

Decomposition of Chinese Life Expectancy via Occupation

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In this article, we applied the concept of partial life expectancy to calculate the expected years of working life via occupation for the Chinese population beyond age 15. The calculations were based on the data from the population censuses of China in 1982, 1990 and 2000, which covered the period of eighteen years from the early economic reform years to the end of last century when the market economy became the official goal of the Chinese government. From our study, we found that, using partial life expectancy as the indicator, majority of the working life of the Chinese population has been on farming although it was slowly declining for both sexes from 1982 to 2000. In 1982, the expected years of working life on farming were 30.98 years for males and 26.45 years for females. In 2000, these values decreased to 27.09 and 26.16 years respectively. However, the expected years of working life in service sector increased from 1.88 years and 1.57 years in 1982 for males and females to 3.35 years for both sexes in 2000.

KEYWORDS: Labor statistics, life expectancy, occupation, partition of life expectancy, China.

INTRODUCTION

Life expectancy at birth is a well-established indicator of measuring the health of a population (Silcocks, Jenner & Reza 2001). The estimate of the life expectancy for a population is usually based on the age-specific mor-

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tality rate (Chiang 1984). Following the decrease of the age-specific mortality, life expectancy has been increased in the last century dramatically in most countries. Life expectancy increased initially in developed countries and then, since 1950, the life expectancy in many developing countries has also increased greatly (Oeppen & Vaupel 2002). As the increase of life expectancy, more and more attention has been paid to the quality of life of a population for the increased expected years of life. One popular class of indicators in measuring the quality of life is based on the concept of healthy expectancy (Lai, Lee & Lee 2000, Robine et al. 2003).

In a modern society, people participate in various economic activities through their occupations. In addition to measuring population health, the concept of life expectancy can also be used in quantifying the socio-economic aspect of a population. For example, the expected years of working life spent in agriculture for a population would be a better indicator than the total number of farmers in a population since the expected years of working life spent is an age standardized statistic that can be used in cross population comparisons as well as in cross time comparisons. We used it for cross time comparisons for the Chinese population. In this article, we applied life table techniques in computing the expected years of working life spent in various occupations for a hypothetical individual from the Chinese labor force beyond age 15. Obviously, it is unlikely that an individual in the real world could work in all occupations. The resulting values from our computation partition the economic activity of the entire work force rather than any specific person from the study population (Kpedekpo 1969, Lind 1993).

From the results of the decomposite life expectancy in occupations based on the three population censuses in 1982, 1990 and 2000, we analyzed the dynamics of the Chinese labor force after the economic reform started in the late 1970's.

MATERIALS AND METHODS

China accounts more than one-fifth of the world population. Since the establishment of the People's Republic of China in 1949, there have been five population censuses. The censuses were held in 1953, 1964, 1982, 1990 and 2000 respectively. Starting in the late 1970's, economic reform was introduced first in the rural areas in China and then into the cities gradually. Since then, three population censuses were conducted in China with aid of the computer technology that made many cross-tabulations possible for the large population of China (NBSC 1985, 1993, 2002).

There is not much publicly available yearly official information regarding to the age-specific economic activity in China. The population censuses in 1982, 1990 and 2000 collected this type of occupational information. In these population censuses, the occupations were classified into seven large categories with many small subcategories in each large category. These large categories were (a) managers for government agencies, party committees, enterprises and other professional institutions, (b) professionals, (c) clerks and other related staff, (d) staff in service sector, (e) workers in farming, forestry and fishery, (f) workers in production and transportation and (g) others (NBSC 1985, 1993, 2002). The classification of occupations in China were not exactly the same as the International Standard Classification of Occupations (ISCO) used by the International Labor Organization (ILO) (ILO 1988).¹

For the partition of the life expectancy via occupation, we first obtained the life tables for males and females of the Chinese population in 1982, 1990 and 2000 (Jiang, Zhang & Zhu 1985, NBSC 1995, 2003). We then adjusted the person years lived in the age groups (L_x) by multiplying the age specific proportion of the economic activity for each occupation. After this adjustment, we got the person years spent for each occupation by summing the adjusted person years spent beyond age 15. Then, we divided the sum by the number of persons survived at the beginning of age 15 to get the expected years of working life in each occupation. That is, for a given occupation k , the expected years of life in occupation k is

$$e_{15,k} = \frac{\sum_{x=15}^{\infty} L_x P_{x,k}}{l_{15}}, \quad (1)$$

where $P_{x,k}$ is the proportion of the people in occupation k in age group x , l_{15} is the number of persons survived at the beginning of age 15 from the respective tables.

From equation(1), we can easily see that the life expectancy at age 15 is

$$e_{15} = \sum_{k=0}^K e_{15,k}, \quad (2)$$

where $e_{15,0}$ is the expected years of life without economic activity and K is the total number of occupation categories. In our article, we studied the seven large categories ($K = 7$) based on the population censuses of China in 1982, 1990 and 2000.

RESULTS

The age specific proportion of the economically active populations in the seven categories together with the person years lived in each age groups are given in data annex section based on the population censuses in 1982, 1990 and 2000 respectively. These proportions were computed from the official publications from the National Bureau of Statistics of China (NBSC 1985, 1993, 2002). We obtained the life table person years lived in age group x (L_x) for 1982 from Jiang, Zhang and Zhu (1985). The L_x for the 1990 and 2000 life tables was extracted from the official life tables of China (NBSC 1995, 2003). The proportions in the tables in data annex section showed that most people of the Chinese labor force were in farming, forestry and fishery. The workers engaging in production and transportation were the second largest category. To get the summary statistics, we calculated the expected years of working life in each occupation by sex for 1982, 1990 and 2000. The results are presented in Table 1.

Although the rate of decreasing has been slow from 1982 to 2000, the expected years of live spent in farming, forestry and fishery reduced from 30.98 years in 1982 to 27.09 years in 2000 for males and from 26.45 years to 26.16 years for females from 1982 to 2000. Similar phenomenon was observed for managers in government agencies, party committees, enterprises and other institutions. However, for professionals and staff in service sector, the expected years of working life increased from 1982 to 2000 for

TABLE 1

Decomposition of the Chinese working life expectancy in 1982, 1990, 2000 via occupation: (a) managers for government agencies, party committees, enterprises and other professional institutions, (b) professionals, (c) clerk and other related staff, (d) staff in service sector, (e) workers in farming, forestry and fishery, (f) workers in production and transportation (g) other, (EYWL) total expected years of working life and (e_{15}) the life expectancy at age 15

		(e_{15})	(EYWL)	(a)	(b)	(c)	(d)	(e)	(f)	(g)
1982	Male	55.58	45.16	2.58	1.37	0.81	1.88	30.98	7.51	0.03
	Female	58.57	34.14	1.56	0.17	0.26	1.57	26.45	4.11	0.02
1990	Male	55.44	44.27	2.41	1.50	1.05	2.31	30.05	6.93	0.02
	Female	59.14	35.35	1.93	0.21	0.36	2.08	26.94	3.82	0.01
2000	Male	57.17	42.56	1.06	2.05	1.64	3.35	27.09	7.34	0.03
	Female	61.66	36.31	0.21	2.12	0.68	3.35	26.16	3.77	0.02

both sexes. For the professionals, the expected working years of life increased from 1.37 years and 0.17 years for males and females in 1982 to 2.05 years and 2.12 years in 2000 respectively. For clerks and staff in service sector, the expected years of working life were 1.88 years and 1.57 years in 1982 for males and females respectively. In 2000, these values increased to 3.35 years for both sexes.

For males, the total expected years of economic activity decreased from 45.16 years in 1982 to 42.56 years in 2000. However, during the same period of time, for females, the total expected economic active years increased from 34.14 years to 36.31 years. The non-economically active years were 10.42, 11.17 and 14.61 for males and 24.43, 23.79 and 25.35 for females in 1982, 1990 and 2000, respectively. The expected working years in farming, forestry and fishery counted 68.60, 67.88 and 63.65% of the total working life of males, whereas 77.48, 76.21 and 72.05% for the females in 1982, 1990 and 2000, respectively.

Figure 1(a) and (b) plot the expected years of working life of males spent and their proportions to the total expected years of working life, respectively, in three consolidated categories of occupations: (I) farming, forestry and fishery, which is category (e) in Table 1, (II) production and transportation, which is category (f) in Table 1 and (III) services and others, which is the combination of categories (a), (b), (c), (d), (g) and (h) in Table 1. Similarly, Figure 1 (c) and (d) provide the trend for the females. From these plots, we can see that the expected years of working life spent in services and other have increased steadily since 1982. It was greater than that of in production and transportation in the recent years. The rate of increasing was faster for females than that for males.

The life expectancy in years beyond age 65 was 12.44, 12.47 and 13.38 for males and 14.60, 14.88 and 15.98 for females in 1982, 1990 and 2000, respectively. The expected years of economic activity beyond age 65 were 4.08 and 1.07 for males and 5.01 and 2.75 for females in 1990 and 2000 respectively. The data for computing the values in 1982 were not available from the official publications of the population census of 1982.

DISCUSSION

In this article, using the concept of partial life expectancy and data from the population censuses of China in 1982, 1990 and 2000, we studied the dynamics of the economic activity since the economic reform in the late 1970s. Although there has been great changes in Chinese society in the last twenty years, the Chinese labor force are still mostly working in farming,

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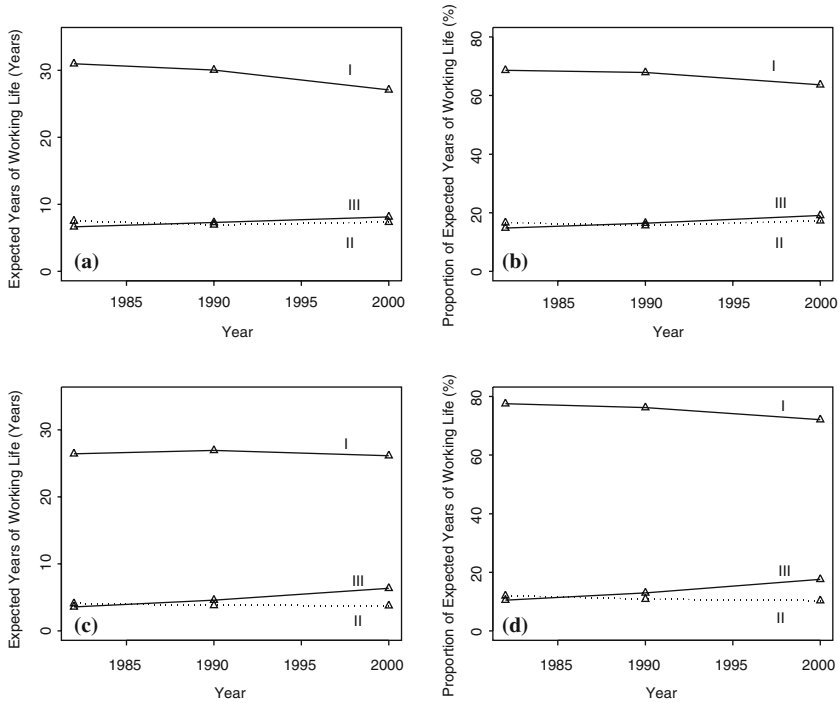


FIGURE 1. Expected years of working life in three consolidated categories of occupations: (I) farming, forestry and fishery, which is category (e) in Table 1, (II) production and transportation, which is category (f) in Table 1 and (III) services and others, which is the combination of categories (a), (b), (c), (d), (g) and (h) in Table 1. For the subplots: (a), expected years of working life for males, (b) the proportion of expected years of working life to the total expected years of working life for males, (c), expected years of working life for females and (d) the proportion of expected years of working life to the total expected years of working life for females. The triangles in the plots denote the three population censuses in 1982, 1990 and 2000.

forestry and fishery. In China, limited arable land accounting of only about 7% of the world total (Lu 1998) is shrinking due to environment degradation and economic development in non-agriculture sectors. The forest coverage in China of the Chinese land is well below the world average (Yin 1998) and the available resource for fishery have been dramatically decreased in the past twenty years (Wang and Zhan 1992). These constraints led to extremely high under employment in agriculture in China. Many young peasants in rural areas are flooding into cities in search for employment and better life

after the economic reform and the relaxation of internal migration in China. For example, there are more than two millions migrant workers in Beijing, the capital, from other parts of China (OBMC 1997). It is estimated that there are more than 100 million migrant workers in Chinese cities (Solinger 1999). The living condition for these migrant workers in cities are well below their city compatriots. The migrant workers are mostly employed or looking for employment in elementary sectors. Even if they can find a job, these type of jobs are usually without any health insurance and other social benefits. In China, most of the social welfare programs are restricted to residents with non-agriculture status in the cities. The status of a person is usually inherited from the mother side of the parents except a very small percent of young peasants who could pass the college entrance examination each year and get a job in the cities after their graduation. The huge population of agriculture status has posed a great public health challenge to the Chinese government. The recent event of severe acute respiratory syndrome (SARS) is a vivid example. One good thing for China having a huge under employed population in farming, forestry and fishery might be that there is a great potential for foreign and domestic capital to make a handsome profit from it.

DATA ANNEX

In this section, we tabulate the proportions of economic activity by age, sex and occupation for the Chinese population based on the three population censuses in 1982, 1990 and 2000. Results are given in Tables A1, A2 and A3 respectively.

TABLE A1

Proportion of economic activity by age, sex and occupation: (a) managers for government agencies, party committees, enterprises and other professional institutions, (b) professionals, (c) clerk and other related staff, (d) staff in service sector, (e) workers in farming, forestry and fishery, (f) workers in production and transportation, (g) other and the life table function person-years lived in the age groups (L_x) in 1982

Age	L_x	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Male								
15-19	468405	0.96	0.01	0.40	1.66	56.30	11.10	0.13
20-24	465383	4.73	0.15	1.51	3.59	60.84	25.18	0.17
25-29	462037	6.13	0.63	1.66	3.44	62.70	23.95	0.08
30-34	458385	6.43	1.58	2.09	3.53	63.09	22.11	0.06
35-54	1760503	7.57	5.35	2.41	3.85	62.45	15.18	0.05
55-59	399096	3.15	3.83	1.15	4.53	63.45	6.81	0.03
60+	1206246	1.05	0.69	0.26	2.83	35.73	2.45	0.02
Female								
15-19	469452	1.15	0.00	0.18	2.03	64.87	9.47	0.11
0-24	466724	4.71	0.06	0.72	4.61	62.66	17.46	0.12
5-29	463415	5.15	0.18	0.85	3.97	65.02	13.53	0.07
30-34	459802	4.65	0.28	0.76	3.83	67.64	11.56	0.05
35-49	1347082	4.81	0.65	0.78	4.02	61.97	8.91	0.03
50-54	430209	1.32	0.62	0.35	2.25	43.39	2.95	0.01
55+	1873670	0.19	0.12	0.05	0.88	13.77	0.64	0.01

TABLE A2

Proportion of economic activity by age, sex and occupation: (a) managers for government agencies, party committees, enterprises and other professional institutions, (b) professionals, (c) clerk and other related staff, (d) staff in service sector, (e) workers in farming, forestry and fishery, (f) workers in production and transportation, (g) other and the life table function person-years lived in the age groups (L_x) in 1990

Age	L_x	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Male								
15-19	472872	0.50	0.01	0.66	1.63	49.74	8.95	0.06
20-24	469503	3.79	0.20	1.70	3.90	62.39	20.52	0.11
25-29	465877	6.92	1.12	2.58	5.47	58.85	22.86	0.04
30-34	461844	6.01	2.57	2.78	6.00	58.56	22.62	0.03
35-39	456885	5.39	4.02	2.67	5.41	61.70	19.62	0.02
40-44	450025	6.33	5.63	2.85	5.18	61.59	17.06	0.02
45-49	440049	7.50	6.49	2.93	4.89	62.34	13.53	0.02
50-54	424749	7.51	6.18	2.71	4.78	61.89	10.20	0.02
55-59	401397	4.77	4.91	2.51	4.64	60.74	5.93	0.05
60-64	364423	1.70	1.23	0.81	3.67	53.55	2.22	0.02
65+	836931	0.55	0.17	0.18	2.15	28.88	0.78	0.01
Female								
15-19	470256	0.97	0.01	0.20	2.30	56.20	8.57	0.05
20-24	467433	4.43	0.06	0.76	4.65	66.06	13.59	0.07
25-29	464374	6.73	0.18	1.13	6.14	63.41	13.19	0.05
30-34	461197	6.43	0.36	1.23	7.16	62.09	13.70	0.04
35-39	457439	5.51	0.63	1.21	6.44	66.10	11.18	0.03
40-44	452461	5.34	0.87	1.08	6.05	65.97	8.93	0.02
45-49	445175	5.69	0.97	0.98	5.11	62.47	5.91	0.01
50-54	433966	3.80	0.82	0.60	2.74	51.98	2.06	0.00
55-59	417383	0.81	0.34	0.19	1.55	41.42	0.76	0.00
60-64	391161	0.19	0.14	0.06	0.99	25.56	0.34	0.00
65+	108285	0.05	0.03	0.01	0.36	7.48	0.09	0.00

TABLE A3

Proportion of economic activity by age, sex and occupation: (a) managers for government agencies, party committees, enterprises and other professional institutions, (b) professionals, (c) clerk and other related staff, (d) staff in service sector, (e) workers in farming, forestry and fishery, (f) workers in production and transportation, (g) other and the life table function person-years lived in the age groups (L_x) in 2000

Age	L_x	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Male								
15-29	480922	0.02	0.48	0.56	2.89	30.47	8.37	0.03
20-24	478274	0.45	4.34	3.18	8.08	45.22	22.62	0.08
25-29	477640	1.26	6.04	3.95	9.34	49.66	24.38	0.08
30-34	471142	2.04	5.26	3.54	9.01	53.21	22.42	0.07
35-39	466327	3.46	5.47	4.29	9.19	51.65	20.99	0.07
40-44	459815	4.05	4.94	4.50	8.94	52.74	19.27	0.07
45-49	450901	4.15	4.56	4.34	7.47	58.21	15.40	0.07
50-54	437701	3.78	4.91	4.23	5.95	59.97	10.41	0.07
55-59	418106	2.56	4.79	3.48	4.19	59.39	5.13	0.05
60-64	387458	0.55	1.64	1.39	2.69	51.74	2.17	0.04
65+	983874	0.10	0.38	0.58	1.18	30.79	0.64	0.02
Female								
15-29	479077	0.02	1.16	0.41	4.77	29.37	10.59	0.03
20-24	477643	0.25	7.19	2.39	0.16	43.41	15.95	0.05
25-29	475778	0.42	7.79	2.17	9.93	50.46	12.27	0.05
30-34	473617	0.52	6.30	1.76	9.53	56.52	10.65	0.05
35-39	471060	0.74	6.46	2.06	10.05	56.48	9.78	0.05
40-44	467678	0.82	5.87	2.18	9.66	56.13	8.66	0.05
45-49	462718	0.78	4.30	1.66	6.69	59.99	4.99	0.04
50-54	454984	0.53	2.77	0.82	3.44	57.42	1.85	0.02
55-59	442879	0.19	0.90	0.27	2.04	50.25	0.82	0.01
60-64	423440	0.07	0.31	0.12	1.23	36.67	0.47	0.01
65+	1375578	0.01	0.07	0.04	0.40	16.54	0.17	0.00

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ENDNOTE

1. The International Standard Classification of Occupations (ILO 1988) divides the workers into 10 large categories: (1) legislators and senior officials, (2) professionals, (3) technicians and associate professional, (4) office clerks, (5) service workers and shop and market sales workers, (6) skilled agricultural and fishery workers, (7) craft and related trade workers, (8) plant and machine operators and assemblers, (9) elementary occupations and (10) armed force. The seven categories used in China can roughly find their corresponding categories in ISCO. In the Chinese classification, the elementary occupation in ISCO is not an independent category which is distributed in various other categories of occupations. It is reasonable to treat almost the entire category of farming, forestry and fishery in the Chinese classification as an elementary occupation. The number of the armed force in China was added to the publication of the census data without much detailed information. As a percentage to the entire population, the armed force in China is very small which was not studied in the current article.

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