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Cognitive Ability: Social Correlates and Consequences in Contemporary China*

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Abstract

In this paper, we describe the measurement of cognitive ability in the China Family Panel Studies (CFPS), especially for verbal skill, mathematical skill, memory, and quantitative reasoning. The available CFPS cognitive measurements can be useful for studies on the importance of cognitive ability in many substantive domains of interest. Using the CFPS data, we show that measures of cognitive ability are clearly related to key demographic and social characteristics, such as age, gender, education, and *hukou* status. We also illustrate how cognitive ability influences school performance and deviant behaviors among children, income and political capital among adults, and daily functioning among the elderly.

Introduction

Cognitive ability has long been considered an important factor affecting individuals' lives. Its conceptualization varies across different social science disciplines. In psychology, cognitive ability refers to aptitude for carrying out mental processes, such as problem solving, adaptation, comprehension, reasoning, knowledge acquisition, abstract thought, and making connections (Flavell 1999). In education, cognitive ability is considered a foundation for learning (Reif 2008). In economics, cognitive ability has been hypothesized to be one of the most important unobserved variables in human capital models for productivity and thus earnings (Heckman and Mosso 2014). Sociology has had a longstanding interest in the association between cognitive ability and socioeconomic outcomes (Farkas 2003; Marks 2013).

Empirical research has shown that certain cognitive skills are important in determining socioeconomic outcomes that shape overall well-being over the life course. A large body of research shows that cognitive ability is strongly associated with children's school performance (Cain, Oakhill, and Bryant 2004; Engle et al. 1999), behavior outcomes

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(Dilchert et al. 2007; Finn and Hall 2004; Guerra and Slaby 1990; McGloin and Pratt 2003). Early childhood cognitive ability has also been shown to have a long-term effect on socioeconomic status in adulthood (De Graaf, De Graaf, and Kraaykamp 2000; Näslund and Schneider 1991).

In addition, cognitive ability plays a much greater role than socioeconomic background in multiple educational outcomes, including student performance, university entry and completion, and overall educational attainment (Jencks et al. 1979; Marks 2013). Net of education, cognitive ability is also significantly associated with labor market outcomes: participation in the labor market (Kirsch 1993), occupational attainment (Herrnstein and Murray 1994) and earnings (Griliches 1979; Griliches and Mason 1972).

In the last two decades, research has shown a strong health return to cognitive ability (Gottfredson and Deary 2004; Schnittker 2005). Many studies have documented cognitive declines with age (Craik and Salthouse 2011; McArdle et al. 2002), and such declines have been linked to physical disabilities and problems of independent living, especially among older people (Moritz et al. 1995; Njegovan et al. 2001).

Notwithstanding all these findings, many researchers have overlooked this important factor in their empirical work on human development due to lack of appropriate data measuring cognitive ability. Although this is true for research in almost all countries, it is particularly true for studies in China. Until recently, little research attention has been paid to cognitive ability in contemporary Chinese society.

Past surveys in China have collected limited data on cognitive ability. In a 1996 survey, Life Histories and Social Change in Contemporary China (LHSCC), Donald Treiman and his colleagues (Treiman and Walder 1996) were the first to attempt to collect cognitive ability data in China in a nationally representative survey. Following U.S. General Social Survey (GSS) measurement with the Wordsum Vocabulary Test, LHSCC used a 10-item vocabulary test to measure Chinese adults' verbal skills. The Study of Family Life in Urban China, also referred to simply as the "Three-City Survey" (Xie and Pan 2010), was a 1999 survey of urban residents in three large Chinese cities: Shanghai, Wuhan, and Xi'an. The Three-City Survey also developed a Chinese language version of Wechsler's Similarities test to capture Chinese urban residents' abstract verbal reasoning skills. Compared to the Wordsum Vocabulary test, the test in the Three-City Survey was intended to assess the respondent's logical reasoning ability. However, this survey was regional.

The China Family Panel Studies (CFPS) has developed comprehensive cognitive measures for a nationally representative sample of people aged 10 and above (Xie and Hu 2014). In this paper, we use this new data source to explain the measures, present basic demographic and social correlates of the measures, and explore the roles played by cognition across the life course. The paper has four sections. After this brief introduction, the second section discusses the measurements of cognitive ability used in the 2010 baseline and 2012 follow-up surveys. The third section describes the variations in the cognitive measures by gender, age, and other social characteristics, and the fourth section presents evidence that cognitive ability has significant socio-economic consequences over the entire life course. Throughout

the analyses, we applied appropriate weights to adjust for sampling design and nonresponses for both the 2010 and 2012 waves of the CFPS data (Xie and Lu 2015).

Cognition Measurement in the CFPS

The CFPS has developed two sets of cognitive measures and used them alternatively in different years. Under this design, each set of cognitive data is collected every four years. The current plan is to keep this rotating scheme into the future. In CFPS 2010, vocabulary and numeracy measures were used to assess respondents' verbal and mathematical achievements, as the test items are drawn from the standard curriculums in primary and secondary schools. Therefore, these measures represent "crystallized intelligence," which is referred to as acquired knowledge through learning, experience, and education (Cattell 1987 word recalls, and the second was a number series test of numerical reasoning. These 2012 cognitive measures represent what is often referred to as "fluid intelligence," the ability to reason abstractly and to solve problems (Cattell 1987). Fluid intelligence is often considered to be independent of acquired knowledge (Ackerman 1996).

Vocabulary

The 2010 vocabulary test consists of thirty-four Chinese characters drawn from the language textbooks used in primary and secondary schools and sorted in ascending order of difficulty. The test seeks to measure one's vocabulary by how difficult a character he/she can recognize. To make the test more efficient, respondents were assigned to one of three entry points, based on their self-reported highest level of education. Specifically, those with primary school educations or less started with the first character (i.e., the easiest one), junior middle school graduates started with the ninth character, and senior middle school graduates and those with more education started with the twenty-first character. Respondents were asked to recognize the increasingly more difficult characters one by one until they failed to recognize three consecutive characters. The final test score would be the rank order of the last character that a respondent correctly recognized. If a respondent did not know any character administered, his/her test score would be assigned as the rank order of the character preceding the entry point.

Mathematics

The 2010 numerical test consists of 24 mathematical problems, drawn from textbooks used in primary and secondary schools and sorted in order of increasing difficulty, with two items corresponding to the math materials taught in each grade. Again, respondents were assigned to one of three entry points, based on their highest level of education. Those with primary school educations or less started with the first problem (i.e., the easiest one), junior middle school graduates started with the fifth problem, and senior middle school graduates and those with more education started with the thirteenth problem. The test continued until a respondent failed three consecutive problems. The test score was assigned using the same rank order rule as that in the vocabulary test.

Memory

Two word recall tasks (immediate recall and delayed recall) were used to assess respondents' short-term memory and long-term memory in the CFPS 2012.

Immediate Word Recall

Short-term memory refers to the ability to process information and store it simultaneously. Respondents were read a randomly selected list of 10 simple nouns (e.g., rice, river, doctor, etc.), then immediately asked to recall as many of those words as possible in any order.

Delayed Word Recall

After 31 questions concerning subjective wellbeing, or approximately 5 minutes of delay, the respondents were again asked to recall as many of the original words as possible.

For both the immediate and delayed word recall tasks, the final test scores were assigned as the numbers of words that the respondents recalled correctly, ranging from 0 to 10.

Respondents were unable to recall any words received a score of 0, while those who refused to take the tests were assigned missing values.

Number Series Test

This is a two-stage adaptive test in which each stage involves 3 test items. Each test item is a series of numbers with a number missing and respondents are asked to fill in the missing number that fits the numerical pattern. In the first stage, all the respondents were asked the same first three items, which consist of an easier item, a moderately difficult item, and a more difficult item. Based on the number of correct items in the first stage, respondents were then asked one of four sets, each with three items, at different levels of difficulty.

We computed the number series test scores in two ways: (1) a Guttman scale with a range of 0–15; and (2) an interval scale W-score developed from a Rasch item response theory (IRT) model. The first approach assumes that the items can be arranged ordinally by difficulty. The second approach attempts to take into account which sets of items were asked and the number of items answered correctly in each set. This score is standardized into an interval scale so that a score of 500 represents the average performance of a 10-year-old child and the difference in performance represented by a given difference in scores is the same, regardless of where the scores fall on the scale. For example, the difference in performance between two individuals scoring 480 and 490 is the same as that between two individuals scoring 510 and 520. These desirable features make it the recommended score to use when analyzing results of the number series test.

Some respondents with little education demonstrated considerable difficulty understanding the introductory examples of the number series test and hence refused to take the test.

Descriptive statistics by education and *hukou* status indicate that the respondents with the highest nonresponse rates were rural, less educated people, especially illiterates. Thus, the unadjusted number series test score is only available for a subsample with better education compared to the full sample. We adjusted for the non-response in the number series test by

inversely weighting the data by the propensity of participation (see Xu and Xie 2015 for more information on number series test weighting and scoring).

Correlates of Cognition in China

Cognitive ability is considered by some scholars to be an inherited factor that influences socioeconomic achievement, in contrast with environmental factors, such as socioeconomic background (Herrnstein and Murray 1994). However, researchers of intelligence have found that cognitive ability is substantially influenced by environmental factors (Marks 2013; Nisbett 2009).

Various studies have found a gain of two to four IQ points per year of education (Gustafsson 2008; Herrnstein and Murray 1994; Sternberg, Grigorenko, and Bundy 2001; Winship and Korenman 1997). IQ is usually referred to as “general cognitive ability” (the *g* factor), and is usually broken down into two sub-dimensions, fluid intelligence and crystallized intelligence. Fluid intelligence is most closely linked to biological and physical processes while crystallized intelligence is based on formal education and informal experience (Cattell 1987). It is reasonable to expect that crystallized intelligence will be more highly correlated with education than fluid intelligence.

Many studies have described the age differences and age changes in cognition across the life span. It seems clear that cognitive ability peaks in young adulthood and then declines steadily with increasing age and that fluid intelligence declines more quickly than crystallized intelligence (Craik and Salthouse 2011). Significant gender differences in cognitive ability are also found in the literature (Halpern 2011). However, the direction of the gender difference depends on measures of cognitive ability, as women usually perform better than men on verbal ability and memory tests, while men perform better than women on mathematical and spatial ability tests.

In this section, we examine the correlates of cognitive ability, such as education, age, and gender in evaluating the quality of the cognitive measures in the CFPS. As urban-rural division plays an important role in generating inequality in China, we also explore the urban-rural gaps in cognitive measures. We first describe the distribution of cognitive skills as functions of education, age, gender, and *hukou* status, then apply multivariate regressions to estimate the partial effects of these factors on cognitive measures.

Education

Figures 1 and 2 present mean scores on the four cognitive tests in the 2010 and 2012 waves of the CFPS by education level. These two figures show that cognitive test scores are clearly related to education. We observe a monotonic and large increase in cognitive ability with higher education levels. As expected, vocabulary and math test scores, measuring crystallized intelligence, are more highly correlated with education than memory test scores and number series test scores, measuring fluid intelligence.

The interpretation of these strong positive correlations between cognitive ability and education is somewhat ambiguous. Sternberg et al. (2001) considered this correlation a

reciprocal relationship between ability and education: higher ability increases educational achievement, and higher educational achievement increases ability test scores.

Age and Gender Distribution in Cognition in China

In Figures 3 to 7, we present smoothed age profiles, using Lowess non-parametric regressions, for the two sets of cognitive ability measurements, stratified by gender and urban-rural *hukou* status.

Figures 3 and 4 show that the 2010 vocabulary and math scores first increase with age in childhood and adolescence and then decline with age in adulthood. Given the cross-sectional nature of the data, the decline is likely attributable to a combination of cohort and aging effects. A prior U.S. study has suggested strong normative age declines in most cognitive functions (McArdle et al. 2002). In the Chinese context, however, these declining trends are more likely to result from cohort difference in educational attainment: the younger birth cohorts are on average much better educated than the older ones. Crystallized intelligence captures not only certain cognitive functions that are independent of education, but also knowledge acquired from schooling. Therefore, it is not surprising that elderly respondents in the 2010 survey scored lower on vocabulary and math tests than younger respondents given the latter's increased educational attainment in recent decades (Treiman 2013; Zhou, Moen, and Tuma 1998).

Gender differences in vocabulary and math scores are also notable and vary with age. Girls score higher than boys on the vocabulary test but lose their advantage with age, with adult women's scores being lower than adult men's. As for math tests, there is almost no discernible gender difference at early ages (around age 10), but a gender divergence in favor of males begins to develop with age. A male advantage develops much earlier in rural China than in urban China. Given the pattern of gender and age interaction, the gender gaps in both math and vocabulary scores are fairly large at later ages (roughly after age 50). Again, caution should be exercised in interpreting the gender-age interaction pattern. The increasing male advantage with age partly reflects the social trend in recent Chinese history that women's educational attainment relative to men's has significantly improved among recent birth cohorts (Lavelly et al. 1990; Treiman 2013; Li and Xie 2013).

There is also a clear rural-urban disparity in that urban respondents generally score much higher than rural respondents, for any age and gender combination. In addition, there is an interaction between rural-urban status and gender in that gender disparity develops at a much younger age for rural residents than for urban residents, reflecting greater gender equality in urban China (Wu 2011). However, the gender gap is larger at old ages among urban than among rural respondents.

We now turn to the results on measures of fluid intelligence in the 2012 data, shown in Figures 5–7. For both men and women, short-term and long-term memory measures decline sharply with age. Although we do not have the appropriate data to disentangle the effects of age and cohort, we interpret the decline more as an aging effect, as fluid intelligence is more independent of education than crystallized intelligence is. Similar to earlier results on crystallized intelligence, we also see a pattern of gender-age interaction: cognitive abilities

favor females at early ages but males at later ages. This result differs from the Western literature reporting females' memory superiority at any age (Allen 1927; Chamorro-Premuzic 2007; Pearman 2009). As the CFPS memory tests may require a certain type of verbal comprehension that correlates with education and there is a gender-cohort gradient in schooling, the lower memory scores among older females may thus partly reflect their educational disadvantage. Among urban residents, women have higher short-term and long-term memory abilities than men before their 70s. Among rural residents, the crossover of gender difference in memory tests occurs around age 30, possibly due to a greater education gender gap in rural areas.

Figure 7 shows a modest rise in numerical test scores in youth and a gradual decline throughout adulthood. The gender gap in favor of men on the number series test scores persists at all ages and indeed increases with age. On the other hand, urban respondents scored much higher than rural respondents.

In this section, we have shown a clear overall age pattern on measured cognitive abilities. Both crystallized and fluid intelligence rise through youth until early adulthood and then decline over all the adult years, which is consistent with the literature (McArdle et al. 2002). Because crystallized intelligence declines more slowly than fluid intelligence with age (McArdle et al. 2002), we attribute the pattern of a sharp decline in measured crystallized intelligence in the CFPS to cohort differences in educational attainment.

The gender differences in cognitive measures in the CFPS are also consistent with findings from earlier research in other countries. Females score higher on verbal ability and memory tests, while males do better on numerical tests (Halpern 2011; Nichols 1978), at least at early ages. However, the reversal in the gender difference in measured verbal ability and the increasing gender difference in memory ability are attributable to much larger gender education disparities for earlier than for later cohorts. Finally, our results highlight a sizable rural-urban disparity in cognitive test scores, reflecting urban-rural inequality in China.

Regression Analysis

Different factors, such as age, education, gender, and *hukou* status, are correlated with each other and thus may jointly contribute to the determination of cognitive functioning. We thus wish to separate the unique contributions of these factors in a regression analysis with cognitive functioning as the dependent variable. We present the estimated regression coefficients of these factors on each measure of cognitive functioning in Table 1.

In the multivariate regression analysis, socio-demographic factors are shown to have significant and large effects on cognitive measures. As expected, education is positively correlated with each measures of cognitive performance, with a one-year increase in schooling attainment increasing the vocabulary and mathematical test scores by more than one; such an effect size would be relatively larger than for memory test scores.

The negative and significant estimates for age indicate that the age-related cognitive decline existed in many cognitive domains after controlling for gender, education, and *hukou* status. As shown in Table 1, men perform better than women on mathematical tasks but worse on

memory tasks. However, women still perform much worse than men on vocabulary tests even net of education, probably due to the increased gender inequality among older people. Urban *hukou* status is identified as a statistically significant positive factor for cognitive performance. Urban residents perform much better than rural residents on all cognitive tasks.

Table 1 presents the accounted variance for each cognitive measure. More than 60% of the variances in vocabulary and mathematical test scores are explained by age, education, gender, and *hukou* status. The accounted variances decline to almost 30% for memory scores and 21% for number series scores. Overall socio-demographic factors explain the variance in cognitive functioning well and the explained variance is much larger for crystallized intelligence than for fluid intelligence.

These results indicate that age, education, gender, and *hukou* status are strong predictors of cognitive performance. Our replication of correlates found in other studies contributes to the construct validity of the CFPS's cognitive measures.

To compare the average gender differences in cognition before and after controlling for other social and demographic correlates, we computed Cohen's *d* statistic, i.e., rescaled in standard deviation, as an index of the gender difference in cognitive skills from the regression analysis. Negative values of *d* indicate that the average cognitive scores for females are less than the average test scores for males.

Table 2 presents the unadjusted and adjusted values of *d* for all the cognitive skills. The unadjusted measures of gender differences were obtained from the baseline models with gender as the sole covariate. The adjusted average gender differences were obtained from the full models that included all of the social and demographic correlates. The results show that gender differences in cognition are significantly influenced by other social and demographic factors. The magnitude of the mean gender difference in crystallized intelligence declines from 0.3 to 0.1 after controlling for education, age, and *hukou* status. Generally speaking, even a 0.3 standard deviation is a small effect size according to Cohen's criteria (Cohen 1977). However, previous research has established that the average gender difference in cognition is small (Hyde 1981), so a 0.1 standard deviation is a sizeable effect of gender difference in cognition.

The magnitude of the effect size of fluid intelligence increased after we controlled for other correlates. It is important to note that the gender differences in memory scores favor females and become statistically significant after adjustment. This result indicates that Chinese women's advantage in memory has been counterbalanced by their educational disadvantage in older cohorts.

Cognition and Socio-economic Status: A Life-course Perspective

Sociologists have resorted to modernization theory to hypothesize that as societies become modernized, the influence of socioeconomic background and other ascribed attributes on education and subsequent socioeconomic outcomes declines (see Blau and Duncan 1967; Treiman 1970; Herrnstein and Murray 1994). Societies become more meritocratic, educational attainment becomes more strongly associated with cognitive ability than

socioeconomic background, and achievement in education becomes a much stronger determinant of occupation and earnings than ascribed attributes (see Grusky and DiPrete 1990; Marks 2013; Herrnstein and Murray 1994).

In *The Bell Curve*, Herrnstein and Murray (1994) argue that in a technologically advanced society, such as the U.S., human intelligence is a better predictor of many important socioeconomic outcomes, including earnings, unemployment, welfare, poverty, and crime than an individual's socioeconomic family background. They maintain that cognitive ability is becoming increasingly important in social stratification. Though Herrnstein and Murray's main thesis that intelligence has become much more important over time has been disputed, a large body of empirical research has documented the significant role of cognitive ability in predicting important life outcomes. In this section, we use short-term and long-term memory test scores as proxies for cognitive ability to demonstrate that cognitive ability has a powerful impact on children's development, adults' socioeconomic success, and elders' health status.

Children's Language Development

Childhood is a period of remarkable cognitive development. Cognitive ability is not only an outcome variable but also a predictor of developmental outcomes during this stage (Cain et al. 2004; Dilchert et al. 2007; Engle et al. 1999; Finn and Hall 2004; Guerra and Slaby 1990; McGloin and Pratt 2003). In adulthood, early childhood skills have also been shown to be predictive of SES (De Graaf et al. 2000; Näslund and Schneider 1991). In this subsection, we analyze a subsample of children aged 10 to 15 in the CFPS to explore the impact of cognitive ability on children's language development and deviant behaviors.

Memory capacity has been known to be associated with language development, as it is a precondition for achieving the proper use of a language (Baddeley 2003). Using longitudinal data from 92 German children, Näslund and Schneider (1991) found that memory capacity measured in kindergarten and first grade predicts performance on reading comprehension during second grade. Cain, Oakhill, and Bryant (2004) also reported relations between working memory capacity and reading comprehension skills in children aged 8, 9, and 11 years. Since memory capacity is important for language skills, we can assume a positive association between memory score and language development level.

The CFPS asked respondents to rate their English language proficiency: "How do you rate your English language proficiency level?" The response is a 5-point Likert scale ranging from very bad (=1) to very good (=5). After controlling for age, grade, gender, and *hukou* status, long-term memory score shows a statistically significant positive influence on self-rated English proficiency level (see Table 3), although the short-term memory score has no significant effect (results not shown). This implies that long-term memory is more important for foreign language acquisition than short-term memory.

Deviant Child Behavior

The importance of cognitive ability for children's behavior is increasingly being recognized, because development of prosocial behavior is thought to require cognitive resources (Moore, Barresi, and Thompson 1998). In recent years, empirical studies have yielded clear evidence

supporting this hypothesis. It has been reported that measured cognitive test scores are significantly associated with children's problematic behavior, including alcoholism (Finn and Hall 2004), aggression in adolescent offenders (Guerra and Slaby 1990), delinquent behavior among inner city adolescents (McGloin and Pratt 2003), and counterproductive behavior in the workplace (Dilchert et al. 2007). Building on this work, we thus hypothesize that childhood cognitive skills affect deviant behavior among Chinese children and adolescents. In this subsection, we investigate this hypothesis with data from the CFPS child subsample.

Information about deviant behavior among children and adolescents is collected in the CFPS, including smoking and drinking alcohol. As teenage romance is considered undesirable in Chinese culture, many Chinese secondary schools have introduced prescriptive rules against it. From the perspective of schools and parents, teenage romantic relationships are a form of deviance. Thus, in our analysis, whether a child respondent had been in a romantic relationship is treated as an outcome indicator.

The results shown in Table 3 indicate that high memory ability reduces the likelihood of smoking, drinking, or being in a romantic relationship. One unit increase in the short-term memory test score decreases the odds ratio for deviant behavior by 14.9% ($1 - \exp(-0.161)$), and for involvement in a teenage romantic relationship by 9.5% ($1 - \exp(-0.100)$). The results provide solid evidence that children's cognitive ability is significantly associated with deviant behaviors.

Adulthood Income

Education has long been recognized as an important predictor of an individual's earnings. However, the observed relationship between education and earnings, quantified through such methods as regression analysis of survey data, may overstate the contribution of education to earnings because it may be confounded by the correlation between education and ability (Chamberlain and Griliches 1975; Griliches 1977). One approach deals with the issue of potential ability bias by including explicit measures that proxy for unobserved ability. Following this approach, researchers have reported an upward bias of education effect when ability is ignored (Card and DiNardo 2002; Griliches 1979; Griliches and Mason 1972).

In this subsection, we examine whether cognitive skill contributes independently to earnings in the Chinese labor market. Using an adjusted human capital earnings equation introduced by Xie and Hannum (1996), we estimate the return to cognitive ability for urban adults aged 18 to 55 working full time throughout the year by including short-term memory in our earnings regression.

Figure 8 plots the predicted logged earnings by short-term memory score after controlling for the other covariates. The results show that short-memory test score has a significant effect on earnings, for both urban males and females. Because of the sizable correlation between cognitive ability and educational attainment and the importance of education for earnings, the effect of cognitive ability is relatively small (3.4%), shown in Table 3, but it remains an independent determinant of income.

Party Membership

The economic return to Communist Party membership has been of primary interest in studies of social stratification in state socialist societies. The earning advantages of party members may persist in the reform era for several reasons. First, from a political capital perspective, party membership can serve as a proxy for political credentials which receive certain institutional returns in the form of monetary resources (Bian and Logan 1996; Zhou 2000). Second, party members may be embedded into a superior social network so that they can better secure advantageous positions in the post-socialist labor market (Hankiss 1990; Hanley, Yershova, and Anderson 1995; Szelenyi and Kostello 1996). Third, party members may be a highly self-selected group in that they are more outstanding in unobservable characteristics such as ambition, opportunism, and cognitive ability compared to nonmembers. Therefore, party members should continue to do well in the post-reform era (Gerber 2000, 2001).

To adjudicate between the self-selection effect and institutional advantage, several studies have examined the party recruitment process and reported an important change in the selection criteria for Party membership since the economic reform: the declining role of family class origin and the increasing emphasis on educational credentials (Bian, Shu, and Logan 2001; Walder, 1995; Walder, Li, and Treiman 2000). These results supported the ability selection hypothesis concerning Party membership. However, due to lack of appropriate data, this hypothesis has not received empirical examination before. In this subsection, we use short-term memory scores to test the importance of cognitive ability in the recruitment of Party members. We are aware that cognitive ability was assessed during the 2012 CFPS survey, after respondents who were party members had already joined the party. Here, we are assuming that cross-person differences in cognitive ability are relatively fixed and are not affected by the event of joining the Party.

We use short-term memory test score as the proxy for cognitive ability to predict the probability of being selected for party membership among adults aged 18 or above in the CFPS, as fluid intelligence is more stable across the life span than crystallized intelligence. Figure 9 plots gender-stratified predicted probabilities of party membership based on a multivariate logistic regression analysis. For both men and women, short-term memory is positively associated with party membership. To be more specific, one unit increase in the short-term memory test score increases the odds of being a party member by 5.8% ($\exp^{(0.056)} - 1$) among men, and by 28.4% ($\exp^{(0.25)} - 1$) among women (see Table 3). The gender difference in the effect indicates that cognitive ability is more important for women than for men as criteria for party members' selection.

ADL Disabilities among elderly adults

In the last decade, more and more researchers have begun to suggest that cognitive ability may predict health outcomes (Baker et al. 1998; Gazmararian et al. 2003). Using the cumulative 1974–2000 General Social Survey, Schnittker (2005) found a significant and strictly monotonic association between verbal ability and self-rated health. Gottfredson and Deary (2004) argued that cognitive ability is important in explaining perpetuation of health disparities. Moreover, cognitive ability is correlated with objective health outcomes. Using

the British 1946 cohort, Richards, Stephen, and Mishra (2010) found childhood cognition to be related to smoking, physical exercise, healthy dietary choices, obesity, hypertension and noninsulin-dependent diabetes, factors linked to risk of cardiovascular disease in midlife.

It is also well known that limitations in Activities of Daily Living (ADLs) usually accompany cognitive impairment in the elderly (Moritz, Kasl, and Berkman, 1995), due to the association between cognition decline and physical function decline in older persons (Njegovan et al. 2001). In this subsection, we will use self-rated ADL as an outcome and a test of memory as an indicator of cognitive ability to examine the relationship between cognitive ability and health. The ADL measurement contains questions about difficulty and needing assistance in 7 activities, including outdoor activities, taking a bus, eating, etc.

We created a dichotomous variable indicating whether a respondent needed help with any single activity (=1) or not (=0). We fit a logistic regression to this measure using short-term memory as an indicator of cognitive ability. Figure 10 plots the predicted probabilities of not living independently for elderly people, after controlling for the other covariates. Short-term memory ability significantly decreases the likelihood of not living independently, or increases the likelihood of living independently, for both elderly men and elderly women. The significant interaction between gender and short-term memory test score in Table 3 indicates that the effects of short-term memory on ADL independence differ between elderly men and women. The odds ratio of ADL disability decreasing by one score of short-term memory is 9.4% ($1 - \exp^{(-0.099)}$) among elderly men, and 15.7% ($1 - \exp^{(-0.171)}$) among elderly women. The interaction effect between gender and short-term memory are such that the effect of cognitive ability in increasing independence for elderly women is higher than for elderly men.

Discussion and Conclusion

Cognition is an important component of human development and correlates strongly with socioeconomic status, behavioral outcomes, and health outcomes. Empirical research on the importance of cognition to human development in China has been hindered by a scarcity of population-based requisite data. The CFPS collected nationally representative data on cognitive abilities in contemporary China by first developing its own cognitive measures in 2010. To allow comparability and reduce respondents' potential learning resulting from the repeated exposure to the same measures, the CFPS adapted cognitive measures from the Health and Retirement Studies (HSR) in its 2012 follow-up survey. This study assesses the data quality and provides preliminary evidence that these measures implemented in the CFPS can enhance researchers' ability to study the roles of cognition in affecting life chances in contemporary China.

Through a variety of descriptive and regression analyses, we have established the validity of the CFPS cognitive measures. First, the cognitive measures correlate with demographic and socioeconomic factors such as age, gender, and education, in ways consistent with previous Western research using different measures of cognitive functioning. Consistent with existing theories (Farkas 2003; Flavell 1999; Heckman and Mosso 2014; Marks 2013; Reif 2008), cognitive abilities are predictive of human development outcomes across the life span. Using

memory test as an example, we have demonstrated that, net of other factors, cognitive functioning is significantly associated with school performance and deviant behaviors in childhood, income and political capital in adulthood, and limitations in daily activities in older people.

In addition to assessing cognitive measures as survey instruments, our analysis has also yielded some interesting new substantive findings. To the best of our knowledge, for example, this is the first study that documents rural-urban disparities in cognitive abilities in a nationally representative sample. We find that, despite the loosened institutional restriction on domestic migration, *Hukou* status remains a strong and independent predictor of cognitive functioning with a notable urban advantage. This finding has very important policy implications regarding the Chinese government's efforts to reduce rural-urban inequalities. Unlike education, poverty, or disease, cognitive abilities past childhood are unlikely to be modified by external forces. That is, effective public interventions to reduce urban-rural cognitive disparities may require intervention in childhood.

We expect that the collection and public release of the CFPS cognitive data will greatly facilitate research efforts to address a variety of significant and long-standing scientific questions. For example, in combination with a wide range of socioeconomic and psychological indicators collected in the CFPS, future researchers will be in a better position to assess the relative importance of different factors in generating and sustaining social inequalities over the life course and disentangle the inter-correlated mechanisms linking socioeconomic status to other developmental outcomes. Because the current design is to repeat the same instruments administered in 2010 and 2012 in subsequent follow-up surveys, future research can also document trends, both over time and across the life course, of cognitive abilities in the Chinese population and investigate social determinants of life course trajectories of cognitive functioning. In short, the new cognitive data in the CFPS are likely to herald a new research agenda on the relationship between cognition and social outcomes in contemporary China.

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References

- Ackerman, Phillip L. A Theory of Adult Intellectual Development: Process, Personality, Interests, and Knowledge. *Intelligence*. 1996; 22(2):227–257.
- Allen, Chauncey N. Studies in Sex Differences. *Psychological Bulletin*. 1927; 24(5):294–304.
- Baddeley, Alan. Working Memory and Language: An Overview. *Journal of Communication Disorders*. 2003; 36(3):189–208. [PubMed: 12742667]
- Baker, David W.; Parker, Ruth M.; Williams, Mark V.; Scott Clark, W. Health Literacy and the Risk of Hospital Admission. *Journal of General Internal Medicine*. 1998; 13(12):791–798. [PubMed: 9844076]
- Bian, Yanjie; Logan, John R. Market Transition and the Persistence of Power: The Changing Stratification System in Urban China. *American Sociological Review*. 1996; 61(5):739–58.

- Bian, Yanjie; Shu, Xiaoling; Logan, John R. Communist Party Membership and Regime Dynamics in China. *Social Forces*. 2001; 79(3):805–841.
- Blau, Peter M.; Duncan, Otis Dudley. *The American Occupational Structure*. New York: Wiley; 1967.
- Cain, Kate; Oakhill, Jane; Bryant, Peter. Children's Reading Comprehension Ability: Concurrent Prediction by Working Memory, Verbal Ability, and Component Skills. *Journal of Educational Psychology*. 2004; 96(1):31–42.
- Card, David; DiNardo, John E. NBER Working Paper No. 8769. Cambridge, MA: National Bureau of Economic Research; 2002. Skill Biased Technological Change and Rising Wage Inequality: Some Problems and Puzzles.
- Cattell, Raymond B. *Intelligence: Its Structure, Growth, and Action*. Amsterdam: North-Holland; 1987.
- Chamberlain, Gary; Griliches, Zvi. Unobservables with a Variance-components Structure: Ability, Schooling, and the Economic Success of Brothers. *International Economic Review*. 1975; 16(2): 422–449.
- Chamorro-Premuzic, Tomas. *Personality and Individual Differences*. Liphook, UK: Blackwell Publishing; 2007.
- Cohen, J. *Statistical power analysis for the behavioral sciences*. Routledge; 1977.
- Craik, Fergus IM.; Salthouse, Timothy A. *The Handbook of Aging and Cognition*. New York: Psychology Press; 2011.
- De Graaf, Nan Dirk; De Graaf, Paul M.; Kraaykamp, Gerbert. Parental Cultural Capital and Educational Attainment in the Netherlands: A Refinement of the Cultural Capital Perspective. *Sociology of Education*. 2000; 73(2):92–111.
- Dilchert, Stephan; Ones, Deniz S.; Davis, Robert D.; Rostow, Cary D. Cognitive Ability Predicts Objectively Measured Counterproductive Work Behaviors. *Journal of Applied Psychology*. 2007; 92(3):616–627. [PubMed: 17484545]
- Engle, Randall W.; Tuholski, Stephen W.; Laughlin, James E.; Conway, Andrew RA. Working Memory, Short-term Memory, and General Fluid Intelligence: A Latent-variable Approach. *Journal of Experimental Psychology: General*. 1999; 128(3):309–331. [PubMed: 10513398]
- Farkas, George. "Cognitive Skills and Noncognitive Traits and Behaviors in Stratification Processes." *Annual Review of Sociology*. 2003; 29:541–562.
- Flavell, John H. "Cognitive Development: Children's Knowledge About the Mind." *Annual Review of Psychology*. 1999; 50:21–45.
- Finn, Peter R.; Hall, Julie. Cognitive Ability and Risk for Alcoholism: Short-term Memory Capacity and Intelligence Moderate Personality Risk for Alcohol Problems. *Journal of Abnormal Psychology*. 2004; 113(4):569–581. [PubMed: 15535789]
- Gazmararian, Julie A.; Williams, Mark V.; Peel, Jennifer; Baker, David W. Health Literacy and Knowledge of Chronic Disease. *Patient Education and Counseling*. 2003; 51(3):267–275. [PubMed: 14630383]
- Gerber, Theodore P. Membership Benefits or Selection Effects? Why Former Communist Party Members Do Better in Post-Soviet Russia. *Social Science Research*. 2000; 29(1):25–50.
- Gerber, Theodore P. The Selection Theory of Persisting Party Advantages in Russia: More Evidence and Implications. *Social Science Research*. 2001; 30(4):653–671.
- Gottfredson, Linda S.; Deary, Ian J. Intelligence Predicts Health and Longevity, but Why? Current Directions in Psychological Science. 2004; 13(1):1–4.
- Griliches, Zvi. Estimating the Returns to Schooling: Some Econometric Problems. *Econometrica*. 1977; 45:1–22. [PubMed: 12278790]
- Griliches, Zvi. Sibling Models and Data in Economics: Beginnings of a Survey. *The Journal of Political Economy*. 1979; 87(5):S37–S64.
- Griliches, Zvi; Mason, William M. Education, Income, and Ability. *The Journal of Political Economy*. 1972; 80(3):74–103.
- Grusky, David B.; DiPrete, Thomas A. Recent Trends in the Process of Stratification. *Demography*. 1990; 27(4):617–637. [PubMed: 2249749]

- Guerra, Nancy G.; Slaby, Ronald G. Cognitive Mediators of Aggression in Adolescent Offenders: II. Intervention. *Developmental Psychology*. 1990; 26(2):269–277.
- Gustafsson, Jan-Eric. Schooling and Intelligence: Effects of Track of Study on Level and Profile of Cognitive Abilities. In: Kyllonen, PC.; Roberts, RD.; Stankov, L., editors. *Extending Intelligence: Enhancement and New Constructs*. London: Routledge Press; 2008. p. 37–59.
- Halpern, Diane F. *Sex Differences in Cognitive Abilities*. New York: Psychology Press; 2011.
- Hankiss, Elemer. *East European Alternatives*. Clarendon Press; Oxford: 1990.
- Hanley, Eric; Yershova, Natasha; Anderson, Richard. Russia—Old Wine in a New Bottle? The Circulation and Reproduction of Russian Elites, 1983–1993. *Theory and Society*. 1995; 24(5):639–668.
- Heckman, James J.; Mosso, Stefano. "The Economics of Human Development and Social Mobility." *Annual Review of Economics*. 2014; 6:689–733.
- Herrnstein, Richard J.; Murray, Charles. *The Bell Curve: Intelligence and Class Structure in American Life*. New York: Free Press; 1994.
- Hyde, Janet S. How Large are Cognitive Gender Differences? A meta-analysis using w^2 and d . *American Psychologist*. 1981; 36(8):892–901.
- Jencks, Christopher; Bartlett, Susan; Corcoran, Mary; Crouse, James; Eaglesfield, David; Jackson, Gregory; McClelland, Kent; Mueser, Peter; Olneck, Michael; Schwartz, Joseph; Ward, Sherry; Williams, Jill. *Who Gets Ahead? The Determinants of Economic Success in America*. New York: Basic Books; 1979.
- Kirsch, Irwin S. *Adult Literacy in America: A First Look at the Results of the National Adult Literacy Survey*. Washington, DC: National Center for Education Statistics; 1993. NCES 93275
- Lavelly, William; Xiao, Zhenyu; Li, Bohua; Freedman, Ronald. The Rise in Female Education in China: National and Regional Patterns. *The China Quarterly*. 1990; 121:61–93.
- Li, Wangyang; Xie, Yu. Gender Differences. In: Xie, Y.; Zhang, X.; Li, J.; Yu, X.; Ren, Q., editors. *Wellbeing Development Report of China 2013*. Beijing, China: Peking University Press; 2013. p. 215–249. in Chinese
- Marks, Gary N. *Education, Social Background and Cognitive Ability: The Decline of the Social*. New York: Taylor and Francis; 2013.
- McArdle, John J.; Ferrer-Caja, Emilio; Hamagami, Fumiaki; Woodcock, Richard W. Comparative Longitudinal Structural Analyses of the Growth and Decline of Multiple Intellectual Abilities over the Life Span. *Developmental Psychology*. 2002; 38(1):115–142. [PubMed: 11806695]
- McGloin, Jean Marie; Pratt, Travis C. Cognitive Ability and Delinquent Behavior among Inner-city Youth: A Life-course Analysis of Main, Mediating, and Interaction Effects. *International Journal of Offender Therapy and Comparative Criminology*. 2003; 47(3):253–271. [PubMed: 12808737]
- Moore, Chris; Barresi, John; Thompson, Carol. The Cognitive Basis of Future-oriented Prosocial Behavior. *Social Development*. 1998; 7(2):198–218.
- Moritz, Deborah J.; Kasl, Stanislav V.; Berkman, Lisa F. Cognitive Functioning and the Incidence of Limitations in Activities of Daily Living in an Elderly Community Sample. *American Journal of Epidemiology*. 1995; 141(1):41–49. [PubMed: 7801965]
- Näslund, Jan Carol; Schneider, Wolfgang. Longitudinal Effects of Verbal Ability, Memory Capacity, and Phonological Awareness on Reading Performance. *European Journal of Psychology of Education*. 1991; 6(4):375–392.
- Nichols, Robert C. Policy Implications of the IQ Controversy. *Review of Research in Education*. 1978; 6(1):3–46.
- Nisbett, Richard E. *Intelligence and How to Get It: Why Schools and Cultures Count*. New York: Norton; 2009.
- Njegovan, Vesna; Man-Son-Hing, Malcolm; Mitchell, Susan L.; Molnar, Frank J. The Hierarchy of Functional Loss Associated with Cognitive Decline in Older Persons. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*. 2001; 56(10):M638–M643.
- Pearman A. Basic Cognition in Adulthood: Combined Effects of Sex and Personality. *Personality and Individual Differences*. 2009; 47(4):357–362.

- Reif, Frederick. Applying Cognitive Science to Education: Thinking and Learning in Scientific and Other Complex Domains. Cambridge, MA: MIT Press; 2008.
- Richards, Marcus; Stephen, Alison; Mishra, Gita. Health Returns to Cognitive Capital in the British 1946 Birth Cohort. *Longitudinal and Life Course Studies*. 2010; 1(3):281–296.
- Schnittker, Jason. Cognitive Abilities and Self-rated Health: Is There a Relationship? Is it Growing? Does it Explain Disparities? *Social Science Research*. 2005; 34(4):821–842.
- Sternberg, Robert J.; Grigorenko, Elena; Bundy, Donald A. The Predictive Value of IQ. *Merrill-Palmer Quarterly*. 2001; 47(1):1–41.
- Szelenyi, Ivan; Kostello, Eric. The Market Transition Debate: Toward a Synthesis? *American Journal of Sociology*. 1996; 101(4):1082–1096.
- Treiman, Donald J. Trends in Educational Attainment in China. *Chinese Sociological Review*. 2013; 45(3):3–25.
- Treiman DJ. Industrialization and Social Stratification. *Sociological Inquiry*. 1970; 40(2):207–234.
- Treiman, Donald J.; Walder, Andrew. Life Histories and Social Change in Contemporary China. Los Angeles, CA: Institute for Social Science Research, University of California, Los Angeles; 1996. Available at http://www.sscnet.ucla.edu/issr/da/da_catalog/da_catalog_titleRecord.php?studynumber=M889V1#sthash.CAcPBLCh.dpuf [Accessed December 19, 2014]
- Walder, Andrew G. Career Mobility and the Communist Political Order. *American Sociological Review*. 1995; 60(3):309–328.
- Walder, Andrew G.; Li, Bobai; Treiman, Donald J. Politics and Life Chances in a State Socialist Regime: Dual Career Paths into the Urban Chinese Elite, 1949 to 1996. *American Sociological Review*. 2000; 65(2):191–209.
- Winship, Christopher; Korenman, Sanders. Does Staying in School Make You Smarter? The Effect of Education on IQ. In: Devlin, B.; Fienberg, SE.; Resnick, DP.; Roeder, K., editors. *Intelligence, Genes, and Success: Scientists Respond to the Bell Curve*. New York: Springer; 1997. p. 215–234.
- Wu, Xiaogang. The Household Registration System and Rural-urban Educational Inequality in China. *Chinese Sociological Review*. 2011; 44(Winter):31–51.
- Xie, Yu; Hannum, Emily. Regional Variation in Earnings Inequality in Reform-era Urban China. *American Journal of Sociology*. 1996; 101(4):950–992.
- Xie, Yu; Hu, Jingwei. An Introduction to the China Family Panel Studies (CFPS). *Chinese Sociological Review*. 2014; 47(1):3–29.
- Xie, Yu; Lu, Ping. The Sampling Design of the China Family Panel Studies (CFPS). *Chinese Sociological Review*. forthcoming.
- Xie, Yu; Pan, Zhongdang. Study of Family Life in Urban China, 1999. Inter-university Consortium for Political and Social Research, University of Michigan; Ann Arbor, MI: 2010. ICPSR 28143 Available at <http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/28143> [Accessed December 31, 2014]
- Xu, Hongwei; Xie, Yu. Technical Report CFPS-31. Institute for Social Science Survey, Peking University; Beijing: 2015. "Number Series Test in the 2012 Wave of China Family Panel Studies". in Chinese
- Zhou, Xueguang. Economic Transformation and Income Inequality in Urban China: Evidence from Panel Data. *American Journal of Sociology*. 2000; 105(4):1135–1174.
- Zhou, Xueguang; Moen, Phyllis; Tuma, Nancy Brandon. Educational Stratification in Urban China: 1949–94. *Sociology of Education*. 1998; 71(3):199–222.

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Figure 1.
Mean Scores of Word and Word Recall Test on Education Levels

Figure 2.
Mean Scores of Math and Number Series Test on Education Levels

Figure 3.
Lowess Fit of Vocabulary Test Score and Age

Figure 4.
Lowess Fit of Numerical Test Score and Age

Figure 5.
Lowess Fit of Short-term Memory Test Score and Age

Figure 6.
Lowess Fit of Long-term Memory Test Score and Age

Figure 7.
Lowess Fit of Number Series Test Score and Age

Figure 8.
Effects of Short-term Memory on Income

Figure 9.
Effects of Short-term Memory on Being a Party Member

Figure 10.
Predicted Probabilities of ADL Disabilities by Short-term Memory, Gender

Table 1

Education, Age, Gender, and *Hukou* Correlates of Cognitive Abilities

	(1)	(2)	(3)	(4)	(5)
VARIABLES	Word test (0–34)	Math test (0–24)	IWR (0–10)	DWR (0–10)	Number Series (409–584)
Years of Schooling	1.352 *** (0.011)	1.036 *** (0.006)	0.098 *** (0.003)	0.107 *** (0.003)	2.036 *** (0.082)
Age	–0.441 *** (0.011)	–0.254 *** (0.006)	–0.061 *** (0.003)	–0.089 *** (0.004)	–0.833 *** (0.095)
Age-squared	0.003 *** (0.000)	0.002 *** (0.000)	0.000 *** (0.000)	0.000 *** (0.000)	0.001 (0.001)
Female	–1.114 *** (0.090)	–0.586 *** (0.047)	0.078 *** (0.026)	0.128 *** (0.028)	–3.871 *** (0.602)
Rural	–1.944 *** (0.109)	–1.106 *** (0.057)	–0.372 *** (0.031)	–0.518 *** (0.034)	–3.549 *** (0.691)
Constant	23.164 *** (0.257)	11.324 *** (0.136)	6.664 *** (0.074)	6.263 *** (0.081)	534.722 *** (1.523)
Observations	36,866	36,866	32,130	31,896	16,261
R-squared	0.615	0.750	0.312	0.346	0.211

Standard errors in parentheses

p<0.01,

**
p<0.05,

*
p<0.1

Table 2Unadjusted and Adjusted Mean Gender Difference (Cohen's *d*) in Cognition

	Total	Urban	Rural
Verbal			
Unadjusted	-0.264 ***	-0.133 ***	-0.307 ***
Adjusted	-0.105 ***	-0.062 ***	-0.118 ***
Math			
Unadjusted	-0.279 ***	-0.167 ***	-0.325 ***
Adjusted	-0.088 ***	-0.071 ***	-0.101 ***
Immediate Word Recall			
Unadjusted	-0.018	0.110 ***	-0.061 ***
Adjusted	0.038 ***	0.105 ***	0.012
Delayed Word Recall			
Unadjusted	0.001	0.109 ***	-0.034 *
Adjusted	0.056 ***	0.100 ***	0.040 ***
Number Serials W Scale			
Unadjusted	-0.068 ***	-0.072 *	-0.071 ***
Adjusted	-0.119 ***	-0.122 ***	-0.118 ***

Note: Index *d* is defined as the standardized difference in cognitive skills between males and females, measured in standard deviations. Negative values of *d* indicate that average cognitive scales for female are less than the average test score for males.

*
p<0.1,

**
p<0.05,

p<0.01

Table 3

Effect of Cognitive Abilities on Socioeconomic Consequences

	(1)	(2)	(3)	(4)	(5)	(6)
	English Level	Deviant Behavior	Teenage Romance	Income	Party Member	Not living Independently
Age	−0.105 *** (0.038)	0.452 *** (0.118)	0.279 *** (0.071)	0.059 *** (0.010)	0.060 *** (0.002)	0.099 *** (0.005)
Age-squared				−0.001 *** (0.000)		
Grade/Years of Schooling	0.085 ** (0.034)			−0.577 *** (0.073)	0.208 *** (0.010)	−0.051 *** (0.010)
Female	0.443 *** (0.068)	−1.871 *** (0.410)	−0.575 *** (0.222)	−0.577 *** (0.073)	−2.202 *** (0.203)	0.642 *** (0.140)
Rural	−0.381 *** (0.082)	−0.470 (0.346)	0.633 ** (0.294)	−0.092 *** (0.027)	−0.802 *** (0.073)	0.237 *** (0.086)
Delayed Word Recall	0.021 (0.017)					
Immediate Word Recall		−0.161 * (0.092)	−0.100 * (0.056)	0.034 *** (0.009)	0.056 *** (0.021)	−0.099 *** (0.032)
Female * Immediate Word Recall				−0.025 * (0.013)	0.194 *** (0.036)	−0.072 * (0.041)
Constant	3.180 *** (0.357)	−7.696 *** (1.663)	−6.184 *** (1.026)	8.964 *** (0.221)	−6.374 *** (0.236)	−8.426 *** (0.418)
Observations	1,923	2,608	2,608	7,452	28,740	6,420
R-squared	0.073	2,608	2,608	0.217		

Standard errors in parentheses

*** p<0.01,

** p<0.05,

* p<0.1