

# Impact of Gender Aspect on Self-Perceived Quality of Life of Elderly

*Dona Ghosh<sup>1</sup>*

<sup>1</sup>Research Scholar, Indian Institute of Technology, Kharagpur, West Bengal, Email: ghoshdona.1707@gmail.com

**Abstract:** Quality of Life (QoL) is a complex, scattered and multidimensional approach that depends on an extensive set of biological to psychological indicators passing through various socio-economic interactions. It induces enormous heteroscedasticity among individuals in the way of ageing and spurs difference in each elderly from the other. Most of the researchers attempted either to identify indicators or develop indexes to channelize the multidimensionality towards measuring subjective appraisal of QoL but in depth analysis especially, regarding perception of female elderly is missing, even in the era of feminization of ageing i.e. increasing number of female elderly to old age, particularly in mostly and second mostly populated countries like China and India.

This study mainly focuses on the gender dimension along with various socio-economic and health constructs in China and India. There are two objectives. Firstly, to analyze the difference across gender with respect to self-perceived Quality of Life (QoL) in different socio-economic and health related contexts. Secondly, to find out the determinants of QoL and try to find out whether sex is an important factor in this regard. The first section of the study consists of the descriptive statistics across gender in both the countries according to their subjective QoL, which is measured on a five point likert scale and further reduced in a trichotomous scale: Good, Moderate and Poor. In the second section Ordered Logit Regression Model has been adopted. Moreover, in determining the control variables three indexes (co-morbidity index, active daily work index and mood index) have been formulated.

In both the countries females have a higher percentage to report about moderate, poor or very poor QoL, while men mostly reported very good or good QoL. The results show that age, active of daily work index, mood index and co-morbidity index have significant impact on QoL. Moreover, for females, the odds of poor QoL versus the combined moderate and good are 0.07597 times lower than for males, given the other variables are held constant.

**Keywords:** Quality of Life, Gender, Active Daily Work Index, Co-morbidity Index and Mood Index.

## 1. Introduction

The combination of declining fertility and increasing life expectancy accentuates the share of elderly in population of the world. In 2007, 152 million and 92 million of elderly (60 years and above) population reside only in the most (China) and the second most (India) populace countries respectively– this figure is expected to become 432 million (in China) and 330 million (in India) by 2050<sup>1</sup>. Human ageing is inevitable process but as the growth rate of elderly population outruns the growth rate of total population with continuous surging difference, whole economy ends up with the major challenge to provide such enormous amount of elderly a decent quality of life (QoL) especially, when they are developing countries like India and China.

The concept of QoL is first modeled with material affluence which gradually extended to designate ‘good life’ (Campbell, 1981 and Ebbs et. al., 1989) including factors like personal care, emotion, enjoyment, freedom etc. – these dimensions have been included because of the subjective nature of QoL since, people ultimately react as they perceive.

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<sup>1</sup> United Nations, “World Population Ageing 2007” (New York: UN, Dept. of Economic and Social Affairs, Population Division, 2007).

Focusing on physical functioning some articles (Schrier et al. 1990, Cynthia et. al. 1990, Grimby et. al. 1992 and Montuclard et. al. 2000) of medical science also try to explain QoL but their contributions are not only confined in their objective-oriented conceptual definitions but also able to explore only Health Related Quality of Life (HRQoL). Health services researchers have extended their scopes by incorporating general health (i.e. physical as well as mental well being) along with physical functioning that to a large extent follow WHO's definition<sup>2</sup> of health – though the definition of health is extended thereafter by Saracci (1997) and Bircher (2005) to include the well being of social, emotional, spiritual and cultural dimensions of a community as whole. But the satisfactions gained from emotional, social, spiritual and cultural well-being overwhelm even the extended definition of health – hence the notion of overall QoL has been manifested. It is the amalgamation of multidimensional aspects that is influenced by several factors like age, gender, marital status, educational attainment, financial condition and studying the influence of these factors on QoL turn into spotlight among social science researchers over past few decades.

Tang et. al. (2006) argues that age has negative impact on QoL but being a subjective concept, any aspire to improve QoL or well-being of elderly requires special understanding about the subject of ageing (Raju, 2011). Individual heterogeneity accentuates with ageing and the perception about QoL in old age largely depends on the years of gathered experience and the amount of health deteriorated. Thus a combination of factors (such socioeconomic status, mental status, activity status) that forms experience and health together determines the perceived QoL at old age. According to Drewnowski & Evans (2001), social factors and health-promoting activities contribute most to QOL. Other studies (like, Mullis, 1990; Ryff, 1995; Tang WL et. al. 2006 and Farzianpour et al. 2012) suggest that elderly with better education and income status entitle improved QoL. Living with spouse also has an important role in this regard as older people cohabit with spouse more likely to report about good QoL (Hannah et. al.). Gender is another important indicator of QoL (Abbasimoghadam et. al. 2009) as gender dimensions influence in perception of QoL – instead of objective health status females are more likely to perceive higher QoL than their male counterpart (Josh & Shekher). Though self reported health status is alleged owing to reporting bias but it has direct bearing on QoL as it is the concentrated feelings of the subject. Other than perceived

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<sup>2</sup>Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

health status, mental health (like, depression) also demonstrate impact on QoL (McCall et. al. 1999 and Ormel et. al. 2002) because the way an elderly feels is the way (s)he perceives about her/his health condition. Old age is also sensitive to non-communicable ailments and co-morbidity (Chatterji, 2008) that requires more than the basic treatments accomplished in Primary Health Care (Marin et. al. 2008). Fereshteh et al. 2012 reports that active lifestyle exhibits better QoL. But functional disabilities due to morbidity incidence can cause (depressive disorder (Gureje et. al., 2006) and) considerable depletion in independent living and hence any deterioration of health even condition fuels dependence on others waning independent activities and thus is inversely related with QoL.

Most of the literatures have considered demographic characteristics, social status, economic status and health status to describe how they influence on QoL but a comprehensive study of all the determinants is missing. The conditions of all elderly are not same but the study of characterization of elderly population on the basis of inherent similarities is also absent in past literatures. Moreover, gender as a factor has been included in many models but the in-depth analysis that how dimensions of QoL change across old age with respect to gender has not been enlightened. Therefore, to fulfill the inadequacies in QoL study, the objectives of the paper are set as follow:

- To identify the determinants of overall QoL of elderly in two different cultural perspectives (India and China), considering a comprehensive model that constitutes demographic components, social status, pecuniary conditions, control over incidence of morbidity, difficulties faced during daily activities and variability of mood in the context of work accomplishing day to day work;
- To find out the gender gap that accentuates with age during old age and its association with QoL dimensions;
- To categorize the elderly population of the country in such a manner that group exhibits common characteristics and similarities among elderly individuals so that the understanding regarding ageing can be expanded.

## **2. Data**

Data are taken from the Study on Global Ageing and Adult Health which is the second wave of World Health Survey conducted in 2007 in India and 2007-10 in China. Surveys are designed by the World Health Organization that contains five major part - 1) household questionnaire; 2) individual questionnaire; 3) proxy questionnaire; 4) verbal

autopsy questionnaire; and, 5) appendices including show cards. This study uses mainly the individual questionnaire and only permanent income of the household data from household questionnaire. Data collection is conducted in the states of Assam, Karnataka, Maharashtra, Rajasthan, Uttar Pradesh and West Bengal in India and, in the provinces of Shanghai, Shandong and Yunnan in China.

### **3. Descriptive Analysis**

Table 1 depicts the difference between percentages of male and female elderly across different categories of perceived QoL. The socioeconomic indicator variables are mainly captured. The negative value of any cell of a particular QoL category shows that female elderly are more likely to belong in that category of QoL corresponding to the specified indicator. Based on the number of negative cells it is clear that in India male elderly are more prone to report their life as very good or good compared to females whereas, the share is equal for the first category in China. Compared to male greater percentages of female elderly without partner (married/cohabiting), have reported very bad/bad QoL in India. Female elderly with lower levels of have predominantly described their life is very good but at the top level male have occupied that category of QoL. Greater percentages of currently working elderly females perceived their quality of life very good in both the countries. Contradicting male counterpart, female elderly in rural areas (of India) have frequently reported moderate, bad or very bad QoL but in China they do it irrespective of the place of residence. In the lowest income class, in both the countries, female elderly have mostly sensed very good QoL whereas male elderly of highest income class mostly shown pessimistic attitude towards QoL. However, from the descriptive analysis it is not evident that how significantly the above considered socioeconomic variables influence to shape the perception of QoL. Additionally, it falls short to recognize the gender specific effect on QoL controlling other indicators.

Hence, the study is further promoted toward econometric analysis incorporating few other determinants of QoL like, ailment status, health perception, physical functionality for independent living and mood variations.

<b>Table 1: Differences in Perceived Quality of Life<sup>3</sup> of Elderly across Gender</b>										
Socioeconomic Indicators	India					China				
	Very Good	Good	Moderate	Bad	Very Bad	Very Good	Good	Moderate	Bad	Very Bad
<i>Marital Status<sup>4</sup></i>										
Alone	0.22	0.16	2.45	-2.41	-0.42	0.5	-0.3	2.58	-2.83	0.08
Married/Cohabiting	0.26	-2.27	-1.48	2.88	0.62	-0.18	2.7	-1.77	-0.64	-0.11
<i>Educational Status<sup>5</sup></i>										
Less than primary	1.3	-2.16	-1.29	1.18	0.97	-0.7	3.72	-4.29	1.48	-0.2
Completed primary	-2.28	-6.62	8.31	-0.58	1.18	-1.12	-1.5	2.24	-0.13	0.5
Completed secondary	-6.73	-13.67	16.69	1.46	-	-0.41	0.21	-3.43	3.56	0.06
Completed higher secondary	-11.3	-8.53	14.56	-	-	1.45	-5	1.44	2.25	-0.1
Above graduation	8.53	0.3	-11.86	-	-	3.63	-7.9	3.11	0.45	-
<i>Working Status<sup>6</sup></i>										
Working	-0.07	1.14	-2.6	1.25	0.28	-0.01	5.75	-2.57	-2.06	-1.11
Not working	1.3	2.08	-3.44	0.8	-0.74	0.25	1.23	-1.64	-0.03	0.18
<i>Residential Status</i>										
Urban	2.37	3.39	-2.81	-3.47	0.52	0.45	3.74	-1.87	-2.02	-0.3
Rural	0.67	0.39	0.25	-0.78	-0.53	-0.04	3.11	-0.29	-2.47	-0.31
<i>Income Status</i>										
Very poor	-0.38	2.5	0.14	-1.89	-0.38	-0.01	0.71	6.21	-5.69	-1.2
Poor	0.98	1.28	-3.86	1.84	-0.26	0.07	0.12	0.74	-1.04	0.11
Middle class	0.24	-5.87	3.6	1.52	0.52	-0.26	1.89	-2.05	0.4	0.02
Rich	-0.5	0.27	5.14	-4.5	-0.39	0.33	3.86	-5.29	0.64	0.46
Very rich	3.45	3.76	-5.7	-1.24	-0.27	0.43	5.24	-5.58	-0.09	
<p><b>Note:</b> Differences are calculated as percentages of male – percentages of females in the respective countries.            Calculated from the data of; (a) China - Study on Global Ageing and Adult Health-2007/10, Wave 1.            (b) India - Study on Global Ageing and Adult Health-2007, Wave 1.</p>										

<sup>3</sup>To measure the perceived overall quality of life, individuals are asked “How would you rate your overall quality of life?” and the answers are recorded in a six point likert scale such as “Very Good”, ‘Good’, ‘Moderate’, ‘Bad’, “Very Bad” and “Don’t Know”. In the present study the last category has been omitted due to very low frequencies in both the countries compared to other five categories.

<sup>4</sup>In the original data marital status is measured in a six point likert scale coded as never married, currently married, cohabiting (only for china), divorced/ separated, widowed and don’t know. In the study, the last group is excluded and due to low frequencies in the groups such as cohabiting and divorced/ separated, rest five groups have been merged into two categories- “currently married/ cohabiting” and ‘alone’. Among the elderly population the first category comprises 65.45 and 76.02 percentages while the second category includes 34.55 and 23.89 percentages for India and China respectively.

<sup>5</sup> Here the question is asked “What is the highest level of education completed?” and the answer is coded as “No formal education”, “Less than primary”, “Primary school completed”, “Secondary school completed”, “High school (or equivalent) completed”, “College/Pre university/University completed” and “Post graduate degree completed”. The last two groups together constitutes only 4.51 (India) and 5.78 (China) percentages and hence they are clubbed into one category as “Graduation and above”.

<sup>6</sup>Working status is categorized in three groups: Not working (coded as 0), Ever worked (coded as 1) and Currently working (coded as 2).

## Methodology

The outcome measure of this paper is perceived overall QoL and it focuses on the determinants of it along with the difference across gender. In case of independent variables, the model considers gender, sector, marital status, educational status, working status due to their significance in the literatures related with QoL. Moreover, *economic determinant* (like, income of the household), *health determinants* (like, perceived health status, Co-morbidity Scores, Mood Indices) and *Problem in Independent Living Index* (as the determinant of functional assessment) are also used in explaining QoL. Therefore, the study first formulates the complex indicators like, *Co-morbidity Scores*, *Mood Indices* and *Problem in Independent Living Index* and then employs them in the econometric analysis.

**Figure 1: Conceptual Framework**

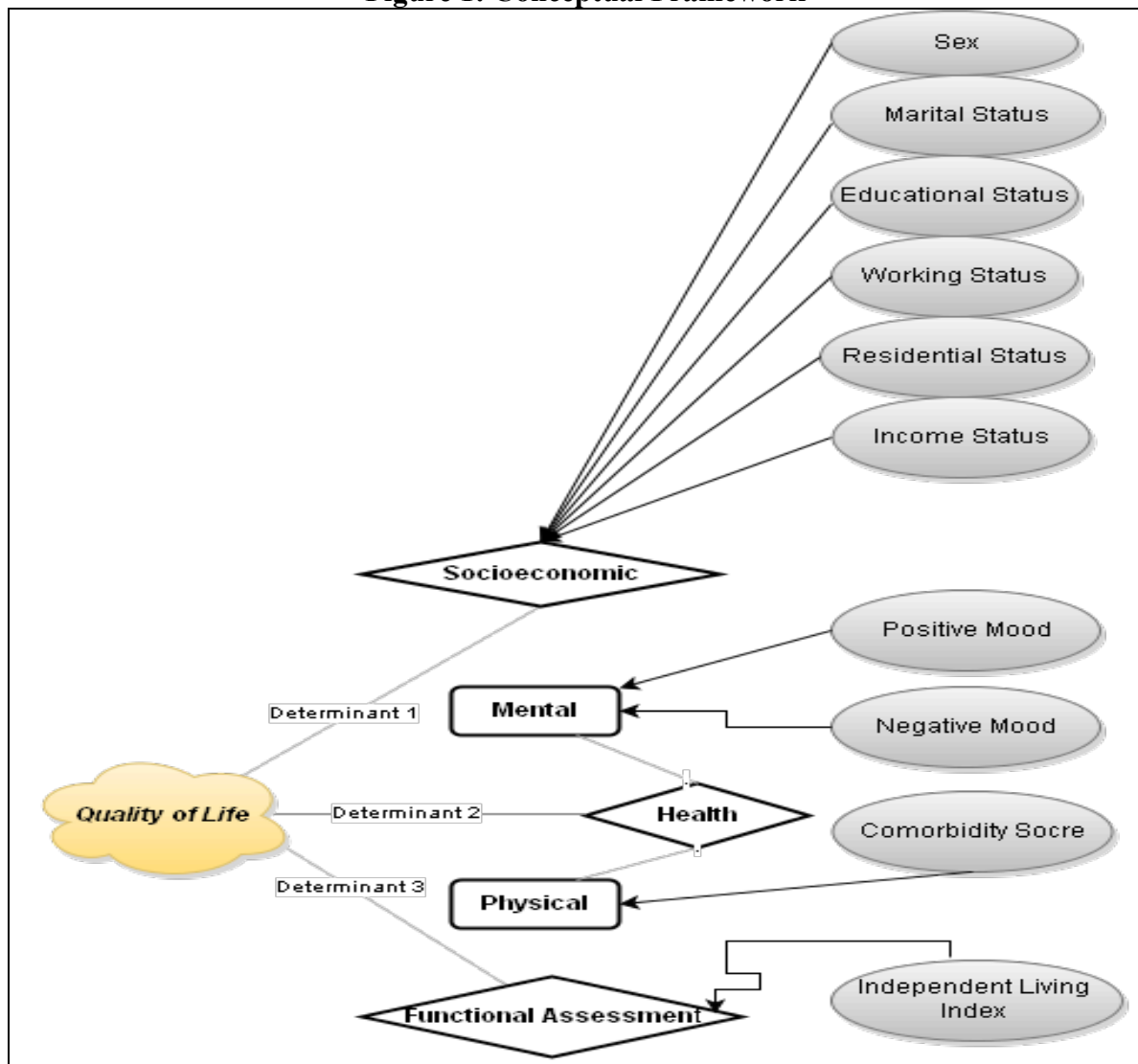


Figure 1 shows how different indicators are related with the outcome variable (i.e. perceived QoL).

## 5. Formulations of Complex Determinants

a. **Co-morbidity Score:** Medication/treatment status of chronic (arthritis, stroke, angina, diabetes, COPD, asthma, depression, hypertension and oral-problem) diseases are measured on a dichotomous (yes/no) scale with two different reference points<sup>7</sup>:

- Whether the respondent taking medicine/treatment for a particular disease during last 2 weeks;
- Whether the respondent taking medicine/treatment for a particular disease during last 12 months.

Two distinguished co-morbidity scores have been computed for each reference point and respondent by simply adding the number of existing diseases for a particular individual. These scores can vary from zero (for that respondent having no diseases record) to nine (for that respondent having all sorts of diseases).

b. **Problem in Independent Living Index:** Incidences of acute illness, chronic illness and cases of hospitalization intervene in normal ageing – deteriorating the functionality and hence, quality of life of elderly. A bunch of indices have been used to measure functional assessment of elderly like; Katz Index<sup>8</sup>, Barthel Index, Lawton Instrumental Activities of Daily Living (IADL). Barthel Index<sup>9</sup> is originally formed to score the disability for the neuromuscular and musculoskeletal patients who receive inpatient rehabilitation considering some tasks like; feeding, bathing, grooming, dressing, toilet use, mobility, stair climbing, bladder and bowels. Though various studies support its reliability and validity<sup>10,11</sup> but it is too simple, least reliable with more disability<sup>12</sup>, not tested for the elderly with multiple diagnoses<sup>13</sup> and applicable mainly in clinical purposes. It is basically aimed to measure disability whereas, Katz Index attempts to measure capability of

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<sup>7</sup> Data is taken from the “Section 4000: Chronic Conditions and Health Services Coverage” in the Individual Questionnaire of “The Study on Global Ageing and Adult Health-2007/10, Wave 1” conducted in China and India.

<sup>9</sup> Mahoney FI, Barthel D. (1965). Functional Evaluation: The Barthel Index. *Maryland State Med J*; 14: 61–65.

<sup>10</sup> Collin C, Wade DT, Davis S, Horne V. (1988). The Barthel ADL index: a reliability study. *International Disability Studies*; 10(2):61-63.

<sup>11</sup> Van der Putten, J. J. M. F., Hobart, J. C., Freeman, J. A., & Thompson, A. J. (1999). Measuring change in disability after inpatient rehabilitation: comparison of the responsiveness of the Barthel Index and the Functional Independence Measure. *Journal of Neurology, Neurosurgery & Psychiatry*, 66(4), 480-484.

<sup>12</sup> Korner-Bitensky N., Wood-Dauphinee S., Siemiatycki J., Shapiro S., Becker R. (1994). Health-related information post discharge: telephone versus face-to-face interviewing. *Archives of Physical Medicine and Rehabilitation*, 75(12): 1287–1296.

<sup>13</sup> Sainsbury, A., Seebass, G., Bansal, A., & Young, J. B. (2005). Reliability of the Barthel Index when used with older people. *Age and Ageing*, 34(3), 228-232.

independent living by initially<sup>14</sup> considering six functions – moving, bathing, dressing, toileting, transferring, continence, feeding and later<sup>15</sup> introducing important housework, shopping, managing finances and telephoning in formulation of the index - but these indices are susceptible to deplete in health status and fail to confine minor improvement in rehabilitation of elderly. Increasing isolated living of elderly necessitates management of more complex works independently, requires both cognition and physical functioning, other than mere self-care that is considered in Katz index. Lawton & Brody (1969)<sup>16</sup> propose a complex IADL scale imperative for independent living comprising self-reported information in eight domains like; using telephone, handling finances, doing shopping, housekeeping, preparing food, managing laundry, traveling and taking responsibility of medication – that can be under/over estimated as there it does not follow any instrumental demonstration. Moreover, for a given amount of functional status, IADL score is situational, not actual due to the biased responses associated with the perception of accomplishing a work that varies across age and different socio-economic factors<sup>17</sup>. To include wide spectrum of situations and diseases in evaluating quality adjusted life, a five point (i.e. mobility, self care, usual activity, pain/discomfort and depression) instrumental EQ-5D Index<sup>1819</sup> has been recently developed and widely used<sup>202122</sup> based on the intensity corresponding to ‘no’, ‘some’ and ‘huge problem’.

This paper attempts to employ a measurement – *Problem in Independent Living Index (PILI)*, that will reflect the amount of difficulties faced by the elderly respondents in maintaining their independent living. It involves two types of work - that requires basic skills

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<sup>14</sup> Katz, S., Down, T.D., Cash, H.R., & Grotz, R.C. (1970). Progress in the development of the index of ADL. *The Gerontologist*, 10(1), 20-30.

<sup>15</sup> Katz, S. (1983). Assessing self-maintenance: Activities of daily living, mobility and instrumental activities of daily living. *Journal of American Geriatric Society*, 31(12), 721-727.

<sup>16</sup> Lawton, M. P., & BRODY, E. M. (1970). ASSESSMENT OF OLDER PEOPLE: SELF-MAINTAINING AND INSTRUMENTAL ACTIVITIES OF DAILY LIVING. *Nursing Research*, 19(3), 278.

<sup>17</sup> Niti, M., Ng, T. P., Chiam, P. C., & Kua, E. H. (2007). Item response bias was present in instrumental activity of daily living scale in Asian older adults. *Journal of Clinical Epidemiology*, 60(4), 366-374.

<sup>18</sup> BROWN, H. (1994). VALIDITY OF EUROQOL—A GENERIC HEALTH STATUS INSTRUMENT—IN PATIENTS WITH RHEUMATOID ARTHRITIS. *British Journal of Rheumrtology*, 33(655), 562.

<sup>19</sup> Group, T. E. (1990). EuroQol-a new facility for the measurement of health-related quality of life. *Health policy*, 16(3), 199-208.

<sup>20</sup> Coucill, W., Bryan, S., Bentham, P., Buckley, A., & Laight, A. (2001). EQ-5D in patients with dementia an investigation of inter-rater agreement. *Medical Care*, 39(8), 760-771.

<sup>21</sup> Bourdel-Marchasson, I., Dubroca, B., Manciet, G., Decamps, A., Emeriau, J. P., & Dartigues, J. F. (1997). Prevalence of diabetes and effect on quality of life in older French living in the community: the PAQUID Epidemiological Survey. *Journal of the American Geriatrics Society*, 45(3), 295-301.

<sup>22</sup> Borowiak, E., & Kostka, T. (2004). Predictors of quality of life in older people living at home and in institutions. *Aging clinical and Experimental Research*, 16(3), 212-220.



(works like, eating, bathing/washing, dressing, toilet, mobility and climbing) and, that requires both basic and cognitive skills (like, household and community work) to calculate the extent of inconvenience (i.e. measured on a five point ascending ordinal scale from ‘none’ having the lowest value 1 to “extreme/cannot” do having the highest value 5) faced by an elderly in accomplishing such works. PILI sum up all the scaled values of activities (given in Table 2) for each elderly to estimate his/her level of overall difficulties that is brazen out in accomplishing independent living.

**Table 2: Different Domains of Indices Measuring Independence in Living**

Barthel Index	Kartz Index	IADL	EQ-5D Index	PILI
Feeding	Feeding	Ability to Use Telephone	Self care	Eating
Bathing	Bathing	Shopping	Usual activity	Bathing/washing
Grooming	Continance	Food Preparation	Pain/discomfort	Grooming
Dressing	Dressing	Housekeeping	Depression	Dressing
Toilet use	Toileting	Laundry		Toilet
Day to day work	Transferring	Mode of Transportation		Household work
Mobility		Responsibility for Own Medications	Mobility	Mobility
Stair climbing		Ability to Handle Finances		Climbing
Bladder				Community work
Bowels				

c. **Mood Indices:** Here, the data on frequencies of respondents’ feelings in various working activities during different parts of the previous day of the day of survey are used in polychoric correlation matrix and then factor analysis is employed to estimate separate mental health indices for Indian and Chinese elderly considering the fact of cultural variation that may influence feelings of the population. In Wave 1, the individual questionnaire of WHO Study on Global Ageing and Adult Health recorded seven (worried, irritated, rushed, tensed, depressed, relaxed, enjoy) types of feelings on a three point likert scale (not at all, a little and very much) associated with different activities throughout the day. The correlation matrix (Table-A4) shows that there is positive correlation exists between worried, irritated rushed, tensed and depressed while all theses state of feelings are negatively interrelated with relaxed or enjoy. Kaiser-Meyer-Olkin (0.75 for China and 0.78 for India), Bartlet sphericity test values (36930.07 for China and 22178.23 for India) at 1 percent level of significance, allow the factor test for the above mentioned mood variables. After orthogonal rotation, two latent factors (that describe the types of mood) have been generated in both the countries. The computation of indices from pattern matrix (Table A5) are as follows;

$$Positive\ Mood\ Index\ (PMI)_{ik} = \sum (frequency\ of\ a\ particular\ mood)_{ik} X (factor\ weight)_{kl}$$

$Negative\ Mood\ Index\ (NMI)_{ijk} = \Sigma(\text{frequency of a particular mood})_{jk} X (\text{factor weight})_{kl}$

Where, i = *worried, irritated, rushed, tensed and depressed*; j = *relaxed and enjoy*; k = *India and China*; l = factor 1 and factor 2.

PMI and NMI together, approximately account for 78 and 88 per cent (respectively in India and China) of total variance in frequency of mood during a day of different activities.

## 6. Econometric Analysis

The response variable is measured in five point (*very good, good, moderate, bad and very bad*) liker scale that has further reduced into three categories (*very bad/bad as 'bad', moderate as 'moderate' and very good/good as 'good'*) due to very low frequencies of the extreme two categories in both the countries.

The study adopts two types of ordinal logit model as the response variable has natural ordering from *'bad'* to *'good'* in terms of perceived QoL and compares the findings of the two models to identify which one suits better with the purpose of the study. To do this the econometric models of this paper assume the following properties:

- The dependent variable has natural ordering;
- There is no multicollinearity in the independent variables;
- a) **Model I: Propotional Odd (PO) model<sup>23</sup>** - It is sketched with the idea of latent dependent variable (QoL) i.e, determined by the combination of all observed variables and is actually measured on a continuous scale of discernment towards attribute of life –the set of observed discrete categories of QoL is nothing but the reporting of the position on the continuum that reflects their perceived quality of life. The model assumes the slope of observed QoL is same for all categories throughout the span of latent QoL and hence, the relationship between each pair of predictor groups is same. As the relationship is same between the pairs of outcome groups, the model exhibits only one set of coefficients which can be expressed as follows,

$$QoL^* = X'\beta + \varepsilon$$

Where, QoL\* is the unobserved measurement of quality of life results from the collective reflection of socioeconomic status, health conditions and activeness status.  $\beta$  is the regression coefficients to be estimated and  $X'$  is the vector matrix of determinants. Therefore, for three categories of QoL the logarithm of odds are,  $\log \{p_1/(p_1+p_2+p_3)\}$  – for bad,  $\log \{(p_1+p_2)/(p_1+p_2+p_3)\}$  – for bad or moderate.

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<sup>23</sup> Liu, I., & Agresti, A. (2005). The analysis of ordered categorical data: An overview and a survey of recent developments. *Test*, 14(1), 1-73.

b) **Model II: Stereotype model**<sup>24</sup> – It assumes the categories of dependent variable are discrete in nature and unlike PO model it tolerates the variation among the categories for each predictor. Therefore, odds of being to a particular category are compared with the baseline. Model can be expressed as,

$$\begin{aligned} \text{Logit}[\pi(j,J)] &= \ln [\pi(QoL=j|x_1, x_2, \dots, x_m) / \pi(QoL=J|x_1, x_2, \dots, x_m)] \\ &= \alpha_j - \phi_j (\beta_1 X_1 + \beta_2 X_2 + \dots + \beta_m X_m) \end{aligned}$$

Where,  $j=1,2$ ;  $J$  implies reference category;  $\beta$ s' are the logit coefficients of the 'p' predictors.  $\phi_j$  are the constraints and  $\alpha_j$  are the intercepts.

## 7. Results

Rejecting the null hypothesis (i.e. all predictors simultaneously have zero coefficients), Wald<sup>25</sup>  $\chi^2$  values for both the models and countries are significant at 1% level with 15 degrees of freedom (from Table-A1). The ancillary parameters (cut-points) of Model-I in Table 4 define the threshold points on the continuous scale of the latent variable to differentiate the adjacent levels to create distinct categories. For India (China), the first estimated cut-point value is -4.8 (-2.64) on the underlying latent variable i.e. used to differentiate bad QoL from moderate and good QoL considering all the predictor variables are set as zero. The second cut-point on latent variable is at -1.27 (1.32) for India (China) that discriminates the lowest two categories (bad and moderate) of QoL from the highest category (good). However, Wald  $\chi^2$  tests of distinguishability between  $\phi$  in Model II for India and China suggest that each category is distinguishable at 1 percent level of significance.

The positive (positive) values of coefficients imply negative (negative) relation between the variable and QoL (i.e. categorized at a decreasing order) because; higher score is associated with higher quality of life. In both the models, the logit effects of gender, log of household income, PILI, perceived health status, PMI and NMI) are found to be significant at least at 10 percent level of significance. Model –I states that, controlling for other variables, the ordered logits for females being in a higher category of QoL are (1.62 for India and 1.22 for China) more than males - implies elderly females are more likely to report about their good quality of life than male counterparts. Considering household income, coefficients

<sup>24</sup> Anderson, J. A. (1984). Regression and ordered categorical variables. Journal of the Royal Statistical Society. Series B (Methodological), 1-30.

<sup>25</sup> “Wald tests can be performed, but they will generally NOT produce exactly the same results as LR tests. LR tests (which require the estimation of constrained and unconstrained models) are preferable, although in practice results will often be similar” - <https://www3.nd.edu/~rwilliam/stats2/183.pdf>.

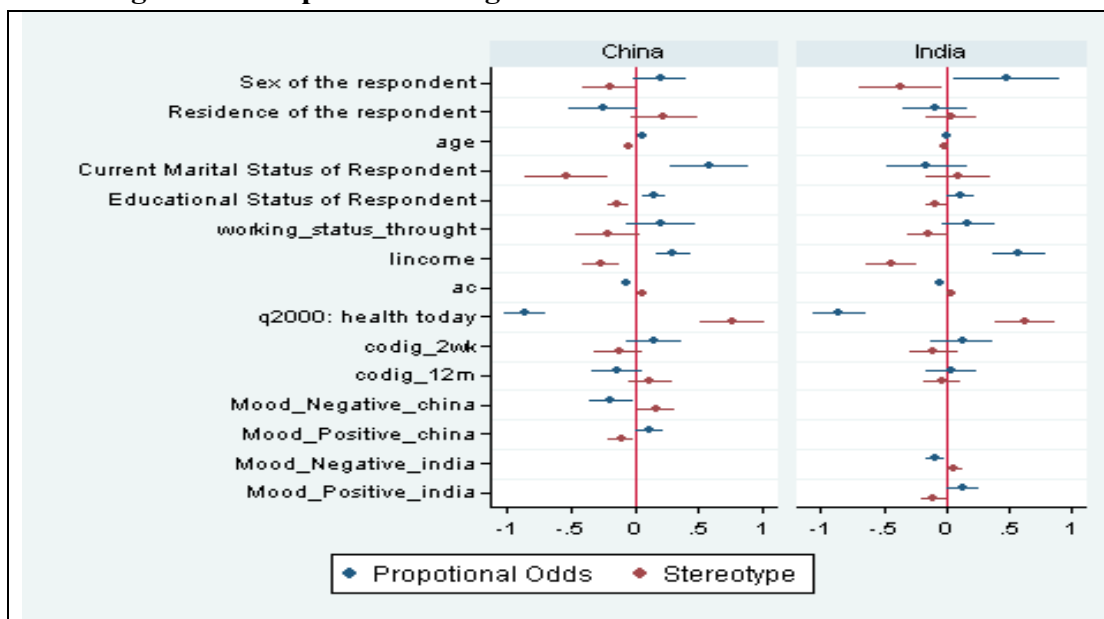
suggest that QoL rises significantly with increase in income irrespective of countries. Coefficients for education status suggest that one unit increase in education level causes 1.12 and 1.16 unit rise in the ordered log-odds of being in a higher quality of life in India and China respectively.

<b>Table 3: Results of Logit Regressions of QoL Indicators</b>										
<b>Indicators</b>	<b>India</b>					<b>China</b>				
	<i>Model I</i>			<i>Model II</i>		<i>Model I</i>			<i>Model II</i>	
	<i>Odd Ratios</i>	<i>Coefficient s</i>	<i>Robust SE</i>	<i>Coefficient s</i>	<i>Robust SE</i>	<i>Odd Ratios</i>	<i>Coefficient s</i>	<i>Robust SE</i>	<i>Coefficient s</i>	<i>Robust SE</i>
<b>Gender</b>	1.62**	0.48**	0.22	-0.36**	0.17	1.22*	0.20*	0.1	-0.20*	0.1
<b>Sector</b>	0.92	-0.09	0.13	0.04	0.1	0.78*	-0.25*	0.14	0.23*	0.1
<b>Age</b>	1.01	0.01	0.01	-0.01	0.01	1.06***	0.06***	0.01	-0.05***	0
<b>Marital status</b>	0.86	-0.15	0.16	0.1	0.13	1.79***	0.58***	0.16	-0.54***	0.2
<b>Educational status</b>	1.12**	0.11**	0.05	-0.08*	0.04	1.16***	0.15***	0.04	-0.13***	0
<b>Working status</b>	1.20*	0.18*	0.11	-0.14*	0.08	1.22	0.2	0.14	-0.21	0.1
<b>Income of household</b>	1.78***	0.58***	0.11	-0.44***	0.1	1.35***	0.3***	0.07	-0.27***	0.1
<b>PILI</b>	0.95***	-0.06***	0.01	0.04***	0.01	0.94***	-0.07***	0.02	0.06***	0
<b>Perceived health</b>	0.43***	-0.85***	0.11	0.63***	0.12	0.43***	-0.85***	0.08	0.76***	0.1
<b>Co-morbidity group of 2 week reference</b>	1.13	0.13	0.13	-0.1	0.1	1.16	0.15	0.11	-0.13	0.1
<b>Co-morbidity group of 12 month reference</b>	1.05	0.05	0.1	-0.03	0.08	0.87	-0.13	0.1	0.12	0.1
<b>Mood Indexes</b>										
<b>Positive</b>	0.92*	-0.08***	0.04	0.07**	0.03	0.83**	-0.19**	0.09	0.16**	0.07
<b>Negative</b>	1.14*	0.13***	0.07	-0.1**	0.05	1.12**	0.11**	0.05	-0.1**	0.05
<b>Cut1</b>		-4.8	0.86				-2.64	0.87		
<b>Cut2</b>		-1.27	0.85				1.32	0.86		
<b>Phi 1</b>				0	base outcome				0	base outcome
<b>Phi 2</b>				1	constrained				1	Constrained
<b>Phi 3</b>				2.22*	0.23				2.03***	0.17
<b>Theta 1</b>				0	base outcome				0	base outcome
<b>Theta 2</b>				3.87*	0.79				2.09***	0.8
<b>Theta 3</b>				5.18*	1.53				0.73	1.58
<b>Note:</b> Description of dummy variables in the model;										
a) Gender: 'female'=1 and 'male'=0.										

b) Sector: 'urban'=1 and 'rural'=0.  
c) Married/cohabiting: "with partner"=1 and 'alone'=0.  
d) Working status: 'working'=1 and "not working"=0.  
Redefined\_QoL=Bad is the base outcome.  
 $\beta_0$  and  $\beta_s$  imply coefficients of ordinal logit and stereotype ordinal logit respectively.  
 $SE_o$  and  $SE_s$  stand for "robust standard errors" of proportional odds and stereotype ordinal logit models respectively.  
\*\*\* implies 1% level of significance. \*\* implies 5% level of significance. \* implies 10% level of significance.

Mood of elderly has significant (at least at 5% level) role in QoL of elderly in both the countries – PMI is positively while NMI is negatively associated with QoL. It implies more the elderly have positive feelings, better is the QoL but increasing amount of negative feelings deteriorates QoL. Considering medication/treatment, whether two-weeks or twelve-month reference, it is surprising that all the coefficients are insignificant. On the other hand, all the coefficients of perceived health status are positively correlated and significant at 1% level. It enlightens that, controlling all other factors, QoL of elderly is more sensitive towards the perception regarding health status rather than for how many morbidities are present or being controlled through medication or treatment. Presence of spouse significantly improves the QoL of elderly in China but not in India - it may due to more number of traditional families in India allows multigenerational household and QoL depends not only on spouse but also other family members as well. Coefficients of age and sector are positively significant only in China – entails that elderly are more prone to perceive higher category of QoL with growing age and living in urban areas. Because of flimsy government support for elderly, working status turns out to be significant and positively associated indicator of QoL, (only) in India.

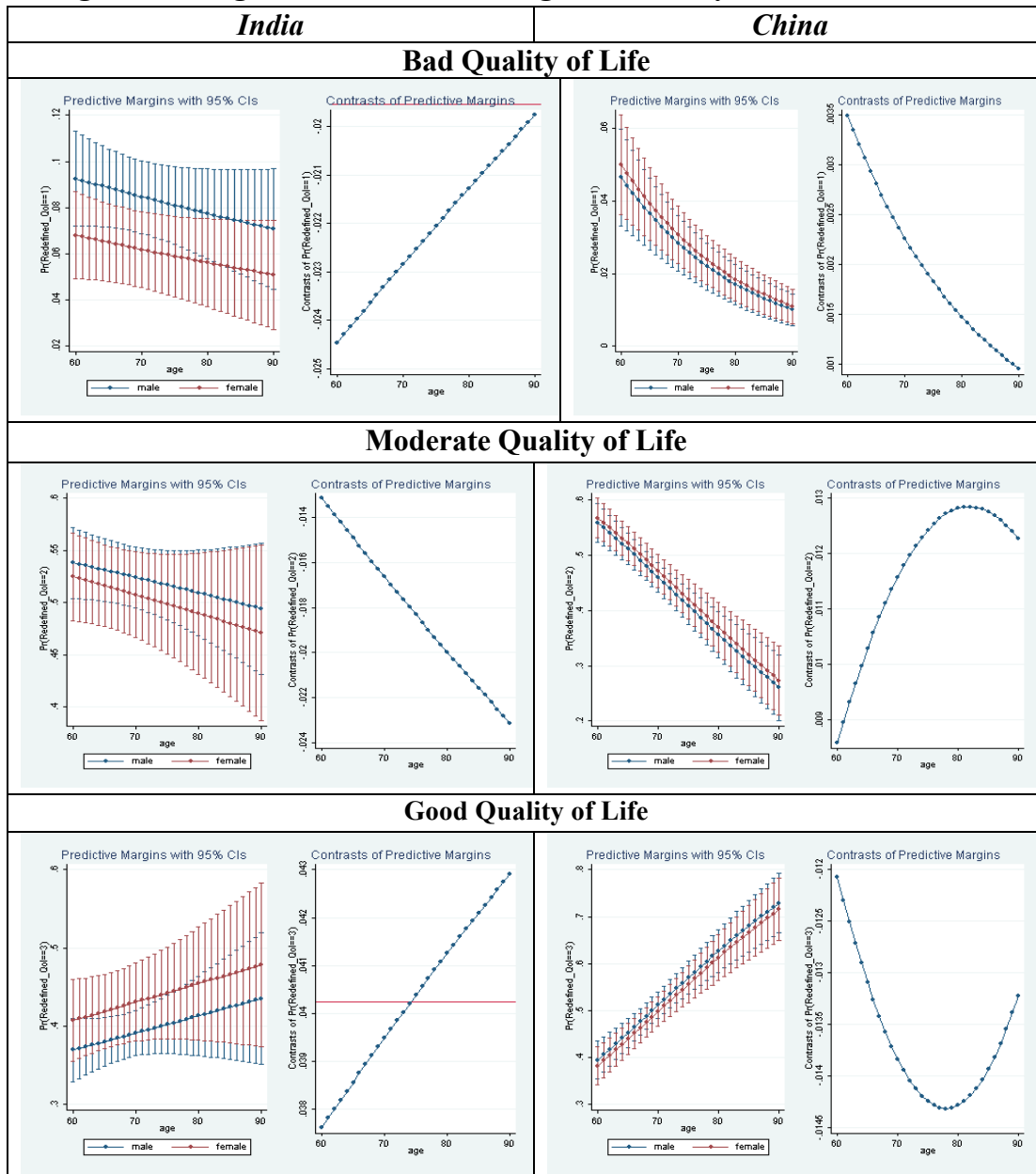
**Figure 2: Comparison of Logit Coefficients between Model I and II**



Model II (in Figure 2) supports the relationship between the determinants and QoL irrespective of the countries as suggested by the Model I. The sign of each coefficient between the two models are just opposite (but relationships are same) since lowest category of QoL (i.e. bad) is taken as base/reference category in model II and comparisons are made choosing the base outcome over higher category of QoL - the outcome categories are compared in opposite directions in two different models. Moreover, the standard deviations are more in Model I than Model II only except in the case of perceived health status of elderly in India. However comparing AIC and BIC (in Table-A1), we can say that Model I fits the data better for both the countries (since the values are lower for Model I than Model II).

In both the models and countries, coefficients of gender exhibit that elderly females are more inclined to perceive higher categories of QoL than the male counterpart and (Table-A3 shows that) being female the latent QoL significantly increases by 0.21 standard deviations (more than double than in China) in India – that may crop up the question of social status of gender in different cultures and individual heterogeneity among elderly. So to understand how across gender QoL varies with additional life years during old age, the study also endeavors to capture the marginal effects of age on predicted probabilities of perceived QoL for males and females along with the gender gap in such perceptions.

**Figure 3: Margins of Gender across Ages for Quality of Life**



The first part of Figure 3 contains the predictive probabilities of three distinct categories of perceived QoL across gender and the second part (contrast) captures the difference between males and females (with males as the reference category) for each category over the span of thirty (from 60 to 90) years of old age.

It is clear from the graphs that unlike China, females are more prone to perceive bad and moderate QoL with increase age in India - gender gap of perceiving so though falls with age for the second category but it actually accentuates for the first one. China has the opposite picture along with sharp decline in gender gap for bad QoL and increases for perceiving moderate QoL up to (around) 82 years old and then fall. Contradicting the

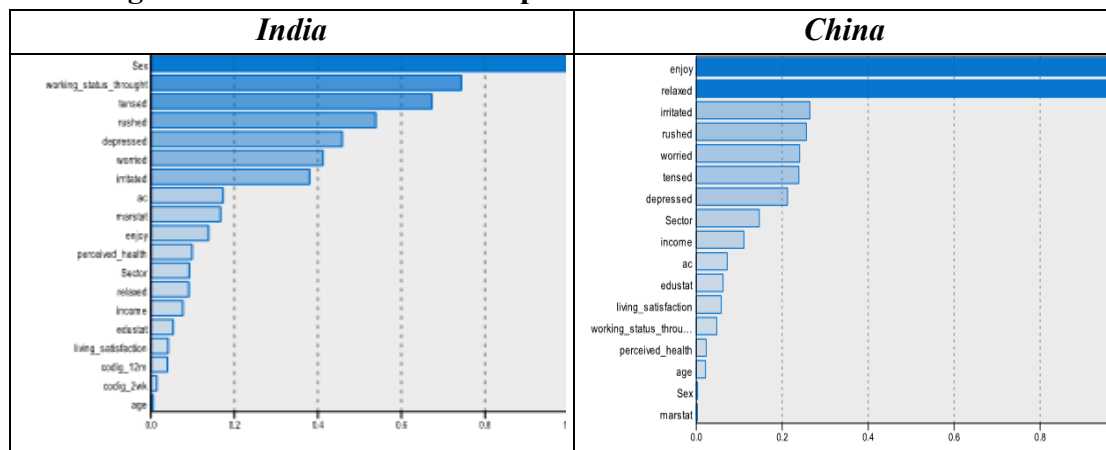
findings for China, elderly females are more likely to report about their good QoL than their male counterparts in India and the gender gap is throughout positively associated with age – though the gender gap has diminishing trend in China but only up to 77 year of age and after that it sharply increases.

Accumulating the above findings we can conclude that gender is a significant determinant of QoL perception that performs distinctively in country/cultural contrast. So the emergence comes to group the elderly naturally to see how the different factors along with gender influence the perceived QoL of elderly.

### 8. Cluster Analysis

Using two-step cluster analysis, the paper attempts to make natural groups of elderly in both the countries based on the indicators of QoL (like, socioeconomic status, functional assessment, physical, mental health and of course gender). Elderly individuals rooted in one group/cluster shows the amount of similarity between them while among groups the dissimilarity is counted. According to the importance of predictors (shown in Figure 4) in determining the natural clusters of elderly, gender play the most imperative role in India while positive feelings like enjoy or relaxed are at the top most places in the predictors’ importance graph and gender comes at the bottom. Mental states during different activities (like irritated, rushed, worried, tensed and depressed) are quite important factors for both the countries.

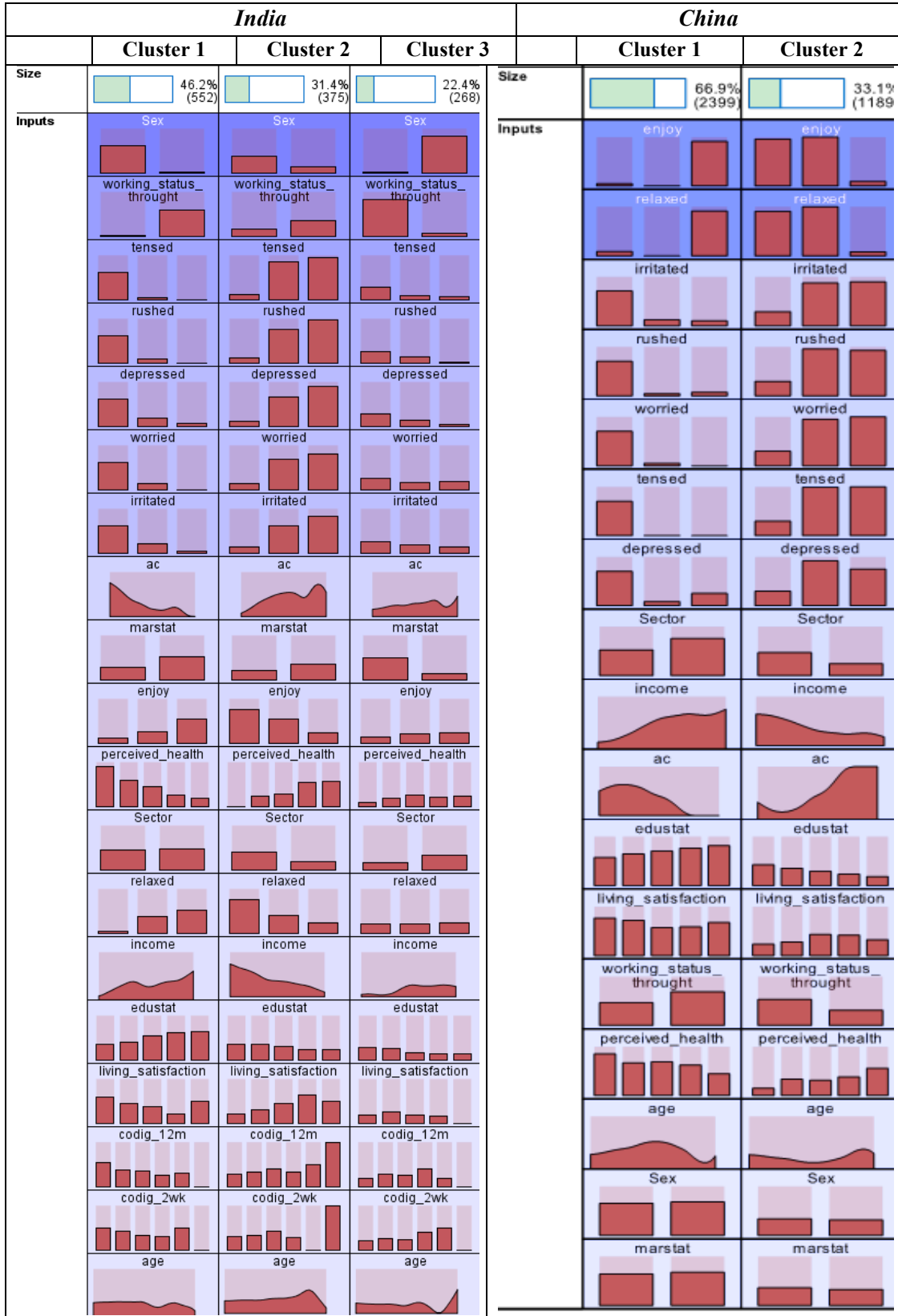
**Figure 4: Overall Predictor Importance in Identification of Clusters**



From two-step cluster analysis identifies three clusters for India and two clusters for China. Contents and comparisons of clusters are given below in Figure 5.



**Figure 5: Relative Factor Importance among Clusters**



First cluster in India mainly consists of males who live with spouse, having lower frequencies of negative feelings (like tensed, rushed, depressed, worried or irritated), meager difficulties in accomplishing independent living, tend to perceive very good/good health status, belong to higher income and education levels and most of them currently working and mostly engaged in the works that generates relaxation or enjoyment – so this class can be identified as “*Fortunate-male category*”. The second cluster bearing most of the male elderly is almost the opposite of the earlier one and hence can be termed as “*Unfortunate-male category*”. Females and never worked elderly are predominant in third cluster – individuals are mostly alone with low level of education and having great amount of difficulties in maintaining independent living. So we can express it as “*Unfortunate-female category*”. Considering China, both genders and marital statuses are almost equally distributed among the two clusters - so distinction on the basis of these determinants is not possible. Contradicting second cluster, the first cluster comprise less frequencies of negative feeling during activities with high income, education and levels of independent living –hence can be coined as “*Privileged class*” while the second one as “*Deprived class*” of elderly.

## **9. Conclusions**

Perceived quality of life is the amalgamation of multidimensional factors that largely alters with socio-cultural variations. China and India are highly populated by elderly people but the variation in social structure is prominent among these countries – for an example, position of females are lower in India than male counterpart while both genders share almost equal position in China. Social structure is important as it shapes the expectations from the society and the perceptions regarding the quality of life. The main findings of the paper are as follows: Firstly, gender is an important determinant of perceived quality of life of elderly in both the countries, as the position of females compared to male fashions the expectations from society – that is further getting reflected in shaping the perception about quality of life. Females with lower position expect less and perceive higher quality of life. Secondly, better education and income in general improves the quality of life whereas, more difficulties faced in accomplishing independent living deteriorates it. Thirdly, instead of control over ailments through medication/treatment, perceived health status is more important in explaining quality of life –this may because some amount of health deterioration is expected to the elderly and hence they do not bother much or tolerate them as a normal living. Thus less complaining about their health and perceives good quality of life instead of presence of co-morbidities. Fourthly, mental states during different activities of a day largely impacts on quality of life.

More frequent fine moods augments better quality of life while bad moods do the reverse. Fifthly, gender disparity in perceiving quality of life vary across ages – females are more likely to report about their good quality of life in India whereas it is just the opposite in China but the tendency to report good quality of life among elderly increases with age irrespective of countries. Lastly, the study categorizes the elderly population of the countries in the natural groups and has identified two groups for China (*Privileged class* and *deprived class*) and three groups for India (*Fortunate-male*, *Unfortunate-male* and *Unfortunate-female*). The groups suggest that conditions of female elderly are distinctively worse in India than male elderly.

The findings suggests that since quality of life is a perceived concept, it truly does not reflect the actual states of elderly rather it is more influenced by the socioeconomic factors, mental status and amount of difficulties confronted in independent living. So along with the socioeconomic improvement of elderly, engaging them in mental-health boosting tasks and enhancing capacity building training to maintain independent living can perk up their quality of life. Moreover, female elderly, particularly in India and elderly of high age groups should be considered especially as their conditions are more vulnerable but their perceptions regarding quality of life demonstrates just the opposite picture.

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