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No. 01: The Urban Food System of Nanjing, China

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HUNGRY CITIES PARTNERSHIP

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Steffanie Scott and Taiyang Zhong

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1. City Background

Nanjing (南京 in Chinese, literally translated as "the southern capital") was established in 571BC and was the first city to house over one million people (during the Six Dynasties period from 222AD to 589AD). The size of the city changed dramatically over the centuries due to frequent shifts of dynasties and warfare. Most recently, after the Nanjing Massacre in 1937 during the Anti-Japanese War (1937-1945), its population was reduced to a mere 170,000. It then regrew to more than one million by 1946. In 1978, when China's economic reform was launched, the Nanjing population had reached 3.38 million, an increase of 67% from 1949, when the People's Republic of China was founded.

Today, Nanjing has a population of 8.2 million, which makes it the 14th largest city in the country (Table 1). It is the capital city of Jiangsu province, one of the richest provinces in China and also a "regional central city" in east China. Located in the southwest of Jiangsu, Nanjing is about 300km from Shanghai (Figure 1). The largest river in China – the Yangtze River – flows through the municipality of Nanjing from southwest to northeast, while the urban centre of Nanjing is on the southeastern side of the riverbank.

Figure 1: Location of Nanjing in China

Table 1: Top 20 Chinese Cities by Size, 2014

Rank	City	Population of municipality	GDP (USD billion)	GDP per capita (USD thousand)	Province
1	Chongqing	29,700,000	232.2	7.8	Chongqing
2	Shanghai	24,152,000	383.6	15.9	Shanghai
3	Beijing	21,516,000	347.2	16.1	Beijing
4	Tianjin	15,168,100	255.9	16.9	Tianjin
5	Chengdu	14,178,000	163.7	11.5	Sichuan
6	Guangzhou	12,926,800	272.0	21.0	Guangdong
7	Shenzhen	10,628,900	260.5	24.5	Guangdong
8	Suzhou	10,466,000	224.0	21.4	Jiangsu
9	Wuhan	10,220,000	163.8	16.0	Hubei
10	Qingdao	8,964,000	130.3	14.5	Shandong
11	Hangzhou	8,844,000	149.8	16.9	Zhejiang
12	Zhengzhou	8,626,500	110.7	12.8	Henan
13	Shenyang	8,257,000	116.5	14.1	Liaoning
14	Nanjing	8,187,800	143.6	17.5	Jiangsu
15	Ningbo	7,639,000	123.8	32.5	Zhejiang
16	Tangshan	7,577,300	99.7	13.2	Hebei
17	Changsha	7,221,400	127.1	17.6	Hunan
18	Foshan	7,194,300	123.8	17.2	Guangdong
19	Dalian	6,876,000	130.3	18.9	Liaoning
20	Wuxi	6,465,500	133.6	20.7	Jiangsu

Source: http://bj.bendibao.com/news/2015128/179182.shtm

Nanjing is the cradle of contemporary Chinese industrial development and one of the country's top-ranked cities in terms of the size of its economy. In 2014, its GDP was CNY882.075 billion (USD142.05 billion), which ranked 11th in the country (Table 1).

Nanjing also plays a pivotal role in the Yangtze River Delta economic zone. It is located at the centre of the Nanjing Metropolitan Circle, which includes seven other cities within 100km of Nanjing across Jiangsu and the neighbouring province of Anhui. The Nanjing Metropolitan Circle consists of more than 30 million people and is closely connected to other major cities in the Yangtze River Delta, such as Shanghai, Hangzhou and Suzhou. Nanjing plays a pivotal role in connecting the east (Shanghai and its nearby cities) with the west (Anhui province). It also connects southern Jiangsu province, which is more economically developed, with the less developed northern Jiangsu province.

There are four hierarchical administrative levels in Nanjing: the municipal (*shi*), districts (*qu*), subdistricts (*jiedao*) and communities (*juweihui* or *cunweihui*). In total, Nanjing has 11 districts, 100 subdistricts and townships, and 307 communities (Table 2). Each community has one or more neighbourhoods (*shequ*

or *xiaoqu*). Gulou, Xuanwu, Jianye and Qinhuai districts are considered to be downtown Nanjing or the old city centre (Figure 2). Gulou, Xuanwu, Jianye, Qinhuai, Qixia and Yuhuatai are the main urban districts and Liuhe, Lishui and Gaochun are the outer suburban districts.

Table 2: Administrative Divisions in Nanjing

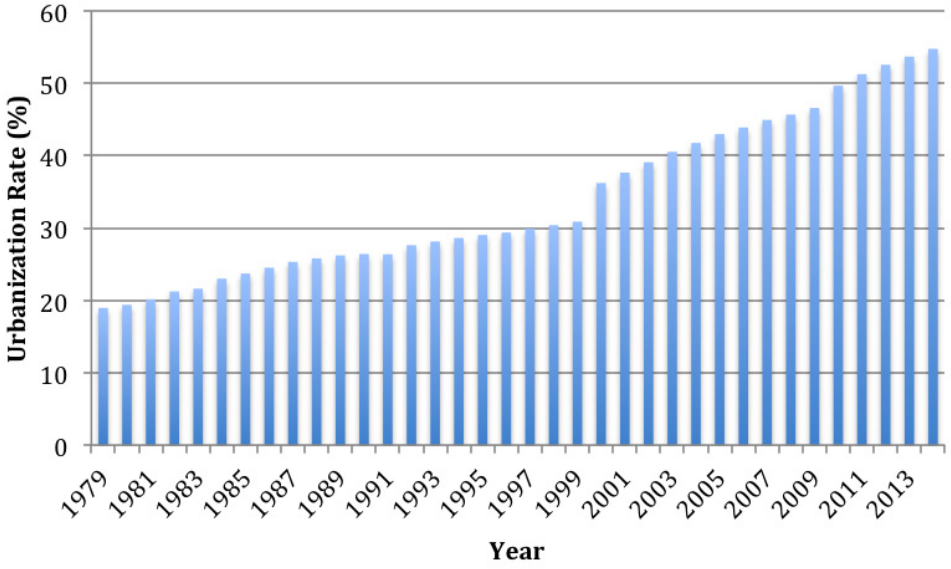
Districts	Area (km^2)	Administrative divisions			
		Sub-districts	Townships	Communities	Neighbourhoods
Gulou	53.1	13	0	42	118
Qinhuai	45.2	12	0	32	106
Xuanwu	75.2	7	0	14	58
Jianye	82.7	6	0	23	44
Yuhuatai	134.6	6	0	13	60
Qixia	376.1	9	0	32	78
Pukou	912.3	9	0	19	87
Jiangning	1,572.9	10	0	30	128
Liuhe	1,467.1	11	1	59	90
Gaochun	792.0	0	8	26	10
Lishui	1,067.3	0	8	17	69
Total	6,582.3	83	17	307	848
Source: Statistical data acquired from the Nanjing government					

Figure 2: Districts of Nanjing

2. Demography of Nanjing

China has undergone a major urban transition since its reform and opening-up policy was introduced in 1978. The economic boom in cities led to major in-migration from the countryside (Siciliano 2012) and urbanization levels increased from 19% in 1979 to 55% in 2014 (Figure 3). China became a predominantly urban nation in 2011, when its urban population surpassed its rural population for the first time. The declining farming population and area of farmland along with the increased food consumption of urban residents have had significant implications for China's food security, including in cities such as Nanjing (Lu et al 2015, Yang X. 2013). Some background on the city is therefore in order.

Figure 3: China's Urban Population, 1979-2014

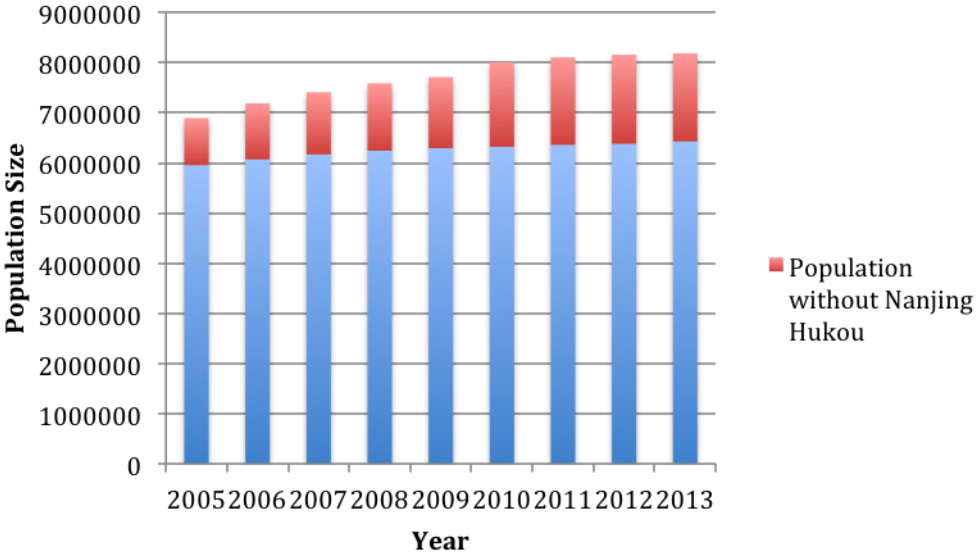


Source: National Statistics Data

In 1979, Nanjing's officially registered population was 3.5 million people. The most recent statistics indicate that by the end of 2014, Nanjing had 8.2 million residents including 6.5 million permanent residents with Nanjing *hukou* (official registration status). UN-Habitat (2015: 196) projects that the population of Nanjing will grow to 9.5 million by 2030. *Hukou*, which is often seen as China's domestic visa system, is the legal status registration that specifies the basic demographic information of all household members. Since 1958, when the *hukou* system was established, Chinese households have been categorized into rural and urban (or agricultural and non-agricultural) households. Migrants living in cities without the local *hukou* are considered temporary residents and are ineligible for many social welfare benefits such as medical care and education opportunities

(Swider 2015). In this way, the *hukou* system hinders free rural-urban migration and constrains movement to the cities. The number of people in Nanjing without *hukou* has increased over the last decade (Figure 4).

Figure 4: Nanjing Population With and Without Hukou Registration



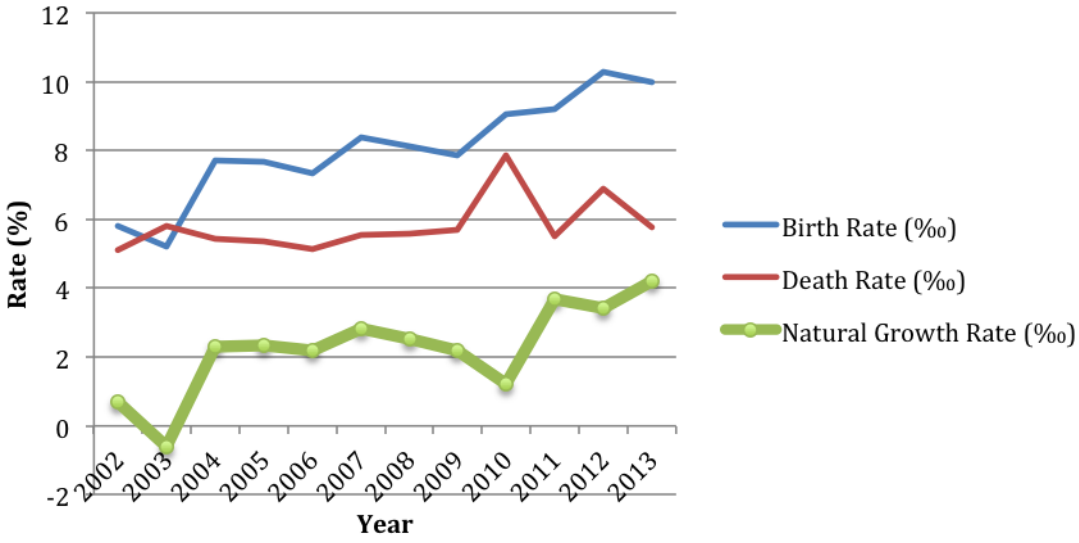
Source: Statistical Yearbooks of Nanjing

Nanjing's population has grown as a result of natural growth and in-migration. There have been major annual fluctuations in the city's natural growth rate over the last decade (Figure 5). In 2003, it experienced a negative natural growth rate. From 2004 to 2007, it remained around 2% per annum. After dropping below 2% in 2010, it increased to over 4% in 2013. In-migration is the other major driver of population growth in Nanjing (Cheng 2011). Many migrants have acquired Nanjing *hukou*, which means permanent residential status of the city. Yet, the temporary residents remain an important component of the total population. Of the more than 1.5 million people without *hukou* in 2010, around 62% came from other cities and rural areas in Jiangsu province and 38% came from other provinces, mostly Anhui province (Zha 2012).

A comparison of in-migration and out-migration from the city shows that both have fluctuated over the last decade (Figure 6). In-migration peaked at over 225,000 in 2006 and declined to less than 150,000 in 2012. Out-migration started to increase after 2001 so that by 2010 the gap (net migration) was significantly smaller than in the early 2000s. This implies a decline in the relative importance of migration-induced population growth in recent years. Declining net migration is consistent with broader Chinese trends. Recent studies have found that the Chinese working-age population (ages 15-59) started to shrink around 2010

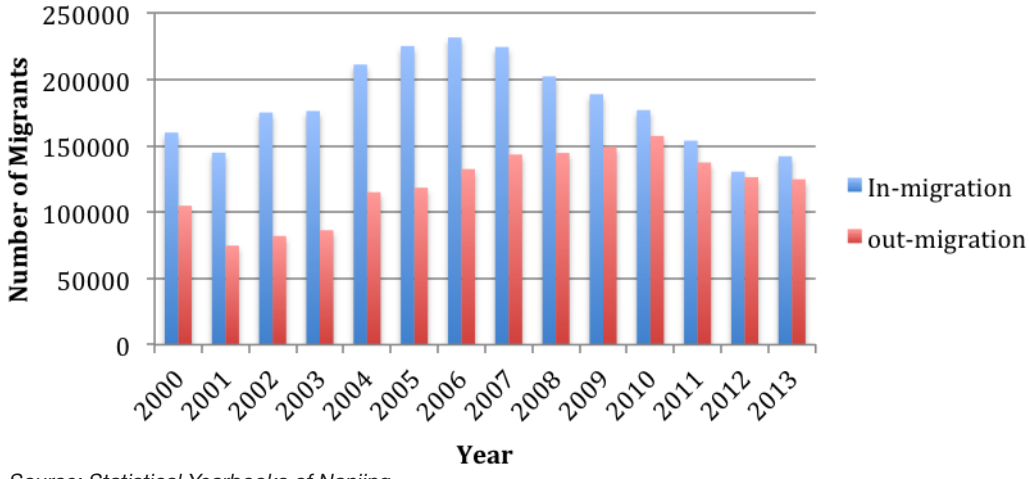
(Chu and Davis 2015). In-migration, which is generally dominated by a younger working-age cohort, has consequently been declining. While the total population has grown over the last decade, Nanjing is becoming more gender-balanced (Figure 7). The male-female ratio dropped from 1.07 in 2000 to 1.01 in 2013.

Figure 5: Natural Population Growth Rate of Nanjing, 2002-2013



Source: Statistical Yearbooks of Nanjing

Figure 6: Migration to and from Nanjing, 2001-2013

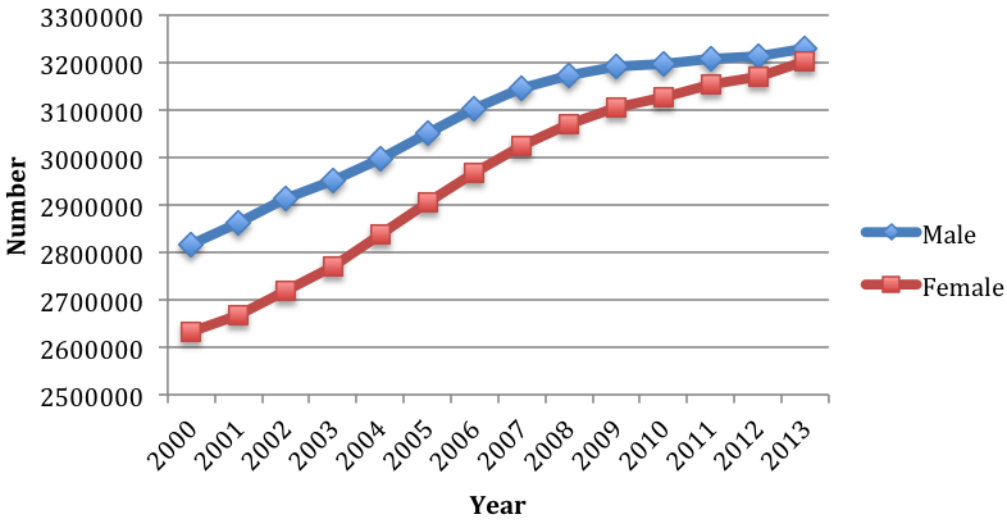


Source: Statistical Yearbooks of Nanjing

China has experienced several "baby booms" in the past 50 years and these are reflected in the age distribution of the Nanjing population. In general, the distribution displays a normal curve with 820,200 people (10%) between 0 and 14 years old, 6,550,300 people (80%) between 15 and 64 years old, and 845,600 people (10%) more than 64 years old (Statistical Bureau of Nanjing 2014). The

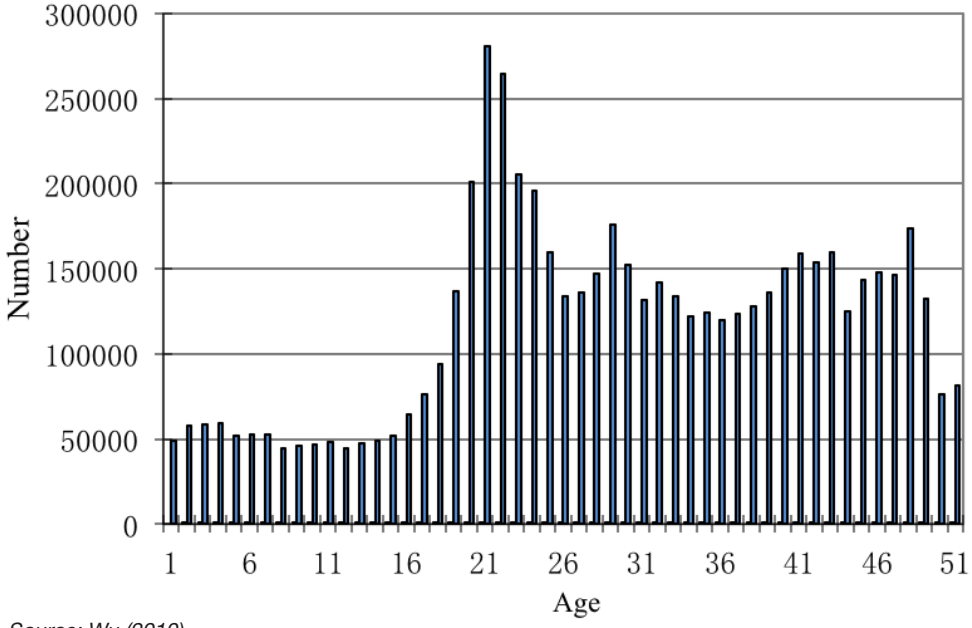
2010 age distribution of the population shows peaks around 21 (born around 1989), 29 (born around 1981) and 48 years old (born around 1962) (Wu 2010) (Figure 8). The period from 1962 to 1970 was a peak birth era after the Great Famine from 1959 to 1961. The sharp decline in the death rate after 1961, and the strong desire to have children after the famine, stimulated an increase in newborns. This led to another birth peak from 1980 to 1990 when the large number of people born in the 1960s entered reproductive age.

Figure 7: Total Registered Male and Female Population in Nanjing, 2000-2013



Source: Statistical Yearbooks of Nanjing

Figure 8: Age Distribution of Nanjing Population, 2010



Source: Wu (2010)

The proportion of the population in each of the three main age groups (0-14, 15-64 and over 64) has changed markedly over the last three decades. The population of Nanjing has certainly been aging with an increase in seniors (those over 64 years old) from 5% in 1982 to 10% in 2014. Over the same period, the proportion under 14 years of age decreased from 26% to only 10%. The absolute number of children in the city declined from 1,160,000 million to 820,000 over the time period, a likely result of the one-child policy as well as the increasing costs of raising children.

Table 3: Distribution of Nanjing's Population by Age Group, 1982-2014

Year	Population in age groups (thousands)				Percentage		
	Total	0-14	15-64	>64	0-14	15-64	>64
1982	4,491	1,160	3,108	223	25.8	69.2	5.0
1990	5,168	1,074	3,768	326	20.8	72.9	6.3
2000	6,126	945	4,661	520	15.4	76.1	8.5
2010	8,005	761	6,507	736	9.5	81.3	9.2
2014	8,216	820	6,550	846	10.0	79.7	10.3

Source: Adapted from Wu (2010) (data of 2014 are extracted from Statistical Yearbook of Nanjing, 2014)

3. Population Distribution in Nanjing

The six urban districts of Nanjing (Gulou, Xuanwu, Jianye, Qinhuai, Qixia and Yuhuatai) cover an estimated 770km^2 and contain about 55% of the total population of the city (Table 4). The most densely populated districts are Gulou and Qinhuai with 24,313 and 20,996 people per square kilometre respectively. By contrast, the least dense district, Lishui, has a population of only 392 people per square kilometre. Over the last decade there has been a marked shift in the population distribution in various districts of Nanjing. The four downtown districts, for example, experienced a significant increase in population between 2000 and 2010 (Figure 9). By contrast, the population increase in the outer suburban districts was relatively small.

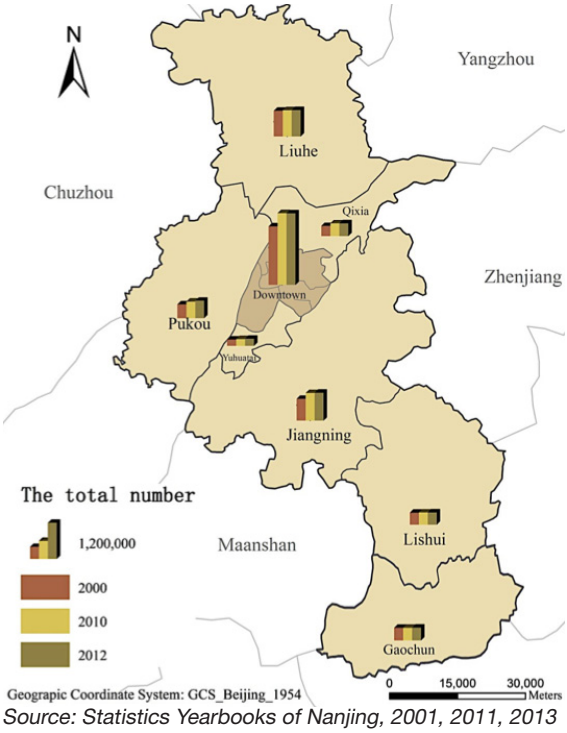
Many of the poor neighbourhoods in the old city centre have disappeared in massive state-led city renovation projects that began in the late 1990s. Most of the renovated neighbourhoods were located in the southern part of the old city (Zhang and Gu, 2012) (Figure 10). The demolitions and the resettlement of the urban poor from the old inner city to other parts of Nanjing peaked in 2006, when 3,716 households were relocated in a single year (Figure 11). By 2011, most of the urban poor had been moved out of the city and the renovation of the old city was almost complete (Song et al 2013). Figure 11 also shows the compensa-

tion that these households received and the increasing price of housing. It shows that the compensation households received per square metre has been rising due to the rising average price of houses and other factors such as inflation.

Table 4: Population Density in Nanjing by District in 2014

Districts	Area (km²)	Population (million)	% of Population	Density (people/km²)
Urban				
Gulou	53.1	1.3	15.9	24,313
Qinhuai	45.2	1.03	12.6	20,996
Xuanwu	75.2	0.66	8.1	8,779
Jianye	82.7	0.45	5.5	5,358
Yuhuatai	134.6	0.42	5.1	3,068
Qixia	376.1	0.66	8.1	1,762
Sub-total	766.9	4.52	55.2	5894
Peri-urban				
Pukou	912.3	0.73	8.9	795
Jiangning	1,572.90	1.18	14.4	746
Liuhe	1,467.10	0.93	11.4	630
Gaochun	792	0.42	5.1	529
Lishui	1,067.30	0.42	5.1	392
Sub-total	5,811.6	3.68	44.9	633
Total	6,582.30	8.19	100	1,240
Source: Statistics Yearbook of Nanjing, 2015				

Figure 9: Population of Nanjing by District, 2000-2012

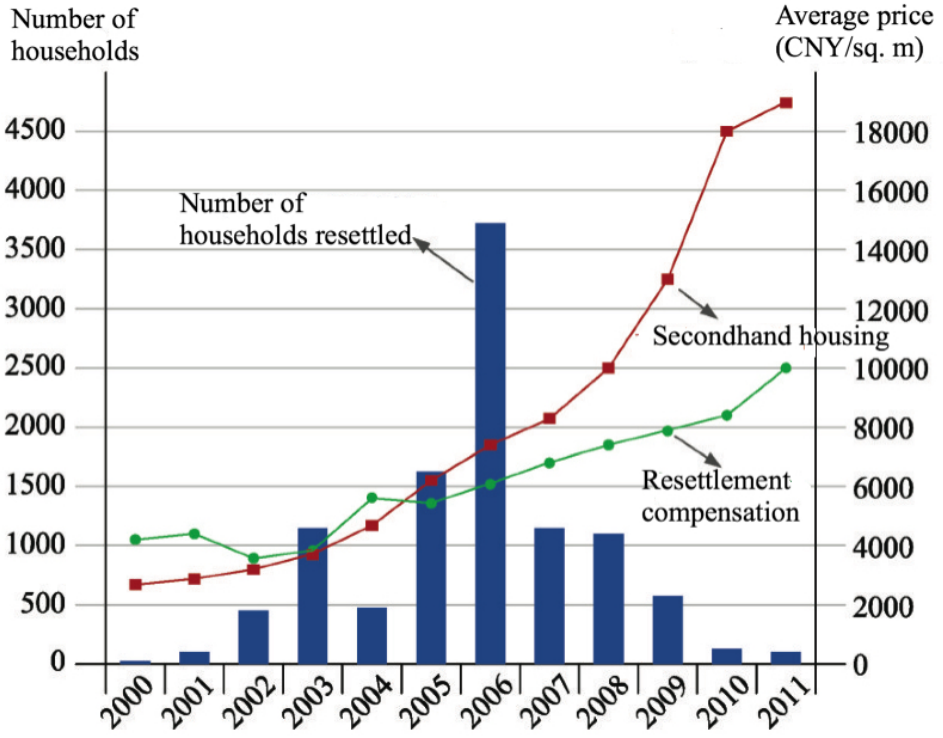


Source: Statistics Yearbooks of Nanjing, 2001, 2011, 2013

Figure 10: Location of Renovated City Centre Areas

Source: Zhang and Gu (2012: 66)

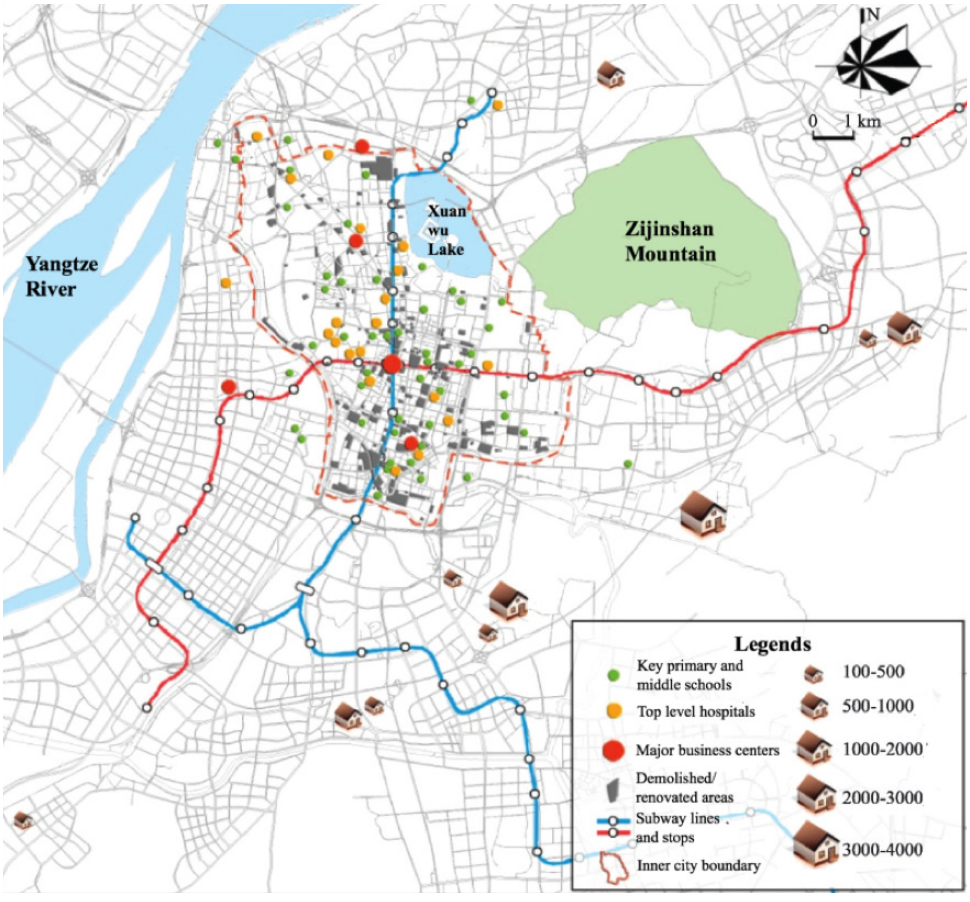
Figure 11: Resettlement of the Urban Poor, 2000-2011



Source: Adapted from Song et al (2013: 1472)

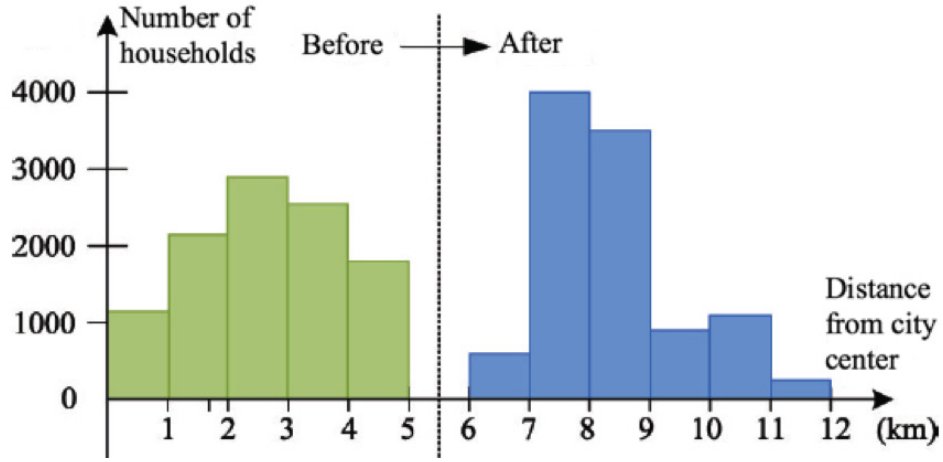
Most of the households in the renovated neighbourhoods were relocated to 25 clusters of affordable housing (*jingji shiyong fang*). The construction of these clusters was approved by the municipal government in 2002 and 2005. After 2003, the affordable housing buildings constituted 20-25% of the total housing units constructed every year (Zhang and Gu 2012). Some of the largest clusters are Chunjiang Xincheng, Xianhemen, Yaohuamen and Sunjiawa. The grey plots in Figure 12 are the demolished and renovated areas in the city centre and the house symbols mark the major resettlements around the city. The map shows how far the resettled households now are from services such as hospitals and schools. Prior to removal, most of the low-income households were 1-5km from the city centre (Song et al 2013). Afterwards, they were between 6km and 12km away. The majority (about 70%) were moved to the 7-9km circle from the centre (Figure 13). Many of the clusters of resettlement housing are located along the round-the-city highway (Figure 14).

Figure 12: Location of Resettlement Communities in Nanjing



Source: Adapted from Song et al (2013: 1474)

Figure 13: The Location of Low-Income Households in Nanjing Before and After Relocation



Source: Adapted from Song et al. (2013: 1472)

Figure 14: Clusters of Resettlement along Round-the-City Highway

Source: Zhang and Gu (2012: 67)

4. Formal Economy of Nanjing

4.1 Major Industrial Sectors

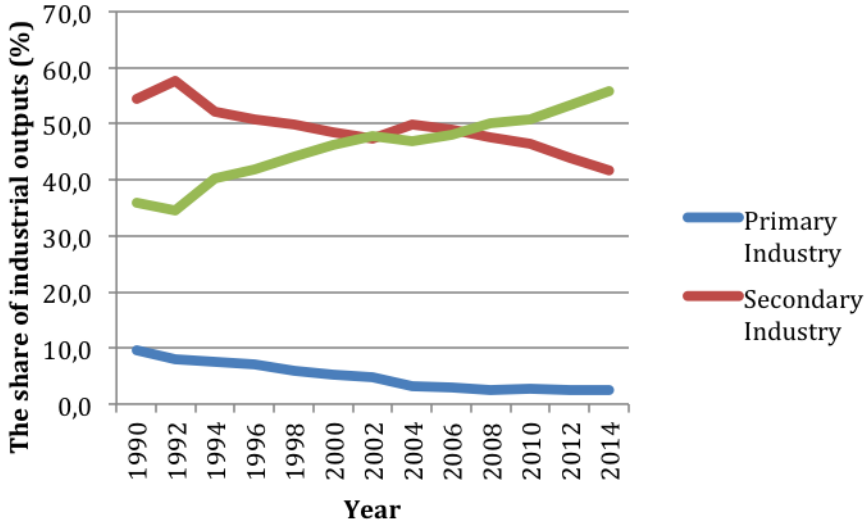
Nanjing is one of China's major industrial centres. Starting with the first mechanical manufacturing plant built in 1865, Nanjing developed a solid industrial foundation with specific strengths in the petrochemical industry, automobile manufacturing, ferrous metallurgical industry and mechanical equipment

industry. Today, the four major pillars of Nanjing's industrial sector are electronics, automobile manufacture, the petrochemical industry and steel manufacturing. The city is also the focus of the development of the biomedical engineering, advanced materials, photoelectricity and communication industries.

Zhou and Li (2012) argue that Nanjing's secondary industrial sector is unbalanced with insufficient light industry compared to the dominance of bigger heavy industry. In 2009, for example, the gross output of Nanjing's light industry constituted only 18% of the total industrial sector. The share of light industry had been dropping until 2006 (Figure 15). Since then, together with the construction industry, the secondary (manufacturing) sector of Nanjing generated CNY367 billion (USD59.74 billion) worth of output in 2014. The computer and electronics manufacturing industry, chemical engineering, and automobile industry had an output of more than CNY100 billion (USD16.28 billion) in 2014.

Tertiary industry in Nanjing – which includes transportation, warehousing industry, postal services, wholesale and retail, the lodging and catering industry, finance, real estate sales and other services – has played an increasingly important role in the city's economic growth in the last decade. Since 2008, the steady growth of tertiary industry has made it the largest industrial sector in terms of gross value of output (Zhou and Li 2012). In 2014, the gross value of output of the tertiary industry was CNY492 billion (USD80.09 billion). The total output of the primary sector (agriculture) was CNY22 billion (USD3.58 billion) in 2014.

Figure 15: Changing Shares of GDP of Three Economic Sectors of Nanjing, 1990-2014



Source: Statistical Yearbooks of Nanjing

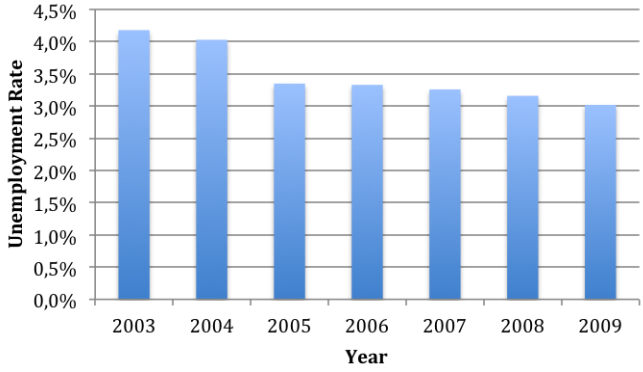
4.2 Employment and Unemployment

The number of people employed in Nanjing increased by 843,600 between 1993 and 2009 (Xu 2010). In 2014, 4,889,000 people were employed in Nanjing, 77,000 more than in 2013. Among these, 225,700 people were new employees, 104,400 were re-employed, and the rest were previous employees (Nanjing Statistics Bureau, 2015). The number of employees in each of the three industrial sectors reflects the size of the sector. Primary industry employed 278,000 in 2014, which accounted for 5.7% of total employment. Secondary industry employed 1,763,000 people, which accounted for 36.1% of total employment. Tertiary industry employed 2,848,000 people, with 58.3% of total employment.

Since the start of the reform and opening-up policy in 1978, many state-run services in China have been privatized and state-owned enterprises have been turned into sharing-holding systems (*gufenzhi gaige*). Nanjing has a large number of corporate enterprises that once were state-owned. Workforces were downsized significantly in the transition, with the layoff of staff reaching its peak in the late 1990s (Jiang 2003). The number of registered laid-off workers rose from around 30,700 in 1989 to 309,700 in 2000. And the registered unemployment rate rose from 2.1% to 3%. Some estimated that the real unemployment rate was more than 8%. Most of these layoffs happened in secondary industry. Some workers transferred to the tertiary industry sector (services and finance), while others started to work in the informal sector.

There is little available data on unemployment in Nanjing as this is a politically-sensitive topic. One online database shows that the registered unemployment rate of Nanjing gradually declined from 4.18% in 2003 to 3.02% in 2009 (Figure 16). The registered unemployment rate in 2014 was only 2.5%. These figures are probably an underestimate because many unemployed people are not registered at the government's human resource and social security department. According to surveys, the unemployment rate in large and middle-sized Chinese cities was 5%, about 1-2% higher than the registered unemployment rate (Liu 2014).

Figure 16: Registered Unemployment in Nanjing, 2003-2009



Source: http://searchina.net.cn/citygdp/trends.asp?id=12&citys=4

5. Informal Economy of Nanjing

5.1 Size and Importance

Jiang (2003) argues that there were three waves of socioeconomic change and policy shifts that fostered the growth of the informal economic sector in Nanjing. The first happened after 1978 as a result of the growth of the private and sole-proprietorship economy and associated redundancies. The second wave was generated in the 1990s with the inflow of migrant workers from rural China. Before the 10th Five-Year Development Plan (2001-2005), rural-to-urban migration was controlled. After 2001, these controls were abolished. The number of temporary residents without local *hukou* status rose rapidly.

Many of these migrants work in the informal sector because of discriminatory policies and the disadvantages they have compared to better-educated, connected and informed Nanjing residents. A survey in 2006 (Liu and Li 2007) found that about 84% of migrant workers were in the informal sector (87% of males and 79% of females). The third wave of growth of the informal economy in Nanjing was a result of the significant increase in laid-off workers after 1998. A survey in 2001 found that about 63% of retrenched workers were in the informal sector (Jiang 2003). An estimated 560,200 people were working in the informal sector in 2000. Currently, the number of people working in the informal sector probably exceeds 1.4 million.

As with many other cities in China, Nanjing's informal economy has become an important source of income for the poor, including migrant workers. Due to the relatively high costs of working in the formal economy or starting a formal business, many people work in the informal sector and connect with the formal sector in various ways (Zhu and Liu 2013). Driven by financial incentives, some migrants have started their own businesses in the city. Their strong entrepreneurial drive contributes directly to the sustainable growth of the economy and provides job opportunities.

5.2 Types of Activity

In Nanjing, activities in the informal economy include work in the construction industry, street-cleaning, selling food and other small commodities on the street, and housekeeping and scavenging (Li 2010, Liu and Li 2007). Types of informal economic activity engaged in differ greatly between men and women. A survey of 380 migrant workers in the informal sector in Nanjing in 2010 found that male migrants mainly worked as removers (83%) and doing interior finishes (79%), while female migrants mainly worked as street cleaners (64%) and housekeepers (48%) (Li 2010). Many migrants were doing multiple jobs.

Table 5: Distribution of Workers in Informal Economic Activity by Sex

	Remover/ construction (%)	Interior finishing (%)	Street-cleaning (%)	Street vending (%)	House-keeper (%)	Scavenger (%)
Male	83	79	29	14	<10	<10
Female	–	36	64	26	48	–

Source: Adapted from Li (2010)

6. Poverty and Income

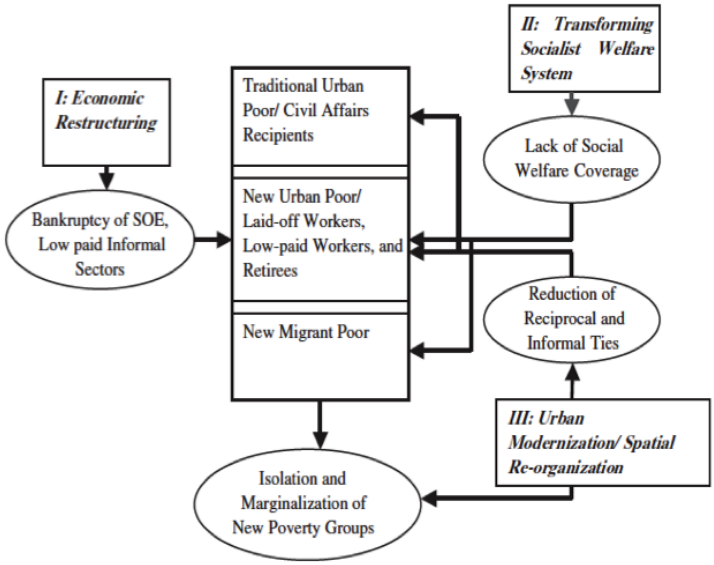
Economic restructuring in China since the 1980s has generated several new conditions for the emergence of urban poverty (Chen et al 2006). These conditions include the bankruptcy of state-owned enterprises, increasing surplus labour in rural areas, and migration from rural to urban areas. Within the broad socio-economic context of market transition, urban poverty in China has been exacerbated in several ways. First, the dismantling of the planned economy and the socialist welfare system led to a widening income gap between different social groups. Second, there was a massive layoff of workers from state-owned enterprises with redundant employees and poor market performance. Third, the ranks of the urban poor were swelled by rural-urban migrants working in the informal sector and in low-paid jobs (Figure 17). Liu et al (2008) note that the new urban poor and rural migrants were the two major pauperized groups under the new policies. According to the 2012 National Census, there were over 236 million migrants living in Chinese cities and more than 22 million of them were impoverished (Park and Wang 2010).

As mentioned above, Nanjing is the capital of one of the richest provinces in east China and its residents are generally better off than those of other Chinese cities. There has also been a steady increase in annual disposable per capita income, which rose from CNY8,282 (USD1,000) in 2000 to CNY42,568 (USD6,930) in 2014 (Figure 18). In 2014, daily disposable income per capita of urban residents in Nanjing was USD18.99, which is very much higher than the moderate poverty level (<USD2-5) suggested by the World Bank.

According to the standards set for determining the eligibility of Affordable Housing in Nanjing in 2015, households with a monthly disposable income of less than CNY1,513 (USD242.08) per household member are considered "low-income" households. Those with monthly incomes of CNY1,513 to 2,421 (USD242.08-377.64) are considered "medium-low income." However, there are no statistics or survey results available on the numbers of households in these income groups. A glimpse of growing income inequality can be garnered from a paper about the financial status of households in Nanjing (Wang 2011). The paper specified that

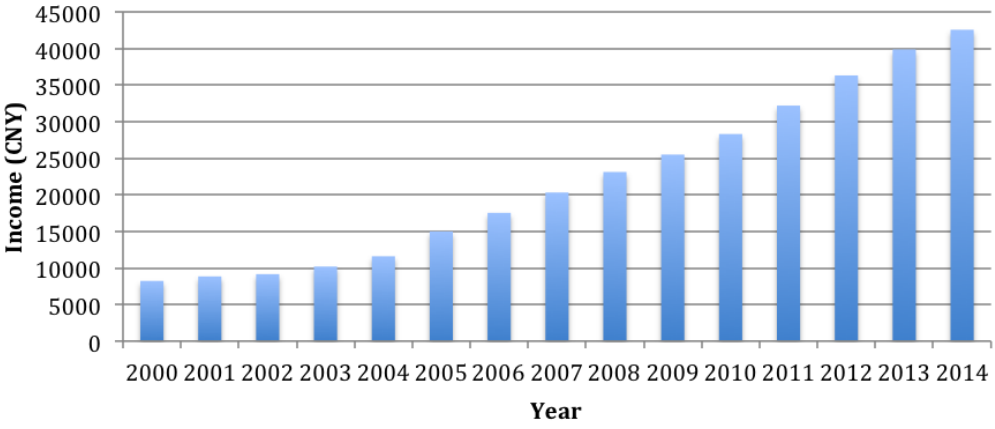
in Nanjing in 2010, the top 10% of high-income households' annual disposable income per person was CNY63,170 (USD9,853.68) higher than that of the bottom 10% of households. This gap had increased by 81% from 2005, when the difference was CNY34,872 (USD5,439.57). The 2014 statistics from the Nanjing Statistics Bureau divided the population in Nanjing into income quintiles, which does show the range of incomes in the city. The lowest income group's average annual disposable income was CNY18,675 (USD2,913.05) per person. The other income levels were CNY28,421 (USD4,433.30) for the lower-medium income group; CNY36,494 (USD5,692.58) for the medium income level group; CNY46,852 (USD7,308.29) for the upper-medium income group; and CNY75,497 (USD11,776.53) for the high-income group.

Figure 17: Framework for Understanding Urban Poverty in China



Source: Chen et al (2006: 6)

Figure 18: Annual Disposable Income Per Capita in Nanjing, 2000-2014



Source: Statistical Yearbooks of Nanjing

The spatial distribution of poverty in Nanjing changed dramatically after 2000. Before then, most households receiving Minimum Living Standard (MLS) poverty funds (*zuidi shenghuo baozhang*) lived in the old city centre. The mass relocation from the city centre reconstructed Nanjing's spatial and social geography and led to considerable "spatial deprivation" (Bradford et al 1995, Townsend 1987). When the low-income residents were moved to suburban areas, they were deprived of easy access to high quality educational, medical and other resources. This will arguably lead to further social segregation and disparity within the city.

The renovation program has meant that the social structure of the city centre is increasingly fragmented and diversified. The old city centre is now dominated by wealthy immigrants who moved there for their children's education (*peidu*); new middle-class groups working in the finance and real estate sectors; government officials and employees; high-income social elite groups; owners of private businesses, and a few of the original residents (Wu et al 2013, 2014). However, people living in the city centre are not all high-income elites. Zhang (2012), for example, analyzed the spatial fragmentation and gentrification of the old city centre of Nanjing and found that there was an intensive mix of rich and poor.

Table 6 shows the spatial variation in income level among the 11 districts in Nanjing in 2013. Two of the central districts, Xuanwu and Gulou, have the highest disposable income per capita while two remote peri-urban districts, Lishui and Gaochun, have the lowest.

Table 6: GDP and Disposable Income by Nanjing District, 2013

Districts	GDP (billion CNY) 2012	GDP (billion CNY) 2013	GDP per capita (USD)	Disposable income per capita (USD)	Daily disposable income per capita (USD)
Xuanwu	41.5	46.2	11,211	6,826	18.7
Qinhuai	54.1	60.4	9,486	6,278	17.2
Jianye	13.0	16.8	6,234	5,959	16.3
Gulou	69.9	78.3	9,751	6,682	18.3
Qixia	62.5	68.1	16,676	5,960	16.3
Yuhuatai	23.5	27.1	10,964	5,898	16.2
Pukou	46.2	52.5	11,703	5,991	16.4
Liuhe	61.6	69.0	11,943	5,874	16.1
Jiangning	92.7	108.6	15,007	6,172	16.9
Lishui	36.2	43.2	16,313	5,601	15.3
Gaochun	35.6	41.8	15,918	5,835	16.0
Nanjing	720.2	801.2	15,852	6,439	17.6
Source: Statistical Yearbooks of Nanjing					

There are five main types of social insurance in Nanjing: endowment insurance, medical insurance, unemployment insurance, work-related injury insurance and maternity insurance. Endowment insurance includes basic endowment

insurance for employees of enterprises, endowment insurance for governmental departments and affiliated institutions, and general residents' insurance for urban and rural residents in Nanjing. Medical insurance includes employee medical insurance and residents' medical insurance. The number of insurants for each of the categories at the end of 2014 is shown in Table 7.

Table 7: Scope of Social Insurance in Nanjing, 2014

Types of social insurance in Nanjing		No. of insurants	Note
Endowment insurance	Basic endowment insurance	2,920,600	756,700 are receiving funds
	Endowment insurance for government employees	113,000	70,700 are receiving funds
	General residents insurance	570,100	–
Medical insurance	Employee medical insurance	3,760,500	84% of hospitalization expenses covered
	Residents medical insurance	1,020,700	74% of hospitalization expenses covered
Unemployment insurance		2,485,100	858-1,630 CNY/month
Work-related injury insurance		2,442,400	–
Maternity insurance		2,288,700	–
Source: Nanjing Municipal Human Resources and Social Security Bureau (2015)			

Besides these types of insurance, Nanjing has also implemented the MLS program, which is a national system to help low-income families cover the costs of basic needs such as food, clothing, shelter and medical expenses (Gao 2009). Only families that meet certain requirements are eligible to apply. The government of Nanjing increased the subsidy to CNY700 per month in July 2015. In 2014, there were about 109,900 Nanjing residents benefiting from the MLS program (Dong 2014).

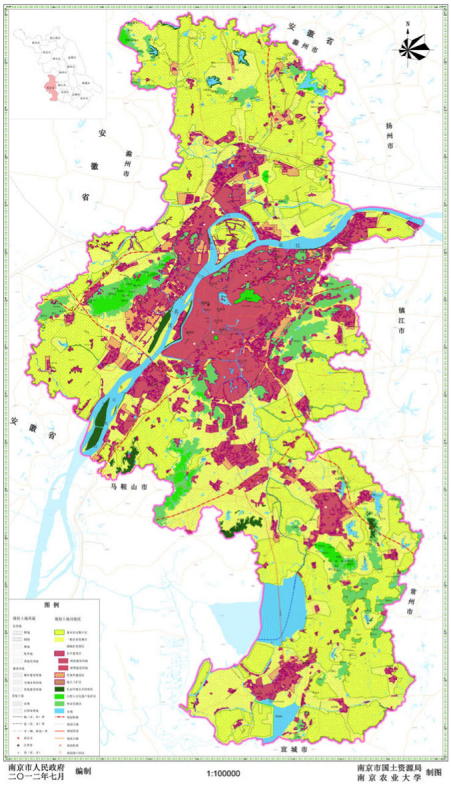
Gao (2011) notes that there were about 23 million residents, about 4% of the total urban population, dependent on the MLS program in China in 2003. Ravallion et al (2006) concluded that the program lowered its beneficiaries' poverty rate by 20%, poverty depth by 29%, and poverty severity by 37%. Despite the large urban population enrolled in the MLS program, various studies found that only 28-51% of eligible families were enrolled (Gao 2011). Gao et al (2009) also point out that only a quarter of the subsidy entitlement was actually received by the beneficiaries. It is not known if and how the MLS program has contributed to the improvement of food security of low-income families in Nanjing. Besides this program, Nanjing has other schemes to assist low-income families in purchasing affordable housing, waiving medical costs and tuition fees, and temporary assistance for victims of disasters. However, no information is currently available about food banks or community kitchens, or other mechanisms designed to enhance the food security of the urban poor in Nanjing.

7. The Food System

7.1 Land Use

The Land Use Planning of Nanjing (2006-2020) (Municipal Government of Nanjing, 2012) includes a municipal-wide land use map (in Chinese) (Figure 19). The map illustrates the location and area covered by different land use types across the city. The actual area of each land use type is available for 2005 and 2010 with projected figures for 2020 (Table 8). The central government's strong farmland protection mandates are reflected in the local government's commitment to protect farmland from urban sprawl (see Lichtenberg and Ding 2008, Lin and Ho 2005). The proportion of farmland only decreased from 37.3% to 36.8% between 2005 and 2010 and is projected to make up 35.9% of the total area in 2010. Although Nanjing enjoys a reputation as one of the greenest cities in China, the local government intends to enhance greening still further by increasing the proportion of forestland from 11.2% in 2005 to 13.1% in 2020. The increased area of constructed land will come from the small decrease of farmland, rural residential land (decrease from 8.4% to 7.9%) and natural reserves (decrease from 1.9% to 0.9%).

Figure 19: Land Use Map of Nanjing



Map Key in English:

Pink = Construction (including residential, industrial and transportation)

Yellow = Agriculture (including farmland, gardens, forestry and grassland)

Blue = Lakes, rivers and ponds

Green = Natural reserves

Source: Land Use Planning of Nanjing 2005-2020

Table 8: Land Use Types in Nanjing, 2005-2020

Land use types			2005 Area (ha)	2005 %	2010 Area (ha)	2010 %	2020 Area (ha)	2020 %
Agricultural land	Farmland		245,593	37.3	242,215	36.8	236,035	35.9
	Gardens		9,404	1.4	9,337	1.4	9,332	1.4
	Forestry		73,928	11.2	77,805	11.8	86,184	13.1
	Grassland		51	0	40	0	20	0
	Other		109,063	16.6	102,593	15.6	91,650	13.9
	Subtotal		438,039	66.5	431,990	65.6	423,221	64.3
Construction land	Construction land in the city	Mining and industry	64,561	9.8	71,662	10.9	80,694	12.3
		Rural residents	55,147	8.4	53,003	8.1	52,294	7.9
		Subtotal	119,708	18.2	124,665	19	132,988	20.2
	Transportation, water conservancy and others	Transportation	10,656	1.6	13,694	2.1	18,203	2.8
		Water conservancy	18,117	2.8	18,448	2.8	18,940	2.9
		Other	8,781	1.3	8,814	1.3	8,881	1.3
		Subtotal	37,554	5.7	40,956	6.2	46,024	7
	Subtotal		157,263	23.9	165,621	25.2	179,012	27.2
Other land	Water		50,572	7.7	50,492	7.7	50,331	7.6
	Natural reserve		12,357	1.9	10,127	1.5	5,666	0.9
	Subtotal		62,929	9.6	60,619	9.2	55,997	8.5
Total			658,231	100.0	658,230	100.0	658,230	100.0

Source: Land Use Planning of Nanjing, 2005-2020

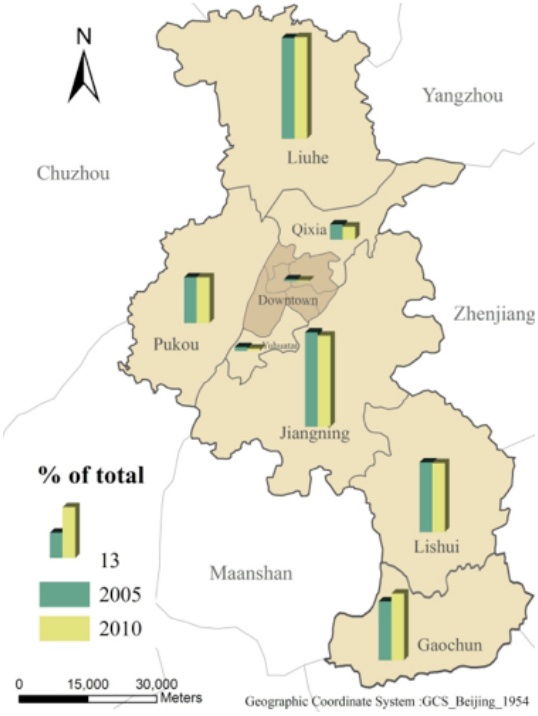
Liuhe and Jiangning districts have the greatest area under farmland. Much less land is under cultivation closer to the city centre. Due to rapid urbanization over the last decade, most districts of Nanjing have witnessed a decline of farmland and agricultural outputs (Table 9). Farmland in the downtown districts (Gulou, Xuanwu, Qinhuai and Jianye) decreased by more than 53% in five years. Nearby Qixia also experienced a 39% decline. Gaochun, one of the remote districts, is the only one that had an increase in the area of farmland between 2005 and 2010 (Xu 2014). Although the gross value of production of the primary sector (agriculture) has increased, it has made up a smaller and smaller share of the total value of production in recent years (Figure 20).

Nanjing was able to produce 44% of the grain, 40% of the fruits and vegetables, 30% of the poultry, 20% of the pork, 15% of the eggs and 10% of the fish that it consumed in 2007 (Lang and Miao 2013). In 2010, 30% of vegetables and 80% of leafy greens consumed in Nanjing were produced on the 460,000mu (about 30,640ha) of vegetable production land in the municipality (Nanjing Agricultural Committee 2013).

Table 9: Changes in Area of Farmland by District, 2005-2010*

	2005 (ha)	2010 (ha)	% change
Pukou	28,755	28,091	-2.3
Jiangning	59,283	55,845	-5.8
Liuhe	63,387	62,381	-1.7
Lishui	43,836	42,405	-3.3
Gaochun	37,057	41,066	10.8
Yuhuatai	2,381	1,454	-39.0
Qixia	9,606	8,072	-16.0
Downtown	1,291	598	-53.7
Total	245,593	239,912	-2.3
Source: Statistical data from Nanjing Municipal Bureau of Land and Resources			
** The area of farmland in 2010 here is different from Table 8 probably because of statistical errors resulting from two different data sources.*			

Figure 20: Change of Farmland by District, 2005-2010



Source: Statistical data from Nanjing Municipal Bureau of Land and Resources: http://www.njgt.gov.cn/default.php?mod=article&fid=7646&s53393558_start=25

7.2 Food Flows Into and Within Nanjing

The Nanjing Daily (2014) reported that with the exception of leafy greens, most of the food consumed in Nanjing comes from outside the city. Nanjing has a close relationship with nearby Hexian County and Lai'an County in Anhui province from where it procures much of its vegetables and other food. In addition

to the 48% of rice sourced locally, rice mainly comes from Anhui (80km away), northern Jiangsu province (250km) and Heilongjiang province (2,000km) (Figure 21). The other 70% of vegetables mainly come from Anhui, Zhejiang province (280km) and Shandong province (640km). Fruits come from Shandong province (640km), Hainan province (2,000km) and the United States. Aquatic products mainly come from Gaoyou, Jiangsu and Gaochun County. Zhou and Lu (2008) found that food from outside of Nanjing accounts for 77% of all the food sold in the city's markets (Table 10). The remainder is local produce, which is either sold direct to consumers at wet markets by producers (19.5%) or via retailers (3.3%).

Figure 21: Sources of Foods from Outside Nanjing

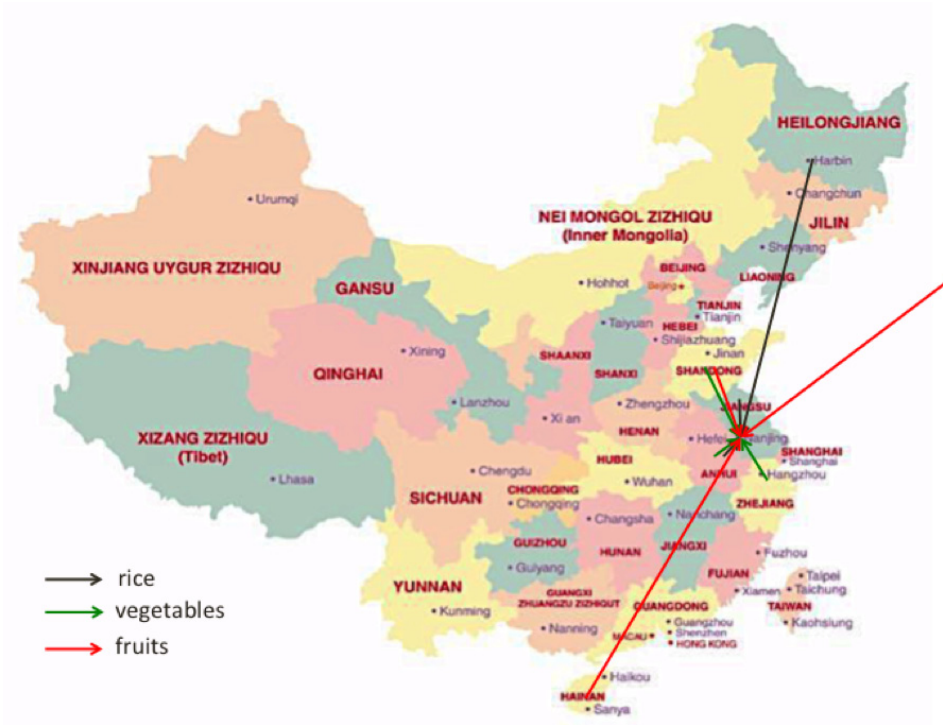


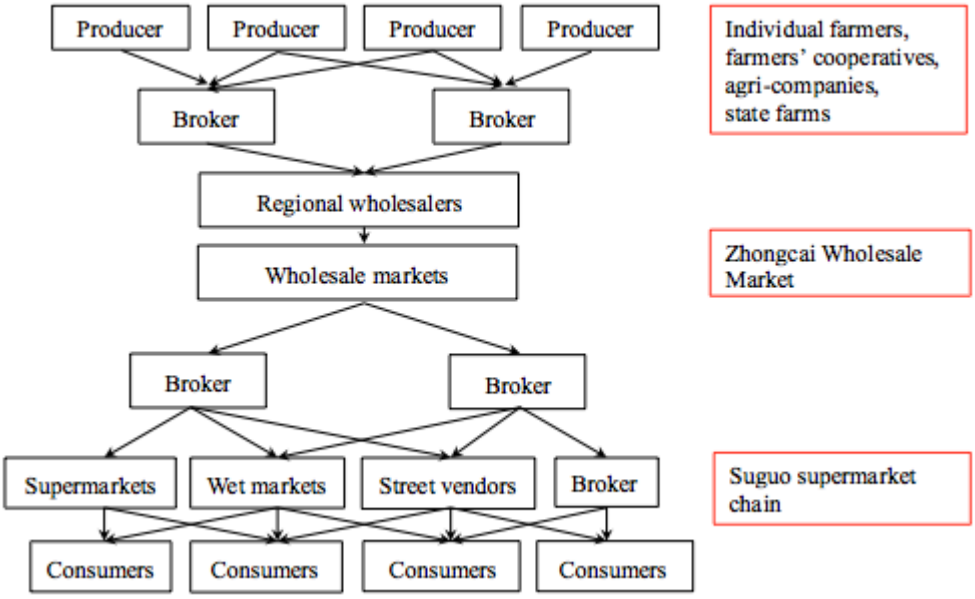
Table 10: Sources of Food in Nanjing Markets

Source	Food value chains	Percentage of food volume
Local produce	Producer-consumer	19.5
Local produce	Producer-retailer-consumer	3.3
Imported produce (other cities or provinces)	Producer-broker-wholesaler-broker-retailer-consumer	77.2
Source: Adapted from Zhou and Lu (2008)		

Figure 22 provides a schematic representation of food flows into and within Nanjing. Brokers collect produce from independent small producers, farmers' cooperatives, contracted producers, agri-food companies and state farms and resell it to regional wholesalers who then resell the bulk food to wholesale markets

(Zhou and Lu 2008, Reardon et al 2012). About 80% of the products imported into Nanjing go to a centralized wholesale distribution centre, Zhongcai Wholesale Market (or Zhongcai Distribution Centre), from where they are distributed across the city (Regnier-Davies 2015). Zhongcai Distribution Centre was established in 2009 by consolidating eight wholesale markets. At the Zhongcai Wholesale Market, regional wholesalers from outside Nanjing come and unload trucks of vegetables. They resell it to buyers from the city, including supermarkets, wet market vendors, street vendors and even other brokers or wholesalers who will resell it again. Margins are gradually added along the value chain.

Figure 22: Food Supply Chain to and within Nanjing



Source: Adapted from Zhou and Lu (2008) and Zhou (n.d.)

7.3 Typology of Food Outlets

According to Zhang and Pan (2013: 509), surveys have repeatedly found that 60-70% of urban consumers do most of their vegetable and fruit shopping at wet markets and only 10-15% at supermarkets. There are two main reasons for this. First, many Chinese still follow the tradition of buying and consuming fresh produce from wet markets without refrigeration. Second, supermarkets do not normally have a price advantage over wet markets. Despite their tremendous expansion in the last two decades, supermarkets in China have not yet developed their own upstream food supply (Goldman 2000, Hu et al 2004, Wang et al 2009, Wang and Zhang 2005, Zhang and Pan 2013).

Supermarkets in Chinese cities normally buy fresh produce from wholesale markets. Only a few supermarket chains in China have their own production base or buy from large contracted farms. Supermarkets are unable to match the labour-intensive efforts of wet market vendors (many of them migrant workers) who constantly sort, clean and spray the vegetables to keep them fresh. Unable to compete with wet markets in vending fresh vegetables and fruits, Chinese supermarkets tend to make their profits from selling packaged and processed food (Zhou et al 2015). This comes from both domestic and international food processing companies. Although processed food represents less than a third of current food purchases in China, it is growing at an annual rate of 50% and generates major health concerns (Zhou et al 2015).

Wet markets in Chinese cities are typically run either by private or state-owned companies, both of which are profit-driven (Zhang and Pan 2013, Hu et al 2004). These companies collect fees from vendors (either farmers or resellers) for renting the space and the costs of garbage disposal, utilities, security and facility maintenance. Although there has been a decline in the number of wet markets in Chinese cities since the demolition of old residential areas and the privatization of vegetable retailing in early 1990s, wet markets maintain their popularity with consumers due to their proximity to residential neighbourhoods, low prices and the freshness of the produce.

Besides wet markets and supermarkets, the other major types of food outlets in Nanjing are hypermarkets, convenience stores, private fruit and/or vegetable shops and street vendors (including street markets). In the Chinese context, hypermarkets are stores with more than 6,000m^2 of floor space, supermarkets range in size from 800m^2 to 6,000m^2, and convenience stores are usually less than 400m^2 (Hu et al 2004).

7.4 The Informal Food Economy

According to a study in Dalian, a city in Liaoning province in northeast China, most street vendors are selling food bought from wholesale markets and other retailers (Reid et al 2010). There are also a small number of farmers from nearby rural areas who bring a basket of food and sell it on the pavement or curb. Some farmers carry food to the street with handcarts or motor tricycles. In contrast to wet markets, which tend to be run by private companies or governmental organizations in covered venues, street markets are simply an informal gathering of a group of street vendors and operate in the open air. Besides the outlets of fresh produce, thousands of Chinese and Western restaurants also play a important role in Nanjingers' daily lives.

Figure 23: **Supermarket in Nanjing**

Figure 24: **Garlic Wholesaler at a Wholesale Market in Nanjing**

Figure 25: **Street Vendor Selling Watermelons in Nanjing**

Figure 26: Convenience Fruit Store in Nanjing

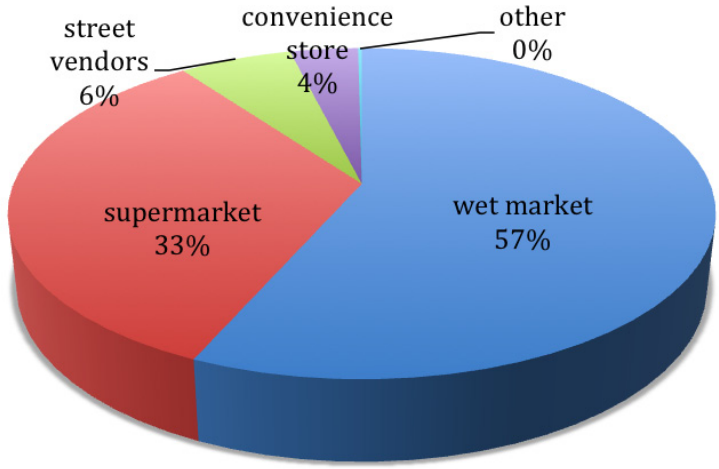
Figure 27: Chinese Restaurant in Nanjing

Figure 28: McDonald's in Nanjing

Source: https://www.flickr.com/photos/129687388@N07/22574763539

Bo (2011) examined the preferences of Nanjing residents for different types of outlets for fresh vegetables and found that wet markets dominate. Most of the 312 informants (57%) chose wet markets as the major outlet for fresh vegetables, followed by supermarkets (33%), street vendors (6%) and convenience stores (4%) (Figure 29). Bo (2011) also found that compared to wet markets, there was less variety of vegetables in supermarkets, where vegetables were also more expensive and not as fresh. Factors affecting people's choice of vegetable outlets included whether the outlet was close to home or work place (40%), whether the food was fresh and hygienic (26%), cheap (21%) and of sufficient variety (13%).

Figure 29: Preferences for Fresh Vegetable Outlets in Nanjing



Source: Adapted from Bo (2011)

Since the beginning of economic reform in 1978, street vendors have been a "ubiquitous and integral part of China's urban streetscapes" (Swider 2015: 707). Their types of activity are diverse, including selling fresh and processed food, as well as cooking it. In Nanjing's small streets, there are many vendors making fresh Chinese pancakes, steamed dumplings and buns, fried chicken and potatoes, barbeques, cold noodles, stir-fried bean jelly, and so on. They bring all their cooking wares and materials with them on mobile carts. Some even carry tables and chairs to set up dining areas around their booths. Their frequent and intensive involvement in cooking provides fast, cheap and tasty food for urban dwellers. It also makes them a group widely blamed for food safety problems and pollution (Modern Express 2015).

As in other major cities in China, street vendors are strictly controlled in Nanjing. Enforcers (para-police known as *chengguan*) are known for their coercive methods, such as beating up vendors or confiscating their goods and carts (Zhang and Pan 2013). Enforcers are also said to take bribes (Meng, 2009). Vendors are often on high alert for the appearance of city enforcers and call themselves guerilla workers (*dayoujizhan*). However, since the 2009 enactment of the Regulations

on the Management of Temporary Street Vendors in Nanjing vendors have been able to get a licence (Nanjing City Management Committee Office 2009). This regulation was enacted amid widespread discontent over the forcing of vendors off China's city streets (Meng 2009).

The 2009 Regulations on the Management of Temporary Street Vendors in Nanjing are the first city-level bylaws that officially allow street vendors to operate, although various restrictions still apply. The regulation fosters the livelihood of poor local residents and also makes food services more accessible in Nanjing (Shen 2009, Li 2009). Vendors are still prohibited along main streets and specific areas, but in other places (such as residential neighbourhoods, small alleys and vacant land) they are allowed to operate if they hold a licence. According to Meng (2009) and Xu (2009), the City Appearance Regulations of Nanjing (issued before the Regulations on the Management of Temporary Street Vendors) allows the government of Nanjing to issue 10,000 licences to low-income local residents. All vendors who are eligible for the licences have to have a Nanjing *hukou*, which means that street vendor licences are open only to permanent residents of Nanjing. MLS recipients and low-income households are prioritized in the issuing of licences and migrants are unable to obtain them.

According to the 2009 regulations, no table or chairs are allowed for breakfast and lunch stalls. Coal stoves had to be replaced with liquefied gas bottles. Carts have to follow a specific model proposed by the government. Vendors have to present their approval licence and health certificate and are not allowed to move out of the designated area. The regulations also specify that breakfast vendors have to close by 8.30am on weekdays and 9am over weekends, holidays and during winter (November to February). Lunch vendors' operating time is from 11am to 1.30pm. Night vendors can begin no earlier than 6pm. Although the regulations in Nanjing seem punitive, they are in fact some of the first regulations in China to allow street vendors to operate legally under certain conditions.

Figure 30: Street Vendor Selling Radish Pancakes in Nanjing

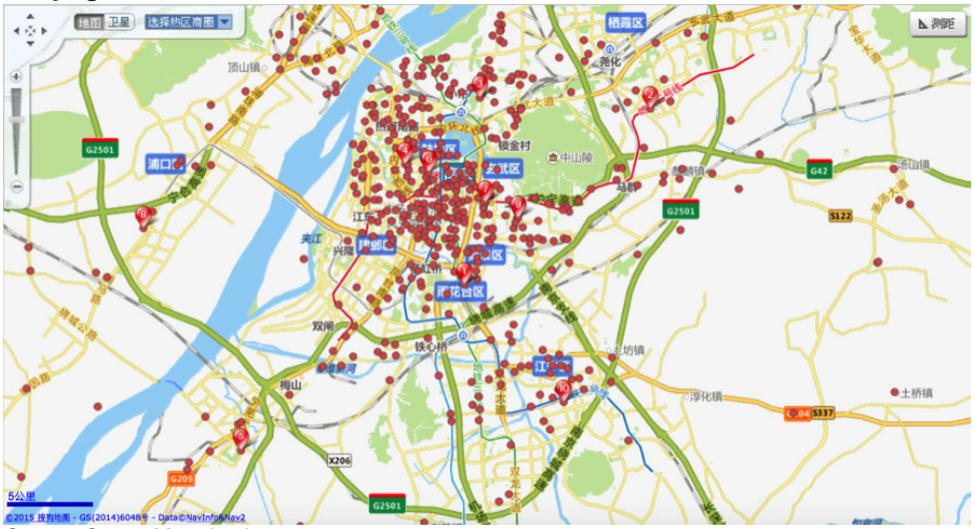
Source: http://js.qq.com/a/20140124/010101.htm#p=3

Figure 31: Fruit Vendor in Nanjing

7.5 Spatial Distribution of Food Outlets

The diversity of food outlets in big Chinese cities like Nanjing makes the food-scape extremely complex. There are thousands of supermarkets, small stores and more than 100 wet markets and wholesale markets in Nanjing. New outlets open and close constantly, complicating any attempt to map the spatial distribution of outlets. There is no information available about the distribution of informal markets and activities in Nanjing. Sogou is one of many supermarket and convenience store chains in Nanjing, albeit among the most popular. The Sogou database (Sogou Map n.d.) records 661 Sogou stores across the Nanjing municipality (Figure 32). Most major food outlets are clearly located within the old city centre.

Figure 32: Location of Sogou Supermarkets and Convenience Stores in Nanjing



Source: Sogou Map database

7.6 Urban and Peri-Urban Agriculture

Nanjing's urban core has very little land dedicated to urban agriculture. However, there are various attempts at growing food around residential buildings, especially in tiny front yards and on unused land. Balcony and rooftop gardening is found on a few buildings. Nanjing residents seem to use every available square inch in their communities to grow food. Even the narrow riverbanks of Qinhuan River are planted. It is common for property management companies in charge of landscaping to forbid residents to grow food in the community. They argue that growing food would destroy the ornamental landscaping and the manure or fertilizer would cause an unpleasant smell. Figures 33-38 provide examples of small-scale urban agriculture in different settings in the city. These forms of urban agriculture, including front yard, balcony and rooftop gardening and farming on unused land, provide a way for local residents to obtain food they trust. Residents say they grow vegetables because they believe vegetables from the market are contaminated with chemicals.

Figure 33: Front-yard Gardening (1)

Figure 34: Front-yard Gardening (2)

Figure 35: Food Grown on Unused Land Surrounding a Neighbourhood

Figure 36: **Water Spinach Growing along a Curb**

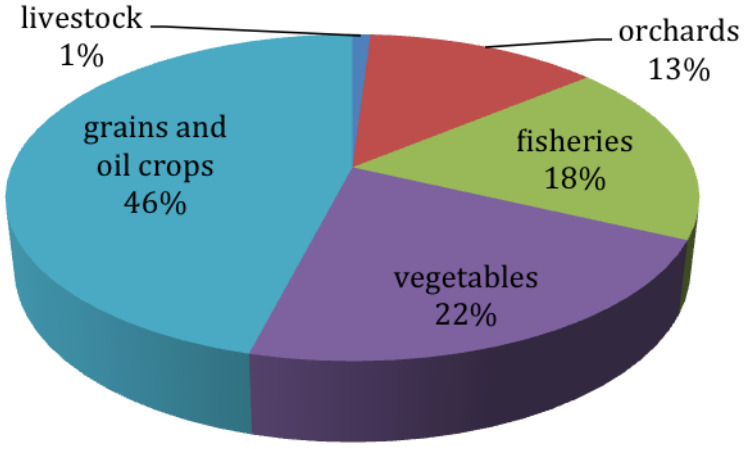
Figure 37: **Food Grown on the Narrow Riverbank of Qinhuai River in Downtown Nanjing**

Figure 38: **Rooftop Gardening**

Although urban agriculture is limited in Nanjing, the city does have very prosperous peri-urban agriculture. Nanjing's peri-urban areas had 242,000ha of farmland in 2011 and 46% of it was used for growing grains and oil crops and 22% for growing vegetables (Figure 39). Over 80% of all the farmland was certified hazard-free, green or organic (Scott et al 2014). Agri-tourism in Nanjing's suburban areas attracted about 7 million visitors in 2011. Nanjing Agriculture Carnival has become a well-known agri-tourism brand for promoting peri-urban agriculture.

Figure 39: Paddies in Peri-Urban Nanjing

Figure 40: Use of Agricultural Land in Peri-Urban Nanjing



Source: Data acquired from Nanjing Agricultural Committee

Given that the oldest organic certification agency in China – the Organic Food Development and Certification Centre of China (OFDC) – is based in Nanjing, Jiangsu province has a significant amount of certified organic farming. By the end of 2014, Nanjing had 119 certified organic production bases (Figure 41). Organic rice production is mainly located in Gaochunyaxi county, Dongba county, Gubai county and Lishuibaima county. Organic vegetable production is mainly in Lishuibaima county, Yongyang county, Liuhezhu county, and Maji county. Organic aquatic products, mainly crab and bighead carp, are in Gucheng Lake in Gaochun county, Yangjiang county, Foshou Lake in Pukou district and Jinniu Lake in Liuhe district. There are also organic tea gardens.

Figure 41: Packaged Organic Vegetables from an Organic Farm in Nanjing

8. Household Food Security in Nanjing

8.1 Household Food Access

Despite much global discussion about the multi-dimensional connotations of food security, China's understanding of food security seems outdated (Zhang 2011). The Chinese government understands the term "food security" (*liangshi anquan*) to mean grain self-sufficiency at the national level. This is probably due to the impact of the big famine from 1959 to 1961 and Lester Brown's (1995)

well-received Malthusian interrogation of "who will feed China" in 1995 that stressed the significance of food supply. As a result, food policies in China revolve around maintaining the food supply by preserving farmland, subsidizing farmers, investing in agricultural facilities, and establishing food reserves (Scott et al 2014, Chen and Scott 2014).

Food security at the household and community levels (micro-level food security) has only been approached in the context of mitigating urban poverty (Regnier-Davies 2015). Chinese scholars rarely examine the term food security from a micro-level perspective (Xiao and Nie 2009, Zhang 2011). It is difficult even to find an appropriate Chinese term to express the rich meanings of "food security." People are apt to confuse the term "food security" with "food safety." Regnier-Davies (2015), in what might be the first analysis of household food security in Nanjing, collected data on the perceptions of 214 Nanjing residents about household food security (accessibility) in 2014 (Table 11).

Although far fewer (27.1%) informants worried about not having enough food to eat, compared to the 80.8% of informants concerned about rising food prices, it was still an alarming percentage. It was found that 64.5% of surveyed residents shared food with extended family members and friends on a regular basis. Also, 21.5% of people surveyed disagreed that most people in Nanjing can afford, or have access to, enough food to have a healthy life.

Table 11: Perceptions of Food Cost and Accessibility in Nanjing

	% Agree	% Neutral	% Disagree	% Non-response
The cost of food is of growing concern to me	80.8	10.7	4.7	3.7
My household shares food with my extended family and other close friends on a regular basis	64.5	12.6	17.3	5.6
I feel the food available to me and my family is good both in quality and quantity	57.1	22.4	15.4	5.1
I think most people in Nanjing can afford or have access to enough food to have a healthy life	56.5	16.8	21.5	5.1
In the last 12 months I worried whether our food would run out before we could purchase more	27.1	12.6	54.2	6.1
Source: Regnier-Davies (2015: 59)				

8.2 Changing Diets and Consumption Patterns

Chinese urban residents have experienced a dramatic change in dietary patterns over the last 35 years (Christiansen 2009, FORHEAD 2014). FORHEAD (2014: 17) noted the increasing consumption of processed food and sugar while "consumption of grains (especially coarse grains), tubers, vegetables and legumes has been declining." Lam et al (2013: 2046) mention the connection between the increase of metabolic syndromes and diet-related diseases and the tran-

sition in dietary patterns from "a semi-vegetarian diet to an animal-product-dominant diet." Despite a decrease in the direct consumption of grains, increased use of grain as animal feed means that total consumption of grains has been rising (Zhong and Xiang 2012). They estimate that if a new urban resident consumed the same amount of calories as in the rural areas, he or she would consume 22.34kg more grain per year due to the change in consumption patterns.

In Nanjing, Wang et al (2013) conducted a survey of food intake by 1,255 residents in three districts. They found that Nanjing residents consumed too much fat and salt and too little aquatic products, vegetables, fruits and soybean products and nuts (Table 12). Some 32% of the informants were overweight and 10% were obese. Yuan et al's (2012) analysis of the food intake of residents in Jiangsu province had similar conclusions. Examining the historical data from 1989 to 2009, Yuan et al (2012) found that there was a significant increase in intake of animal products and a drop in plant-based food intake. The rapid increase in consumption of animal products and fat resulted in a sharp increase in overweight and obesity rates in Nanjing from 14.3% in 1989 to 41.1% in 2009, and in hypertension rates from less than 8% in 1989 to more than 30% in 2009 (Wang et al 2013).

Table 12: Food Intake of Nanjing Residents

Types of food	Recommended intake (gm/day)	Insufficient intake (%)	Appropriate intake (%)	Excessive intake (%)
Water	1,200ml	75.4	20.6	4.0
Aquatic products	50-100	70.6	25.8	3.7
Soybeans/nuts	30-50	62.1	27.1	10.8
Fruits	200-400	60.8	31.9	7.3
Meat	50-75	47.1	42.7	10.2
Vegetables	300-500	46.9	35.6	17.5
Cooking oil	25-30	33.8	45.8	20.4
Salt	6	26.9	52.9	20.2
Dairy	300	25.2	71.0	3.8
Grains/tubers/beans	250-400	18.8	63.8	12.9
Eggs	25-50	4.0	83.7	12.3

Source: Wang et al (2013: 321)

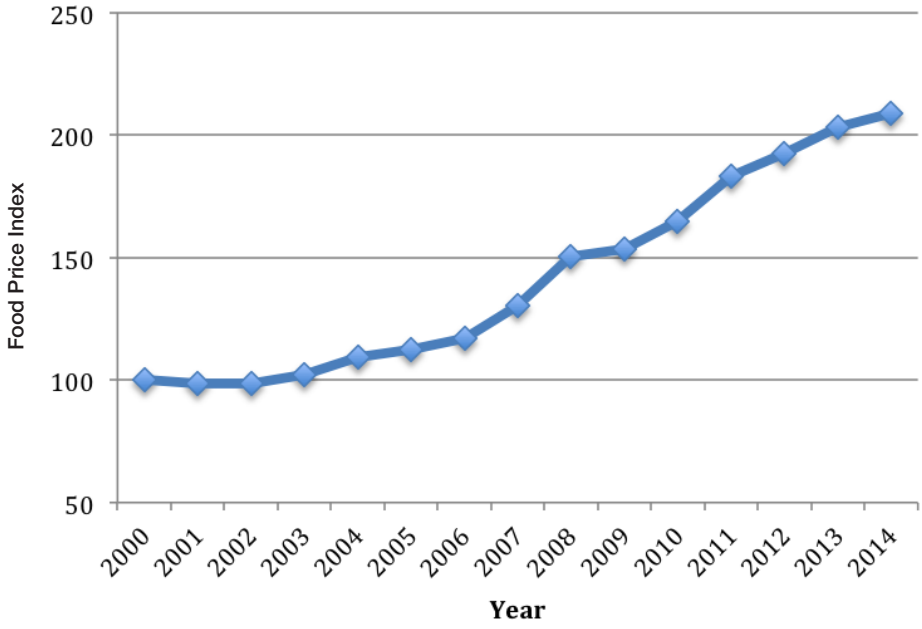
Accompanying rapid urbanization, Chinese urban residents not only eat out more but also eat more formal business meals and have fewer cooking skills (Bai 2012). Urban residents eat more meals in restaurants than they did a decade ago (Sun 2010). Between 1995 and 2010, China's catering industry grew by 10-15% per annum. In 2007, Chinese urban residents spent CNY762.9 (USD101.4) per person on dining out, which accounted for 21% of all spending on food. In 2010, almost 15% of urban residents in China ate out every day.

Data on the annual expenditures of Nanjing residents reveal that dining out has contributed to the increase in total food expenses. According to the Statistical Bureau of Nanjing, on average Nanjing residents spent CNY1,508.1 (USD220.9) per annum on dining out in 2010. Sun's (2010) survey in Nanjing found that 36% of meals were eaten outside the home and 52% of food expenses were on dining out, most of which (68%) were working meals. Eating in restaurants has led to a larger amount of food intake, especially vegetables and meat, compared to eating at home.

8.3 Impact of Rising Food Prices

Since 2000, and especially after 2004, food prices in Nanjing have risen rapidly with an average annual increase of 6.8% from 2004 to 2014. The price of food in Nanjing in 2014 had more than doubled since 2000 (Figure 42). A food price index of 100 in 2000 increased to 209 in 2014. With the exceptions of 2001 and 2002, every year witnessed an increase in food prices. The most significant increase happened in 2008 when food prices rose by 15%. The largest increase was in the price of beans (40%), followed by cooking oil (28%), meat (26%), dairy products (21%), fruit (15%), aquatic products (12%), grains (10%), vegetables (6%) and eggs (5%). The cost of eating out increased by 10%.

Figure 42: Changing Food Price Index in Nanjing, 2000-2014

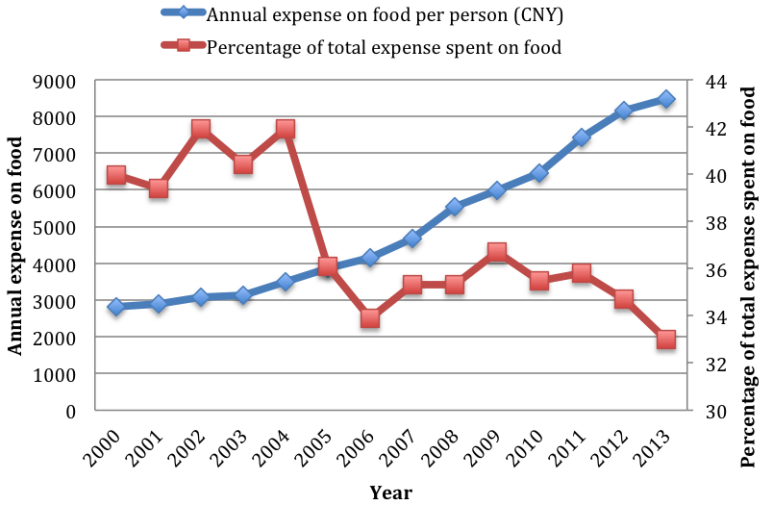


Source: Statistical Yearbooks of Nanjing

Although food prices have been increasing rapidly, annual per capita disposable income has grown even faster. Between 2000 and 2014, the average increase was 12.2% per annum, much higher than the 6.8% increase in food prices over the

same period. While total expenditures on food increased from 2000 to 2013, the proportion of total household expenditure on food decreased from 40% in 2000 to only 33% in 2013 (Figure 43). This means that, on average, rising food prices did not lead to an absolute decline in living standards or increased hunger. However, this ignores the impact of income inequality and disparities between the rich and the poor. Rising food prices have especially affected marginal groups such as the elderly and migrants from rural areas.

Figure 43: Expenditures on Food, 2000-2013



Source: Statistical Yearbooks of Nanjing

Zhao and Wang (2013) analyze the impacts of rising food prices on low-income and high-income families in China and find that low-income families tend to reduce expenditures on other services and commodities and save for food purchase. In contrast, high-income families tend to reduce expenditures on high-end food but maintain expenditures on other services and commodities. Rising food prices lead to a decline in the social welfare of low-income families as more income is spent on food (Huang and Jiang 2011). Regnier-Davies (2015) notes that rising food costs make low-income families more vulnerable. Her survey in Nanjing found that 27% of respondents worried that they would run out of food before they could afford to purchase more. She also found that food vendors and restaurant owners responded by squeezing their profit margins.

8.4 Food Safety

The most relevant dimension of food security for Chinese urban residents might well be access to safe food. Food safety has become an urgent and important issue in the last few years, especially after the 2008 melamine-tainted milk scandal that affected the health of about 300,000 infants and killed at least six of them (Xiu and Klein 2010, Pei et al 2011). Lam et al (2013: 2047) noted "shifting concerns

from food supply to food safety in China." As Regnier-Davies (2015: 12-13) has noted, "food safety is of utmost concern for Chinese residents, and current systems of food regulation and monitoring lack structure and reliability" (see Gale 2011, Garnett and Wilkes 2014, Lam et al 2013, Kriflik and Yeatman 2005, Yan 2012, Zhang 2005, Zhou 2005).

An annual survey done by Tsinghua University found that despite public concerns about issues such as corruption, rising commodity prices, environmental protection, and the wealth gap, "food safety" was the top concern from 2012 to 2014 (Xiaokang 2014, see also Veeck et al 2015). The 2014 survey found that only 15% of the informants were satisfied with the current food safety status. In 2012, food safety became a national priority and it was integrated as an indicator into the annual performance assessment of local governments (The Lancet, 2012).

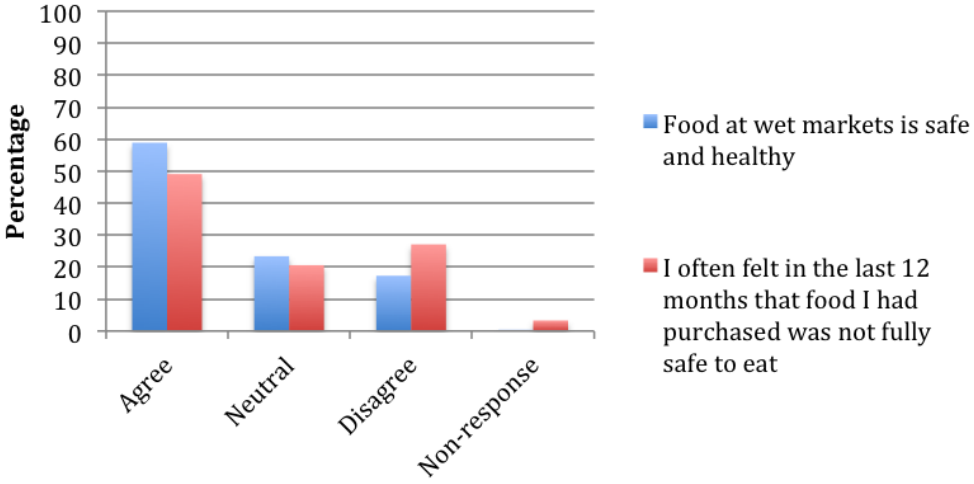
FORHEAD's report about mounting food safety concerns in China highlighted four major causes of the food safety problem: heavy metal pollution, overuse of pesticides, heavy use of antibiotics, and illegal food additive usage (Lam et al 2013). The usage of food additives includes both excessive use of allowed additives and use of unsanctioned additives (Yang 2013). Chemical residues are another key concern, related to the increasing consumption of processed food and growing awareness of health issues. Yang (2013) also notes that food safety anxiety has become a political issue.

Discussion of food safety is extensive but specific studies of food safety in Nanjing are limited. Regnier-Davies's (2015) survey of 214 Nanjing residents identified the existence of contradictory perceptions of food safety (Figure 44). While 59% of respondents felt that the food at wet markets was safe and healthy, 49% concurred that they had purchased food not safe for consumption in the previous 12 months. Regnier-Davies (2015) concludes that although people believe food at wet markets is safe, their confidence in food safety in general is lower due to environmentally devastating agricultural practices and the intensively reported food safety scandals. Her study found that 76% of respondents had concerns about environmental degradation's impacts on food safety, and 66% had concerns about the possible presence of genetically modified ingredients in the food they purchased. There is intensive debate over genetically modified food and its health implications in China. Studies of consumer preferences and genetically modified food (Lin et al 2008, Zhong et al 2002) have contradictory findings.

In interviews with Nanjing residents, Regnier-Davies (2015: 68) found that "meats and prepared foods were the most commonly mentioned foods that residents felt anxiety about from markets and street food vendors…because it is not clear what ingredients were used in the preparation of those foods; they cannot tell the freshness of the foods; or they simply assume the vendor is trying to make

up lost costs of unsold products." The study also notes that a food traceability information system (IC card system) imposed on market vendors by the Nanjing government was not uniformly adopted in Nanjing.

Figure 44: Conflicting Perceptions of Food Safety in Nanjing



Source: Regnier-Davies (2015: 61)

Veeck et al's (2015) survey of 338 Nanjing residents found that counterfeit foods and chemical contamination were the top concerns, while lack of food was the least important issue. Information about food safety from family and friends was the most trusted by Nanjing residents, while the degree of trust varies between different demographic groups. This implies a strong risk perception embedded within social networks. In terms of strategies employed by residents to cope with food safety problems, Regnier-Davies (2015: 79) found various approaches, including short-term coping strategies and long-term adaptive strategies:

Coping strategies:

- Determine indicators for the presence of agrochemicals;
- Use food preparation techniques to ensure safety;
- Determine quality produce;
- Determine quality animal protein; and
- Commit only to trusted brands and stores.

Adaptive strategies:

- Build strong social networks for ongoing food security; and
- Build relationships with family, friends, colleagues, and with farmers and vendors to maintain access to high quality, affordable foods (Regnier-Davies 2015: 79).

Some Nanjing residents purchase organic food, green food or hazard-free (*wugonghai*) food to combat the food safety crisis. Zhou's (n.d) analysis found that although a large proportion of consumers in Nanjing have heard about these certified foods, their knowledge of them is very limited. Level of household income and educational level were the two major factors affecting the purchase of certified food.

9. Conclusion

This audit of the city of Nanjing and its food system highlights the fact that there are major gaps in our understanding of the food system. As the Hungry Cities Partnership research program progresses, accurate information on a range of food issues in the city will fill many of these gaps. The report will therefore be updated annually as new information (from the Hungry Cities Partnership and other published sources) becomes available.

Bibliography

1. Bai, B. (2012). "A Report about China's Catering Industry". At: http://www.wisburg.com/wp-content/uploads/2014/09/群益证券-餐饮行业报告：发展快、集中度提高将孕育龙头公司.pdf (in Chinese).

2. Bo, B. (2011). "Suggestions on Vegetable Distribution of Chain Supermarkets in Nanjing from a Market Segmentation Perspective" (市场细分视角下南京连锁超市蔬菜物流建议). *Modern Business* 645: 55-56 (in Chinese).

3. Bradford M., Robson B. and Tye R. (1995). "Constructing an Urban Deprivation Index: A Way of Meeting the Need for Flexibility" *Environment and Planning A* 27: 519-533.

4. Brown L. (1995). *Who Will Feed China? Wake-Up Call for a Small Planet.* New York: WW Norton & Co.

5. Chen, A. and Scott, S. (2014). "Rural Development Strategies and Government Roles in the Development of Farmers' Cooperatives in China" *Journal of Agriculture, Food Systems, and Community Development* 4: 35-55.

6. Chen, G., Gu, C. and Wu, F. (2004). "Spatial Analysis of Urban Poverty in Nanjing: A Survey Method" *Scientia Geographica Sinica* 24: 542-549 (in Chinese).

7. Chen, G., Gu, C. and Wu, F. (2006). "Urban Poverty in the Transitional

Economy: A Case of Nanjing, China" *Habitat International* 36: 1-26.

8. Cheng, M. (2011). "Research on Population Size Forecasting and Its Spatial Arrangement of Nanjing City" *Urban Studies* 18: 68-74 (in Chinese).

9. Christiansen, F. 2009. "Food Security, Urbanization and Social Stability in China" *Journal of Agrarian Change* 9: 548-575.

10. Chu, K. and Davis, B. 2015. "As China's Workforce Dwindles, the World Scrambles for Alternatives" *WSJ2015 (Demographic Destiny)*. At: http://www.wsj.com/articles/as-chinas-workforce-dwindles-the-world-scrambles-for-alternatives-1448293942

11. Dong, W. (2014). "Nanjing Implement Equal MLS Subsidies for its Urban and Rural Residents for the First Time." At: http://www.yangtse.com/chengshi/2014-07-26/219696.html (in Chinese).

12. FORHEAD (2014). *Food Safety in China: A Mapping of Problems, Governance and Research*. Forum on Health, Environment and Development, Working Group on Food Safety. At: http://www.ssrc.org/publications/view/food-safety-in-china-a-mapping-of-problems-governance-and-research/

13. Gale, H. (2011). "Building Trust in Food" *China Dialogue (April 04)*. At: https://www.chinadialogue.net/article/4207-Building-trust-in-food

14. Gao, Q. (2009). "Anti-Poverty Effectiveness of the Minimum Living Standard Assistance Policy in Urban China" *The Review of Income and Wealth* 55, 630-655.

15. Gao, Q. (2011). "Anti-Poverty Family Policies in China: A Critical Evaluation" Meeting Report, United Nations, Department of Economic and Social Affairs (DESA), New York. At: http://undesadspd.org/LinkClick.aspx?fileticket=aUR8RssPhD8%3D&tabid=1555

16. Gao, Q., Garfinkel, I. and Zhai, F. (2009). "Anti-Poverty Effectiveness of the Minimum Living Standard Assistance Policy in Urban China" *The Review of Income and Wealth* 55: 630-655.

17. Garnett, T., and Wilkes, A. (2014). *Appetite for Change: Social, Economic and Environmental Changes in China's Food System*. Food Climate Research Network, Department of Business, Innovation and Skills of the UK Government.

18. Goldman, A. (2000). "Supermarkets in China: The Case of Shanghai" *International Review of Retail. Distribution and Consumer Research* 10: 1-21.

19. Hu, D., Reardon, T., Rozelle, S., Timmer, C. and Wang, H. (2004). "The Emergence of Supermarkets with Chinese Characteristics: Challenges and

Opportunities for China's Agricultural Development" *Development Policy Review* 22: 557-586.

20. Huang, C. and Jiang, N. (2011). "The Rise of Food Price, The Increasing Income Gap and the Disparity of Food Spending: An Empirical Analysis of Urban Residents in China" *Problems of Agricultural Economy* 9: 80-85 (in Chinese).

21. Jiang, Z. (2003). "The Informal Employment in Nanjing" Master's Thesis Nanjing University of Science and Technology, Nanjing (in Chinese).

22. Kriflik, L. and Yeatman, H. (2005). "Food Scares and Sustainability: A Consumer Perspective" *Health, Risk & Society* 7: 11-24.

23. Lam, H., Remais, J., Fung, M., Xu, L. and Sun, S. (2013). "Food Supply and Food Safety Issues in China" *The Lancet* 381: 2044-2053.

24. Lang, G. and Miao, B. (2013). "Food security for China's cities" *International Planning Studies*, 18(1): 1-16.

25. Li, B. (2009). "How are Temporary Street Vendors 'Partly Allowed'?" *Modern Express* At: http://news.sina.com.cn/c/2009-09-08/024316256969s.shtml (in Chinese).

26. Li, Y. (2010). "A Study of Migrant Workers in the Informal Economic Sector in Urban Nanjing" *Theory Research* 27: 75-76. At: http://www.docin.com.cn/p-1220674857.html (in Chinese).

27. Lichtenberg, E. and Ding, C. (2008). "Assessing Farmland Protection Policy in China" *Land Use Policy* 25: 59-68.

28. Lin, G. and Ho, S. (2005). "The State, Land System, and Land Development Processes in Contemporary China" *Annals of Association of American Geographers* 95: 411-436.

29. Lin, W., Tuan, F., Dai, Y., Zhong, F. and Chen, X. (2008). "Does Biotech Labeling Affect Consumers' Purchasing Decisions? A Case Study of Vegetable Oils in Nanjing, China" *AgBioForum* 11: 123-133.

30. Liu, M. (2014). "Nanjing Will Release Unemployment Data Based on Monthly Surveys" *Nanjing Daily* 15 September. At: http://society.people.com.cn/n/2014/0915/c136657-25664123.html (in Chinese).

31. Liu, Y. and Li, Y. (2007). "Gender Difference of Migrant Workers in the Informal Sector" *China's Rural Economy* 12: 20-27 (in Chinese).

32. Liu, Y., He, S. and Wu, F. (2008). "Urban Pauperization Under China's Social Exclusion: A Case Study of Nanjing" *Journal of Urban Affairs* 30: 21-36.

33. Lu, Y., Jenkins, A., Ferrier, R., Bailey, M., Gordon, I., Song, S., Huang, J., Jia, S., Zhang, F., Liu, X., Feng, Z. and Zhang, Z. (2015). "Addressing China's Grand Challenge of Achieving Food Security While Ensuring Environmental Sustainability" *Science Advances* 1(1) e1400039. At: http://advances.sciencemag.org/content/1/1/e1400039.full

34. Meng, Y. (2009). "A Study of the Regulatory Policies of Individual Business in China" *Background and Analysis.* At: http://www.world-china.org/newsdetail.asp?newsid=2712 (in Chinese).

35. Modern Express (2015). "Eradication of Street Barbecue Vendors in Nanjing" At: http://news.sohu.com/20150317/n409895694.shtml (in Chinese).

36. Municipal Government of Nanjing (2012). *The Land Use Planning of Nanjing (2006-2020)*. At: http://www.njgt.gov.cn/default.php?mod=c&s=ss1e389e9 (in Chinese).

37. Nanjing Agricultural Committee (2013). "A Report on the Progress of the 'Vegetable Basket' Program in Nanjing." At: http://www.moa.gov.cn/ztzl/clz25zn/dybg/201306/t20130621_3501104.htm (in Chinese).

38. Nanjing City Management Committee Office (2009). "Regulations on the Management of Temporary Street Vendors in Nanjing." At: http://221.226.86.187:8080/pub/njszfnew/bm/cgj/201207/t20120712_1216450.html (in Chinese).

39. Nanjing Daily (2014). "Cities Became Nanjing's 'Vegetable Basket'." At: http://www.moa.gov.cn/ztzl/clz25zn/dybg/201306/t20130621_3501104.htm (in Chinese).

40. Nanjing Municipal Human Resources and Social Security Bureau (2015). "Statistics of Human Resources and Social Security of Nanjing in 2014." At: http://www.njhrss.gov.cn/38966/38988/39018/201507/t20150710_3448465.html (in Chinese).

41. Nanjing Statistics Bureau (2015). "Statistics of Nanjing National Economy and Social Development." At: http://jsnews.jschina.com.cn/system/2015/04/02/024205395.shtml (in Chinese).

42. Park, A. and Wang, D. (2010). "Migration and Urban Poverty and Inequality in China" IZA Discussion Paper No. 4877, Institute for the Study of Labour (IZA). At: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1591704

43. Pei, X., Tandon, A., Alldrick, A. and Giorgi, L. (2011). "The China Melamine Milk Scandal and Its Implications for Food Safety Regulation" *Food Policy* 36: 412-420.

44. Ravallion, M., Chen, S. and Wang, Y. (2006). "Does the Di Bao Program

Guarantee a Minimum Income in China's Cities?" In W. Lou and S. Wang (eds.), *Public Finance in China*. Washington, DC: World Bank.

45. Reardon, T., Timmer, C. and Minten, B. (2012). "The Supermarket Revolution in Asia and Emerging Development Strategies to Include Small Farmers" *PNAS: Proceedings of the National Academy of Science of the USA* 109(31): 12332-12337.

46. Regnier-Davies, J. (2015). "'Fake Meat and Cabbageworms': Connecting Perceptions of Food Safety and Household Level Food Security in Urban China" Master's Thesis, University of Waterloo, Waterloo.

47. Reid, D., Fram, E. and Chi, G. (2010). "A Study of Chinese Street Vendors: How They Operate" *Journal of Asia-Pacific Business* 11: 244-257.

48. Scott, S., Si, Z., Schumilas, T. and Chen, A. (2014). "Contradictions in China's Path to Zero Food Safety Risk: State- and Civil Society-Driven Developments in the Ecological Agriculture Sector" *Food Policy* 45: 158-166.

49. Shen, L. (2009). "The Much Relaxed Atmosphere in Nanjing" *People's Daily* 29 October. At: http://paper.people.com.cn/rmrb/html/2009-10/29/content_370920.htm (in Chinese).

50. Siciliano, G. (2012). "Urbanization Strategies, Rural Development and Land Use Change in China: A Multiple Level Integrated Assessment" *Land Use Policy* 29: 165-178.

51. Song, W., Chen, P. and Xu, D. (2013). "Research on the Deprivation-Type Reconstruction of Inner-City Registered Poverty Space Based on Resettlement Data of Nanjing" *Geographical Research* 32: 1467-1476 (in Chinese).

52. Sogou Map. (n.d.) At: http://map.sogou.com/store/nanjing_104244__82cf_679c_8d85_5e02#hb=0,1&c=13226000,3741500,11

53. Statistical Bureau of Nanjing (2014). *Statistical Report of Nanjing's Economic and Social Development*. At: http://jsnews.jschina.com.cn/system/2015/04/02/024205395.shtml (in Chinese).

54. Sun, X. (2010). "Food-Away-From-Home and the Food Consumption Structure: A Case Study of Consumption Behavior of Urban Residents in Nanjing" *Journal of Capital Normal University* 4: 72-79 (in Chinese).

55. Swider, S. 2015. "Reshaping China's Urban Citizenship: Street Vendors, Chengguan and Struggles over the Right to the City" *Critical Sociology* 41: 701-716.

56. The Lancet (2012). "Food Safety in China: A Long Way to Go." At: http://

www.thelancet.com/journals/lancet/article/PIIS0140-6736(12)61157-X/fulltext

57. Townsend P. (1987). "Deprivation." *Journal of Social Policy* 16: 125-146.

58. UN-Habitat (2015). *The State of Asian and Pacific Cities 2015*. New York: ECAS and UN-Habitat.

59. Veeck, G., Veeck, A., and Zhao, S. (2015). "Perceptions of Food Safety by Urban Consumers in Nanjing, China" *Professional Geographer* 67: 490-501.

60. Wang, H., Dong X., Rozelle, S., Huang, J. and Reardon, T. (2009). "Producing and Procuring Horticultural Crops with Chinese Characteristics: The Case of Northern China" *World Development* 37: 1791-1801.

61. Wang, S. and Zhang, Y. (2005). "The New Retail Economy of Shanghai" *Growth and Change* 36: 41-73.

62. Wang, K. (2011). "Analysis of Household Income in Nanjing during the 11th Five Year Plan Period" *Statistical Theory and Practice* 6:15-16 (in Chinese).

63. Wang, S., Lu, X., Wang, G., Yang, L., Lu, Y. and Sun, G. (2013). "A Survey on Dietary Patterns and Health Status of Residents in Nanjing City" *Chongqing Medical Science* 42: 320-322 (in Chinese).

64. Wu, Q., Wu, X., Chen, G., Hammel, J., Liu, Y. and Liu, D. (2013). "Social-Spatial Differentiation and Residential Segregation of Old City of Nanjing, China: Evidence from the Community-Level Census Data in 2000" *Scientia Geographica Sinica* 33: 1196-1205 (in Chinese).

65. Wu, Q., Cheng, J., Chen, G., Hammel, D. and Wu, X. (2014). "Socio-Spatial Differentiation and Residential Segregation in the Chinese City Based on the 2000 Community-Level Census Data: A Case Study of the Inner City of Nanjing" *Cities* 39: 109-119.

66. Wu, Z. (2010). "An Analysis of the Age and Gender of Nanjing's Population." At: http://221.226.86.104/WebPlus/picture/article/4/fd494d92-ca65-43c4-8d17-bbebfae208af/9989826105d24c6cb26878beb854c26a.doc (in Chinese)

67. Xiaokang (2014). "The 10 Hottest Topics in 2014: Food Safety Tops the List." At: http://news.sina.com.cn/c/sd/2014-12-04/105031244405.shtml (in Chinese).

68. Xiao, Y. and Nie, F. (2009). *A Report on the Status of China's Food Security*. Beijing: China Agricultural Science and Technology Press.

69. Xiu, C. and Klein, C. (2010). "Melamine in Milk Products in China:

Examining the Factors that Led to Deliberate Use of the Contaminant" *Food Policy* 35: 463-470.

70. Xu, M. (2010). "Empirical Analysis of the Relationship between the Industrial Structure and the Employment Structure of Nanjing" *Henan Science* 28(9) (in Chinese).

71. Xu, X. (2009). "The Happiness and Sorrow with the Legalization of Mobile Street Vendors." At: http://news.xinhuanet.com/focus/2009-07/24/content_11759599.htm (in Chinese).

72. Xu, Z. (2014). "The Changing Food Production Land in Nanjing and Its Driving Forces" Bachelor's Thesis, Nanjing University, Nanjing (in Chinese).

73. Yan, Y. (2012). "Food Safety and Social Risk in Contemporary China" *Journal of Asian Studies* 71: 705-729.

74. Yang, G. (2013). "Contesting Food Safety in the Chinese Media: Between Hegemony and Counter-Hegemony" *The China Quarterly* 214: 337-355.

75. Yang, X. (2013). "China's Rapid Urbanization" *Science* 342(6156): 310.

76. Yuan, B., Dai, Y., Luo, Y. and Zuo, H. (2012). "Study on Transition of Dietary Pattern in Jiangsu Province" *Jiangsu Journal of Preventative Medicine* 23: 27-30 (in Chinese).

77. Zha, J. (2012). "Temporary Residents in Nanjing Increased 6 Times in the Past 10 Years" *Nanjing Daily* 11 July. At: http://njrb.njdaily.cn/njrb/html/2012-07/11/content_20550.htm (in Chinese).

78. Zhang, H. (2011). *China and Global Food Security: Conflicting Notions*. S. Rajaratnam School of International Studies (RSIS), Singapore.

79. Zhang, Q. (2012). "A Survey and Analysis of Fragmentation and Gentrification in Nanjing Old City" *Modern City Study* 6: 72-78 (in Chinese).

80. Zhang, Q. and Pan, Z. (2013). "The Transformation of Urban Vegetable Retail in China: Wet Markets, Supermarkets and Informal Markets in Shanghai" *Journal of Contemporary Asia* 43: 497-518.

81. Zhang, S., and Gu, J. (2012). "A Study on Spatial-Differentiation of Low-Income People in Nanjing" *Architecture and Culture* 7: 65-67 (in Chinese).

82. Zhang, X. (2005). "Chinese Consumers' Concerns About Food Safety: Case of Tianjin" *Journal of International Food & Agribusiness Marketing* 17: 57-69.

83. Zhao, X. and Wang, Y. (2013). "Research on the Effects of Food Price Rise

on the Consumption Behavior and Welfare of Urban Residents Based on QUAIDS Model" *China Soft Science* 8: 154-162 (in Chinese).

84. Zhong, F., Marchant, M., Ding, Y. and Lu, K. (2002). "GM Foods: A Nanjing Case Study of Chinese Consumers Awareness and Potential Attitudes" *AgBio-Forum* 5: 136-144.

85. Zhong, P. and Xiang, J. (2012). "The Impacts of Urbanization on the Demand of Grains: A Study Based on the Calorie Intake" *Agricultural Technology and Economy* 1: 4-10 (in Chinese).

86. Zhou, B., and Li, X. (2012). "Study on Relation of Urbanization and the Changes of Industrial Structure in Nanjing City" *Science-Technology and Management* 14: 74-78 (in Chinese).

87. Zhou, L. (2005). "A Nanjing Case Study on Residents Consumption of Safe Foods." At: http://202.195.244.2/jgjw/download/Pdf/6/24/05届优秀论文/南京市消费者安全食品消费情况的调查与分析.pdf (in Chinese).

88. Zhou, X. (n.d.). "Build Vegetable Safety Supply Chain Into Supermarkets: At the View of the Vegetable Industry in Nanjing." At: http://202.195.244.2/jgjw/download/Pdf/6/24/07届优秀论文/构建安全蔬菜超市供应链——从南京蔬菜产业角度阐述.pdf (in Chinese).

89. Zhou, Y. and Lu, L. (2008). "Efficiency of Supply Chains of Fresh Vegetables: A Case Study of Nanjing" *Jiangsu Agricultural Science* 1: 69-72 (in Chinese).

90. Zhou, Y., Du, S., Su, C., Zhang, B., Wang, H. and Popkin, B. (2015). "The Food Retail Revolution in China and Its Association with Diet and Health" *Food Policy* 55: 92-100.

91. Zhu, H. and Liu, X. (2013). "Isolated from the City? Urban-Rural Immigrants' Entrepreneurship in the Urban Fringe Area of Suzhou, China" *Economic Geography* 33: 135-140 (in Chinese).

Data Sources

Statistical Yearbooks of Nanjing (http://221.226.86.104/file/nj2004/njtjnj.htm)

Official Bulletins about the Economy and Social Development of Nanjing

Baidu baike: 南京、南京都市圈

Sogou database

With a population of 8.2 million people, Nanjing is the 14th largest city in China. China became a predominantly urban nation in 2011, when its urban population surpassed its rural population for the first time. The declining farming population and area of farmland along with the increased food consumption of urban residents have had significant implications for China's food security, including in cities such as Nanjing. As with many other Chinese cities, Nanjing's informal economy has become an important source of income for the poor, including migrant workers. Since the beginning of economic reform in 1978, street vendors have become an integral part of urban China. Their activities are diverse and include selling fresh and processed food, as well as cooking it. The diversity of food outlets in big Chinese cities like Nanjing makes the foodscape extremely complex. There are thousands of supermarkets, small stores and more than 100 wet markets and wholesale markets in Nanjing. Food safety has become an urgent and important issue in the last few years, and the most relevant dimension of food security for Chinese urban residents might well be access to safe food. This audit of the city of Nanjing and its food system highlights the fact that there are major gaps in our understanding of the food system. As the Hungry Cities Partnership research program progresses, accurate information on a range of food issues in the city will fill many of these gaps.

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