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THE DETERMINANTS OF UTILIZATION ABILITY AND THE EFFECTS ON THE FUNCTIONINGS OF ELDERS: EVIDENCE FROM CHINA

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ABSTRACT

Using the China Health and Retirement Longitudinal Survey (CHARLS) data from 2011 to 2015 and bivariate ordered probit regression models, this study investigates the determinants of utilization ability and the effects on the functionings of Chinese elders based on the capability approach. The results suggest that three factors may affect the Chinese elders' utilization ability (Basic Activities of Daily Living and Instrumental Activities of Daily Living). These are personal factors, like physical conditions or educational attainment; social factors like gender roles or the healthcare systems; and environmental factors, like residential environment. It is also shown that the utilization ability significantly affects the functionings of Chinese elders, like being in work, participating in social activity, and providing child care. Finally, it is found that there are inter-group differences between the rural elder group and the urban elder group in the determination of utilization ability and the effect on elder functionings in China.

Contribution/ Originality: This study is one of very few studies which have investigated two arguments of the capability approach: (i) individual utilization ability which acts as the technology part in converting resources into functionings, is determined by personal, social and environmental factors; (ii) along with resources, utilization ability affects functioning achievements.

1. INTRODUCTION

In recent years, the capability approach (CA) has attracted interest from policy makers and researchers in a broad variety of fields like development, poverty, and inequality. This trend has been motivated for the most part by the increasing need for analysis from relevant alternative approaches on individual well-being. The traditional approaches such as a resource-based approach or a utility-based approach have been criticized for a long time. It is argued that there are weaknesses, such as unidimensional features, ignoring human diversity, or relying too much on mental states. These drawbacks make it an inadequate measurement of individual well-being (Sen, 1985; 1992).

The CA is an alternative multi-dimensional approach which uses functionings or capabilities to capture individual well-being. Unlike traditional approaches, the CA takes human diversity into consideration through the

utilization ability or conversion rates[1]. It is thought that utilization ability may determine the obtainable level of functioning achievement by using a certain amount of resources. One of the main distinctions between the CA and the traditional approaches is that the CA stresses the importance of taking individual utilization ability into consideration in the process of generating well-being.

An exemplary case may clarify this point. The same protein-rich foods are given to person A and person B. Person B is healthy but person A has Phenylketonuria (PKU). PKU inhibits nutrients absorption and therefore Person A cannot achieve as high a level of functioning as person B. This example indicates that the interpersonal variations in converting resources into functioning's must be considered in studies on individual well-being. Previous studies which take an economics perspective may focus on the influence of resources on well-being, such as the effects of income on well-being (e.g. health status, happiness, life satisfaction). There are few empirical studies which investigate the determinants of individual utilization ability and its effects on well-being using the CA.

In the last two decades, empirical studies based on the CA, for the most part, investigate the determinants of the functionings or capabilities, only a few relate to utilization ability or conversion factors. Previous studies which analyze utilization ability or conversion factors can be categorized as follows. First, Lelli (2005), Kuklys (2005) and Zaidi and Burchardt (2005) use an equivalence scale to compare the income or cost which is needed by an individual or a household with a disadvantage, like a disability or being illiterate, with the non-disadvantage group. Hick (2016) investigates the existence and influence of conversion factors and their influence on poverty for the UK. Second, Binder and Broekel (2011; 2012) introduce the efficiency frontier methods of empirical studies into the CA. These studies discuss the conversion efficiency of transforming resources or income into functioning[2]. Third, Chiappero-Martinetti and Salardi (2008) consider the process of generating functionings is similar to the production process and the role of utilization ability to be a technology or skill. It is not new for CA literature to consider the individual functionings to be a production process. This idea has also been considered by other CA researchers, for example, Kuklys (2005) and more recently by Gotoh (2014; 2017) and Gotoh and Kobayashi (2018). Gotoh (2014; 2017) discusses the idea from a theoretical perspective. Chiappero-Martinetti and Salardi (2008) employ an empirical study utilizing the "functioning production function" based on the CA and point out that conversion factors act as "technical" constraints to determine the utilization ability. These studies of the CA indicate that it would be useful to analyze the determinants of the utilization ability and its effects on functionings.

The four main contributions of this study to international debate are; firstly, it utilizes Basic Activities of Daily Living (BADL) and Instrumental Activities of Daily Living (IADL) data as the indices of utilization ability and investigates the determinants of BADL and IADL[3]. According to CA, the determinants of utilization ability consist of personal factors, social factors and environmental factors (Robeyns, 2005). Therefore, an empirical study is used to investigate the influences of these three kinds of conversion factors on utilization ability. The results provide empirical evidence to test the utilization ability of hypotheses and theories.

Secondly, analysis of the influence of utilization ability on functionings provides empirical evidence about the process of functioning generation.

Thirdly, (1) according to empirical study methodology permanent income is a better index of economic resources than temporary income, yet in the previous studies temporary income is usually used: there are few studies that use permanent income[4]. This study uses permanent income indices: household assets and domicile

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[1] Conversion rates are used in some CA literature Sen (1999), Bruni, Comim and Pugno (2008), Chiappero-Martinetti and Salardi (2008), Chiappero-Martinetti, Salardi and Scervini (2018) In this study utilization ability is used because it may be more familiar to economists.

[2] It should be noted that an individual with low utilization ability may be efficient in the conversion process.

[3] For detailed introductions of the utilization ability indices (BADL and IADL), please see the Section 3.3 "Variable setting for the utilization function" in the paper.

[4] Hick (2016) utilizes the current and five-year average income as indices of temporary income and permanent income.

ownership status. (2) The income found in the longitudinal survey data for the prior survey year is used to address the endogeneity problem.

Fourthly, most previous studies are of European countries, for example, Chiappero-Martinetti and Salardi (2008) for Italy, Anand and Roope (2016) for Germany, and for the UK, Kuklys (2005), Binder and Broekel (2011; 2012) and Anand *et al.* (2015). To the writers' knowledge very few empirical studies of functionings based on a CA framework have addressed the issue in China, notably Alkire and Shen (2017) and Kayo and Takashi (2016). China is a rapidly developing country with a very large aging population. Therefore, the nature of the determinants of the utilization ability of elders and the effects on elderly functionings based on the CA is increasing in importance. This study provides new evidence for China, a major developing country.

The remainder of this paper proceeds as follows. Section 2 introduces the capability approach, particularly the utilization ability and its determinants (conversion factors) and four hypotheses for empirical study. Section 3 discusses the empirical analyses methodology including the models, data and variable setting. Section 4 presents and explains the empirical results, and conclusions are exhibited in Section 5.

2. THEORETICAL FRAMEWORK: THE CAPABILITY APPROACH

With respect to traditional well-being measurements, Sen (1985; 1992) comments that income merely provides a means to pursue ends, and the measurement of happiness is subjective and not reliable. Sen admits that resources are important in expanding the real opportunity to pursue a good life and thereby enhances one's freedom of choice. It does not provide information about how well an individual may convert resources into well-being. An individual with difficulties in converting the means into the ends may suffer from deficiencies in functionings or capabilities, even though they may be rich in resources. Equally, the utility-based approach which measures the subjects' self-assessment of well-being does not provide sufficient information to judge individual well-being. For instance, a deprived individual could appear in the data as happy if he or she is adaptive to circumstances.

Sen argues that individual well-being should be measured using data about functionings and capabilities because this captures individual well-being from the perspective of the actual achievements and the freedom to achieve. More precisely, a functioning is one of the person's achievements, or what a person succeeds in doing with the commodities at his or her command. The functionings can be thought to be the person's beings or doings, e.g. being well-nourished, participating in the social activity and so on. It reflects a 'state' of the person. Sen argues that how well a person is must be a matter of what kind of life he or she is living and what the person is succeeding in 'doing' or 'being' (Sen, 1985). On the other hand, capabilities refer to the real opportunities that the person has, which represent the opportunity someone has to achieve functionings. A person's capabilities include varied combinations of functionings that are achievable with the given resources and utilization ability.

In empirical studies on the determinants of functionings based on the CA, the process of converting resources into functionings is usually captured by the utilization function (or conversion function). Utilization function reflects a pattern of using resources. Each individual may have different sets of utilization functions. Disadvantage in the conversion process, rather than the lack of resources, may lead to deprivation of functionings. For example, there may be a huge inequality in functionings between individuals with equal economic resources (income).

Utilization ability reflects the ability of an individual to convert resources into functionings, the differences in individual utilization ability may explain why some individuals achieve higher functionings than others even with the same amount of resources (or why someone can achieve the same level of functionings with less resources). The variation of utilization ability can be caused by a set of factors. Robeyns (2005) distinguishes the conversion factors into three types: personal factors (physical condition, sex, intelligence), social factors (public policies, social norms, gender roles) and environmental factors (climate, geographical location). It should be noticed that the utilization ability (or conversion rates) and the conversion factors are two different concepts. Chiappero-Martinetti and Salardi (2008) clarify the linkages between these concepts based on production theory which is similar to the production

theory in neoclassical economics. They emphasize that "the utilization or conversion function, is similar with a production function, transforms inputs (resources, public and private goods and commodities) into outputs (achieved functionings). The amount of output generally depends on the amount of inputs but also on the 'technology', represented here as the result of the interaction of the conversion factors. These factors act as 'technical' constraints and determine the conversion rates."

Although Sen states that attention should be paid to the utilization ability or conversion factors in his studies (Sen, 1980; 1987; 1992; 1999; 2009) he does not provide an empirical method to investigate the utilization ability. Other researchers find no effective method to measure the utilization ability (e.g. (Brandolini and D'Alessio, 1998; Chiappero-Martinetti and Salardi, 2008; Chiappero-Martinetti *et al.*, 2018)). In some cases the conversion variation problems are complex, especially for sociological issues, such as participating in the life of the community (Sen, 1992). Another unavoidable difficulty is stated by Comim (2008) he argues that "the CA provides a justification for using broader informational spaces in normative evaluations but offers no guidance about how different informational spaces are to be filled in, combined, or sequenced." There are few empirical studies to investigate the determinants of utilization ability because of the difficulties and complexities of applying the CA. This study offers a methodological solution.

Based on the CA and the empirical study results for other countries, this study employs an empirical method to test the H1-1 and H2-1 hypotheses for Chinese elders (see below). Some studies find inter-group differences remain for the determinants of utilization ability and its effects on functionings. For instance, Anand *et al.* (2015) found a gender gap in the UK based on the CA perspective. Since 1958 Chinese society has been segmented by the rural and urban registration system (*Hukou* system). The economic development level (GDP per capita), public health care, public education, and social security systems differ with the *Hukou* systems, therefore, there may be great differences in the determinants of utilization ability and functioning's between rural and urban elders. To consider this aspect of Chinese society the H1-2 and H2-2 hypotheses, which are not analyzed in the previous studies, are tested.

H1-1: The utilization ability of Chinese elders is determined by conversion factors, including personal factors, social factors and environmental factors.

H1-2: There are inter-group differences in the determination of utilization ability between the rural elder group and the urban elder group.

H2-1: Utilization ability affects the Chinese elder functionings.

H2-2: Utilization ability affects functioning differ for the rural elder group and the urban elder group.

The H1-1 and H1-2 are for the determinants of the utilization ability, and the H2-1 and H2-2 are for the influences of utilization ability on the individual functioning.

3. METHODOLOGY

3.1. Models

First, to test the H1-1 and H1-2, the ordered bivariate probit models are utilized to investigate the influence of personal, social and environmental factors on the utilization ability (BADL and IADL) as follows.

$$y_{1t}^* = \alpha_1 + \beta_{1P} P_{1(t-2)} + \beta_{1S} S_{1(t-2)} + \beta_{1E} E_{1(t-2)} + \varepsilon_1$$

$$y_{1t} = 1, \text{ if } y_{1t}^* < \mu_{11}, = 2, \text{ if } \mu_{11} < y_{1t}^* < \mu_{12}, \cdots, = 4, \text{ if } \mu_{13} < y_{1t}^* \qquad (1.1)$$

$$y_{2t}^* = \alpha_2 + \beta_{2P} P_{2(t-2)} + \beta_{2S} S_{2(t-2)} + \beta_{2E} E_{2(t-2)} + \varepsilon_2$$

$$y_{2t} = 1, \text{ if } y_{2t}^* < \mu_{21}, = 2, \text{ if } \mu_{21} < y_{2t}^* < \mu_{22}, \cdots, = 4, \text{ if } \mu_{23} < y_{2t}^* \qquad (1.2)$$

When the Equations 1.1 and Equations 1.2 are correlated, they can be jointly estimated on the assumption that ε_1 and ε_2 have the binomial standard normal distribution, where ρ is the covariance of errors.

$$\begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right) \qquad (1.3)$$

In the Equations 1.1, Equations 1.2 and Equations 1.3, y_{1t} and y_{2t} are the observed utilization ability, y_{1t}^* and y_{2t}^* are the corresponding unobserved latent variables. t-2 stands for the prior period which is two years before the survey year. $P_{1(t-2)}, S_{1(t-2)}, E_{1(t-2)}$ and $P_{2(t-2)}, S_{2(t-2)}, E_{2(t-2)}$ are exogenous variables, corresponding to the personal factors, social factors and environmental factors. $\mu_{11}, \mu_{12}, \mu_{13}$ and $\mu_{21}, \mu_{22}, \mu_{23}$ are the threshold parameters. $\beta_{1P}, \beta_{1S}, \beta_{1E}, \beta_{2P}, \beta_{2S}, \beta_{2E}$ are coefficients. α_i are the constants and ε_i are the error terms, where i=1, 2. The bivariate ordered probit models are used to estimate $\beta_{1P}, \beta_{1S}, \beta_{1E}, \beta_{2P}, \beta_{2S}, \beta_{2E}, \mu_{11}, \mu_{12}, \mu_{13}, \mu_{21}, \mu_{22}, \mu_{23}$, and ρ simultaneously using maximum likelihood method. When the null hypothesis that ρ equals zero cannot be rejected, it is thought that running the usual ordered probit models separately will lead to consistent estimation results. In order to compare the results of two different kinds of models the usual ordered probit models are used to analyze the BADL and IADL separately under the assumption that ρ equals zero. In all estimations robust standard errors are computed to correct for potential heteroscedasticity.

To test the H1-1 the whole samples including both the urban and rural regions are used to employ the analyses based on the Equations 1.1 and Equations 1.2. When the $\beta_{1P}, \beta_{1S}, \beta_{1E}, \beta_{2P}, \beta_{2S}, \beta_{2E}$ are statistically significant H1-1 is supported. To test the H1-2 the samples are divided into two subsamples, the rural elder group and urban elder group and the results of the $\beta_{1P}, \beta_{1S}, \beta_{1E}, \beta_{2P}, \beta_{2S}, \beta_{2E}$ are compared. When the values and statistical significances differ for the rural elder group and urban elder group H1-2 is supported.

Second, to test the H2-1 and H2-2, probit regression models are used to analyze the influence of the utilization ability on functionings as follows.

$$f_{ijt}^* = \alpha_1 + \beta_1 R_{i(t-2)} + \gamma Z_{it} + \varepsilon_i, \text{ where } j = 1, 2, 3$$

$$\Pr(f_{ijt} = 1) = \Pr(f_{ijt}^* > 0) = \Pr(\varepsilon_i > -\alpha_1 - \beta_1 R_{i(t-2)} - \gamma Z_{it}) \qquad (2.1)$$

$$f_{ijt}^* = \alpha_2 + \beta_2 Y_{i(t-2)} + \gamma Z_{it} + \varepsilon_i, \text{ where } j = 1, 2, 3$$

$$\Pr\left(f_{ijt} = 1\right) = \Pr\left(f_{ijt}^* > 0\right) = \Pr\left(\varepsilon_i > -\alpha_2 - \beta_2 Y_{i(t-2)} - \gamma Z_{it}\right) \qquad (2.2)$$

$$f_{ijt}^* = \alpha_3 + \beta_1 R_{i(t-2)} + \beta_2 Y_{i(t-2)} + \gamma Z_{it} + \varepsilon_i, \text{ where } j=1, 2, 3$$

$$\Pr\left(f_{ijt} = 1\right) = \Pr\left(f_{ijt}^* > 0\right) = \Pr\left(\varepsilon_i > -\alpha_3 - \beta_1 R_{i(t-2)} - \beta_2 Y_{i(t-2)} - \gamma Z_{it}\right) \qquad (2.3)$$

In the Equations 2.1, Equations 2.2 and Equations 2.3, f_{ijt} is the observed functioning j of the ith individual at year t, f_{ijt}^* is the corresponding unobserved latent variable. $Y_{i(t-2)}$ stands for the utilization ability (the BADL and the IADL). $R_{i(t-2)}$ is the resource variables, including household assets and ownership of living house, and Z_{it} represents the demographic variables. β_1, β_2, γ are the coefficients. α_i are the constants and ε_i are the error terms, where $i=1, 2, 3$.

To test the H2-1 the whole samples are used including both the urban and rural regions to employ the analyses based on the Equations 2.1, Equations 2.2 and Equations 2.3. When the β_2 is statistically significant H2-1 is supported. To test the H2-2, the samples are divided into two subsamples, the rural elder group and the urban elder group and the results of β_2 are compared for these two groups. H2-2 is supported when the coefficient values and statistical significances differ by these two groups.

3.2. Data

The individual-level data used in the analyses is from the China Health and Retirement Longitudinal Survey (CHARLS). The CHARLS which is conducted by Peking University every two years covers the representative regions in China. Its survey objects are individuals aged 45 and older. The baseline national wave of CHARLS conducted in 2012 includes about 10,000 households and 17,500 individuals in 150 counties/districts and 450 villages/resident committees. The first and second follow-up survey waves are for 2014 and 2016.

Individual-level information such as demographic characteristics, family structure, intra-household transfer, health care and insurance, health status and physical functions, employment status and pension, income and assets, housing and other related information can be obtained from the CHARLS.

To analyze the social factors and environmental factors, we utilize the individual information in the CHARLS as well as government published regional data from *China Statistical Yearbook* (2012) and *China Health Statistics Yearbook* (2012, 2013) to construct a new individual-region matched dataset.

This study uses the samples that are present in all three waves of the CHARLS (CHARLS 2011, 2013 and 2015). The samples aged below 45 in the first wave (2011) and those whose key variables are missing are excluded. As a result, the total sample is 11,812 observations.

3.3. Variable Setting for the Utilization Ability Estimations

For the utilization ability estimations, the main dependent and independent variables are constructed as follows.

For the dependent variables, as the indices of the utilization ability, the ADL (Activities of Daily Living) are utilized. Comparing to the specific physical conditions that are usually considered in the previous studies (e.g.

disability), the ADL reflects an individual's general functional status. The ADL is used in this study. It is composed of the Basic Activities of Daily Living (BADL), often used to measure an individual's ability to perform basic tasks, and the Instrumental Activities of Daily Living (IADL), often used to measure an individual's ability to perform more complex tasks in daily life. The BADL reflects the individual's ability to care for themselves, and the IADL is often used to judge whether the individual could live independently or not. In the context of elders, it is reasonable to think that individual functional status is associated with their ability to achieve functionings. Therefore, the BADL and the IADL are used as the indices of individual utilization ability.

The Basic Activities of Daily Living has six items in the CHARLS: (i) dressing, (ii) bathing, (iii) eating, (vi) getting into or out of bed, (v) using the toilet and (vi) controlling urination and defecation. The Instrumental Activities of Daily Living covers five items: (i) doing household chores, (ii) preparing hot meals, (iii) shopping for groceries, (iv) taking the right portion of medication on time and (v) managing money. The CHARLS asks the respondents if they have any difficulty in doing each item and lets them choose each item from 1 (No, I don't have any difficulty.), 2 (I have difficulty but can still do it.), 3 (Yes, I have difficulty and need help.), to 4 (I cannot do it.). The values are reversed using the following rules: when the individual chooses the item of "I cannot do it", the value is equal to 1; while when the individual chooses the item of "No, I don't have any difficulty", it is equal to 4. Then the BADL category variable is constructed as follows: when the respondent has no difficulty in doing all six items, the individual's BADL score is equal to 4 (I don't have any difficulty.). When the individual cannot do at least one of the items, his/ her BADL is scored as 1 (I cannot do it.). When the individual finds difficulty finishing these actions and needs help for at least one of the items, then the individual's BADL is scored as 2 (I have difficulty and need help.). Similarly, when "I have difficulty but can still do it" is chosen with at least one item, then the BADL is scored as 3. The IADL category variable is defined in the same way. Both the BADL and the IADL are used as the dependent variables in the utilization ability estimations and as the independent variables in the functionings estimations.

For the main independent variables, as in the previous study (Robeyns, 2005) the conversion factors which are composed of personal factors, social factors and environmental factors are constructed as follows.

First, for the personal factors, the individual physical condition is used as well as a set of demographic variables. Specifically, (i) the individual physical condition is expected to substantially affect both the BADL and the IADL. The CHARLS provides useful information about individual health status. This study focuses on three aspects: disability, chronic disease and body pain. Disability has been widely discussed in previous CA literature, also in empirical studies for the conversion factors (e.g. (Kuklys, 2005; Zaidi and Burchardt, 2005)). The CHARLS asks if the individual has any disabilities, including physical disabilities, brain damage/mental retardation, vision problems, hearing problems and a speech impediment. The total number of disability items is used as the disability variable.

Other kinds of a physical condition may affect individual utilization ability and merit further research. It has been pointed out that previous studies tend to focus on the disabled group (e.g. Hick (2016)). In recent years it is extensively recognized that along with economic growth, most countries including China have experienced epidemiological transformation from acute infectious disease to predominantly chronic disease. The CHARLS data shows that the proportion of respondents with chronic disease is greater for urban residents than for rural residents. Pain is an important influence on well-being, in the dataset for this study about one third of respondents suffer from some kind of body pain. Fourteen kinds of the chronic disease and fifteen kinds of body pain are surveyed in the CHARLS. The chronic disease and body pain variables are constructed in the same way as the disability variable using this information. (ii) As in most previous studies a set of demographic variables are constructed, that include age, gender, marital status[5], *Hukou*[6] and educational attainment[7].

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[5] Marital status is a dummy variable, which is equal to 1 for married, and is equal to 0 when the individual is separated, divorced, widowed, or never married.

[6] *Hukou* status is a dummy variable, which is equal to 1 if the individual is of the rural *Hukou*, and is equal to 0 if the individual is of the urban *Hukou*.

Table 1 shows the joint frequency distribution of the BADL and the IADL. As shown in the Table 1, the proportion of the top category group whose scores of both the BADL and the IADL are greatest is close to three fourths (73.82%,), perhaps because the respondents in the sample are relatively young (the mean value of age is 58.51).[8] Regarding the category "I cannot do it", the proportion of the IADL (12.41%) is more than that of the BADL (2.61%). In the largest group, the proportion of the IADL (80.68%) is less than that of the BADL (84.26%), which conforms to common sense. Spearman's ρ between the BADL and the IADL is calculated as 0.4102, which is a positive value and statistically significant at 1%.

Table-1. Joint frequency distribution of BADL and IADL.

BADL	IADL				
	1	**2**	**3**	**4**	**Total (%)**
1	1.74	0.11	0.15	0.61	2.61
2	0.96	0.24	0.14	0.52	1.86
3	2.82	0.67	2.06	5.73	11.28
4	6.89	1.14	2.41	73.82	84.26
Total (%)	12.41	2.16	4.76	80.68	100.01

Notes: (i) 1. I cannot do it.; 2. I have difficulty and need help.; 3. I have difficulty but can still do it.; 4. I don't have any difficulty. (ii) Spearman's ρ = 0.4102 (p=0.000).

Second, the social factors and environmental factors are constructed from the combination of individual-level data from the CHARLS and the regional-level data from the *China Statistics Book* and the *China Health Statistics Boo*k. The CHARLS is a national survey which covers 28 provinces and cities, thus the 28 regions' data are used as the social and environmental factors in this study.

With regard to social factors, (i) the per capita GDP is an important indicator which reflects the regional development level. In China, the development level varies considerably from region to region, so it is necessary to consider the differences in economic circumstances. (ii) The accessibility of regional public resources may also influence individual utilization ability. Three variables are used to control the regional social health security system disparities: the health insurance coverage rate, the per capita health expenses of the local government, and the number of community health service centers and stations per 10,000 population. (iii) As suggested by the CA framework, social culture or social norms may affect the utilization ability. Thus, the gender ratio is included to control the regional gender attitude gap and intra-household gender resource gap.

With respect to environmental factors, the individual-level and the regional-level data are analyzed. (i) Residential circumstances may be associated with BADL and IADL. Therefore, two indicators of residential circumstances are included as individual-level environmental factors. Two dummy variables are constructed to identify whether there are handicapped facilities, and whether the toilet is flushable. (ii) With respect to regional environmental factors, the emission of smoke and dust is constructed as an indicator for the regional air pollution situation, as is regional forest coverage rate.

Third, three block dummy variables, the Eastern, the Central and the Western Regions are used to control the regional disparities.

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[7] Even though there are 11 categories of education in the CHARLS, we construct five kinds of education dummy variables: (i) illiterate, (ii) elementary school or lower, (iii) junior high school, (iv) senior high school or vocational school and (v) college or higher.

[8] Joint frequency distribution of BADL and IADL of samples aged older than 60 and 70 are summarized in Appendix Table 1 and Table 2, where it is found that the proportion of no difficulty decreases greatly with increasing age.

3.4. Variable Setting for the Functionings Estimations

Due to the multidimensional nature of the CA, three aspects of elders' functionings are considered in this study: being in work, participating in social activity and providing child care, which reflects an elder's well-being related to society, leisure and family role.

As the dependent variables, (i) "being in work" is equal to 1 when the respondent engaged in agricultural work, the wage earning work, self-employed activities or unpaid family business work[9] for more than ten days in the past year or at least one hour in the last week. (ii) The "participating in social activity" is equal to 1 if the respondent participated at least one kind of social activity daily or weekly in the last month. A wide range of social activities have been investigated in CHARLS, in this study the focus is on the following activities: interacting with friends, playing Mahjong/chess/cards or going to a community club, going to a sport/social/or other kind of club. (iii) "Providing child care" is equal to 1 in the case that the respondent has ever provided child care for their grandchildren for three weeks or more over the last year.

For the independent variables, (i) utilization ability (BADL and IADL) are used. (ii) Economic resources (e.g. income) can be thought to substantially affect individual functionings. To address the endogeneity problem such as the reversal causality between income and functionings (e.g. being in work), two kinds of financial status in the prior period are selected which is two years before the survey year as the indices of resources; they are the per capita household assets[10], and the ownership status of the home. The logarithm value of the household assets is utilized in the study. The ownership status of the home is a dummy variable which is equal to 1 if the individual is an owner of the home.

The summary of the descriptive statistics of all variables is shown in Table 2 for the total, the rural group, and the urban group. It can be observed that the urban elders have better utilization ability in both the BADL and the IADL, especially for the IADL. Urban elders' household resources are three times those of the rural elders. In general, urban elders are likely to be more advantaged in both utilization ability and resources than rural elders.

4. RESULTS

4.1. The Determinants of Utilization Ability: Testing Results of H1-1

Table 3 summarizes the results by the bivariate ordered probit model (Model 1) as well as the usual ordered probit models that are separately estimated for the BADL and IADL (Model 2 and Model 3). Even though the results based on Model 1 and Model 2/Model 3 are similar, because the coefficient of ρ is 0.611 with a standard error of 0.021, and the results of the Wald statistic for the test of the null hypothesis that ρ is equal to zero is 835.62, which is well above the critical value of the chi-squared with a single restriction at 1% level, it is indicated that there remains a correlation between the unobserved factors affecting both the BADL and the IADL, and the bivariate ordered probit models should be utilized in analyses. Therefore, the results based on the Model 1 to test the H1-1 are used.

The main findings are as follows. First, for the personal factors, (i) all the coefficients of the physical condition related covariates are negative values and they are statistically significant for both the BADL and the IADL, it is indicated that the disability, chronic disease and body pain may decrease individual utilization ability. (ii) The utilization ability (both the BADL and the IADL) is low for older people, rural residents, women and the low-education groups. It is shown that higher educational attainment may help elders to improve their utilization ability,

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[9] In CHARLS, work does not include doing housework or doing activities without wage, such as voluntary work.

[10] The per capita household assets are calculated from the total household assets and the number of family members.

which implies that elders may obtain benefit from education even in old age. Marriage status positively affects the BADL, while it is statistically insignificant for the IADL.

Second, for social factors, the health insurance coverage rates and the numbers of community health centers and stations influence the BADL positively and statistically significantly, whereas the regional per capita GDP negatively affects the BADL.

Table-2. Descriptive statistics.

Variables	Total		Rural		Urban	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Utilization ability						
BADL	3.772	0.608	3.763	0.613	3.812	0.583
IADL	3.537	1.018	3.491	1.058	3.732	0.797
Personal factors						
No. of disabilities	0.209	0.514	0.218	0.523	0.17	0.474
No. of chronic diseases	1.37	1.392	1.324	1.351	1.564	1.539
No. of body pains	1.447	2.849	1.582	2.953	0.872	2.265
Age	58.51	8.894	58.2	8.778	59.81	9.264
Gender	0.487	0.5	0.476	0.499	0.534	0.499
Education	2.2	0.988	2.026	0.872	2.94	1.102
Spouse	0.901	0.299	0.902	0.298	0.898	0.303
Social factors						
Regional GDP (Yuan)	37,144	13,967	36,700	13,807	39,030	14,475
Health insurance coverage rate	98.39	7.725	98.72	7.384	96.98	8.896
Health expense (Yuan)	1,689	389.9	1,666	335.5	1,786	554.9
Community health centers/stations	0.234	0.22	0.23	0.219	0.249	0.225
Gender ratio	104.6	4.454	104.6	4.502	104.4	4.239
Environmental factors						
Handicap facilities	0.275	0.447	0.295	0.456	0.194	0.395
Toilet flushable	0.368	0.482	0.296	0.457	0.673	0.469
Smoke and dust	52.82	27.1	52.47	27.35	54.33	25.92
Forest coverage rate	32.35	15.69	32.32	15.8	32.52	15.2
Functionings						
Working	0.643	0.479	0.709	0.454	0.363	0.481
Participating in social activity	0.31	0.463	0.289	0.453	0.4	0.49
Providing child care	0.363	0.481	0.371	0.483	0.329	0.47
Resources						
Household assets (Yuan)	11,316	30,087	8,254	23,421	24,305	47,021
Ownership of home	0.865	0.341	0.872	0.334	0.835	0.371
Regional blocks						
East	0.345	0.475	0.35	0.477	0.327	0.469
Central	0.329	0.47	0.312	0.464	0.398	0.49
West	0.326	0.469	0.338	0.473	0.275	0.447
Observations	11812		9559		2253	

Source: (i) Personal factors and regional blocks are drawn from CHARLS (2011). (ii) Utilization ability and resources data are from CHARLS (2013). (iii) Functionings data are from CHARLS (2015). (iv) Social and environmental factors are constructed from CHARLS (2011), China Statistical Yearbook (2012) and China Health Statistics Yearbook (2012, 2013).

Third, for the environmental factors, the results show that better residential circumstances such as a flushable toilet in the house may increase the elders' utilization ability. The emission of smoke and dust negatively affects the BADL. Moreover, to compare with the elders in the western area, the utilization ability (both the BADL and the IADL) is higher for the elders in the eastern area.

It is found that even though almost all of the individual-level factors affect the IADL as well as the BADL significantly, the influence of the regional-level social and environmental factors on the IADL are not statistically significant. Two reasons may explain these results. First, it indicates the effects of the public policy implementations on the IADL may be small. Second, although current public policy may improve the basic needs it may not be effective in improving the advanced needs of the elder group. These results merit further research.

The results for personal factors, social factors and environmental factors support the H1-1 (The utilization ability of Chinese elders is determined by conversion factors, including personal factors, social factors and environmental factors).

Table-3. Results of determinants of utilization ability.

Dependent Variables	BADL		IADL	
	Model 1	Model 2	Model 1	Model 3
Personal factors				
No. of disabilities	–0.180***	–0.176***	–0.297***	–0.296***
	(0.025)	(0.025)	(0.025)	(0.026)
No. of chronic diseases	–0.119***	–0.120***	–0.055***	–0.056***
	(0.010)	(0.011)	(0.010)	(0.011)
No. of body pain	–0.044***	–0.045***	–0.033***	–0.034***
	(0.005)	(0.005)	(0.005)	(0.005)
Age	–0.027***	–0.027***	–0.038***	–0.038***
	(0.002)	(0.002)	(0.002)	(0.002)
Gender	0.126***	0.115***	0.136***	0.130***
	(0.031)	(0.031)	(0.030)	(0.030)
Spouse	0.082*	0.072	0.067	0.074*
	(0.044)	(0.045)	(0.042)	(0.043)
Hukou	–0.117***	–0.123***	–0.230***	–0.231***
	(0.045)	(0.045)	(0.046)	(0.046)
Education	0.080***	0.077***	0.295***	0.289***
	(0.018)	(0.019)	(0.020)	(0.020)
Social factors				
lnregion_gdp	–0.206**	–0.210**	0.059	0.058
	(0.097)	(0.099)	(0.087)	(0.087)
Health insurance coverage rate	0.008***	0.008***	0.004	0.003
	(0.003)	(0.003)	(0.003)	(0.003)
Health expense	0.000	0.000	–0.000	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Community health centers/stations	0.249*	0.254*	0.057	0.065
	(0.133)	(0.135)	(0.115)	(0.115)
Gender ratio	–0.003	–0.003	–0.006	–0.006
	(0.004)	(0.004)	(0.004)	(0.004)
Environmental factors				
Handicap facilities	0.025	0.028	0.034	0.035
	(0.032)	(0.033)	(0.032)	(0.032)
Toilet flushable	0.073**	0.068*	0.083**	0.083**
	(0.034)	(0.035)	(0.035)	(0.035)
Smoke and dust	–0.001*	–0.002*	–0.001	–0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Forest coverage rate	0.000	0.000	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.0 1)
East	0.316***	0.319***	0.198***	0.200***
	(0.060)	(0.061)	(0.058)	(0.058)
Central	0.051	0.043	0.034	0.032
	(0.043)	(0.043)	(0.040)	(0.040)
Athrho	0.611***			
	(0.021)			
Rho	0.545			
	(0.015)			

Notes: (i) Robust standard errors in parentheses. (ii)*** p<0.01, ** p<0.05, * p<0.1. (iii) The number of observations is 11,812. (iv) For the bivariate ordered probit model, Wald test of ρ=0: chi2(1) = 835.62.

4.2. The Determinants of Utilization Ability by Rural Group and Urban Group: Testing Results of H1-2

Table 4 summarizes the estimation results of bivariate ordered probit models for the rural resident group and for the urban resident group. The main findings are as follows.

First, for personal factors chronic disease and being male significantly influence the rural elders' utilization ability (IADL), while they are not statistically significant for the urban elder group.

Second, for social factors (i) both the per capita regional GDP and the regional gender ratio negatively affect the rural elders' utilization ability, whereas the influence of these two factors is not statistically significant for the urban elder group. (ii) The health insurance coverage rate positively affects the rural elders' utilization ability (BADL), but its influence is not statistically significant for the urban elder group. (iii) The health services provided by the community health care centers and stations may improve the urban elders' utilization ability (IADL), whereas its influence on the rural elders' IADL is not statistically significant.

Third, for environmental factors the residential circumstances affect elder utilization ability significantly, whereas the influence of the local environment factors is not statistically significant. Handicapped facilities negatively influence the IADL for urban elder group, whereas its influence on the rural elders is positive. Access to flushable toilets may positively affect both the BADL and the IADL for the rural elder group, whereas its influence is not statistically significant for the urban elder group.

These results support the H1-2 (There are inter-group differences in the determination of utilization ability between the rural elder group and the urban elder group.).

4.3. The Influence of Utilization Ability on Chinese Elder Functionings: Testing Results of H2-1

Table 5 summarizes the determinants of three functionings of Chinese elders: being in work, participating in social activity and providing child care. To investigate the influence of the utilization ability and other factors including resources, three models are estimated based on Equations 2.1, Equations 2.2 and Equations 2.3. The main findings are as follows.

First, the coefficients of both the BADL and IADL in the Model 2 and Model 3 are positive values and they are statistically significant. To compare the results of Model 2 with the results of Model 3, it is observed that the significances of the coefficients of the BADL and the IADL do not change for the three functionings (being in work, participating in social activity, providing child care). These results support the H2-1 (Utilization ability affects the Chinese elder functionings.).

Second, for the other factors, (i) the probability of both being in work and providing child care is lower for the older age group than the middle-age group, while the probability of participating in social activity is higher for the older age group. (ii) There are gender gaps for the three functionings. The results show that the probability of being in work is higher for the male group than for the female group. The probability of participating in social activity and providing child care is lower for the male. (iii) The elder with a spouse is more likely to be in work and provide child care, but he or she may be less likely to participate in social activity. (iv) The probability of being in work and providing child care is higher for the rural elder group than for the urban group. The probability of participating in social activity is lower for the rural elder group. (v) The probability of being in work is lower for the high-education group (those whose educational level is college or higher than college) and higher for elders in the low and middle-level education group. The probability of participating in social activity is greater for the high-education group. (vi) The probability of being in work and caring for grandchildren is lower for the group in the eastern and central areas than for elders living in the western area. The probability of participating in social activity is higher for elders in the eastern and central areas.

Table-4. Results of the determinants of utilization ability by the rural group and urban group.

Dependent Variables	Rural		Urban	
	BADL	**IADL**	**BADL**	**IADL**
Personal factors				
No. of disabilities	-0.166***	-0.274***	-0.263***	-0.431***
	(0.028)	(0.027)	(0.065)	(0.069)
No. of chronic diseases	-0.132***	-0.061***	-0.068***	-0.027
	(0.012)	(0.012)	(0.024)	(0.024)
No. of body pains	-0.044***	-0.034***	-0.047***	-0.033**
	(0.005)	(0.005)	(0.014)	(0.014)
Age	-0.028***	-0.038***	-0.028***	-0.037***
	(0.002)	(0.002)	(0.004)	(0.004)
Gender	0.127***	0.153***	0.138*	-0.005
	(0.034)	(0.033)	(0.076)	(0.078)
Spouse	0.062	0.059	0.153	0.154
	(0.049)	(0.047)	(0.103)	(0.103)
Education	0.069***	0.305***	0.100***	0.265***
	(0.022)	(0.023)	(0.035)	(0.039)
Social factors				
lnregion_gdp	-0.266**	-0.007	-0.097	0.032
	(0.117)	(0.110)	(0.222)	(0.226)
Health insurance coverage rate	0.011***	0.004	0.002	0.003
	(0.003)	(0.003)	(0.006)	(0.007)
Health expense	0.000	-0.000	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Community health centers/stations	0.216	-0.064	0.310	0.622**
	(0.158)	(0.140)	(0.315)	(0.315)
Gender ratio	-0.004	-0.008*	0.013	0.016
	(0.005)	(0.005)	(0.014)	(0.012)
Environmental factors				
Handicap facilities	0.059*	0.054	-0.171**	-0.113
	(0.035)	(0.034)	(0.086)	(0.098)
Toilet flushable	0.102***	0.095**	-0.068	-0.019
	(0.039)	(0.038)	(0.081)	(0.085)
Smoke and dust	-0.001	-0.001	-0.001	-0.000
	(0.001)	(0.001)	(0.002)	(0.002)
Forest coverage rate	0.000	0.002*	0.001	-0.002
	(0.001)	(0.001)	(0.003)	(0.004)
Eastern	0.345***	0.235***	0.263*	0.135
	(0.070)	(0.068)	(0.136)	(0.144)
Central	0.077	0.083*	-0.054	-0.098
	(0.051)	(0.049)	(0.094)	(0.096)
Athrho	0.599***		0.684***	
	(0.023)		(0.059)	
Rho	0.536		0.594	
	(0.016)		(0.038)	
Observations	9,559	9,559	2,253	2,253

Notes: (i) Robust standard errors in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1. (iii) For the bivariate ordered probit model, Wald test of ρ=0: chi2(1) = 701.59 for rural and chi2(1) = 134.12 for urban.

Table-5. Estimation results of functionings.

Dependent	Being in work			Participating in social activity			Providing child care		
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Resources									
lnhousehold_assests	0.014**		0.003	0.035***		0.030***	-0.004		-0.008
	(0.006)		(0.006)	(0.006)		(0.006)	(0.006)		(0.006)
Ownership	0.081**		0.072*	-0.002		-0.008	0.127***		0.123***
	(0.037)		(0.038)	(0.036)		(0.037)	(0.036)		(0.036)
Utilization ability									
BADL		0.233***	0.232***		0.060***	0.055**		0.025	0.025
		(0.023)	(0.023)		(0.023)	(0.023)		(0.022)	(0.022)
IADL		0.130***	0.129***		0.104***	0.098***		0.073***	0.074***
		(0.014)	(0.014)		(0.015)	(0.015)		(0.014)	(0.014)
Demographic variables									
Age	-0.056***	-0.052***	-0.051***	-0.000	0.002	0.003*	-0.020***	-0.018***	-0.017***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Gender	0.514***	0.498***	0.498***	-0.143***	-0.159***	-0.157***	-0.188***	-0.196***	-0.198***
	(0.028)	(0.028)	(0.028)	(0.026)	(0.026)	(0.026)	(0.025)	(0.025)	(0.025)
Spouse	0.201***	0.213***	0.212***	-0.126***	-0.104***	-0.125***	0.240***	0.234***	0.240***
	(0.034)	(0.034)	(0.034)	(0.033)	(0.032)	(0.033)	(0.033)	(0.033)	(0.033)
Hukou	0.844***	0.877***	0.878***	-0.155***	-0.165***	-0.142***	0.058*	0.077**	0.068**
	(0.034)	(0.034)	(0.034)	(0.033)	(0.032)	(0.033)	(0.033)	(0.033)	(0.033)
Education	-0.079***	-0.103***	-0.104***	0.126***	0.123***	0.113***	-0.002	-0.014	-0.012
	(0.016)	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
East	-0.170***	-0.216***	-0.220***	0.094***	0.090***	0.076**	-0.187***	-0.200***	-0.201***
	(0.032)	(0.032)	(0.032)	(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.030)
Central	-0.092***	-0.106***	-0.105***	0.151***	0.152***	0.146***	-0.058**	-0.067**	-0.063**
	(0.032)	(0.032)	(0.033)	(0.030)	(0.030)	(0.030)	(0.029)	(0.029)	(0.030)
Constant	2.925***	1.523***	1.419***	-0.808***	-1.297***	-1.487***	0.716***	0.360**	0.277*
	(0.152)	(0.169)	(0.179)	(0.138)	(0.159)	(0.169)	(0.134)	(0.155)	(0.164)
Pseudo R2	0.1738	0.1923	0.1926	0.0206	0.0236	0.0255	0.0277	0.0293	0.0302
Observations	11,812	11,812	11,812	11,812	11,812	11,812	11,812	11,812	11,812

Notes: (i) Robust standard errors in parentheses. (ii) *** p<0.01, ** p<0.05, * p<0.1.

Table-6. Results of determinants of functionings for the rural resident group.

Dependent	Being in work			Participating in social activity			Providing child care		
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Resources									
lnhousehold_assets	0.025***		0.013*	0.038***		0.033***	-0.009		-0.013**
	(0.007)		(0.007)	(0.007)		(0.007)	(0.006)		(0.006)
Owner of home	0.088**		0.081*	-0.042		-0.046	0.083**		0.080*
	(0.043)		(0.044)	(0.042)		(0.042)	(0.041)		(0.041)
Utilization ability									
BADL		0.253***	0.250***		0.040	0.036		0.028	0.029
		(0.025)	(0.025)		(0.025)	(0.025)		(0.025)	(0.025)
IADL		0.138***	0.136***		0.094***	0.089***		0.063***	0.065***
		(0.015)	(0.015)		(0.016)	(0.016)		(0.015)	(0.015)
Demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constants	3.267***	1.868***	1.682***	0.930***	1.302***	1.480***	0.986***	0.584***	0.577***
	(0.167)	(0.181)	(0.195)	(0.152)	(0.172)	(0.186)	(0.146)	(0.166)	(0.179)
Pseudo R2	0.1160	0.1413	0.1419	0.0145	0.0162	0.0185	0.0310	0.0327	0.0333
Observations	9,377	9,377	9,377	9,377	9,377	9,377	9,377	9,377	9,377

Notes: (i) Robust standard errors in parentheses. (ii) *** $p<0.01$, ** $p<0.05$, * $p<0.1$. (iii) Demographic variables in this table is from CHARLS (2015).

Table-7. Results of determinants of functionings for the urban resident group.

Dependent	Being in work			Participating in social activity			Providing child care		
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Resources									
lnhousehold_assets	-0.013		-0.018	0.029**		0.021*	0.008		0.003
	(0.012)		(0.012)	(0.011)		(0.011)	(0.012)		(0.012)
Owner of home	0.086		0.076	0.117		0.104	0.253***		0.244***
	(0.079)		(0.080)	(0.072)		(0.072)	(0.075)		(0.075)
Utilization ability									
BADL		0.108*	0.111*		0.127**	0.122**		-0.002	-0.004
		(0.060)	(0.060)		(0.052)	(0.053)		(0.053)	(0.053)
IADL		0.101**	0.105**		0.182***	0.175***		0.149***	0.145***
		(0.048)	(0.048)		(0.042)	(0.042)		(0.042)	(0.041)
Demographic variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	4.511***	3.639***	3.643***	0.954***	2.043***	2.208***	0.080	-0.283	-0.517
	(0.300)	(0.378)	(0.387)	(0.250)	(0.329)	(0.339)	(0.250)	(0.327)	(0.335)
Pseudo R2	0.1828	0.1862	0.1872	0.0155	0.0246	0.0263	0.0187	0.0198	0.0233
Observations	2,435	2,435	2,435	2,435	2,435	2,435	2,435	2,435	2,435

Notes: (i) Robust standard errors in parentheses. (ii) *** $p<0.01$, ** $p<0.05$, * $p<0.1$. (iii) Demographic variables in this table is from CHARLS (2015).

4.4. The Influence of Utilization Ability on Functionings for the Rural Group and Urban Group: Testing Results of H2-2

The results of the determinants of functionings for the rural elder group are summarized in Table 6. The results of the determinants of functionings for the urban elder group are summarized in Table 7. The main findings are as follows.

First, the BADL and the IADL positively and significantly affect the probability of being in work for the rural elder group and for the urban elder group (see Model 2 and Model 3 in Table 6 and Table 7), but it is more significant for the rural elder group than for the urban elder group. Second, the influences of the BADL is not statistically significant for the rural elder group but the IADL positively affects the probability of participating in social activity. Both the BADL and the IADL positively affect the probability of participating in social activity for the urban elder group. Third, the IADL positively affects the probability of providing child care for both the rural elder group and urban elder group but the influence of the BADL is not statistically significant. In general, these results support the H2-2 (Utilization ability affects functionings differ for the rural elder group and the urban elder group.).

5. CONCLUSIONS

This study employs an empirical method to investigate the determinants of utilization ability and its influence on Chinese elder functionings. It uses the capability approach, using three waves data from the China Health and Retirement Longitudinal Survey (CHARLS) from 2011 to 2015 and the bivariate ordered probit regression models.

The main findings are as follows. First, the influence of three factors: personal, social and environmental on utilization ability (BADL and IADL) are statistically significant, therefore the H1-1 (The utilization ability of Chinese elders is determined by conversion factors, including personal factors, social factors and environmental factors.) is supported. Second, the influence of these three factors on utilization ability differs for the rural elder and urban elder groups, therefore the H1-2 (There are inter-group differences in the determination of utilization ability between the rural elder group and the urban elder group.) is supported. Third, utilization ability (BADL and IADL) significantly affects the individual functionings including being in work, participating in social activity and providing child care. These results support the H2-1 (Utilization ability affects the Chinese elder functionings.). Fourth, the influence of the utilization ability on functionings differs for the rural elder group and urban elder group: the H2-2 is supported.

These results provide empirical evidence and support Sen's argument that along with resources, utilization ability plays an important role and should be considered in research on well-being. The statement by Robeyns (2005) that the determinants of utilization ability are composed of three kinds of conversion factors (personal, social, and environmental factors) is confirmed by the empirical study. The results provide new evidence about human diversity (inter-group differences) in the process of pursuing well-being.

These results have two important implications. First, it is indicated that public policies such as the public health care system may improve the BADL rather than the IADL. The current public health care policy only focuses on the basic needs of elders (BADL), whereas public support for more advanced needs (IADL) may not be adequate. Second, economic development seems likely to decrease individual utilization ability (BADL). More detailed research is needed about the Kuznets hypothesis (Kuznets, 1955) that income inequality increases with economic growth, and this increased income inequality may decrease the utilization ability of Chinese elders.

This study usefully employs an empirical study to investigate the determinants of utilization ability and its effects on Chinese elder well-being based on the CA. However, the study has three limitations. First, based on the questionnaires of the CHARLS, this study uses the BADL and the IADL as the indices of utilization ability. In the CA, utilization ability is mostly discussed from a theoretical perspective, the challenge for the future is how to operationalize, how to define utilization ability and measure it with empirical research. Second, Sen (1992) argues that in some cases, conversion variation problems are extremely complex, especially those relating to social issues,

such as life style or social capital in a community. A priority for the future is to explore the best way to develop methodologies to capture these complexities. Third, due to limitations of the data about well-being only three functionings (being in work, participation in social activity and providing child care) have been examined in this study. In order to better capture elder well-being, a broader range of functionings as well as the freedom aspects (capabilities) should be discussed and even more targeted and detailed surveys should be constructed in the future.

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Appendix Table-1. Joint frequency distribution of BADL and IADL of the elderly aged 60+.

BADL	IADL				
	1	2	3	4	Total (%)
1	3.07	0.18	0.28	0.78	4.31
2	1.63	0.38	0.16	0.60	2.77
3	4.90	0.88	2.65	6.77	15.20
4	11.32	1.33	2.81	62.26	77.72
Total (%)	20.92	2.77	5.90	70.41	100.00

Notes: (i) 1. I cannot do it.; 2. I have difficulty and need help; 3. I have difficulty but can still do it.; 4. I don't have any difficulty. (ii) Spearman's ρ = 0.4001 (p=0.000).

Appendix Table-2. Joint frequency distribution of BADL and IAD of the elderly aged 70+.

BADL	IADL				
	1	2	3	4	Total (%)
1	5.20	0.20	0.33	1.07	6.80
2	2.40	0.60	0.20	0.53	3.73
3	7.59	1.00	3.66	6.86	19.11
4	16.32	2.07	3.40	48.57	70.36
Total (%)	31.51	3.87	7.59	57.03	100.00

Notes: (i) 1. I cannot do it.; 2. I have difficulty and need help; 3. I have difficulty but can still do it.; 4. I don't have any difficulty. (ii) Spearman's ρ = 0.3743 (p=0.000).