



## **ARC Centre of Excellence in Population Ageing Research**

### **Working Paper 2015/18**

#### **How do Chinese Predict their Life Expectancy?**

Bei Lu<sup>1</sup>, Zhenzhen Yang<sup>2</sup>, John Piggott<sup>3</sup> and Hong Mi<sup>4</sup>

<sup>1</sup> ARC Centre of Excellence in Population Ageing Research, UNSW Business School, UNSW Australia. Sydney, Australia, email: [lubei@unsw.edu.au](mailto:lubei@unsw.edu.au)

<sup>2</sup>College of Public Administration, Zhejiang University, Hangzhou, China, email: [yangzhenzhen0611@gmail.com](mailto:yangzhenzhen0611@gmail.com)

<sup>3</sup> ARC Centre of Excellence in Population Ageing Research, UNSW Business School, UNSW Australia. Sydney, Australia, email: [j.piggott@unsw.edu.au](mailto:j.piggott@unsw.edu.au)

<sup>4</sup>The Centre for Non-Traditional Security and Peaceful Development Studies, Zhejiang University, Hangzhou, China, email: [spsswork@163.com](mailto:spsswork@163.com)

This paper can be downloaded without charge from the ARC Centre of Excellence in Population Ageing Research Working Paper Series available at [www.cepar.edu.au](http://www.cepar.edu.au)

## **How do people predict their life expectancy?**

### *Abstract*

Understanding subjective life expectancy (SLE) is critical for pension design and longevity insurance markets. Yet there are very few studies that focus on this question. This paper is the first of its kind to analyse subjective life expectancy in China. It draws on a recent longitudinal survey data (two years) in which participants were asked about their life expectancies.

This paper statistically analyses the relationship between subjective life expectancy and various demographic, social and economic factors. We compare SLE with census-based life expectancy. Results suggest that unisex samples between late 30s and late 60s in general underestimate their life expectancy relative to national data. But while younger women also underestimate life expectancy, younger men over-estimate time to death relative to national estimates. Econometric model analysis focuses on provincial levels covering age, sex, education, health, marital, income and social relationship and retirement arrangements. The results indicate that demographics and family relationships are more important than economic status in people's perceptions of their life expectancy.

### *Introduction*

The systematic errors people make in estimating life expectancy have been little explored. O'Connell (2012), in a recent survey of the literature, found only 40 studies in total, many of which were based on small or highly selected samples. She found only six studies based on what she considered to be samples representative of a national population.

Patterns of subjective life expectancy (SLE) have profound implications for the operations and viability of public and private pensions, and longevity insurance more generally. "SLE provides individuals with their own unique timeframe to guide how they apportion work and transitioning to full retirement, as well as informing considerations of how to plan the distribution of their finances and activities over their remaining lifetime. SLE might be thought of as a personal mental model about the span of remaining life. This individual mental model of longevity potentially provides an important source of information over and above population actuarial estimates for those making retirement transition decisions." (Griffin et al, 2012, p129). If people systematically misperceive their longevity, then policies and products will be distorted, through political or market processes, by this misapprehension.

The process of formulating SLE is not well understood. One long-standing hypothesis is that people base their SLE on the life experience of older family members (Hamermesh 1985, Nemoto and Finkel 2004). Reliance on the experience of older generations might be inferred from the wide-spread under-estimation of life expectancy in the six national surveys listed by O'Connell (2012). This becomes more important when life expectancies are changing rapidly from one generation to

another, since experience of a previous generation then provides little guidance about life expectancy of younger cohorts.

The present study focuses both on rural and urban China, the first of its kind to do so. China's population is about 1.3 billion and is about 20% of world population. The life expectancy, for both rural and urban residents, has been increasing rapidly. In 1950, life expectancy at birth in China was less than 40 years; by 1980 it had risen to 68, and is currently 74.8: 72.4 for men and 77.4 for women.<sup>1</sup>

We use data from a new Ford Foundation funded longitudinal survey<sup>2</sup>, which sampled about 10,000 rural Chinese in 2011 and about 8200 in 2012. Age in samples ranged from 16 to 90, and about a quarter of the sample were individuals above 60. The survey, which mainly deals with retirement arrangements in rural China, has a specific life expectancy question. In 2011, it asked "How long do you think most people will live?"<sup>3</sup>, and in 2012 a different approach was tried and two questions were asked: both their own life expectancy and others. The present study links responses to this question to "objective" life expectancy estimates (by men, women and region) and personal, family, and economic characteristics.

The next section deals with current literature reviews. It is followed by the description of the survey and data and the comparisons between the survey and the aggregated life table. Section 3 provides multi-nominal analysis from the survey data. Section 4 draws on implications to policy makers for pension plans as well as insurance companies for pension related products. Section 5 concludes.

## 1. Literature Review

Theoretical works (Brock, 2007, Persson *and* Tabellini 2000, Tabellini 2000, Walliser 2000 ) have examined the impact of life expectancy on the choice of public pension, but mainly on the life expectancy in general rather than individual's subjective life expectancy scenarios. The Health and retirement Study (HRS) in the United States also has a question related to life expectancy. The question is about how the interviewee judges whether they would live for another 10 years from very unlikely to very likely (5 levels of confidants). There are few trials try to understand people's knowledge of their own longevity (Bucher-Koenen and Kluth 2013, Mirowsky and Ross 2000). Literatures focusing on this survey have generated some interesting findings of the subjective life expectancy puzzle.

Some use HRS to study the subjective belief of individual's survival probabilities. Smith (et al, 2001) analysed 4 waves of HRS data and found that "subjective beliefs about longevity are consistent with individuals' observed survival patterns", and "the evolution of subjective belief from those who later

---

<sup>1</sup> Data from National Bureau of Statistics of China, at [http://www.stats.gov.cn/tjgb/rkpcgb/qgrkpcgb/t20120921\\_402838652.htm](http://www.stats.gov.cn/tjgb/rkpcgb/qgrkpcgb/t20120921_402838652.htm)

<sup>2</sup> The English translation of the survey title is very unwieldy: The Evaluation and Improvement of the Pilot Project of the New Rural Old-age Insurance in China (NROAI). We will refer to the survey by its acronym.

<sup>3</sup> The more direct question about the individual's views of his or her own life expectancy was considered too confronting. The nature of responses, however, suggests that this indirect question provides guidance on that issue. In the Western literature, this same issue is finessed by asking about their subjective probabilities of survival (SPS) to different ages.

die displays a consistent decline over time". And "*an individual's longevity expectation is a fairly accurate index of personal survival probability*, both in its responsiveness to events that experts would suggest increase the odds of death and as a prediction of future mortality." However, they also acknowledge that "models based on this subjective probability do not reflect all of the private information people have about their survival prospects" (p 1126). While HRS makes contributions to subjective probability of survival from survey respondents age 45 and above, it does not give actual prediction of people's life expectancy in general, especially in young ages. Increasing studies confirmed that subjective life expectancy has large variations among different people (Perozek 2008, Wang 2014).

A number of studies relate the subjective life probability to labour and pension policy designs. Hurd (et al., 2004) found that "those with very low subjective probabilities of survival retire earlier and claim earlier than those with higher subjective probabilities, but the effects are not large. The great majority of workers claim as soon as they are eligible (p 762)". Solinge and Henkens (2009) conclude that life expectancy is taken into account in retirement decision making, but when it comes to actual behaviour, the time horizon does not seem to be significant. This seems to indicate that social security plays a much more important role in labour participating patterns than individual's own mortality risk. People would tend to retire early if the government social policy allows them to, regardless of their subjective life expectancy. But subjective life expectancy has an effect on workers' acceptance of certain policies. This is confirmed by Aisa et al. (2012) who showed that increasing retirement age will receive less and less opposition from workers as a consequence of the growth of their life expectancy.

Some of the subjective life expectancy literature attributes attitudes to health related issues. Hurd (et al., 2002) found that respondents in HRS survey modify their survival probabilities in response to new information such as the onset of a new disease condition.

Few independent surveys reveal how people respond to their longevity expectancy. Mirowsky (1999) used the 1995 survey of *Aging, Status and the Sense of Control (ASOC)* in USA to explore how people predicted their life expectancy and found that men were much more optimistic about their life expectancy than women.

This study examines the actual life expectancy belief based on recent longitudinal survey data in China. It relates individual's subjective longevity expectation to their demographic situation, economic status and social contact environment. It answers how people predict their life expectancy and the characteristics of those who are optimistic, moderate and pessimistic and why. We believe the findings are important for policy design as well as the insurance industry.

## **2. Survey Data**

Our data were taken from The Evaluation and Improvement of the Pilot Project of the New Rural Old-age Insurance in China (NROAI)<sup>4</sup> in 2011 and 2012. Though majority of the questions are the same, there are some adjustment in each year and in each region in 2012. This is a trend study.

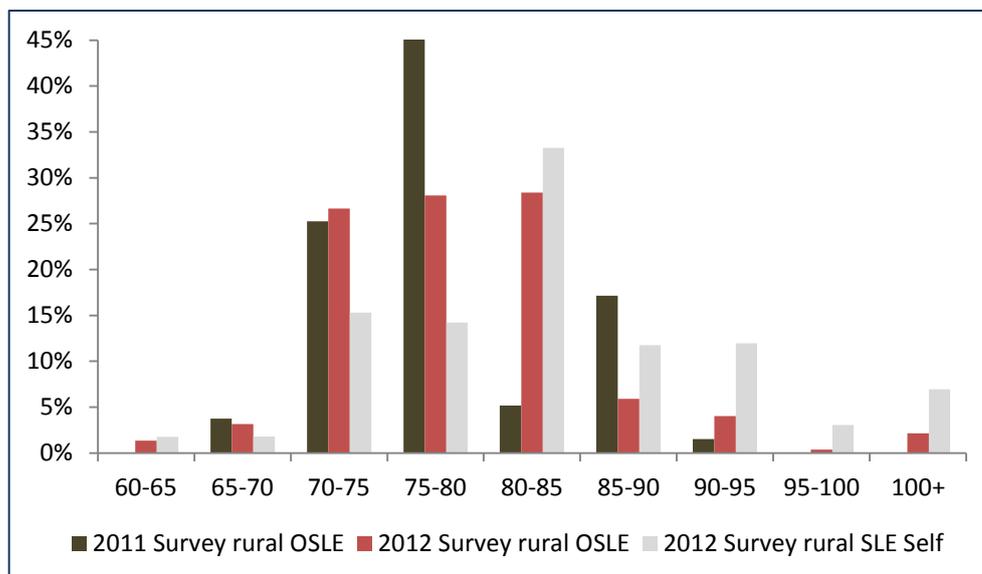
The NROAI used cluster samplings to select sites. In 2011, 10 typical counties from 113 villages in eastern, central and western areas of China (six provinces: Hebei, Liaoning, Shangdong, Hubei, Sichuang and Gansu-hereinafter called 2011 survey) with weight economic status were chosen. And it chose about 80% respondents aged 16-59 years old and 20% respondents aged 60 years and above in each of these villages (except in Sichuan, with much higher percentage sample in aged group above 60).

In 2011, face to face interviews took place resulting in 9244 samples. The final number of valid samples was 9054 including 6962 samples aged 16-59 years and 2192 samples aged 60 years and above. As one of the questions, the respondent was asked how long do they think most people would live up with a choice of 1)65-70, 2)70-75, 3)75-80, 4) 80-85 and 5) 85-90 and 6)90 and above.

In 2012, interview samples were 8168 with 5641 residents in rural areas and the rest in urban areas in 4 provinces (Zhejiang, Heilongjiang, Guizhou and Shannxi – hereinafter called 2012 survey). The questions were different: instead of multiple choices, they were asked to fill in any age they thought. Two questions were asked separately: what is your own life expectancy, and what is your prediction of other people’s life expectancy of your age? Respondents wrote their own numbers as answers.

The distribution of the answer is presented in chart 1. This looks different from the actual mortality table as it is centred rather than left aligned. It is simple because death before age 60 was not considered in this survey.

Chart 1. Distribution of life expectancy of other people in general of two surveys’ respondents:



<sup>4</sup> Survey data is based on the Investigation of Ten Counties conducted by the Research Team for Policy Simulation of Social Security & Demographic Data Mining in 2011 and 2012 by the Center for Labor Economics & Public Policy Studies of Zhejiang University. The survey is funded for Ford Foundation.

*Note: 2011 survey only ranges from 65-70 to 90+, thus the proportion for 60-65 and 95+ are not reported. OSLE is the short form for others' subjective life expectancy in relation to question what ages you think other people will live up to.*

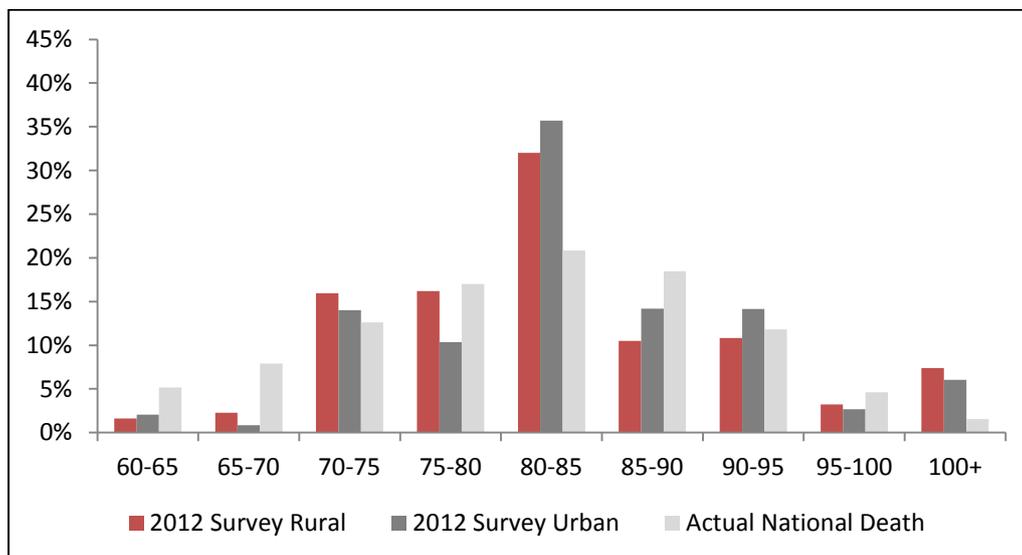
The 2011 data shows that about 72% of the respondents predict their life expectancy between 70-80 years. About 22% predicted their SLE to be above 80 years old and only 6% below age 70. The 2012 data shows that in rural areas, the proportion with SLE between 70-80 was smaller at 29.5% and SLE to 80-90 is about 33% of the sample (urban is about 50% of the sample), much higher than the 2011 survey.

In general, 2011 survey shows predicted average life expectancy of other people was 78 years and 2012 survey shows that predicting other people's average was about 76.5 while self SLE reached 81 years, a much higher perception towards self SLE than other people.

As to other people's SLE, the distribution is more flat. Evenly concentrated in 70-85 and self SLE is more concentrated in higher life expectancy (above 85+). This shows people in general expect they would live longer than most people.

The Chinese rural and urban have different life expectancies. Chart 2 presents the difference between urban area and rural area in SLE.

Chart 2: SLE in 2012 Survey for urban and rural samples, and actual national death rate from 2010 census



The data also shows a much higher predicted life expectancy in urban than rural areas in 2012 survey which is consistent with the actual data. It is also worth mentioning that rural respondents had higher percentage of subjective life expectancy at very high ages – 95 and 100 above – than urban. It is also true that most 100 year old people are living in rural areas.

China has vast regional differences. Life expectancy in each province is also different. Chart 3 present some interesting results from 2012 survey. It describes provincial difference in SLE distributions.

Chart 3: Provincial Distribution in 2012 survey: Zhejiang, Heilongjing, and Shaanxi

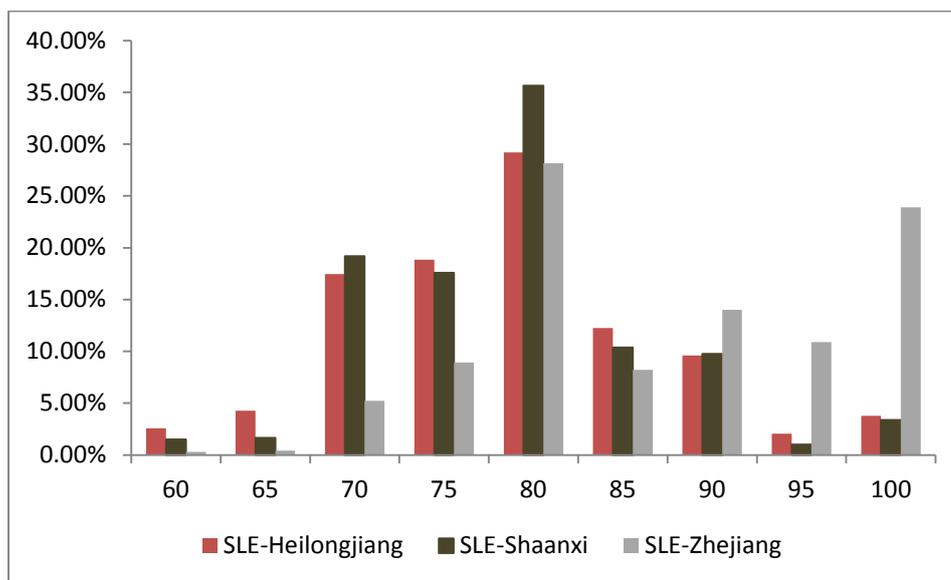


Chart 3 combines rural and urban residents in three provinces. Zhejiang is the richest among the three and is the highest GDP per capita province in China. It is not surprising that Zhejiang residents in general have a higher than average subjective life expectancy (which is also consistent with actual data). And it is quite unusual that about quarter of residents choose 100 as their subjective life expectancy.

Those distributions explain that people in rich and urban areas expect longer life expectancy than poor and rural areas. Higher percentage of rural residents predicts very high SLE (above age 100) than urban residents. And people are expecting themselves in general to live longer than other people on average.

2012 Survey Self SLE Results Compared to the Aggregated Life Table (ALE)

We also use the full sample data to compare age specific subjective life expectancy to generate our own life expectancy charts and compare to the aggregated life expectancy (using the 6<sup>th</sup> national census data for national and each province herein called “ALE”). As there are limited samples before age 25, we start the age at 25 instead of the data starting age of 16.

Chart 4: Life expectancy at each sample age group: male and female:

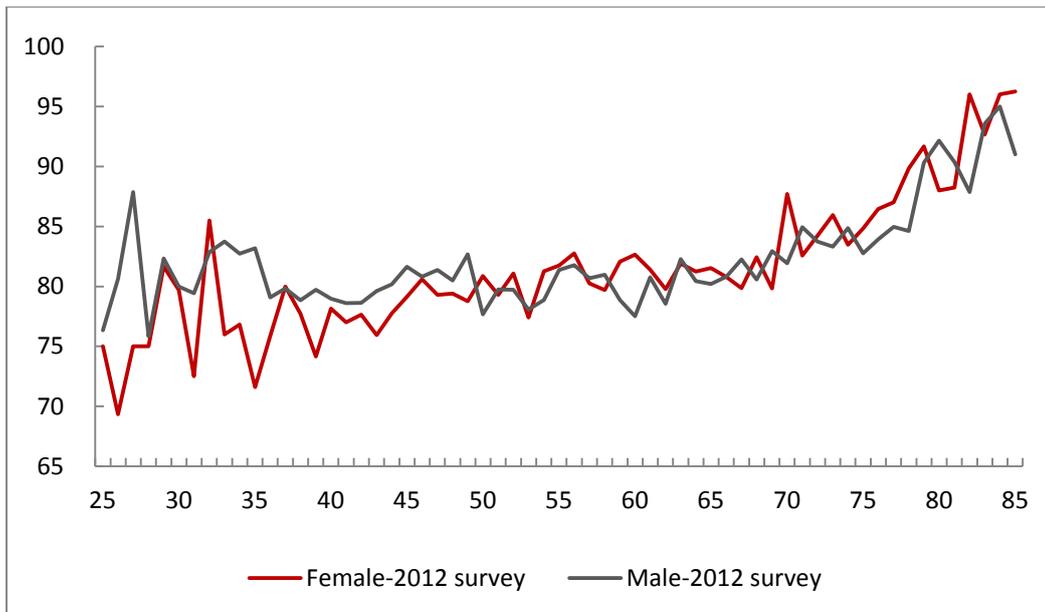


Chart 4 displays that men have much higher life expectancy than women, especially at young and old ages from 25-32 and 62-68. Women in their late 20s and early 30s are very pessimistic about their longevity, which is also true for women in their early 50s and mid 60s in 2011. However, according to the 2012 survey, SLE for women at later life stages have greatly improved. Women live longer than men in rural China, yet the survey shows that women in rural areas seem not to be aware of this. In the 2012 survey, people are much more optimistic about their life expectancy in later ages than the 2011 survey. It might be the effect that people are aware of their life expectancy much more after the new rural pension plan implementation.

Chart 5 further explains the gaps between subjective life expectancy and the aggregated life expectancy both for men and women.

Chart 5: Life balance comparison: ALE vs. survey data SLE

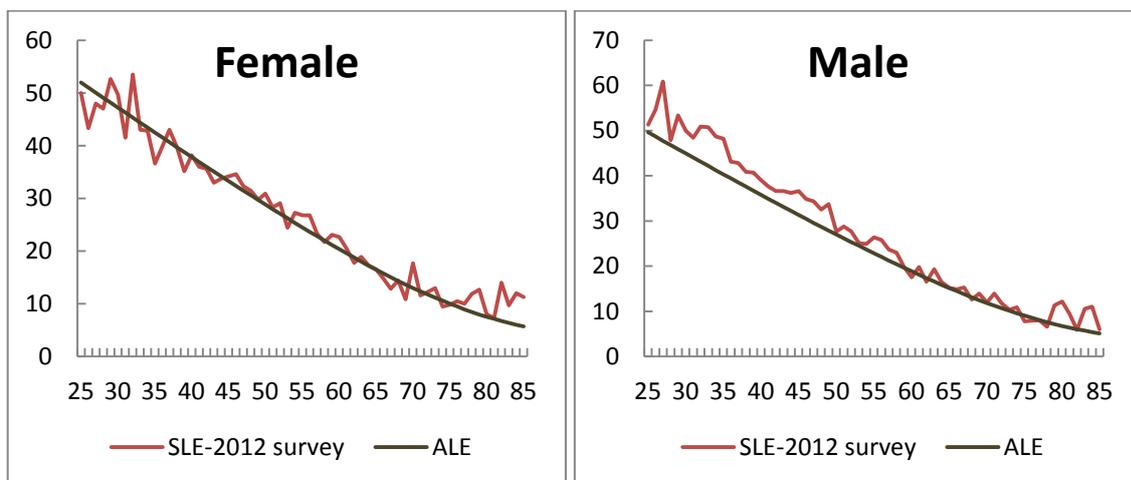


Chart 5 shows that in 2012, the SLE line for females swings around the national aggregated life expectancy levels, especially at early ages, and males are showing an optimistic perception on their life expectancy at almost all levels except in late 50s to late 70s.

SLE compared to ALE help to understand population decisions by age cohorts. Chart 6 and 7 combine the man and woman subjective life expectancy (SLE) and compare to the aggregated data (ALE), which explain the accuracy of unisex in their life expectancy claims.

Chart 6: Survey remaining life expectancy compared to aggregated remaining life expectancy:

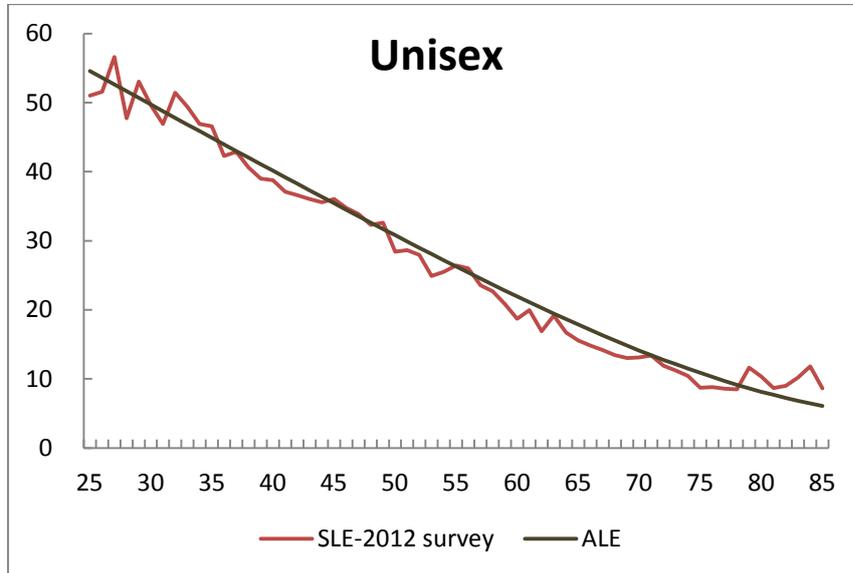
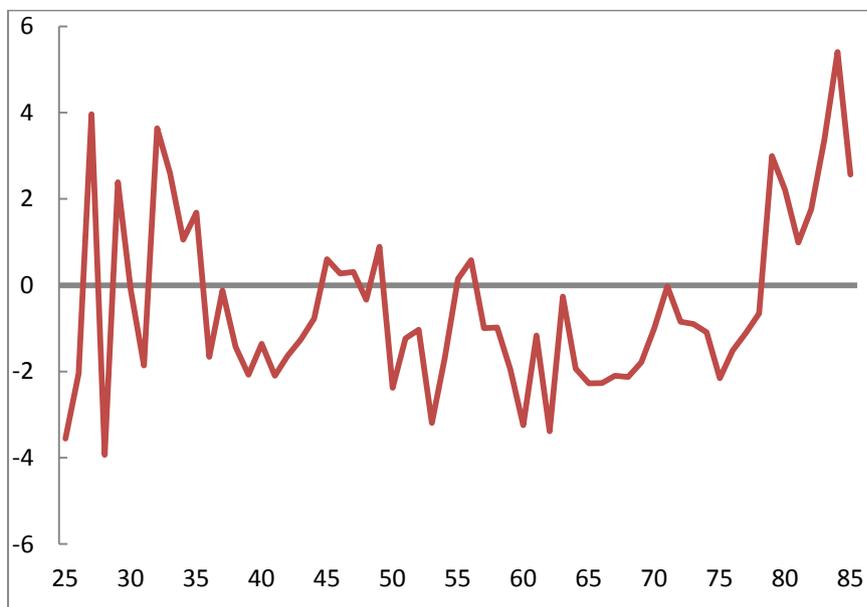


Chart 7 Difference between 2012 unisex survey SLE and ALE remaining life expectancy at each age cohort:



The Chart 6 indicates very close estimates for unisex person in rural China about their life expectancy. The Chart 7 explains the difference between the survey data and aggregated remaining life in much detail. In 2012, before age 35, a unisex person in rural China fluctuates around aggregated estimates. Between age 35 to 75, SLE estimates are a bit lower than the aggregated data, from 75 onwards, there is a tendency to over-estimate and at a much greater gap.

### 3. Logit Analysis about Subjective Life Expectancy (SLE)

What are the determinants when individuals predict about their life expectancy? Why some people predict a much longer life expectancy than others? What are the characteristics involved to project subjective longevity? We try to tackle these questions by using the ALE as reference, and compare to individual NORAI survey data. If the answer is within the 5 year range of selection, we define them as accordance group, and if above and below the range, they are defined to be overestimate or underestimate groups respectively.

We choose 3 provinces data as a comparison setting for 2012 survey: Zhejiang, Shaanxi and Heilongjiang province. We do not include Guizhou, as we only have limited rural samples in this province.

Table 1. Statistics about Sichuan and Shandong in 2011

| Area                 | Zhejiang | Shaanxi | Heilongjiang | National |
|----------------------|----------|---------|--------------|----------|
| GDP per capita       | USD9144  | USD5195 | USD5043      | USD5417  |
| Population (million) | 55       | 37      | 38           | 1347     |
| Life Expectancy      | 78       | 75      | 76           | 75       |
| Urban population     | 62%      | 47%     | 51%          | 51%      |
| Rural Net income     | USD2020  | USD777  | USD1173      | USD1080  |
| Rural Consumption    | USD1540  | USD694  | USD824       | USD807   |

Source: various 2011 statistics reports, author's calculation into USDs at an exchange rate of 6.47:1. Rural net income and rural consumption are all per capita based.

Shaanxi is one of the typical province situated in less economically developed areas (mid west of China) and Heilongjiang represents moderate developed areas but in northern China, and Zhejiang is one of the most developed areas in east coast. Regional statistics show the vast differences among Chinese jurisdictions and separate treatment is essential in research studies.

Table 3 Demographic statistics of 2012 survey data –chosen provinces

| Province          | Zhejiang |      | Heilongjiang |      | Shaanxi |      |
|-------------------|----------|------|--------------|------|---------|------|
|                   | 17-59    | 60+  | 17-59        | 60+  | 17-59   | 60+  |
| Ave. income (USD) | 3640     | 1382 | 1681         | 1250 | 1506    | 1151 |
| Education         |          |      |              |      |         |      |
| no education      | 7%       | 32%  | 4%           | 22%  | 3%      | 28%  |
| primary school    | 30%      | 49%  | 24%          | 50%  | 17%     | 43%  |
| middle school     | 47%      | 17%  | 57%          | 25%  | 57%     | 26%  |
| high school+      | 16%      | 2%   | 14%          | 4%   | 23%     | 4%   |
| % married         | 90%      | 62%  | 92%          | 71%  | 93%     | 78%  |
| Sample size       | 386      | 323  | 762          | 409  | 1151    | 670  |

Source: from 2012 Zhejiang Survey.

The survey data shows a much higher level of income than the national statistics in the 2012 survey. This can be explained that people might be giving various income figures in rural areas when it comes to survey. The statistics bureau listed rural total income, cash income and net income. In

2011, rural total income is about 40% higher than net income. We could interpret the 2012 survey income as close to total per capita income.

We use multinomial logit model to estimate 2012 data due to convergence issue. We only include samples from age 25-70 and divide them into two groups: group for age 25-59 and age 60-70. For age 16 to 25, samples are limited as most of them are either in school or working as migrants, so our analysis does not include this age group.

The analysis indicates several interesting characteristics. We report them in Annex 3 and 4 in terms of sex, marital status, education levels, income levels, parent status and pension requirement.

#### Male vs. Female:

For young age group between 25-59, men are showing consistent optimistic attitude to subjective life expectancy compared with women. Almost all sampled provinces in China showed compared to women, men are either unlikely to underestimate or likely to overestimate for age groups below 60 (this is along with the US survey result (Mirowsky (1999))). But for elders, life expectancy is more rationale and does not present the same characteristic compared to young men.

#### Marriage Status - Married vs. Single:

In the 2012 survey, singles are more likely to be either underestimate or over-estimate their SLE compared with ALE. For example, Zhejiang singles are unlikely to underestimate and more likely to overestimate their life expectancy but in Shaanxi province, it is *vice versa*.

#### Education:

Education seems to produce similar results in provinces. For young age group, higher education seems to lead less likelihood to underestimate their life expectancy (Shaanxi and Zhejiang province), but there is almost no significance in old age groups. Education does not lead to higher life expectancy from the survey analysis, this may partly be reason that college level education is still limited in the samples (in other words, it is the education of college level rather than high school which might make a difference in SLEs compared with no education groups).

#### Health:

The 2012 survey has self health evaluation question. As expected, results of young sample group in Shaanxi (the only province asked this question for young group) show that poor health is correlated with more probability of underestimate, in other words, poor health is associated with shorter life expectancy. And good health the vice verse. For age groups between 25 and 59, Shaanxi and Heilongjiang samples prove that good health is less likely to underestimate. But the old group (above age 60) does not show correlations between health and SLE.

#### Income:

Income in elder group does not show any significance in SLE patterns compared with ALE. However, in age 25-59 group, there are some signs that higher income tend to report higher SLE (Shaanxi province), but Heilongjiang is an exception which shows a slight tendency to underestimate their

SLEs. This is probably due to the climate and other social effects as more than half of the samples underestimate their SLEs compared to ALEs.

#### Parent Surviving Status

There seems to be no correlation with parent survival status and SLE in Shaanxi and Heilongjiang provinces. Zhejiang data show likelihood to underestimate their SLE with parents and at the same time show that having parents alive are significant in overestimating SLEs.

#### Pension Requirement

Individuals were asked how much they think would be adequate for pension when they retire. The analysis results show that higher pension adequacy requirement seems in general to be related to higher subjective life expectancy. Zhejiang samples indicate these are signs for less underestimates. Requiring better life style seems to be correlated with longer life expectancy.

To summarize, these findings indicate that males are more optimistic in young ages and tend to have higher subjective life expectancy compared with women. People having close family relationships or good social environment tend to have higher SLEs. Higher education so far leads to less likelihood of underestimating SLEs. For people between 25 to 59 years old, income seems to be positively correlated with subjective life expectancy in rich area; however, in older age group, income is not significant in predicting higher or lower SLE. People expecting higher pension adequacy seems to be correlated with higher SLEs.

Same variable sometimes shows opposite signs in SLE predictions, which reflects the importance of regional difference – it might be geographical or cultural, but might well be different stages of economic and social developments. Behaviour changes along with economic and social status. This is indicated by perception of income and marriage status in poor and rich areas in rural China. For example, singles in rich areas seem to be more optimistic about their life expectancy, but singles in poor areas are more pessimistic. High income earners in young age groups are more likely to be under-estimate in Heilongjiang but less likely in Shaanxi, but in rich area like Zhejiang, it is no longer significant.

The sex effect is similar to the US result, but the rests are not consistent with the US finding, as the SLE in US is highly correlated with education and same sex parent survival (Mirowsky and Ross 2000), while in rural China, such characteristics are not obvious. Education only makes young people more rational in predicting their life expectancy. The reason might be the levels of education – college education is more likely to make significant difference – which is limited in our samples. The provincial differences in our analysis reflect people's perceptions of SLEs at different social and economic development stages.

#### **4. Implications for policy makers and insurance industry**

In general people's perceptions of their subjective life expectancy are quite close to the actual aggregated national data. Interestingly, people think others are living shorter than themselves. This might give insurance company some strategies in promoting longevity related products. Regional

differences in perceptions also lead to regional strategies in terms of retirement policy and insurance products. Male and female SLEs indicate separate treatments in promotions of government policies and industry products.

The logit analysis tries to help to understand why some people are optimistic or rational and others are pessimistic. It might give policy makers some references about how people are predicting their life cycle and refine their promotions to pension plans accordingly.

These findings can be applied to the annuity market, pension policy regarding contribution rates and targeting groups.

Annuity market education: This is important for insurance companies, as well as government who promote a mandatory annuity for pension benefit. From the survey, we find that most people younger than 50 might think the currently annuity based on aggregated life table is reasonable, but quite some people at 60 and above would think the price too expensive as their SLEs are underestimated than ALE.

Promoting pension policy or products to households makes more sense to age 33-53 groups as they are rational and matching almost the same as the ALE. An actuarially fair pension product or system should be easier to accept by this group.

Younger males are likely to be more willing to purchase life time products as they have higher life expectancy than actuarial ones. In general, younger generation can actually afford a bigger loading rate of annuity or related pension products based on their anticipation.

Another way to interpret the findings is that since the aggregated SLE is close to ALE, rather than telling the individuals how long they are going to live, asking them how long they expect to live and designing the tailor-made products might be more acceptable.

Contribution levels and years: Higher pension benefit requirements are correlated with higher SLEs, it seems reasonable to set up several contribution levels for pension accumulation. People are motivated to save more when they desire more and expect to live longer. It also indicates that not only contribution level should be linked with retirement benefits, but also the years of contribution shall matter as well, as if one expects to live longer, he has to contribute longer years.

Targeting young women: women in their late 20s and late 40s are the biggest cohorts that underestimate their life expectancies. Women are usually the family decision makers and if they are convinced to make pension arrangement rationally, participation in the pension plan as well as pension contributions could be increased. Better protection of later age could be achieved by earlier and better planning via education.

## **5. Conclusion**

This paper is the first of its kind to understand rural Chinese people's subjective life expectancy and it generates some interesting implications for pension policy and insurance industry.

Using aggregated national statistic data, people in rural China in their 20s tend to overestimate their life expectancy (maybe the ALE is underestimated) and people above age 35 and late 70s show underestimation about their life. In general, men are more optimistic especially at younger age about their subjective life expectancy than women.

People seem to know about their life expectancy quite accurately compared with the national actual data. The SLE of the rural poor is much less than urban rich. But very high life expectancy from age 100 is expected more in rural than urban area.

The econometric results indicate that demographics and family relationships are more important than economic status in people's perceptions of their life expectancy, especially in older ages. Males are more positive than females in their longevity prediction.

Regional differences in subjective life expectancy suggest a perspective change with economic and social developments (may also include geographic differences). This is confirmed by various opposite perspectives in income, education, parent survival status and marriage status in poor and rich areas in rural China. For example, singles in rich areas seem to be more optimistic about their life expectancy, but singles in poor areas are more pessimistic. Policy designs and insurance products may introduce some regional variance to deal with this fact.

The two survey results suggest quite strong consistency between SLEs and ALEs. This indicates people in China are becoming more aware of their longevity facts and it is time for government to promote education on choosing retirement plans and making retirement decisions. The implications of this study help to target on different age and gender groups using different approaches when promoting pension policies by government, or selling retirement products by insurance companies.

## Reference:

- Aisa R., Pueyo F and Sanso M., (2012), "Life expectancy and labour supply of the elderly", *Journal of Population Economics* 25, pp 545-568
- Brock R., (2007), "On the Choice of Public Pension Income and Life Expectancy are Correlated", *Journal of Public Economic Theory*, 9 (4), 2007, pp. 711-725
- Griffin B, Hesketh B., Loh V., (2012), "The influence of subjective life expectancy on retirement transition and planning: A longitudinal study", *Journal of Vocational Behavior*, Volume 81, Issue 2, October 2012, Pages 129 – 137
- Hamermesh, Daniel S. (1985), "Expectations, Life Expectancy, and Economic Behavior ." *Quarterly Journal of Economics*, Vol. 100, No. 2, (May 1985), pp. 389-40 8.
- Hurd M., and McGarry K., (2002), "The Predictive Validity of Subjective Probabilities of Survival", *The Economic Journal*, 112 (October), pp. 966-985. Royal economic Society 2002, Blackwell Publishers
- Hurd M., Smith J and Zissimopoulos JM, (2004), "The Effects of Subjective Survival on Retirement and Social Security Claiming", *Journal of Applied Econometrics*, 19: pp. 761-775 (2004), Wiley InterScience
- Mirowsky, J. (1999). "Subjective life expectancy in the US: correspondence to actuarial estimates by age, sex and race". *Social Science & Medicine*, 49, 967–979.
- Mirowsky J. and Ross C. E., (2000), "Socioeconomic Status and Subjective Life Expectancy", *Social Psychology Quarterly*, Vol. 63, No. 2 (Jun., 2000), pp. 133-151
- Nemoto S. and Finkel T., (2004), "Ageing and the mystery at Arles" *Nature* **429**, 149-152(13 May 2004) doi:10.1038/429149a
- O'Connell A, (2012), "How Long Do We Expect to Live? A Review of the Evidence", *Population Ageing* (2011) 4:185–201
- Perozek, M. (2008). Using subjective expectations to forecast longevity: Do survey respondents know something we don't know? *Demography*, 45(1):95{113.
- Persson, T., and G. Tabellini (2000) *Political Economics*. Cambridge, MA :MIT Press
- Smith T., D.H., and Sloan F.A., (2001), "Longevity Expectations and Death: Can People Predict Their Own Demise", *The American Economic Review*, Vol 91, No. 4 (September 2001), pp. 1126-1134, American Economic Association
- Solinge H., Henkens, K., (2009), "Living longer, working longer? The impact of subjective life expectancy on retirement intentions and behaviour", *European Journal of Public Health*, Vol. 20, No 1. pp 47-51, Oxford University Press
- Tabellini, G. (2000), "A positive theory of social security", *Scandinavian Journal of Economics* **102**, 523–545.

Walliser, J. (2000) "Adverse selection in the annuities market and the impact of privatizing social security", *Scandinavian Journal of Economics* **102**, 373–393.

Wang, Y. (2014). Dynamic implications of subjective expectations: Evidence from adult smokers. *American Economic Journal: Applied Economics*, 6(1):1{37.2011

Sichuan Economic and Social Development Statistic Report, available at [http://district.ce.cn/newarea/roll/201203/05/t20120305\\_23129917\\_1.shtml](http://district.ce.cn/newarea/roll/201203/05/t20120305_23129917_1.shtml)

2011 Shandong Economic and Social Development Statistic Report, available at <http://www.stats-sd.gov.cn/disp/tjgb.asp?aa=1101201200>

2011 China Economic and Social Development Statistic Report, available at [http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20120222\\_402786440.htm](http://www.stats.gov.cn/tjgb/ndtjgb/qgndtjgb/t20120222_402786440.htm)

**Annex 1 Descriptive Information on 2012 sample, N (%) 25-59 Age Group**

| <b>Province</b>                          | <b>Heilongjiang</b> | <b>Shaanxi</b> | <b>Zhejiang</b> |
|--|---------------------|----------------|-----------------|
| <b>Sample Size</b>                       | 762                 | 1151           | 386             |
| <b>Dependent Variables</b>               |                     |                |                 |
| <b>Self reported life expectancy</b>     |                     |                |                 |
| Underestimate                            | 57%                 | 43%            | 21%             |
| Accordance                               | 23%                 | 35%            | 24%             |
| Overestimate                             | 20%                 | 22%            | 55%             |
| <b>Independent Variables</b>             |                     |                |                 |
| <b>Age</b>                               | 45                  | 47             | 47              |
|  | (9)                 | (9)            | (8)             |
| <b>Gender</b>                            |                     |                |                 |
| Female                                   | 26%                 | 25%            | 15%             |
| Male                                     | 74%                 | 75%            | 85%             |
| <b>Marital status</b>                    |                     |                |                 |
| Unmarried                                | 8%                  | 7%             | 10%             |
| Married                                  | 92%                 | 93%            | 90%             |
| <b>Education Degree</b>                  |                     |                |                 |
| No education                             | 4%                  | 3%             | 7%              |
| Primary                                  | 24%                 | 17%            | 30%             |
| Middle school                            | 57%                 | 57%            | 47%             |
| High school and above                    | 14%                 | 23%            | 16%             |
| <b>Average individual Income (RMB)</b>   | 10874               | 9741           | 23552           |
|  | (8383)              | (8299)         | (50949)         |
| <b>Worked in the cities<sup>1</sup></b>  |                     |                |                 |
| Never                                    | 82%                 |                | 36%             |
| Worked                                   | 10%                 |                | 53%             |
| Not reported                             | 8%                  |                | 11%             |
| <b>Minimum Pension Requirement (RMB)</b> |                     |                |                 |
| <400 (<500)                              | 12%                 | 11%            | 11%             |
| 400-600 (500-1000)                       | 16%                 | 34%            | 5%              |
| 600-800 (1000-1500)                      | 13%                 | 29%            | 16%             |
| 800-1000 (1500-2000)                     | 18%                 | 13%            | 20%             |
| 1000-1500 (>2000)                        | 13%                 | 12%            | 22%             |
| >1500                                    | 27%                 |                | 26%             |
| <b>Parents<sup>1</sup></b>               |                     |                |                 |
| Alive                                    | 57%                 |                | 33%             |
| Dead                                     | 28%                 |                | 28%             |
| Missing                                  | 14%                 |                | 39%             |

**Annex 2 Descriptive Information on the 2012 sample, N (%) 25-59 Age Group**

| <b>Province</b>                         | <b>Heilongjiang</b> | <b>Shaanxi</b> | <b>Zhejiang</b> |
|---|---------------------|----------------|-----------------|
| <b>Sample Size</b>                      | 409                 | 670            | 323             |
| <b>Dependent Variables</b>              |                     |                |                 |
| <b>Self reported life expectancy</b>    |                     |                |                 |
| Underestimate                           | 59%                 | 55%            | 45%             |
| Accordance                              | 25%                 | 25%            | 8 %             |
| Overestimate                            | 16%                 | 20%            | 47%             |
| <b>Independent Variables</b>            |                     |                |                 |
| <b>Age</b>                              | 68<br>(7)           | 68<br>(6)      | 71<br>(8)       |
| <b>Gender</b>                           |                     |                |                 |
| Female                                  | 31%                 | 29%            | 38%             |
| Male                                    | 69%                 | 71%            | 62%             |
| <b>Marital Status</b>                   |                     |                |                 |
| Unmarried                               | 29%                 | 22%            | 38%             |
| Married                                 | 71%                 | 78%            | 62%             |
| <b>Education Degree</b>                 |                     |                |                 |
| No education                            | 22%                 | 28%            | 32%             |
| Primary                                 | 50%                 | 43%            | 49%             |
| Middle school                           | 25%                 | 26%            | 17%             |
| High school and above                   | 4%                  | 4%             | 2%              |
| <b>Average individual Income (RMB)</b>  | 8088<br>(7306)      | 7449<br>(6638) | 8943<br>(11802) |
| <b>Worked in the Cities</b>             |                     | N/A            |                 |
| Never                                   | 89%                 |                | 76%             |
| Worked                                  | 5%                  |                | 12%             |
| Not reported                            | 6%                  |                | 13%             |
| <b>Minimum Pension Requirement *</b>    |                     |                |                 |
| <400 (<500)                             | 19%                 | 14%            | 26%             |
| 400-600 (500-1000)                      | 21%                 | 44%            | 16%             |
| 600-800 (1000-1500)                     | 21%                 | 22%            | 22%             |
| 800-1000 (1500-2000)                    | 17%                 | 12%            | 16%             |
| 1000-1500 (>2000)                       | 9%                  | 7%             | 12%             |
| >1500                                   | 13%                 |                | 9%              |
| <b>Financial Transfer From Children</b> |                     |                |                 |
| Continue                                | 49%                 | 70%            | 64%             |
| Stop                                    | 7%                  | 9%             | 3%              |
| Never Before                            | 26%                 | 11%            | 13%             |
| Missing                                 | 18%                 | 10%            | 20%             |

\*Shaanxi measurement is different from the other two provinces (see bracket)

Anex 3: Logit for 2012 Survey samples (age below 60) with health status

|  | <b>Shaanxi</b>       |                     | <b>Heilongjiang</b>  |                     | <b>Zhejiang</b>      |                      |
|--|----------------------|---------------------|----------------------|---------------------|----------------------|----------------------|
|  | underestimate        | overestimate        | underestimate        | overestimate        | underestimate        | overestimate         |
| <b>Age</b>   | 0.00858<br>(0.009)   | -0.0143<br>(0.010)  | 0.0108<br>(0.012)    | -0.00824<br>(0.014) | 0.0196<br>(0.027)    | 0.00634<br>(0.021)   |
| <b>Male</b>  | -0.0534<br>(0.159)   | 0.382*<br>(0.200)   | -1.498***<br>(0.260) | -0.285<br>(0.327)   | -3.554***<br>(0.691) | -1.806***<br>(0.656) |
| <b>Single</b>  | 0.740**<br>(0.327)   | 0.795**<br>(0.358)  | 0.524<br>(0.419)     | 0.431<br>(0.480)    | -2.225***<br>(0.690) | -1.238**<br>(0.488)  |
| <b>Education (Baseline: primary school or below)</b>             |                      |                     |                      |                     |                      |                      |
| middle school  | -0.546***<br>(0.185) | 0.0274<br>(0.236)   | -0.260<br>(0.225)    | 0.134<br>(0.281)    | -1.263***<br>(0.452) | -0.842**<br>(0.359)  |
| high and above   | -0.175<br>(0.218)    | 0.0945<br>(0.278)   | -0.237<br>(0.310)    | 0.284<br>(0.371)    | -1.089*<br>(0.619)   | -0.698<br>(0.481)    |
| <b>Log income per capita</b>                                     | -0.331***<br>(0.096) | 0.0755<br>(0.115)   | 0.337***<br>(0.130)  | -0.0810<br>(0.151)  | -0.157<br>(0.128)    | 0.144<br>(0.134)     |
| <b>Minimum Pension Requirement (baseline: &lt;400 (&lt;500))</b> |                      |                     |                      |                     |                      |                      |
| 400-600 (500-1000)   | 0.210<br>(0.237)     | 0.0693<br>(0.301)   | -0.289<br>(0.339)    | -0.255<br>(0.385)   | 0.492<br>(1.152)     | -1.364<br>(0.984)    |
| 600-800 (1000-1500)  | 0.117<br>(0.246)     | 0.228<br>(0.301)    | 0.319<br>(0.356)     | -0.318<br>(0.432)   | -2.413**<br>(0.977)  | -2.929***<br>(0.738) |
| 800-1000 (1500-2000)   | 0.177<br>(0.280)     | 0.0956<br>(0.348)   | 0.447<br>(0.347)     | 0.207<br>(0.392)    | -0.592<br>(0.947)    | -0.578<br>(0.763)    |
| 1000-1500 (>2000)  | 0.330<br>(0.304)     | 0.982***<br>(0.344) | 0.239<br>(0.368)     | -0.131<br>(0.429)   | -0.101<br>(0.921)    | -0.925<br>(0.750)    |
| >1500  |                      |                     | 0.482<br>(0.317)     | -0.172<br>(0.369)   | 0.225<br>(0.873)     | -1.236*<br>(0.717)   |
| <b>Health Condition</b>  |                      |                     |                      |                     |                      |                      |
| disabled health  | -0.397***<br>(0.149) | 0.247<br>(0.171)    |                      |                     |                      |                      |
| poor   | 0.800**<br>(0.334)   | 0.675<br>(0.426)    |                      |                     |                      |                      |
| <b>Parents alive</b>   |                      |                     | -0.0756<br>(0.157)   | -0.0481<br>(0.190)  | 0.942***<br>(0.270)  | 0.417**<br>(0.210)   |
| <b>Worked in the cities<sup>2</sup></b>                          |                      |                     | -0.0180<br>(0.164)   | 0.192<br>(0.181)    | 0.0382<br>(0.339)    | 0.419<br>(0.274)     |
| _cons  | 3.010***<br>(0.971)  | -1.242<br>(1.175)   | -1.425<br>(1.429)    | 1.190<br>(1.667)    | 2.943<br>(2.083)     | 1.752<br>(1.792)     |
| N  | 1144                 | 759                 | 385                  | 665                 | 408                  | 317                  |

Standard errors in parentheses: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

**Annex 4: Logit for 2012 Survey (Shannxi, Heilongjiang and Zhejiang, age 60+ samples) with health status**

|  | Shaanxi              |                     | Heilongjiang       |                    | Zhejiang             |                      |
|--|----------------------|---------------------|--------------------|--------------------|----------------------|----------------------|
|  | underestimate        | overestimate        | underestimate      | overestimate       | underestimate        | overestimate         |
| <b>Age</b>   | -0.00113<br>(0.018)  | -0.00756<br>(0.022) | -0.0339<br>(0.021) | 0.0140<br>(0.027)  | -0.119***<br>(0.040) | -0.0473<br>(0.038)   |
| <b>Male</b>  | -0.984***<br>(0.257) | -0.277<br>(0.328)   | -0.163<br>(0.313)  | 0.0686<br>(0.426)  | -0.395<br>(0.591)    | -0.443<br>(0.575)    |
| <b>Single</b>  | 0.135<br>(0.264)     | 0.121<br>(0.339)    | 0.120<br>(0.323)   | 0.548<br>(0.418)   | -1.527**<br>(0.618)  | -1.194**<br>(0.596)  |
| <b>Education (Baseline: primary school or below)</b>             |                      |                     |                    |                    |                      |                      |
| primary  | 0.151<br>(0.254)     | 0.809**<br>(0.340)  | 0.0328<br>(0.325)  | 0.723<br>(0.483)   | -0.960<br>(0.617)    | -0.749<br>(0.594)    |
| middle and above   | 0.217<br>(0.279)     | 0.778**<br>(0.372)  | -0.0236<br>(0.380) | 1.137**<br>(0.533) | -2.354***<br>(0.832) | -1.318*<br>(0.780)   |
| <b>Log income per capita</b>                                     | -0.0643<br>(0.126)   | -0.252<br>(0.156)   | -0.196<br>(0.181)  | -0.118<br>(0.238)  | -0.219<br>(0.170)    | -0.104<br>(0.171)    |
| <b>Minimum Pension Requirement (baseline: &lt;400 (&lt;500))</b> |                      |                     |                    |                    |                      |                      |
| 400-600 (500-1000)   | -0.0717<br>(0.289)   | 0.170<br>(0.372)    | -0.271<br>(0.370)  | 0.584<br>(0.545)   | 1.028<br>(0.932)     | -1.661*<br>(0.899)   |
| 600-800 (1000-1500)  | 0.470<br>(0.336)     | 0.404<br>(0.431)    | -0.102<br>(0.379)  | 0.763<br>(0.540)   | -0.00600<br>(0.771)  | -2.317***<br>(0.727) |
| 800-1000 (1500-2000)   | 0.343<br>(0.386)     | -0.442<br>(0.566)   | -0.0452<br>(0.395) | 0.467<br>(0.584)   | 0.257<br>(0.885)     | -0.658<br>(0.803)    |
| 1000-1500 (>2000)  | -0.944**<br>(0.480)  | 0.651<br>(0.507)    | 0.272<br>(0.531)   | 1.260*<br>(0.694)  | 0.202<br>(0.935)     | -1.362<br>(0.873)    |
| >1500  |                      |                     | 1.178**<br>(0.528) | 1.346*<br>(0.709)  | 16.69<br>(1445.888)  | 13.36<br>(1445.888)  |
| <b>Health Condition</b>  |                      |                     |                    |                    |                      |                      |
| disabled   | 0.274<br>(0.699)     | -13.75<br>(717.910) | 0.323<br>(0.758)   | -0.781<br>(1.235)  | 16.59<br>(3215.202)  | 15.18<br>(3215.202)  |
| Health   | -0.827***<br>(0.283) | -0.208<br>(0.320)   | -0.122<br>(0.540)  | 0.199<br>(0.669)   | 0.0440<br>(0.646)    | 0.0535<br>(0.640)    |
| poor   | 0.346<br>(0.239)     | 0.213<br>(0.297)    | 0.590**<br>(0.285) | 0.0219<br>(0.370)  | -0.0979<br>(0.622)   | -0.447<br>(0.600)    |
| <b>Worked in the cities<sup>2</sup></b>                          |                      |                     | -0.0866<br>(0.242) | -0.348<br>(0.381)  | -0.951**<br>(0.377)  | -0.198<br>(0.332)    |
| <b>Transfer from Children</b>                                    |                      |                     |                    |                    |                      |                      |
| Never Given  | 0.0982<br>(0.313)    | -0.579<br>(0.443)   | -0.0626<br>(0.305) | 0.00239<br>(0.420) | -1.370**<br>(0.667)  | -1.183*<br>(0.668)   |
| Stop Transfer  | 0.228<br>(0.358)     | -0.0390<br>(0.449)  | 0.0981<br>(0.532)  | 0.814<br>(0.617)   | 14.76<br>(2079.715)  | 15.54<br>(2079.715)  |
| Not reported   | 0.149<br>(0.340)     | -0.412<br>(0.464)   | -0.157<br>(0.382)  | 0.598<br>(0.495)   | -0.789<br>(0.715)    | -0.283<br>(0.685)    |
| Constant   | 1.910<br>(1.746)     | 1.896<br>(2.156)    | 4.698**<br>(2.298) | -1.972<br>(3.063)  | 14.00***<br>(3.572)  | 8.946***<br>(3.423)  |
| N  | 1144                 | 759                 | 385                | 665                | 408                  | 317                  |

Standard errors in parentheses: \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$