



Gender differences in cognition in China and reasons for change over time: Evidence from CHARLS



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ABSTRACT

In this paper, we model gender differences in cognitive ability in China using a new sample of middle-aged and older Chinese respondents. Modeled after the American Health and Retirement Survey (HRS), CHARLS respondents are 45 years and older and are nationally representative of the Chinese population in this age span. Our measures of cognition in CHARLS rely on two measures that proxy for different dimensions of adult cognition – episodic memory and intact mental status. We relate these cognitive measures to adult health and SES outcomes during the adult years. We find large cognitive differences to the detriment of women that were mitigated by large gender differences in education among these generations of Chinese people. These gender differences in cognition are especially concentrated in the older age groups and poorer communities within the sample.

We also investigated historical, geographical, and cultural characteristics of communities to understand how they impact cognition. Economic development and environmental improvement such as having electricity, increases in wage per capita and green coverage ratio generally contribute to higher cognition ability. Women benefit more from the fruits of development – electricity and growth of green coverage ratio are conducive to lessening female disadvantage in cognition.

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Introduction

Cognitive skills are important for many decisions including those that involve health and financial outcomes. This is especially true for older populations in a country such as China where individuals often have to make important life decisions without the aid of professionals specializing in those topics and where levels of cognitive ability are not high. Since Chinese women mostly outlive their husbands and then must start making these decisions on their own, good cognition may be particularly important for them. Largely due to the absence of relevant data for China, the importance of cognitive skills for older populations in China has until recently received little scholarly attention¹.

In traditional low-income environments such as rural China, families may emphasize development of human capital skills broadly defined in favor of sons at the expense of daughters. This appears to be the case with standard measures of human capital

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¹ In a previous paper (Lei et al., 2011), we examined these cognition issues using the CHARLS pilot sample that only included people in two very distinct Chinese provinces—Zhejiang and Gansu.

such as schooling where large gender gaps in schooling exist in low-income settings (Parish and Willis, 1993). As per-capita incomes increase and education expands, education growth is much stronger for women than for men so that gender disparities begin to dissipate (Becker et al., 2010). In this paper, we investigate whether these gender disparities extend ever deeper to basic cognitive skills and how gender disparities in cognition change as economic development improves over time.

In this research, we use a new data source – the Chinese Health and Retirement Longitudinal Survey (CHARLS) – that is nationally representative of those ages 45 and over in the Chinese population in 2011. This data set contains detailed demographic, health, economic and cognitive information on individuals and families who are part of the study. CHARLS also contains contemporaneous and historical information on the communities in which CHARLS respondents live. Since many attributes of these communities may be related to the cognitive abilities of their older residents, they will be investigated to increase understanding of sources of gender bias in cognition.

This paper is divided into five sections. The next section describes the baseline CHARLS and the main cognition variables that will be used in our analysis. “Statistical models for estimating gender differences in cognition” outlines statistical models estimated

to identify the underlying reasons for gender differences in cognition in the Chinese context. Our main empirical findings relating individual and community level attributes to the cognitive ability of male and female respondents are in “Empirical findings”. The final section highlights our main conclusions.

Materials and methods

Data – CHARLS

The China Health and Retirement Longitudinal Study (CHARLS) is a nationally representative longitudinal survey of the middle-aged and elderly population (45+) in China along with their spouses, which includes an assessment of the social, economic, and health circumstances of community-residents². The ultimate purpose of CHARLS is to study the main health and economic adjustments to rapid population aging in China. The national baseline survey of CHARLS was conducted between June 2011 and March 2012 on 17,708 respondents. CHARLS respondents will be followed every 2 years using a face-to-face, computer-aided personal interview (CAPI). CHARLS has been harmonized with leading international research studies in the Health and Retirement model (HRS) to ensure adoption of best practice and international comparability of results.

CHARLS baseline data contains detailed information of respondents and their living spouses. The main questionnaire includes information on basic demographics, family, health status, health care, employment, and household economy (income, consumption and health).

The principal adult outcome variables span key adult health and SES outcomes. Adult health includes self-reported general health status, doctor diagnoses of chronic illnesses, depression, word recall, lifestyle and health behaviors (physical activities, smoking, drinking), subjective expectation of mortality, activities of daily living (ADLs), and instrumental activities of daily living (IADLs). Some health variables, such as weight and height, are obtained from health measurements conducted in the field.

Financial dimensions of SES in CHARLS exist in terms of income, wealth, and consumption expenditures. CHARLS separately measures income and assets at the individual as well as the household level depending on whether the items are separable amongst individuals. For example, wage income is measured at individual level while agricultural income is at household level since it is difficult for the respondent to separate agricultural income into each individual involved. CHARLS income components include wage income, self-employment income, agricultural income, pension income and transfer income, where wage income is collected for each of the household members, and transfer income separates government transfers specific to individuals from those to households.

Asset measurements collected at household level include housing, fixed assets, durables and land. Information on ownership status, value and characteristics of current residence, as well as other housing owned by the household, are recorded. Deposits and other investments are asked at the individual level, but debts are asked both for respondent and spouse, and for the household as a whole.

Household expenditures are collected in CHARLS since the existing literature has shown that expenditures are a much better measure of economic resources than income in developing countries (Strauss and Thomas, 2008). Depending on the frequency of purchases, consumption items are measured at weekly, monthly, and yearly frequencies to minimize recall bias. Food expenditure,

(expenditures on dining out, food bought from market, and values of home-produced food consumed) is collected on weekly basis. Food expenditures induced by inviting guests for important events are collected to better reflect household food expenditure per capita in a normal week. Monthly-based expenditures are those usually spent each month, including fees for utilities, nannies, communications, etc. Yearly-based items record expenditures occurred occasionally in a year, including traveling, expenditures on durables, and education and training fees.

Measurement in CHARLS – cognition

Based on similar concepts in HRS, there are two cognition measures used in this research. The first is memory *recall* based on a respondent's ability to immediately repeat in any order ten Chinese nouns just read to them (immediate word *recall*) and to recall the same list of words 4 minutes later (delayed *recall*). Following McArdle et al. (2007) and Lei et al. (2012), we form an *episodic memory* measure as the average of immediate and delayed recall scores. *Episodic memory* is a necessary component of reasoning in many dimensions. Our second cognitive measure is based on some components of the mental status questions of the Telephone Interview of Cognitive Status (TICS) battery established to capture intactness or *mental status* of individuals. In CHARLS, mental status questions contain the following items – serial 7 subtraction from 100 (up to five times) and whether the respondent needed any explanation or used an aid such as paper and pencil, naming today's date (month, day, year, and season), the day of the week, and the ability to redraw a picture shown to him/her. Answers to these questions are aggregated into a single *mental status* score that ranges from 0 to 11.

Table 1 presents mean levels of our two measures of cognitive ability separately for Chinese men and women stratified by age using samples of those providing their own responses³. Across all ages, Chinese men remember about two-tenths of a word more than their female counterparts – a differential in favor of men that exists in all age groups in this table. The male cognitive advantage is even larger for intact mental status where Chinese men achieve a score more than a full point above that of Chinese women.

For both men and women, each cognitive measure declines sharply with age, a decline likely a combination of cohort and aging effects. Prior research has suggested strong normative age declines in most cognitive functions reflecting different aspects of adult cognitive profiles (Levy, 1994; McArdle et al., 2002). In a country such as China, which has experienced rapid economic development during the last thirty years with impressive increases in schooling for each new generation, one would also anticipate significant cohort effects in improved cognition. We come back to this issue of cohort and aging effects below. There is a strong indication for both mental intactness and episodic memory of smaller gender differences among younger cohorts in Table 1, suggesting that there may be gender differential cohort or aging effects or both on cognition.

Education

An important dimension of socioeconomic status (SES) in any cognition analysis is education, which is well known to be directly associated with increased cognitive ability in several dimensions

² For a detailed description of the CHARLS survey, see Zhao et al. (2012), “Cohort Profile: The China Health and Retirement Longitudinal Study,” *International Journal of Epidemiology*, forthcoming, published ahead of print December 12, 2012: <http://ije.oxfordjournals.org/content/early/2012/12/12/ije.dys203.long>.

³ Sample sizes in Table 1 and subsequent analysis tables are smaller than for the full CHARLS samples because respondents moved since their time and place of birth (2,311 observations), they were less than 45 years old (298 observations), or there were missing values on our two cognition variables (2,073 observations). We re-estimated our models in Tables 4 and 5 below including those who moved since birth and those less than age 45 and essentially found the same results as those presented in Tables 4 and 5. In addition, the third and sixth models in Table 4 lose about 1,900 observations since height was not measured for these respondents. Once again, this deletion does not appear to affect the results significantly.

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