level city	Jilin	4417	Yangjiang	Prefectural-level city	Guangdong
2224	JL-other	Defined by this research	Jilin	4418	Qingyuan	Prefectural-level city	Guangdong
2301	Harbin	Prefectural-level city	Heilongjiang	4419	Dongguan	Prefectural-level city	Guangdong
2302	Qiqihar	Prefectural-level city	Heilongjiang	4420	Zhongshan	Prefectural-level city	Guangdong
2303	Jixi	Prefectural-level city	Heilongjiang	4451	Chaozhou	Prefectural-level city	Guangdong
2304	Hegang	Prefectural-level city	Heilongjiang	4452	Jieyang	Prefectural-level city	Guangdong
2305	Shuangyashan	Prefectural-level city	Heilongjiang	4453	Yunfu	Prefectural-level city	Guangdong
2306	Daqing	Prefectural-level city	Heilongjiang	4501	Nanning	Prefectural-level city	Guangxi
2307	Yichun-HLJ	Prefectural-level city	Heilongjiang	4502	Liuzhou	Prefectural-level city	Guangxi

2308	Jiamusi	Prefectural-level city	Heilongjiang	4503	Guilin	Prefectural-level city	Guangxi
2309	Qitaihe	Prefectural-level city	Heilongjiang	4504	Wuzhou	Prefectural-level city	Guangxi
2310	Mudanjiang	Prefectural-level city	Heilongjiang	4505	Beihai	Prefectural-level city	Guangxi
2311	Heihe	Prefectural-level city	Heilongjiang	4506	Fangchenggang	Prefectural-level city	Guangxi
2312	Suihua	Prefectural-level city	Heilongjiang	4507	Qinzhou	Prefectural-level city	Guangxi
2327	HLJ-other	Defined by this research	Heilongjiang	4508	Guigang	Prefectural-level city	Guangxi
3101	Shanghai	Municipality	-	4509	Yulin-GX	Prefectural-level city	Guangxi
3201	Nanjing	Prefectural-level city	Jiangsu	4510	Baise	Prefectural-level city	Guangxi
3202	Wuxi	Prefectural-level city	Jiangsu	4511	Hezhou	Prefectural-level city	Guangxi
3203	Xuzhou	Prefectural-level city	Jiangsu	4512	Hechi	Prefectural-level city	Guangxi
3204	Changzhou	Prefectural-level city	Jiangsu	4513	Laibin	Prefectural-level city	Guangxi
3205	Suzhou-JS	Prefectural-level city	Jiangsu	4514	Chongzuo	Prefectural-level city	Guangxi
3206	Nantong	Prefectural-level city	Jiangsu	46	Hainan	Province	Hainan
3207	Lianyungang	Prefectural-level city	Jiangsu	5001	Chongqing	Municipality	-
3208	Huai'an	Prefectural-level city	Jiangsu	5101	Chengdu	Prefectural-level city	Sichuan
3209	Yancheng	Prefectural-level city	Jiangsu	5103	Zigong	Prefectural-level city	Sichuan
3210	Yangzhou	Prefectural-level city	Jiangsu	5104	Panzhuhua	Prefectural-level city	Sichuan
3211	Zhenjiang	Prefectural-level city	Jiangsu	5105	Luzhou	Prefectural-level city	Sichuan
3212	Taizhou-JS	Prefectural-level city	Jiangsu	5106	Deyang	Prefectural-level city	Sichuan
3213	Suqian	Prefectural-level city	Jiangsu	5107	Mianyang	Prefectural-level city	Sichuan
3301	Hangzhou	Prefectural-level city	Zhejiang	5108	Guangyuan	Prefectural-level city	Sichuan
3302	Ningbo	Prefectural-level city	Zhejiang	5109	Suining	Prefectural-level city	Sichuan
3303	Wenzhou	Prefectural-level city	Zhejiang	5110	Neijiang	Prefectural-level city	Sichuan
3304	Jiaxing	Prefectural-level city	Zhejiang	5111	Leshan	Prefectural-level city	Sichuan
3305	Huzhou	Prefectural-level city	Zhejiang	5113	Nanchong	Prefectural-level city	Sichuan
3306	Shaoxing	Prefectural-level city	Zhejiang	5114	Meishan	Prefectural-level city	Sichuan
3307	Jinhua	Prefectural-level city	Zhejiang	5115	Yibin	Prefectural-level city	Sichuan
3308	Quzhou	Prefectural-level city	Zhejiang	5116	Guang'an	Prefectural-level city	Sichuan
3309	Zhoushan	Prefectural-level city	Zhejiang	5117	Dazhou	Prefectural-level city	Sichuan
3310	Taizhou-ZJ	Prefectural-level city	Zhejiang	5118	Ya'an	Prefectural-level city	Sichuan
3311	Lishui	Prefectural-level city	Zhejiang	5119	Bazhong	Prefectural-level city	Sichuan
3401	Hefei	Prefectural-level city	Anhui	5120	Ziyang	Prefectural-level city	Sichuan
3402	Wuhu	Prefectural-level city	Anhui	5135	SC-other	Defined by this research	Sichuan
3403	Bengbu	Prefectural-level city	Anhui	5201	Guiyang	Prefectural-level city	Guizhou
3404	Huainan	Prefectural-level city	Anhui	5202	Liupanshui	Prefectural-level city	Guizhou
3405	Ma'anshan	Prefectural-level city	Anhui	5203	Zunyi	Prefectural-level city	Guizhou
3406	Huaibei	Prefectural-level city	Anhui	5204	Anshun	Prefectural-level city	Guizhou
3407	Tongling	Prefectural-level city	Anhui	5205	Bijie	Prefectural-level city	Guizhou
3408	Anqing	Prefectural-level city	Anhui	5206	Tongren	Prefectural-level city	Guizhou
3410	Huangshan	Prefectural-level city	Anhui	5228	GZ-other	Defined by this research	Guizhou
3411	Chuzhou	Prefectural-level city	Anhui	5301	Kunming	Prefectural-level city	Yunnan
3412	Fuyang	Prefectural-level city	Anhui	5303	Qujing	Prefectural-level city	Yunnan

3413	Suzhou-AH	Prefectural-level city	Anhui	5304	Yuxi	Prefectural-level city	Yunnan
3415	Lu'an	Prefectural-level city	Anhui	5305	Baoshan	Prefectural-level city	Yunnan
3416	Bozhou	Prefectural-level city	Anhui	5306	Zhaotong	Prefectural-level city	Yunnan
3417	Chizhou	Prefectural-level city	Anhui	5307	Lijiang	Prefectural-level city	Yunnan
3418	Xuancheng	Prefectural-level city	Anhui	5308	Pu'er	Prefectural-level city	Yunnan
3501	Fuzhou-FJ	Prefectural-level city	Fujian	5309	Lincang	Prefectural-level city	Yunnan
3502	Xiamen	Prefectural-level city	Fujian	5335	YN-other	Defined by this research	Yunnan
3503	Putian	Prefectural-level city	Fujian	54	Tibet	Province	Tibet
3504	Sanming	Prefectural-level city	Fujian	6101	Xi'an	Prefectural-level city	Shaanxi
3505	Quanzhou	Prefectural-level city	Fujian	6102	Tongchuan	Prefectural-level city	Shaanxi
3506	Zhangzhou	Prefectural-level city	Fujian	6103	Baoji	Prefectural-level city	Shaanxi
3507	Nanping	Prefectural-level city	Fujian	6104	Xianyang	Prefectural-level city	Shaanxi
3508	Longyan	Prefectural-level city	Fujian	6105	Weinan	Prefectural-level city	Shaanxi
3509	Ningde	Prefectural-level city	Fujian	6106	Yan'an	Prefectural-level city	Shaanxi
3601	Nanchang	Prefectural-level city	Jiangxi	6107	Hanzhong	Prefectural-level city	Shaanxi
3602	Jingdezhen	Prefectural-level city	Jiangxi	6108	Yulin-SH	Prefectural-level city	Shaanxi
3603	Pingxiang	Prefectural-level city	Jiangxi	6109	Ankang	Prefectural-level city	Shaanxi
3604	Jiujiang	Prefectural-level city	Jiangxi	6110	Shangluo	Prefectural-level city	Shaanxi
3605	Xinyu	Prefectural-level city	Jiangxi	6201	Lanzhou	Prefectural-level city	Gansu
3606	Yingtian	Prefectural-level city	Jiangxi	6202	Jiayuguan	Prefectural-level city	Gansu
3607	Ganzhou	Prefectural-level city	Jiangxi	6203	Jinchang	Prefectural-level city	Gansu
3608	Ji'an	Prefectural-level city	Jiangxi	6204	Baiyin	Prefectural-level city	Gansu
3609	Yichun-JX	Prefectural-level city	Jiangxi	6205	Tianshui	Prefectural-level city	Gansu
3610	Fuzhou-JX	Prefectural-level city	Jiangxi	6206	Wuwei	Prefectural-level city	Gansu
3611	Shangrao	Prefectural-level city	Jiangxi	6207	Zhangye	Prefectural-level city	Gansu
3701	Jinan	Prefectural-level city	Shandong	6208	Pingliang	Prefectural-level city	Gansu
3702	Qingdao	Prefectural-level city	Shandong	6209	Jiuquan	Prefectural-level city	Gansu
3703	Zibo	Prefectural-level city	Shandong	6210	Qingyang	Prefectural-level city	Gansu
3704	Zaozhuang	Prefectural-level city	Shandong	6211	Dingxi	Prefectural-level city	Gansu
3705	Dongying	Prefectural-level city	Shandong	6212	Longnan	Prefectural-level city	Gansu
3706	Yantai	Prefectural-level city	Shandong	6231	GS-other	Defined by this research	Gansu
3707	Weifang	Prefectural-level city	Shandong	6301	Xining	Prefectural-level city	Qinghai
3708	Jining	Prefectural-level city	Shandong	6302	Haidong	Prefectural-level city	Qinghai
3709	Tai'an	Prefectural-level city	Shandong	6329	QH-Other	Defined by this research	Qinghai
3710	Weihai	Prefectural-level city	Shandong	6401	Yinchuan	Prefectural-level city	Ningxia
3711	Rizhao	Prefectural-level city	Shandong	6402	Shizuishan	Prefectural-level city	Ningxia
3712	Laiwu	Prefectural-level city	Shandong	6403	Wuzhong	Prefectural-level city	Ningxia
3713	Linyi	Prefectural-level city	Shandong	6404	Guyuan	Prefectural-level city	Ningxia
3714	Dezhou	Prefectural-level city	Shandong	6405	Zhongwei	Prefectural-level city	Ningxia
3715	Liaocheng	Prefectural-level city	Shandong	6501	Urumqi	Prefectural-level city	Xinjiang
3716	Binzhou	Prefectural-level city	Shandong	6502	Karamay	Prefectural-level city	Xinjiang
3717	Heze	Prefectural-level city	Shandong	6504	Turpan	Prefectural-level city	Xinjiang
4101	Zhengzhou	Prefectural-level city	Henan	6505	Hami	Prefectural-level city	Xinjiang

4102	Kaifeng	Prefectural-level city	Henan	6591	XJ-other	Defined by this research	Xinjiang
4103	Luoyang	Prefectural-level city	Henan				

1.2 The list of city clusters

According to the research achievement of Fang and his colleges (Fang and Yu, 2020), there are 14 major city clusters, which are 5 key development national-level city clusters (Yangtze river delta, Pearl river delta, Jing-Jin-Ji, Middle Yangtze, and Chengyu) and 9 steady development regional-level city clusters (Harbin-Changchun, Central and Southern Liaoning, Shandong Peninsula, Jianghuai, Central Plain, Western Coast of the Taiwan Strait, Guanzhong, Guangxi Beibu, and the Northern Slope Tianshan Mountains). Because Jianghuai cities very close to the Yangtze river delta and its development is highly impacted by this region, so we combined Jianghuai city cluster to the Yangtze river delta city cluster. So, there are 13 city clusters in this study. The city cluster list can be seen in Table S2.

Table S2 City list for clusters

City cluster (163 cities)	City code
Yangtze river delta	3101, 3201, 3202, 3204, 3205, 3206, 3210, 3211, 3212, 3301, 3302, 3304, 3305, 3306, 3309, 3310, 3401, 3402, 3403, 3404, 3408, 3417, 3407, 3405, 3411, 3418
Pearl river delta	4401, 4403, 4404, 4406, 4407, 4412, 4413, 4419, 4420
Jing-Jin-Ji	1101, 1201, 1302, 1310, 1306, 1303, 1301, 1309, 1308, 1307
Middle Yangtze	4201, 4202, 4207, 4209, 4211, 4212, 4230, 4206, 4205, 4210, 4208, 4301, 4302, 4303, 4304, 4306, 4309, 4307, 4313, 3601, 3604, 3602, 3606, 3605, 3610, 3609, 3603, 3611, 3608
Chengyu	5001, 5101, 5106, 5107, 5114, 5120, 5109, 5111, 5118, 5103, 5105, 5110, 5113, 5115, 5117, 5116
Harbin-Changchun	2301, 2306, 2302, 2312, 2310, 2201, 2202, 2207, 2203, 2204, 2224
Central and Southern Liaoning	2101, 2102, 2106, 2107, 2108, 2111, 2114, 2103, 2104, 2105, 2110, 2112
Shandong Peninsula	3701, 3702, 3706, 3710, 3711, 3705, 3707, 3703, 3709, 3712, 3716, 3714, 3715
Central Plain	4101, 4103, 4102, 4107, 4108, 4110, 4104, 4111
Western Coast of the Taiwan Strait	3501, 3502, 3505, 3303, 4405, 3506, 3503, 3509, 4451, 4452, 4415
Guanzhong	6101, 6104, 6103, 6102, 6105, 6110, 6205, 6106, 6210, 6208
Guangxi Beibu	4501, 4505, 4506, 4507, 4509, 4514
The Northern Slope Tianshan Mountains	6501, 6502

2 Lifespan model

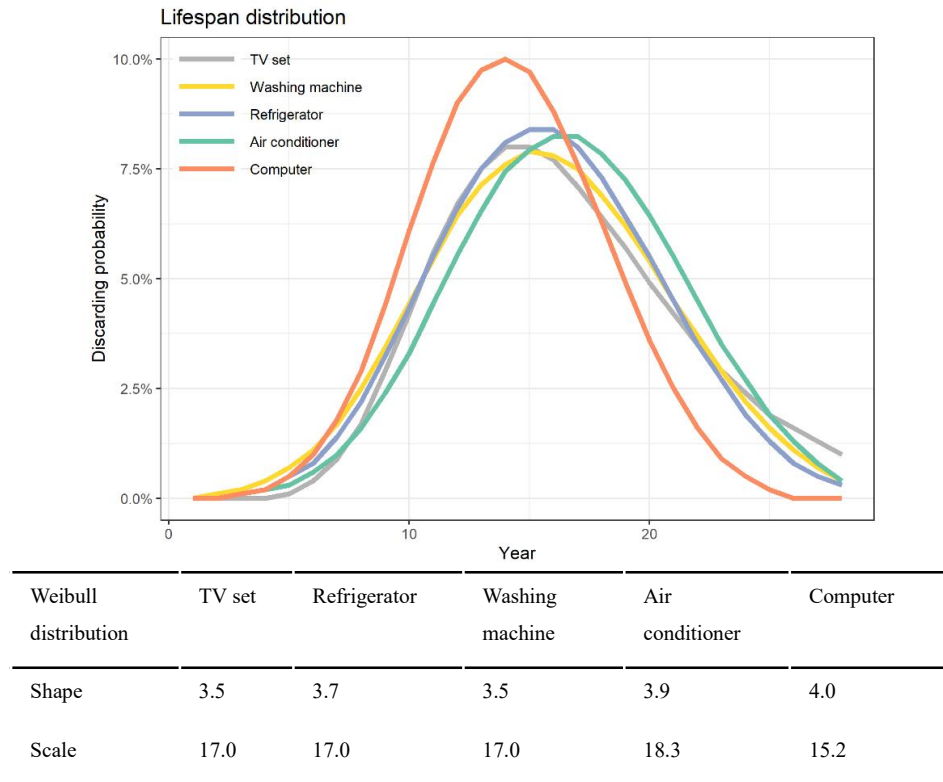


Figure S1 Lifespan distribution model and indicators.

3 Results

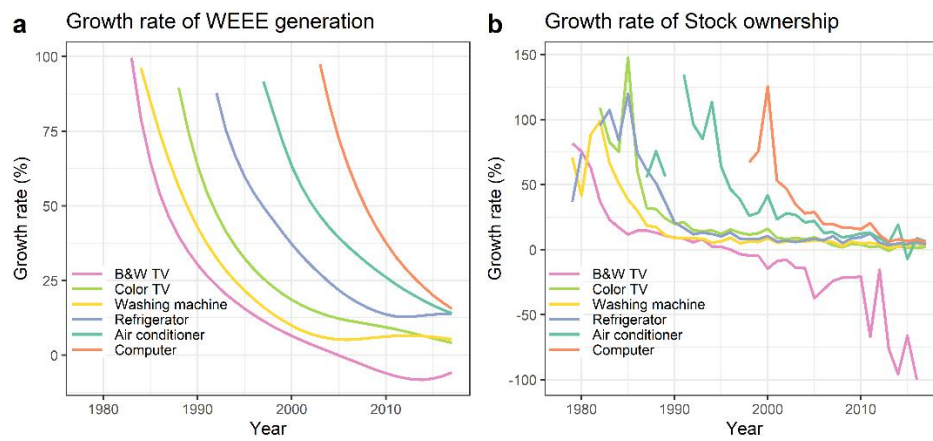


Figure S2 The growth rate of EEE stock and WEEE generation for each household appliance from the year 1978 to 2017.

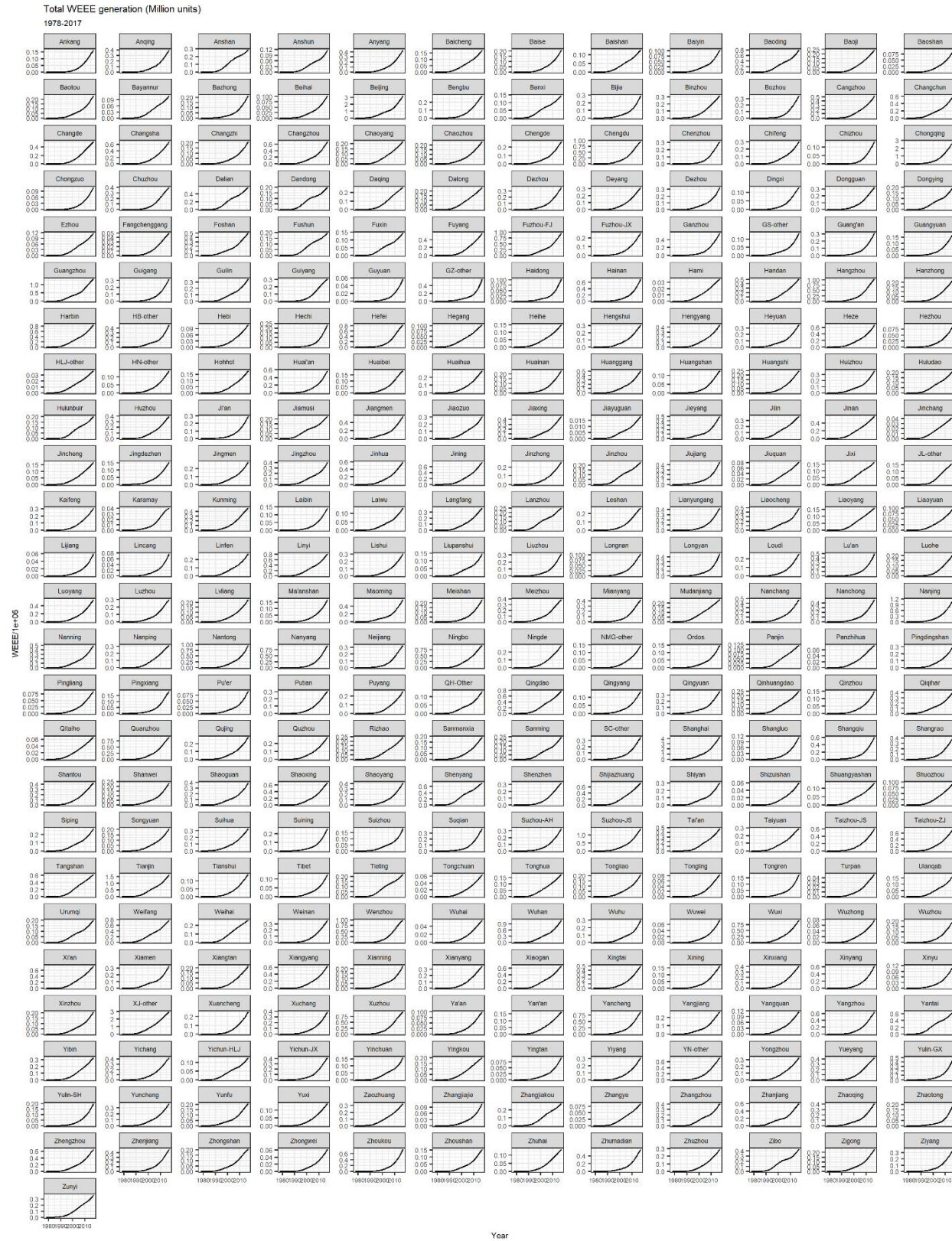


Figure S3 WEEE generation in each city from 1978 to 2017.

Obsolete Washing machine (Million units)

1978-2017

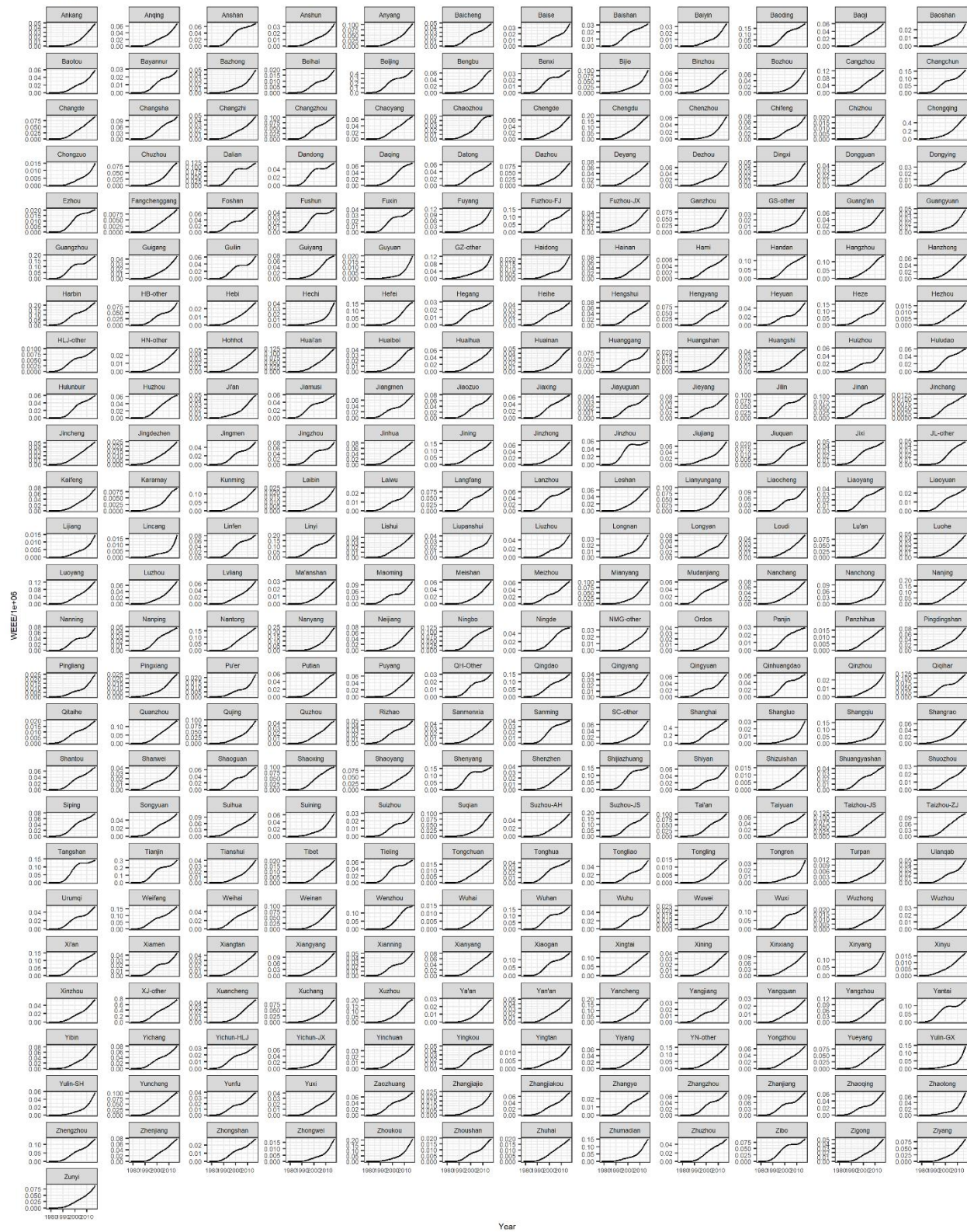


Figure S5 Obsolete washing machine generation in each city from 1978 to 2017.

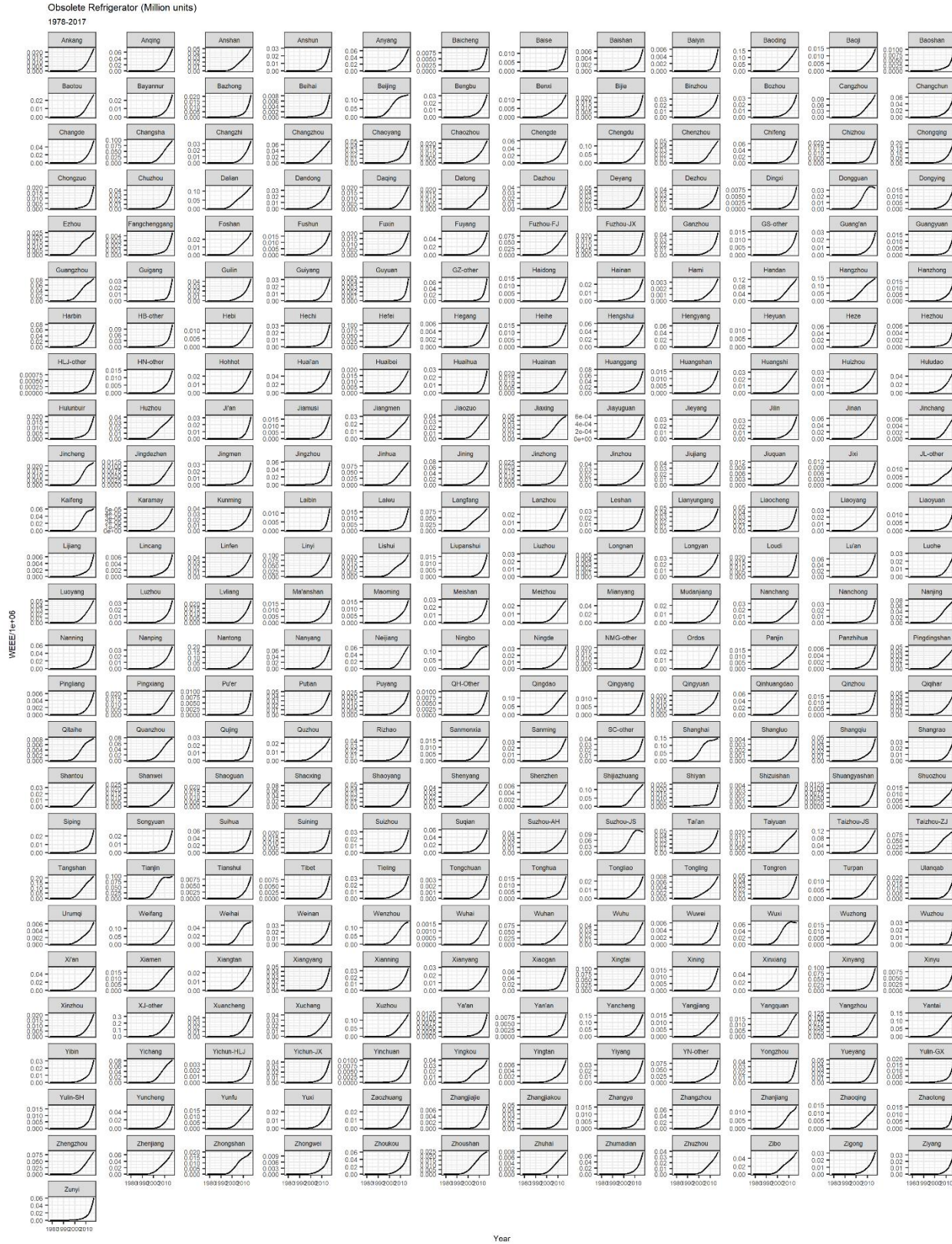


Figure S6 Obsolete refrigerator generation in each city from 1978 to 2017.

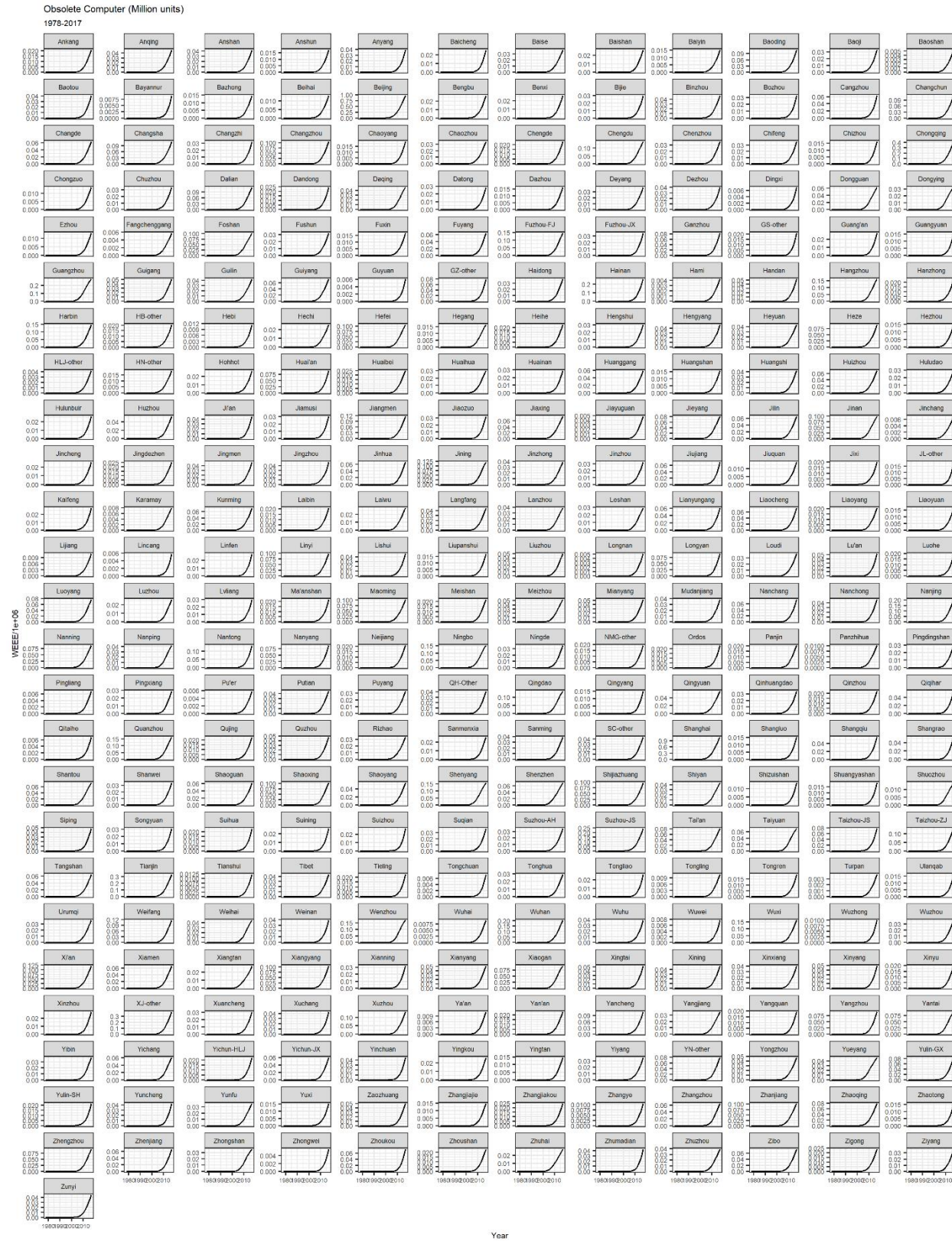


Figure S8 Obsolete computer generation in each city from 1978 to 2017.

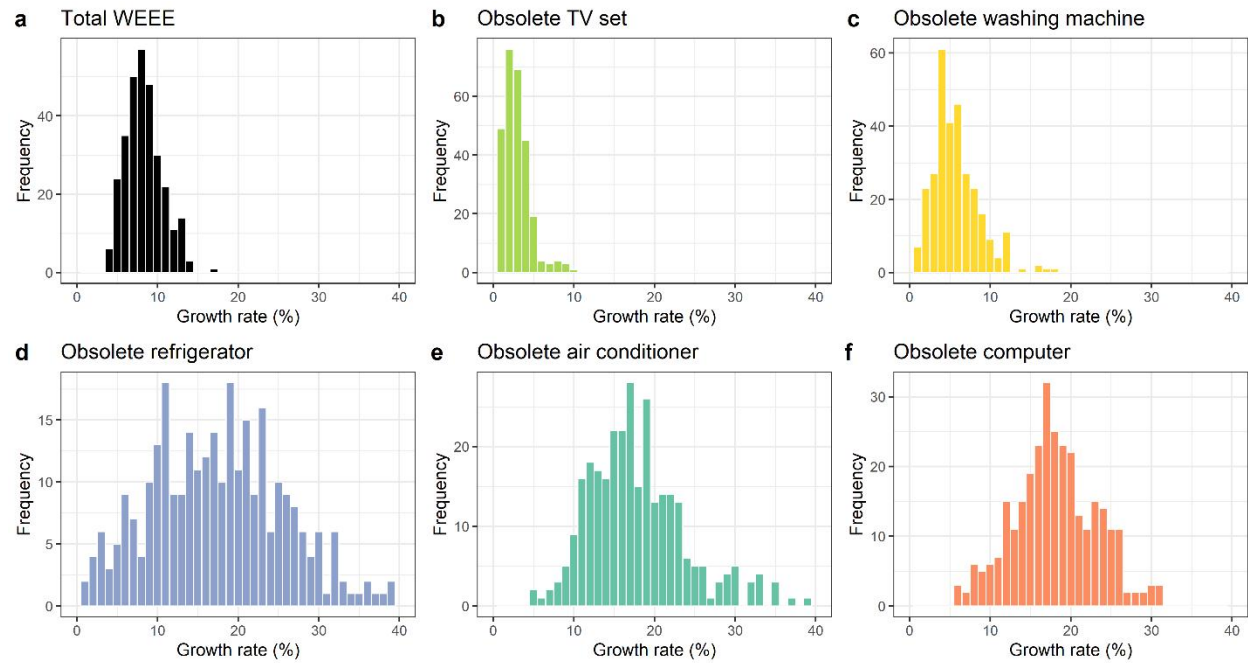


Figure S9 The number of cities for each growth rate of (a) Total WEEE, (b) obsolete TV set, (c) obsolete washing machine, (d) obsolete refrigerator, (e) obsolete air conditioner, and (f) obsolete computer in 2017.

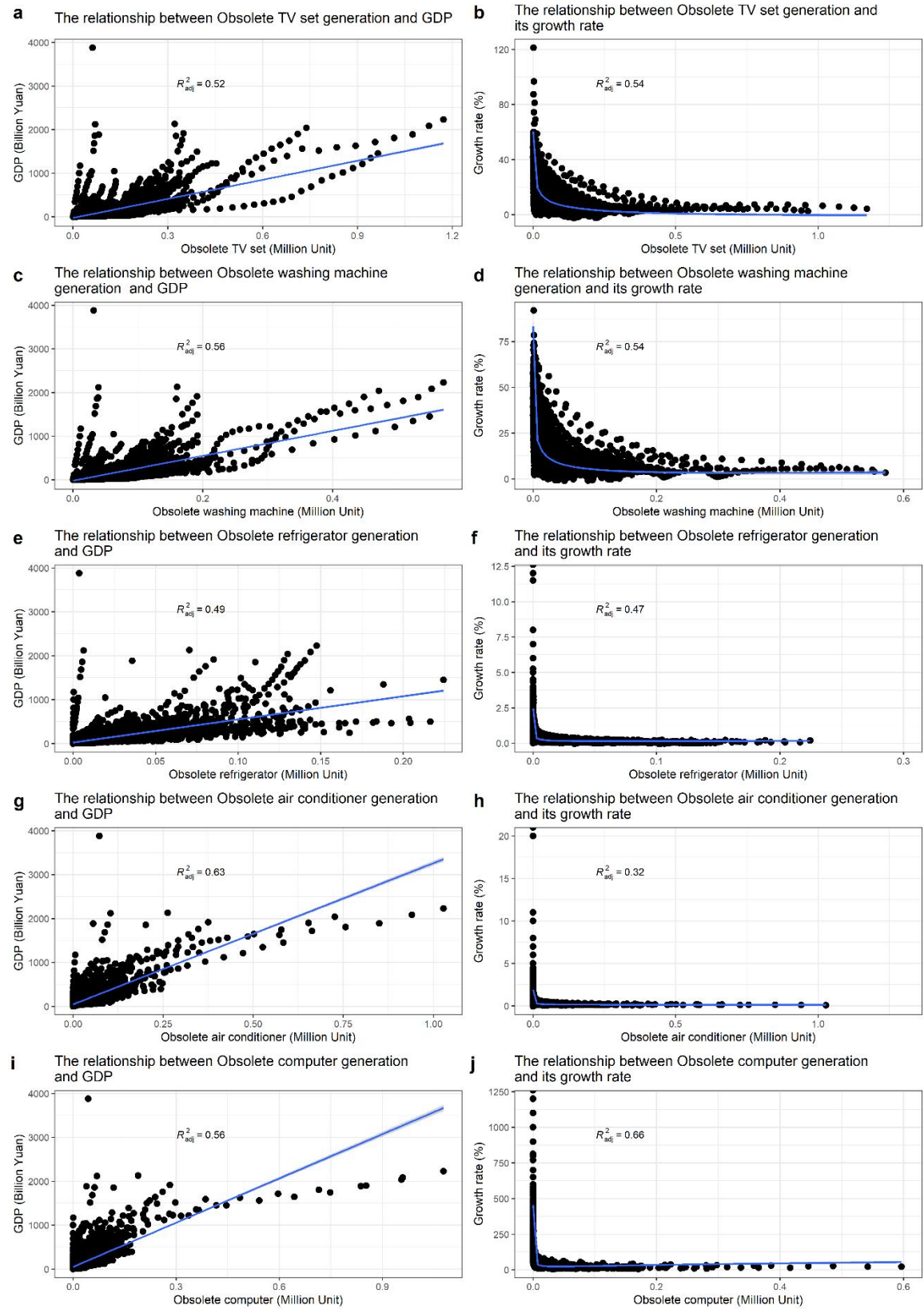


Figure S10 Relationships among different types of WEEE generation, their growth rates, and GDP.

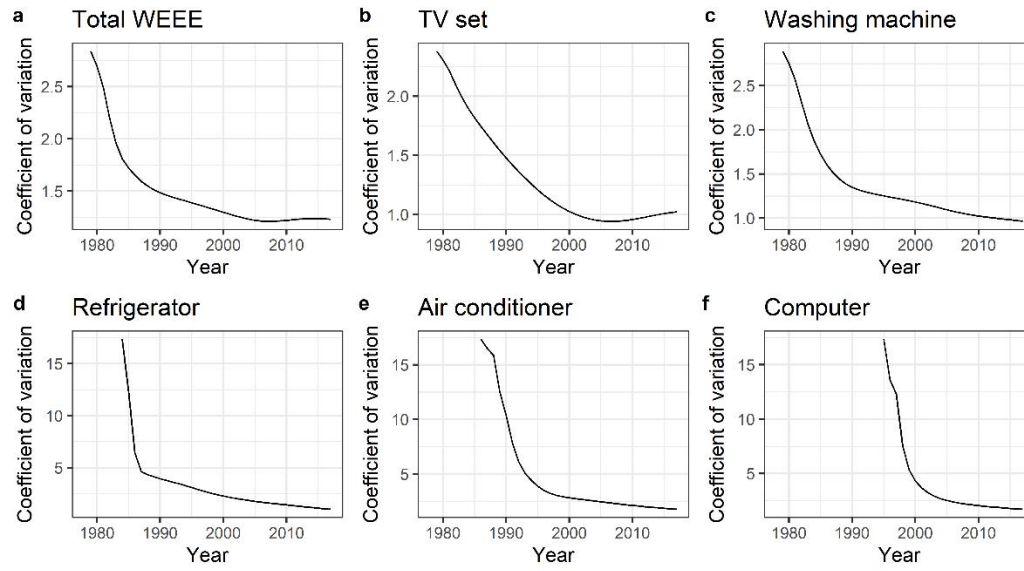


Figure S11 Coefficient of variations for cities' total and different types of WEEE generation.

Total WEEE generated from urban area (Million units)
1978-2017

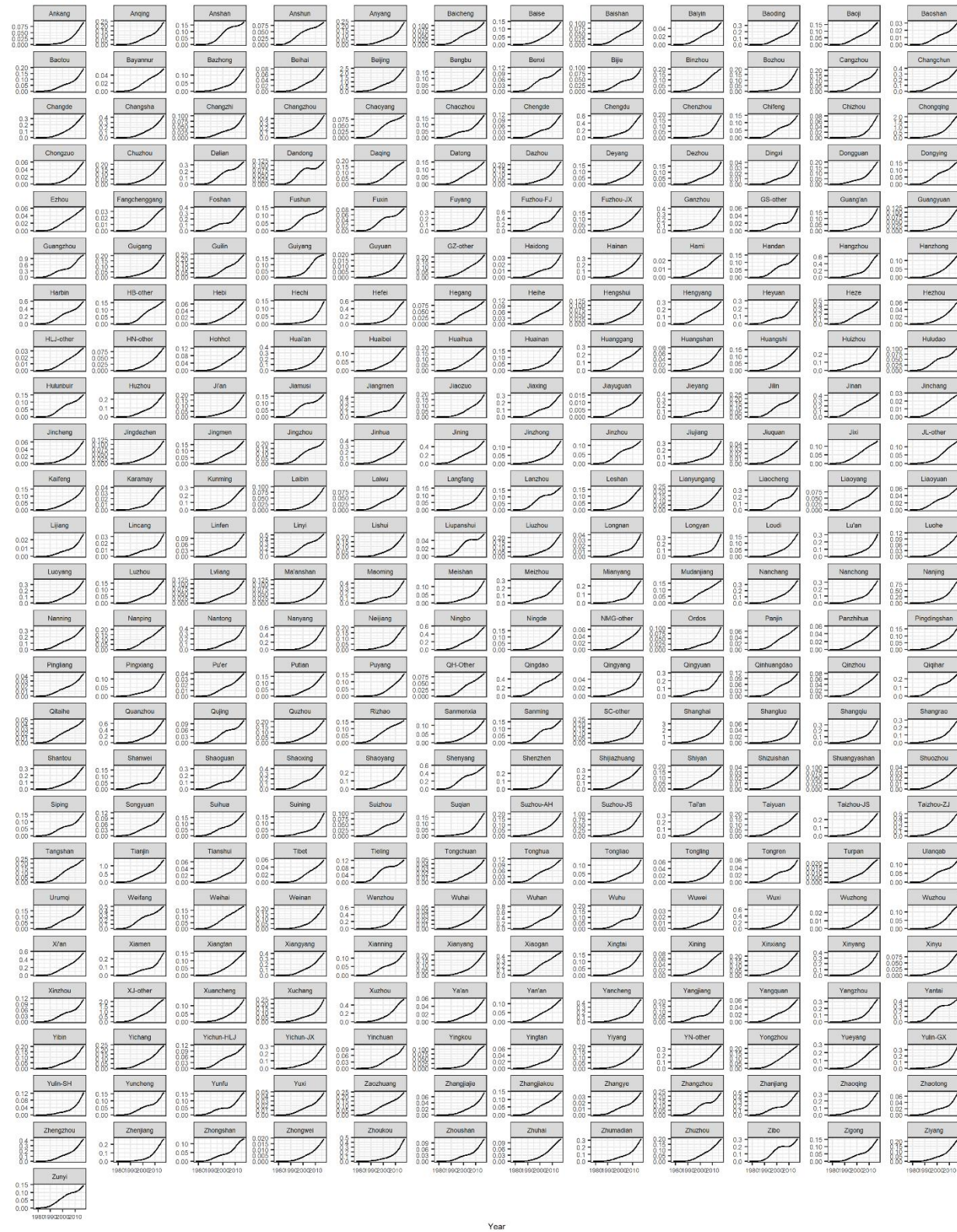


Figure S12 Total WEEE generated from urban area in each city of China from 1978 to 2017.

Total WEEE generated from rural area (Million units)
1978-2017

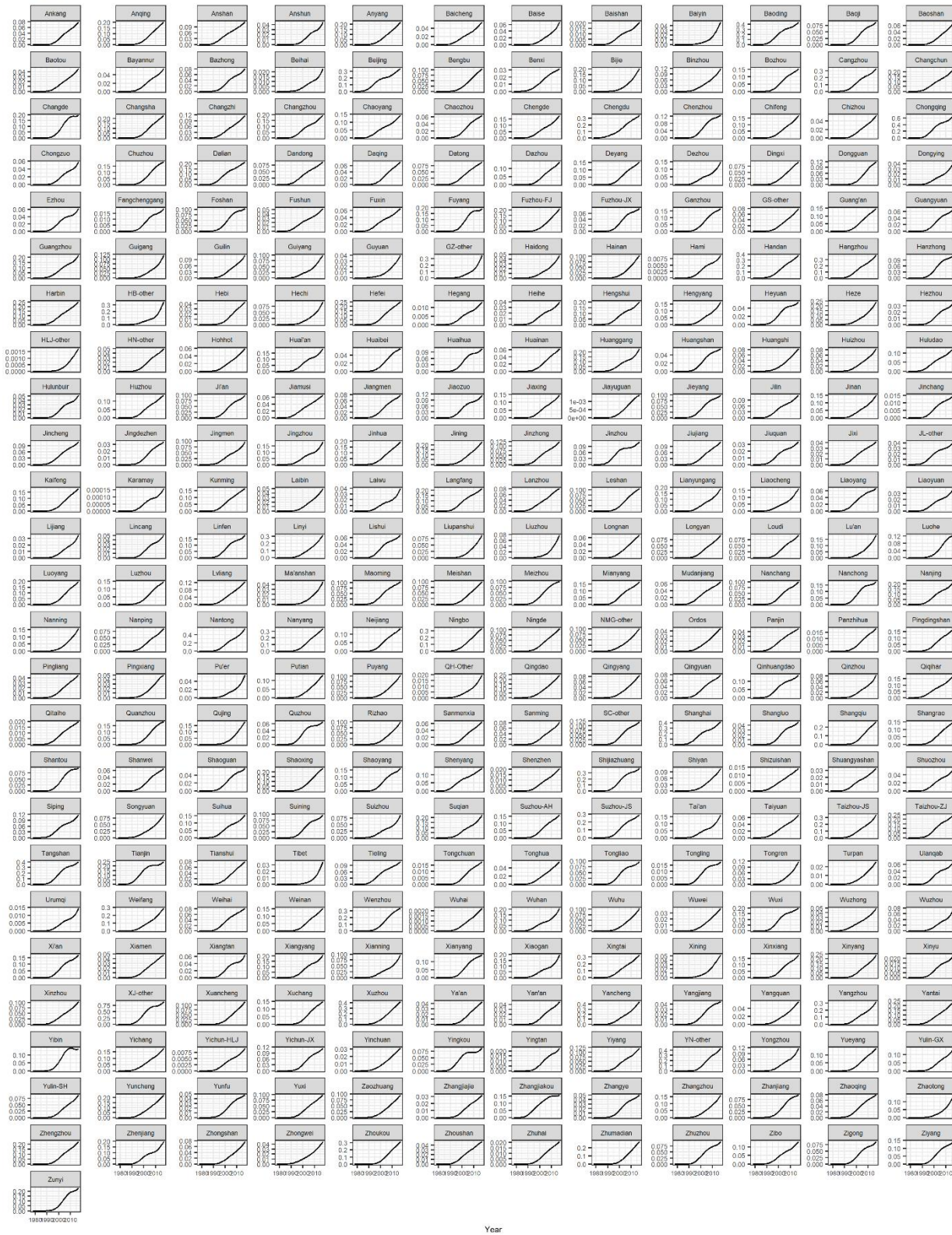


Figure S13 Total WEEE generated from rural area in each city of China from 1978 to 2017.

Total WEEE generated from enterprises (Million units)
1978-2017

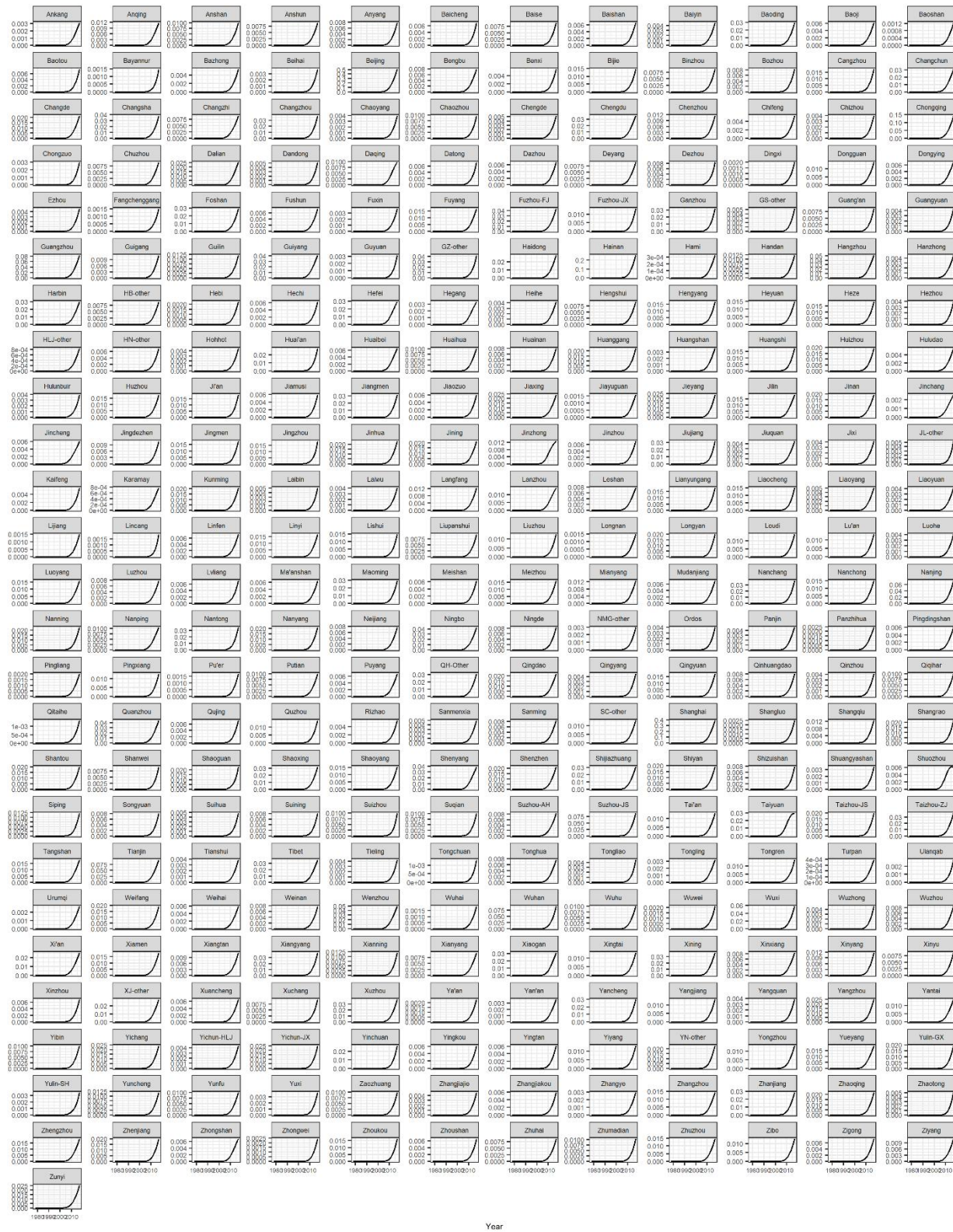


Figure S14 Total WEEE generated from enterprises in each city of China from 1978 to 2017.

Obsolete TV generated from urban area (Million units)

1978-2017

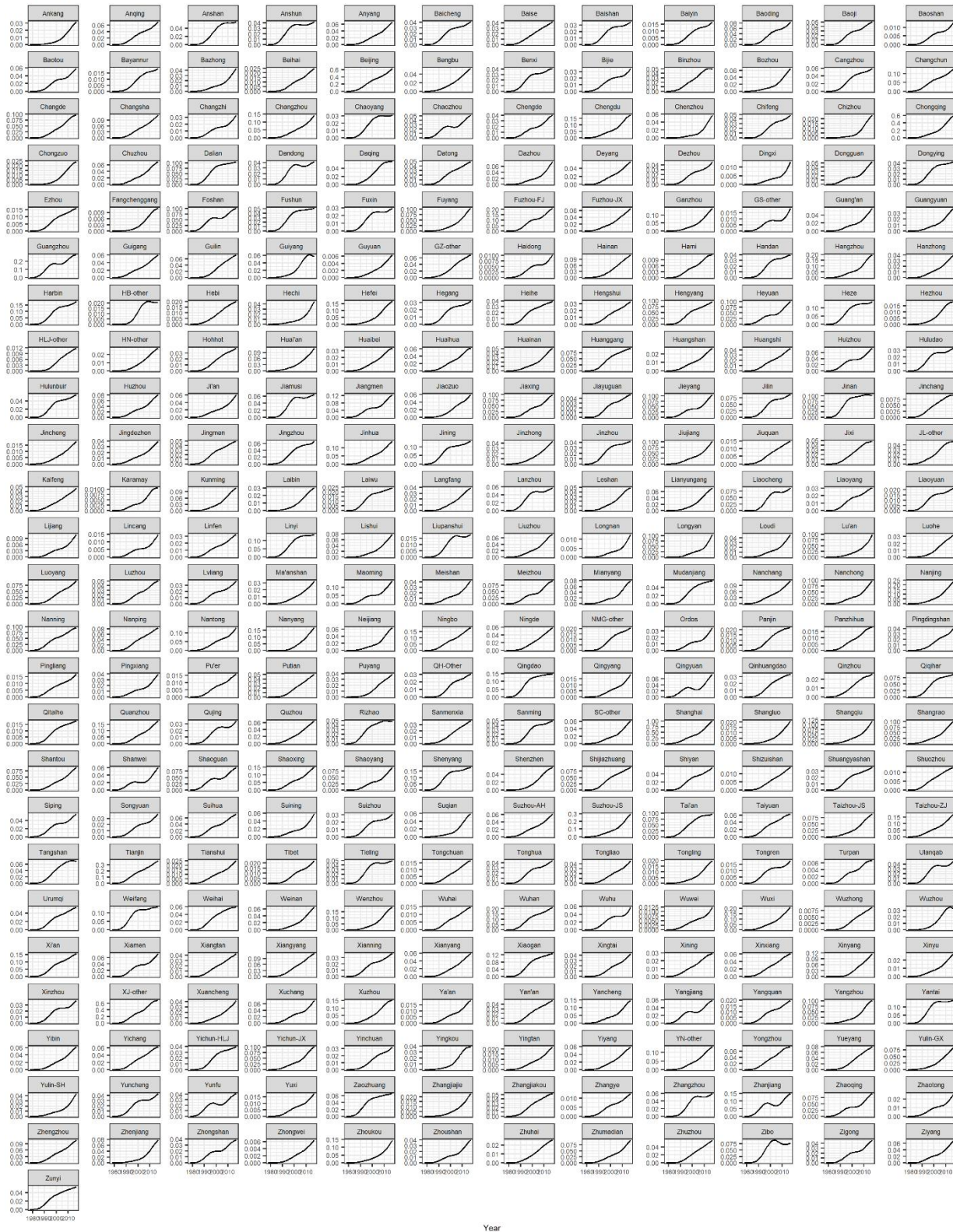


Figure S15 Obsolete TV generated from urban area in each city of China from 1978 to 2017.

Obsolete refrigerator from rural area (Million units)
1978-2017

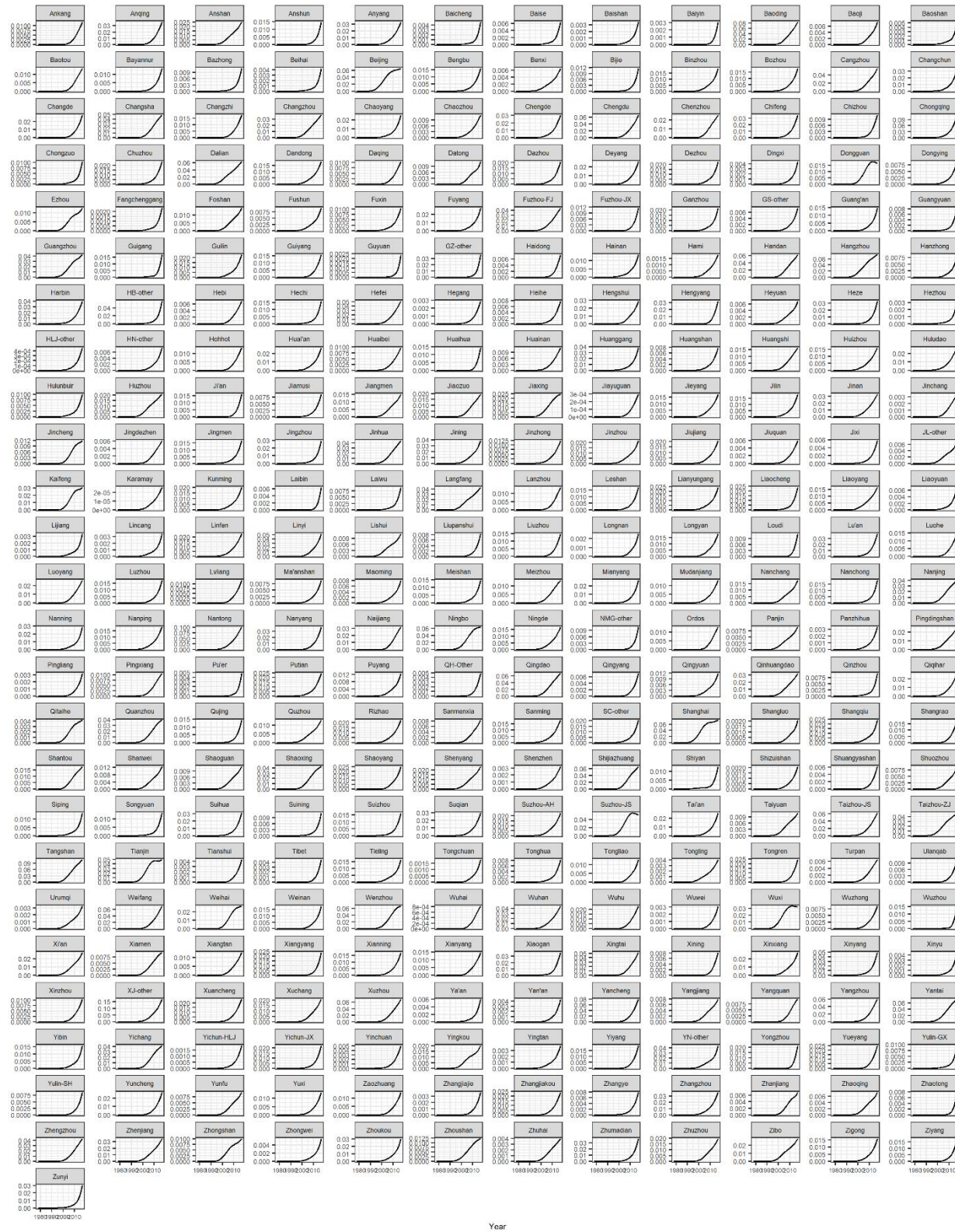


Figure S20 Obsolete refrigerator generated from rural area in each city of China from 1978 to 2017.

Obsolete air conditioner from rural area (Million units)

1978-2017

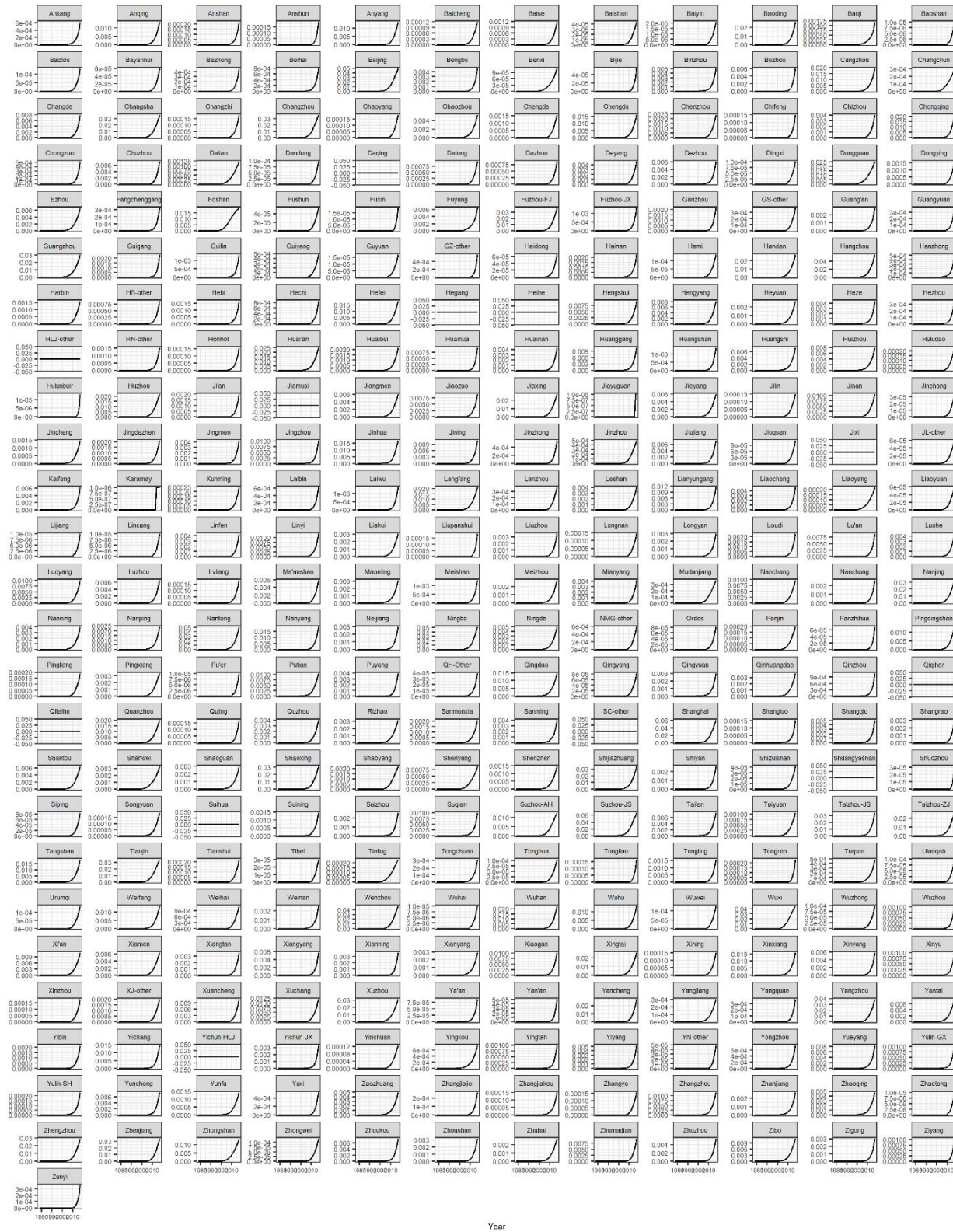


Figure S22 Obsolete air conditioner generated from rural area in each city of China from 1978 to 2017.

Obsolete computer from urban area (Million units)

1978-2017

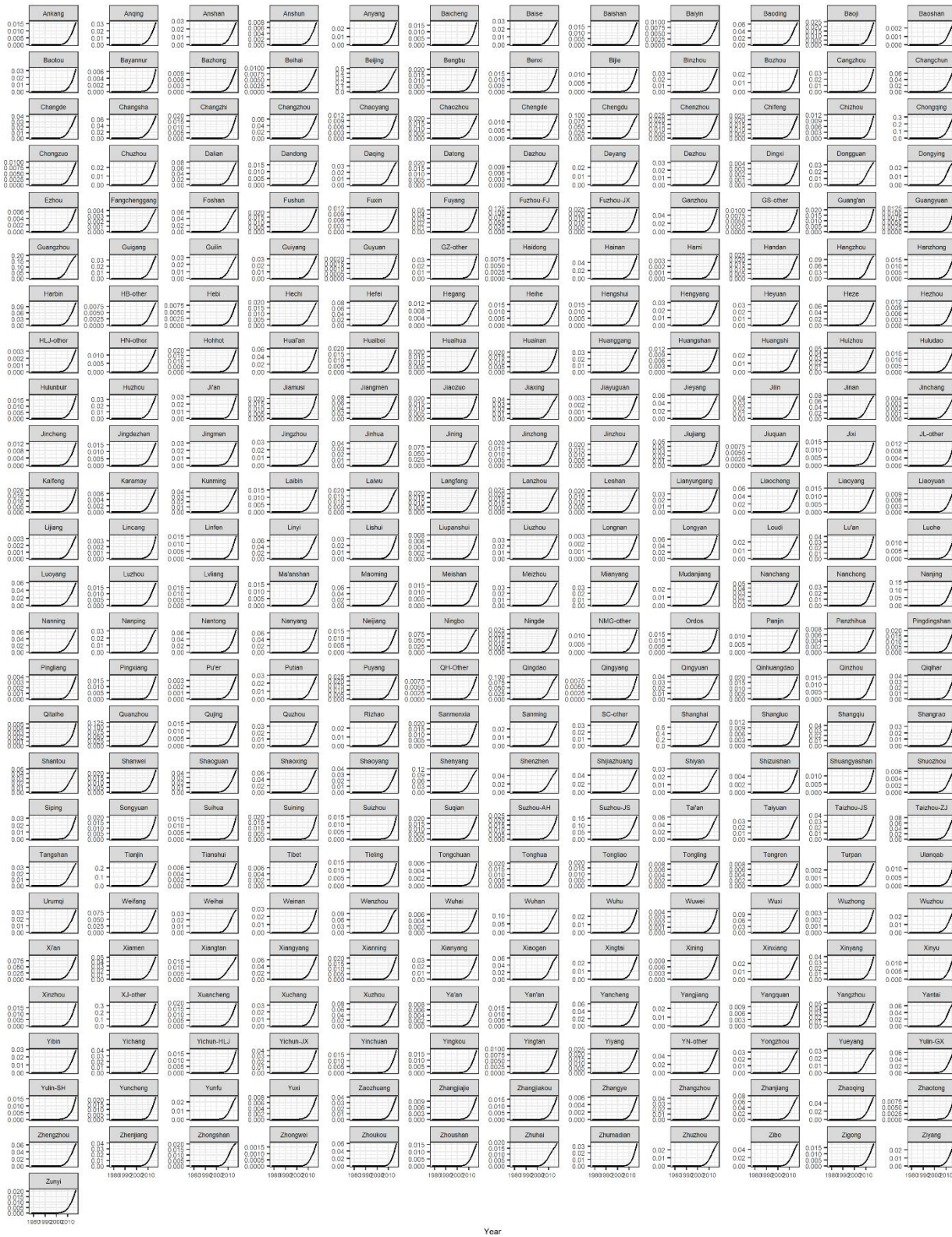


Figure S24 Obsolete computer generated from urban area in each city of China from 1978 to 2017.

Obsolete computer from rural area (Million units)

1978-2017

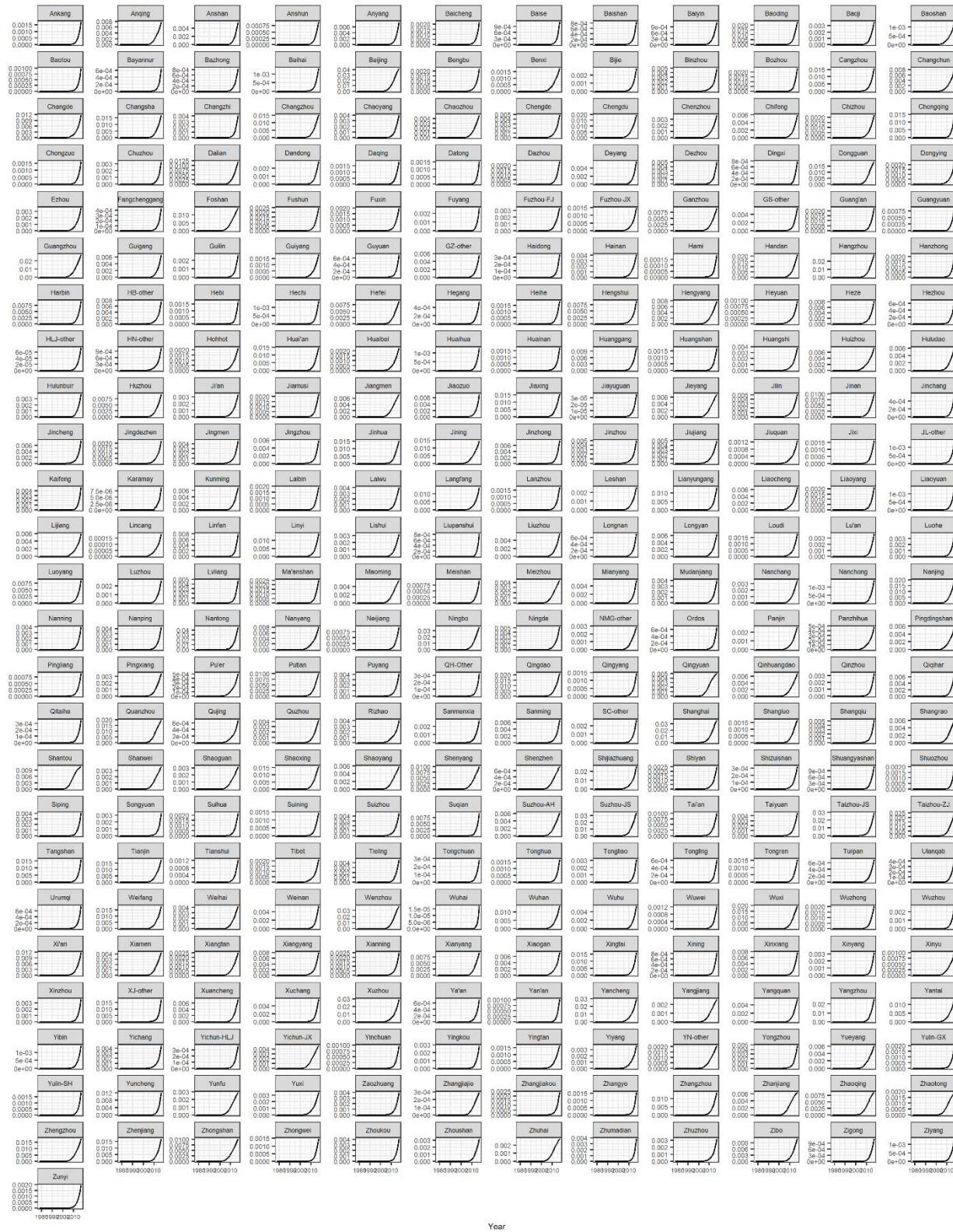


Figure S25 Obsolete computer generated from rural area in each city of China from 1978 to 2017.

Obsolete computer from enterprises (Million units)

1978-2017

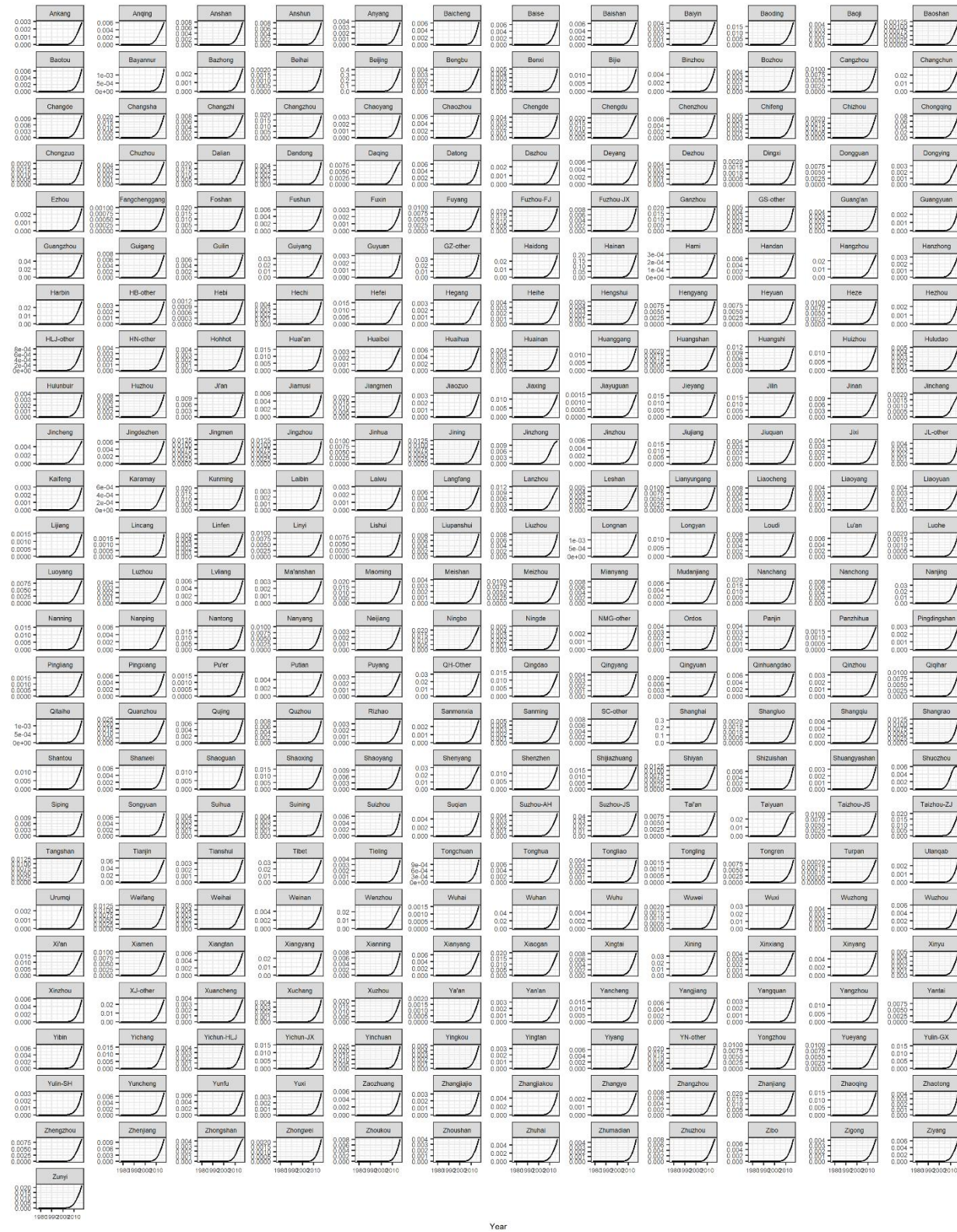


Figure S26 Obsolete computer generated from enterprises in each city of China from 1978 to 2017.

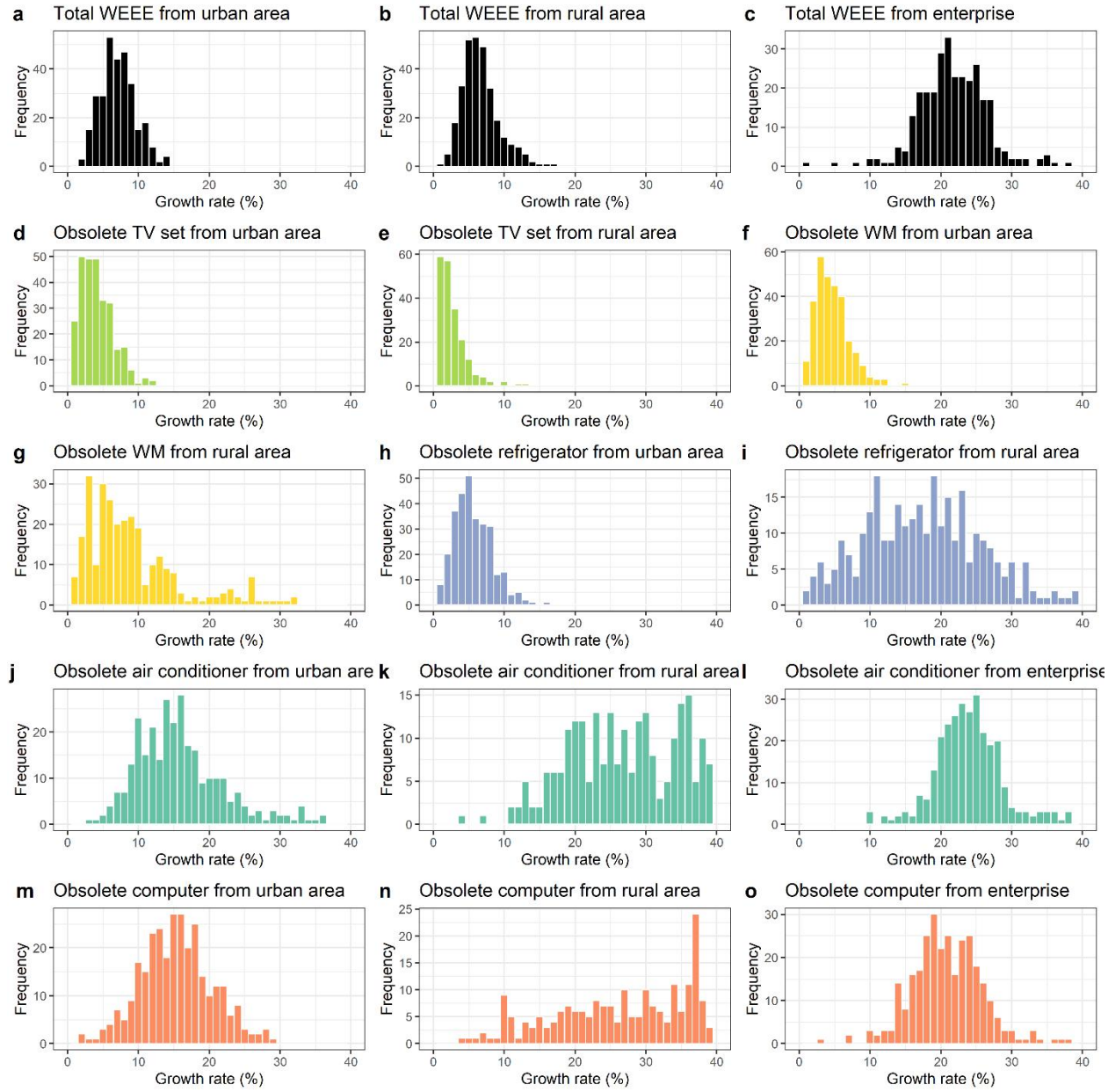


Figure S27 The number of cities for each growth rate of WEEE from (a) urban area, (b) rural area, and (c) enterprises, of obsolete TV from (d) urban area, (e) rural area, of obsolete washing machine (WM) from (f) urban area, (g) rural area, of obsolete refrigerator (R) from (h) urban area, (i) rural area, of obsolete air conditioner (AC) from (j) urban area, (k) rural area, (l) enterprises, and of obsolete computer (C) from (m) urban area, (n) rural area, (o) enterprises in 2017.

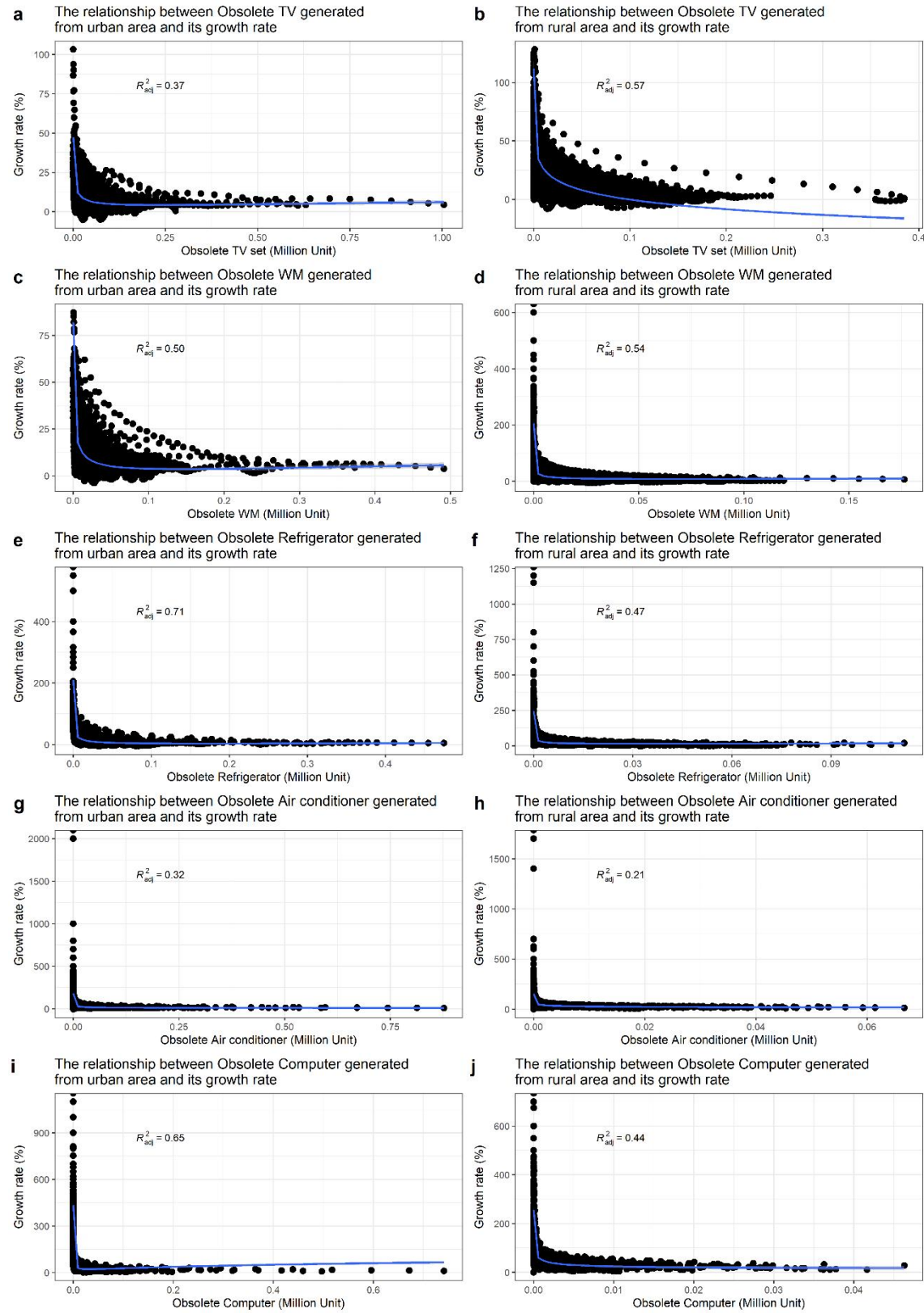


Figure S28 The relationship between WEEE generation from urban and rural area and their growth rates.

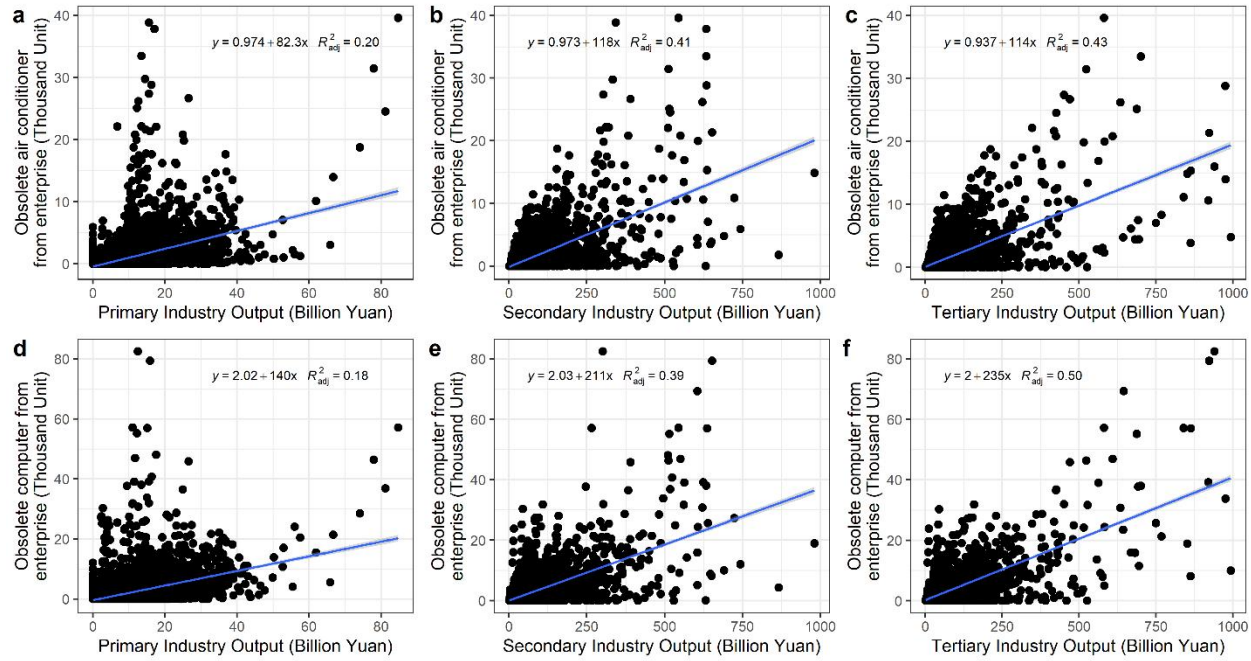


Figure S29 The relationship between obsolete air conditioner and obsolete computer generated from enterprises and the outputs of three industries.

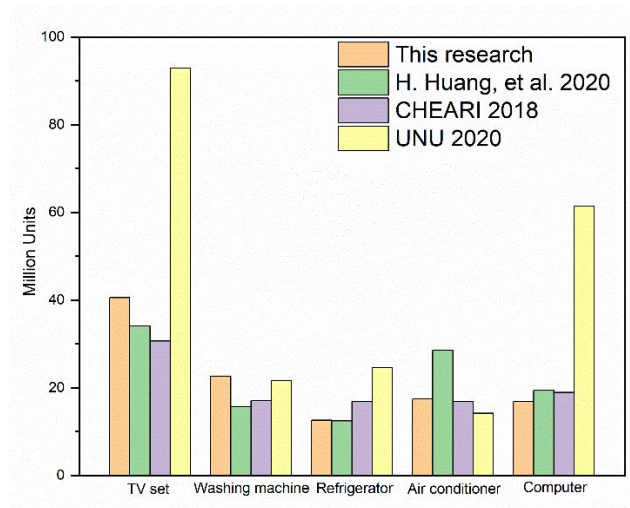


Figure S30 The comparison with previous studies.

4 References

Fang C, Yu D (2020). China's Urban Agglomerations. Singapore: Springer Singapore.

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