The Growth and Determinants of Literacy in China

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ABSTRACT

In China, as in other nations, reading skills depend mainly on the level of education attained. But reading skills in China depend on other factors as well: the quality of schooling; the cultural capital of the family of origin–parental education, of course, but also such measures of cultural capital as the number of books in the household and the reading behavior of parents; gender; and the extent to which literacy is used over the life course. I exploit data from a 1996 national probability sample of Chinese Adults (N=6,090) that includes information on literacy (the number of characters identified from a list of 10 characters), measures of family cultural capital, and the usual socioeconomic data on both respondents and their families of origin, to study the determinants of the number of characters recognized. My analysis includes three components: (1) An overall assessment of the determinants of literacy in the adult population of China In addition to years of schooling, a number of factors positively affect literacy: father's years of schooling; the "cultural capital" of parents, manifest in their reading behavior; urban residence at age 14; and male gender. Further, the effect of father's education is entirely mediated by the effect of family cultural capital. (2) The effect of occupational experience on literacy. Net of education, those with non-manual jobs gain in literacy over the life course whereas the literacy of those with manual jobs declines. The fact that the two trends go in opposite directions suggests an age as opposed to period interpretation of the results. (3) An assessment of the effect of the Cultural Revolution on literacy. Net of years of schooling, those educated during the Cultural Revolution (especially the first years) are less literate than those educated before or after the Cultural Revolution, and the effect of the Cultural Revolution is larger in magnitude than the effect of an additional year of schooling.

INTRODUCTION

A major factor in the transformation of China from one of the world's poorest nations to a rapidly industrializing nation with an unprecedented rate of per capita economic growth over the past 25 years has been the increasing literacy of the population. In a simple literacy test administered to a national sample of the Chinese population in 1996 (details are given below), the average number of characters correctly identified out of 10 ranged from just over two for those born in 1927 (and hence age 69 in 1996) to just over five for those born in 1976 (and hence age 20 in 1996). In China gains in literacy are strongly linked to gains in years of schooling (see Fig. 1). Thus, the systematic expansion of education in China over the course of the 20th century (Deng and Treiman 1997) appears to be what mainly drove the expansion in literacy.

Nonetheless, education is not the sole determinant of literacy in China. We can see this from Fig. 2, which shows substantial variation in literacy levels at each level of school completed. In the figure, the middle line shows the median level of literacy for a given level of schooling, the top line shows the 95th percentile, and the bottom line shows the 5th percentile. This figure thus shows the range of literacy at each level of schooling, excluding extreme outliers. For example, among those with three years of schooling, some people are effectively illiterate while others can identify as many as six characters, the median level achieved by university graduates. Determining the sources of the variability in literacy within levels of education is the task of this paper.

There are several possibilities. First, in China, as in other nations, the quality of schooling varies widely from place to place, and differentials are particularly sharp between urban and rural places (Unger 1982). Although in the data set analyzed here, there is no direct

information on the quality of schooling, evidence that literacy is greater among those educated in towns and cities than among those with the same level of education who attended school in rural areas provides indirect support for a claim of differential schooling quality. Of course, urbanites also may be more likely to retain or enhance their literacy as adults because they are much more likely to have to handle written materials in their work and daily lives than are rural people. For both reasons, we would expect urban residents to be more literate than rural residents with the same amount of schooling.

For much the same reason, it is likely that the literacy of nonmanual workers, whose work demands the manipulation of written materials–reading and writing–will increase over their working lives while that of manual workers will, if anything, decline.

In addition, reading skills are likely to depend not only on schooling but also upon the cultural capital of the family of origin–parental education, of course, and perhaps parental occupational status, but also such measures of cultural capital as the number of books in the household and the reading habits of parents.

Finally, given the dominant role of males in Chinese society, manifest in preference for male children (Banister 1987, Zheng 1993, Lee and Wang 1999), higher survival levels of male infants in contemporary China (Lavely and Mason 2002), higher levels of education for sons than for daughters (see Table 4), and the greater propensity of men than of women to read, we would expect men to be more literate than equally educated women.

Apart from the factors affecting the literacy of individuals at any point in time, we might well expect variations over time in the level of literacy in China. In particular, it is possible that literacy declined during the 1966-1977 Cultural Revolution, relative to the amount of schooling

obtained by individuals. Although the average level of education actually systematically increased during the Cultural Revolution (see Fig. 1), mainly through the establishment of many new rural schools (Hannum 1999), many of these schools had very low standards and were closed after the end of the Cultural Revolution. Moreover, secondary schools were closed from 1966-68 and when they re-opened were largely devoted to ideological indoctrination (Unger 1982); and universities were closed from 1966-72 and also had a large political component to the curriculum when they re-opened. The re-establishment of academically oriented schooling did not occur until 1977, the year after Mao died (Unger 1982). Given the disruption of both the standard curriculum and school attendance, it would be surprising if the Cultural Revolution was without cost. A simple way to assess one possible cost is to analyze the effect of the Cultural Revolution on literacy, controlling for the other factors hypothesized to affect literacy. Some suggestion that there was, indeed, a cost can be seen in Fig. 1, which shows that for cohorts born between 1955 and 1966 (and therefore age 11 between 1966 and 1977) the average level of literacy was lower than that expected from the overall relationship between years of schooling and literacy.

The remainder of the paper assesses the hypotheses sketched in the above discussion.

DATA, VARIABLES, AND METHODS

The analysis is based on data from a stratified national probability sample of Chinese adults age 20-69 carried out in 1996 (N=6,090); see Treiman (1998), Walder, Li, and Treiman (2000), and Wu and Treiman (2002) for details. This is a very high quality survey, with little missing data. Except where noted, all the analysis is based on the 5,962 cases with complete

data for the variables considered here. The basic strategy of the analysis is to estimate a series of OLS regression models predicting literacy from the factors discussed above. However, since the data are weighted and clustered, I utilize survey estimation procedures to get correct standard errors (StataCorp 2001:Vol. 4, pp. 15-101). I then show a series of graphs highlighting specific results by holding the other independent variables constant (usually at their mean).

The *dependent variable* for each of the analytic models is a transformation of a 10-item character recognition test in which respondents were shown each character and asked to identify it by name. The items, listed in the order they were presented to respondents, along with the percentage answering correctly,[1] are shown in Table 1. The items were chosen from three Chinese dictionaries, representing common words, words of medium difficulty, and difficult words. This proved to be a sub-optimal procedure for choosing words since it resulted in a very uneven distribution of difficulty, clustering into what are effectively four categories (see Table 2). To determine whether the sub-optimal distribution had any important substantive consequences, I explored several transformations of the dependent variable (scores derived from a Rasch model (Wessie 1999); the midpoints of the percentile range for each level of correct responses; and the normal transformation of the percentile scores (Powers and Xie 2000:202-205)), and also estimated an ordered logit model parallel to that reported in Table 5. All of these alternatives to a simple count of the number of correct responses suggested that the simple count underestimates the importance of place of residence at age 14 for literacy. I thus chose the simplest of the transformations, the midpoints of the percentile ranges corresponding to each

[1]All other responses–answering incorrectly, the respondent saying s/he does not know the meaning of the character, or refusing to answer altogether, are coded as "not correct." Since fewer than one per cent refused to answer each item, the responses can be taken as an accurate indication of the ability of the Chinese adult population to identify each character.

number of correct responses (see Table 2), as the dependent variable and estimated OLS regression models. The regression coefficients can be interpreted as indicating the difference in the predicted percentile (the percentage of respondents with the same or a lower level of literacy) for two respondents who differ by one unit with respect to the corresponding independent variable but are identical with respect to each of the other independent variables. For example, in Model 2 of Table 5, each year of additional schooling would be expected to increase the level of literacy by 4.9 percentile points, among people who are identical with respect to father's years of schooling, gender, and place of residence at age 14.

Among the *independent variables*, gender (male=1, female=0), years of schooling, and father's years of schooling are all coded in a straightforward way. In preliminary analysis, I also considered mother's education and father's occupational status (ISEI; see Ganzeboom, DeGraaf, and Treiman 1992), but neither variable had any net impact. Thus, in the interest of simplicity I dropped them from the analysis reported here.

Residence at age 14 is a six category classification formed by cross-tabulating whether the respondent had rural or urban residential status (*hukou*) at age 14 by the type of place of residence at age 14: village, town, or city.[2] Residential status is a crucial determinant of life chances in China, with urban registrants enjoying many privileges, including access to superior schooling; mobility from rural to urban residential status is very difficult to achieve (Wu and Treiman 2002). Although the children of holders of urban *hukou* residing in rural areas (engineers working in rural facilities, teachers, health workers, etc.) can be sent to the cities for

[2]The seven-category urban hierarchy coded in the 1996 data (villages, townships or towns, county seats, county-level cities, prefecture-level cities, provincial capitals, and provincial-level cities (Beijing, Shanghai, and Tianjin)) is collapsed into three categories. Villages remain distinct; townships or towns and county seats are coded as towns; and the remainder are coded as cities.

schooling, it is not clear how many actually are sent nor whether other aspects of the rural environment affect their level of literacy. It thus seems prudent to consider all combinations of registration and residential status at age 14. Technically, this is done by representing each category except the first (rural *hukou* and village residence) by a dichotomous variable, scored one for people in the category and scored zero otherwise; the omission of one category is necessary to estimate the equation. Regression coefficients for each dichotomous (or "dummy") variable are then interpreted as deviations from the coefficient for the omitted category, which is implicitly zero.

I include two measures of family cultural capital when the respondent was age 14: the number of books in the household, and whether the respondent's father ever read a newspaper. Since the number of books in the household is an ordinal variable with no clear metric, I converted this variable to a set of dichotomies, scored one for people in the category and scored zero otherwise, with no books in the household as the omitted, or reference, category. Although the number of books in the household dominated a factor analysis in which several indicators of parental reading behavior were included, it has been suggested[3] that the measure is vulnerable to the possibility that in households with relatively few books a large fraction may be school books, or books brought into the household by a child who liked to read, thus rendering the number of books dependent upon the respondent's education or literacy rather than vice-versa. I thus included a second measure, whether the father ever read a newspaper when the respondent was about age 14, which is unambiguously causally prior to educational attainment or literacy.

[3]I thank Eric Grodsky (personal communication) for suggesting this possibility.

To consider whether the level of literacy changes over the life course because of the demands of work, I divide respondent's current occupation into two categories: nonmanual (ISCO codes 0001-4999) and manual (ISCO codes 5000-9999) and exclude from the analysis those not currently employed. Although the rate of intragenerational occupational mobility is quite low in China, especially between manual and nonmanual occupations (in these data 84 per cent have never changed categories over the course of their work lives), in a second analysis I exclude the 16 per cent who have been mobile. As we will see, the basic result holds up.

Finally, to analyze the effect of the Cultural Revolution on literacy, I define three cohorts, based on the year of birth corresponding to the year the respondent turned age 11: the pre-Cultural Revolution cohort includes people born in 1955 or earlier (and hence turning age 11 in 1966, the start of the Cultural Revolution, or earlier); the Cultural Revolution cohort includes people born between 1956 and 1966, inclusive (and hence turning 11 between 1967 and 1977); and the post-Cultural Revolution cohort includes people born in 1967 or later (and hence turning 11 in 1978 or later). While it is difficult to decide at what age(s) particular cohorts are most influenced by events occurring in a specific period, age 11 seems an appropriate point to assess literacy since it corresponds to about four years of schooling,[4] by which time children are expected to know more than 2,000 characters (Ren 1998).

[4]In the data set used here, both the median and the mode of school entry age (among those who ever attended school) was seven, which is consistent with the claim of Hannum and Xie (1994:76) that in China children typically begin school when they are seven years old.

ANALYSIS

I begin with descriptive statistics showing the distributions of the variables included in the analysis (Table 3) and the simple relationships (without controls) between selected independent variables and, respectively, years of schooling attained and the level of literacy achieved (Table 4). With one possible exception, these relationships are just what we would expect: men achieve more schooling and higher literacy levels than do women; and education and literacy increase with increasing father's education, for those whose fathers read newspapers when they were growing up, and who had more books in their households when they were growing up. The exception is that it turns out that even among those with urban registration at age 14, village residence is costly, precisely about 1.7 years of school and 12 percentile points on the literacy scale relative to those with urban registration who grew up in cities. Thus, urban registration does not completely protect individuals from the disadvantage of growing up in a village. On the other hand, the advantage of city residence is substantially stronger for those with a rural *hukou* than for those with an urban *hukou*–3.1 additional years of schooling and nearly 20 percentile points on the literacy scale.

Determinants of Literacy

The next step is to see whether the relationships between these factors and literacy continue to hold when the other factors are controlled. Table 5 shows the coefficients for five models predicting the level of literacy (the percentile-transformed scale of the number of characters identified). Consistent with Fig. 1, it is evident that the level of literacy is largely a result of education. About 64 per cent of the variance in literacy scores is due to variation in the number of years of school completed, and each additional year of schooling results in an

expected increase of 5.5 percentile points on the literacy scale. Thus, for example, while the average person without any schooling would be expected to be at the 15th percentile of literacy (the intercept), the average high school graduate would be expected to be at the 81st percentile of literacy (since 15.02+5.46*12=80.54).

Model 2 takes account also of father's years of schooling, gender, and size and type of residence at age 14. All of these factors contribute significantly to literacy and the effects of all but father's years of schooling are substantial in magnitude. For example, among equally educated people with equally educated fathers and living in the same type of place with the same residential status, men would be expected, on average, to score nearly four percentile points higher on the literacy scale than would women. Also, education continues to strongly affect literacy, although, since the size of the education coefficient drops from 5.46 to 4.93, a modest portion of the total effect of education shown for Model 1 is due to the correlation of education with father's education, gender, and residence. However, the real story in Model 2 is the strength of the effect of residence. Relative to those who at age 14 had rural *hukou* status and resided in a village, those with urban *hukou* status residing in cities would be expected, on average, to be eight percentile points higher on the literacy scale. That is, the difference between the two extreme residential circumstances for otherwise similar people is the equivalent of about 1.6 years of schooling (since 1.62=7.99/4.93).

Models 3 and 4, respectively, add a measure of cultural capital when the respondent was age 14, the number of books in the household and whether the father read a newspaper, and Model 5 includes both measures of cultural capital. For our purposes, it is sufficient to discuss Model 5. The first point to note is that years of schooling continues to be the most important

determinant of level of literacy, although the coefficient drops moderately relative to that for Model 2, suggesting that part of the effect of education is due to family cultural capital. Still, the coefficient of 4.4 tells us that people of the same gender whose fathers are equally educated, who live in the same type of place with the same residential status, and who come from families with the same amount of cultural capital, but who differ by a year of schooling, would be expected to differ, on average, by 4.4 percentile points on the literacy scale. Thus, the difference in percentile points between a person with no more than primary schooling and a high school graduate would be 26.4 percentile points (=4.4*(12-6)). Second, when family cultural capital is controlled, father's years of schooling has no significant impact. Thus, the reason that the children of more educated fathers are more literate, net of their own level of schooling, is that homes with educated fathers are more literary–there are more books and fathers read more. Third, the impact of interest in the written word is very strong. The difference between the expected literacy levels of otherwise similar people coming from households with many books (501 or more) and from households with no books is nearly 13 percentile points, the equivalent of the effect of nearly three years of schooling. Whether the father read a newspaper also has an impact on literacy, controlling for all other factors, but it is much more modest, about three percentile points. Finally, once other factors are taken into account, it turns out that there is a clear advantage in having an urban *hukou*. Even urban *hukou* holders living in villages have higher expected percentile scores than do any rural *hukou* holders, even those living in cities. Further, urban residence at age 14 turns out to be much more important for rural *hukou* holders than for those with urban *hukou*. This can be seen most clearly in Fig. 3, which shows the expected percentile scores for urban and rural *hukou* holders by size of place of residence at age

14, with all other variables in the model set at the sample mean. What the graph shows is the effect of the combination of registration status and size of place of residence for Chinese adults who are average with respect to all the other factors studied here. Since respondent's and father's education, gender, and family cultural capital differences are all taken into account in the graph, the result suggests that urban registration status immunizes individuals from the disadvantages of village life when it comes to their level of literacy, but that the cost of rural *hukou* status more or less disappears among those who were raised in cities. Exactly what mechanisms (other than schooling, father's education, family cultural capital, and gender) differentiate urban and rural *hukou* holders living in villages but not those living in cities is unclear and requires further study.

Changes in Literacy over the Life Course

We now turn to consideration of the suggestion made earlier that literacy is differentially reenforced over the life course because of the kind of work people do. Some work requires the manipulation of symbols–reading and writing (and also computing)–much more than does other work. A large fraction of the work that professionals, managers, and clerical workers do involves handling written materials, but this is much less true of manual workers and farmers. Thus, we might expect that the level of literacy at school-leaving age would be reenforced and enhanced over the life course for nonmanual workers but would, if anything, decline for manual workers.[5] As a simple test of this hypothesis, I consider those currently employed (as of the survey date); this reduces the sample size from 5,962 to 4,768 since some people are in school,

[5]The theoretical literature on the effect of age on verbal skills, summarized in Wilson and Gove (1999:257-258), suggests that such skills should either increase or remain stable from young adulthood until old age (that is, over the entire age span included here). However, there has been little consideration of age trends differentiated by type of work performed or other attributes that might affect verbal skills.

waiting for work, keeping house, retired, or not in the labor force for other reasons. For those with a job, I extend Model 5 of Table 5 by adding a distinction between nonmanual and manual workers at the time of the survey, age at the time of the survey, and the interaction between the two variables. The interaction term allows both the slope and the intercept of the relationship between literacy and type of work (nonmanual vs. manual) to vary with age. I have not reported the coefficients of the model since they differ little from those in Table 5, Model 5. However, in Fig. 4 I show the relationship between age and literacy for nonmanual and manual workers when all the remaining variables in Table 5, Model 5 are set at their mean. Inspecting the graph, it is evident that among equally well educated people with equally well educated fathers, equal family cultural capital, the same gender, the same residential status, and the same type of place of residence at age 14, there is no difference in the level of literacy of nonmanual and manual workers among those age 20. However, among nonmanual workers the level of literacy increases substantially as age increases, while among manual workers the level of literacy decreases as age increases.

This result makes it tempting to attribute the change in literacy with age as confirming the hypothesis that nonmanual work reenforces literacy over the life course while manual work suppresses it. Before accepting this conclusion, however, we need to rule out an alternative explanation–that the observed differences between those of different ages in 1996 simply reflect historical changes in China that result in differences among birth cohorts that remain constant over the life course. There are two reasonable possibilities: that schools have systematically improved or declined since the mid 1930s when our oldest cohorts first entered school until the date of the survey in 1996; or that a shift in the composition of the labor force–an increase in the

percentage of workers who hold nonmanual jobs–causes the observed effects. However, neither possibility is consistent with the pattern of results. If there were a decline in the quality of education (as some claim is true of the U.S., e.g. Alwin 1991; Glenn 1994; but see also the critique of this position by Wilson and Gove 1999 and the critiques and rejoinders that follow), we would expect the level of literacy for each level of education to decline for successive cohorts (that is, increase with age) for *both* nonmanual and manual workers. Similarly, if there were an increase in the quality of education, as might be expected in the long term given the sustained economic development of China since 1978, we would expect the level of literacy for each level of education to increase for successive cohorts (that is, decline with age) for both nonmanual and nonmanual workers. However, since the level of literacy diverges with increasing age for the two groups, overall changes in the quality of education in China over time cannot explain the pattern and there is no basis for positing a complex scenario in which the quality of education declined for nonmanual workers but improved for manual workers.

The second alternative explanation fares no better. On the assumption that in China, as elsewhere, the proportion of the population engaged in nonmanual work has been increasing over time, a genetic determinist might argue that the average "quality" of both nonmanual and manual workers has declined, as the best and the brightest of those who formerly would have become manual workers increasingly achieve nonmanual occupations. But this scenario is inconsistent with the facts. Somewhat surprisingly, the nonmanual sector has not been growing in a linear fashion; rather, it follows a U-shaped distribution, declining during the Cultural Revolution and only by the 1990s regaining the relative size of the pre-Cultural Revolution

period.[6] Morever, a claim that the Chinese labor force is increasingly sorted by talent (as Herrnstein and Murray 1994 claim for the U.S.) is inconsistent with the diverging age trends for nonmanual and manual workers; under such a claim we would expect exactly the opposite pattern, a *converging* trend with age or, putting it in cohort terms, a *diverging* trend across cohorts. It thus appears that the pattern of increased literacy with age for nomanual workers and decreasing literacy with age for manual workers, net of education and the other factors in Model 5, is best understood as a life course effect–over the life course, nonmanual workers utilize their literacy and thus reenforce and enhance it, while nonmanual workers by and large do not, and hence suffer some decline in literacy.

There is, however, another possibility that needs to be taken seriously–that over the life course the more literate are upwardly mobile, from manual to nonmanual jobs, and the less literate are downwardly mobile. Although the overall rate of intragenerational mobility is quite low in China (only 16 per cent of those with jobs at the time of the survey had ever worked at both manual and nonmanual jobs) there is a great deal of mobility into nonmanual jobs, with fully 65 per cent of current nonmanual workers having had experience at manual jobs and having, on average, spent about half (51.4 per cent) of their total working lives in such jobs. Thus, it could be the case that the diverging literacy of nonmanual and manual workers with age simply reflects the sorting of the more literate into nonmanual jobs as workers age. To test this possibility, I restricted the analysis to those who had never been mobile across the manual-nonmanual divide in the course of their careers; this reduced the sample size to 3,121. These results are shown in Fig. 5. Although the slope for the gain in literacy with age for nonmanual

[6]The same pattern holds when cohort variations in the proportion nonmanual are considered for the first job after leaving school, for the job held at age 20, and for the job held at age 25.

workers is somewhat reduced relative to the corresponding line in Fig. 4, and the intercept shifts downward, both indicating that part of the effect observed in Fig. 4 is, in fact, due to the infusion into the nonmanual sector of especially literate workers over the life course, the basic pattern remains unchanged in Fig. 5[7]: there is a divergence of literacy with age between "permanent" manual and nonmanual workers, strongly suggesting that literacy is reenforced or undercut by the demands of work.

A similar pattern holds for urban and non-urban residents. Fig. 6 shows a comparison of changes in literacy with age for two groups–those living in villages both at age 14 and at the time of the survey and those living in cities both at age 14 and at the time of the survey.[8] Here the argument is that city life demands literacy while rural life does not, so that a similar pattern of divergence in the level of literacy with age for rural and urban residents would be expected as we just observed for nonmanual and manual workers. Again, the results are consistent with the claim. Village residents start (at age 20) with a slight disadvantage, about four percentile points on the literacy scale, but this disadvantage has grown to 16 percentile points among the oldest respondents (those age 69). And again there is no basis for assuming variation across cohorts, specifically variation of a kind that leads to greater literacy among rural residents net of all other factors in the model and declining literacy among urban residents. Thus the appropriate

[7]Note that the lines for manual workers are virtually identical in Figs. 4 and 5, which is what we would expect given that 95 per cent of current manual workers have always been manual workers.

[8]To avoid the selection problems inherent in a comparison of people who migrated from rural to urban areas, I restrict the graph to permanent village and city residents, although all nine combinations of rural and urban residence at age 14 and at the time of the survey are included in the analysis. These two categories constitute 80 per cent of the population of China (68 per cent in villages and 12 per cent in cities).

conclusion is that urban life does, indeed, promote literacy over the life course while rural life undercuts it.

The effect of the Cultural Revolution

The 1966-77 Cultural Revolution in China was a cataclysmic event in which the entire society was thrown into chaos (for good general accounts, see Bernstein 1977 and Lee 1978; for analyses of its effect on education, see Unger 1982 and Deng and Treiman 1997). Unleashed initially by Mao Zedong and his agents as a device for purging Mao's (perceived) political enemies, it soon acquired its own escalating dynamic as an uncontrolled mass movement. Universities were shut down entirely from 1966-1972, and secondary schools from 1966-68 and when they reopened schools at both levels were concerned primarily with political indoctrination until the restoration of academic standards in 1977. At the same time, many new primary schools were opened in villages, but typically with a very low academic standard (Unger 1982). Students and other urban workers, especially the "intelligentsia" (those with upper secondary or tertiary education working in professional or technical jobs), were "sent down" to the countryside to work as peasants, and political loyalty rather than competence became the main criterion for both educational and occupational advancement. Under these circumstances, especially the school closings and abandonment of the academic curriculum for several years after schools reopened, it would be surprising if the quality of education did not suffer. In particular, since an important aspect of schooling is the expansion of literacy–the ability to identify increasing numbers of characters–we should expect that, relative to their level of schooling, students educated during the Cultural Revolution would be able to identify fewer characters than those educated before or since. Of course, differences in the number of

characters identified at the time of the survey, when respondents ranged from age 20 to 69, is hardly an ideal measure of the number of characters learned in school since, as we have seen literacy appears to vary over the life course, increasing for nonmanual workers and those living in urban areas and decreasing for manual workers and those living in rural areas. Still, the number of characters identified is the only measure available, and its use is warranted given how little is yet systematically known about how the Cultural Revolution affected the development of adult intellectual skills.

To estimate the effect of the Cultural Revolution on literacy, I explored a number of different spline models, each including all the variables in Model 5 of Table 5 and in addition allowing the net trend in literacy (that is, the trend controlling for all the other independent variables) to vary across three cohorts: the pre-Cultural Revolution cohort, which consists of those born in 1955 or earlier; the Cultural Revolution cohort, which consists of those born between 1956 and 1966, inclusive, and the post-Cultural Revolution cohort, which consists of those born in 1967 or later. The models all have knots at 1955 and 1966 but differ with respect to the presence or absence of discontinuities at those years and also with respect to whether or not the Cultural Revolution period was represented by a straight line or a curved line. The best fitting and most parsimonious model was that which posited a discontinuity at birth year 1955 (people who turned 11 at the start of the Cultural Revolution in 1966), a curvilinear trend during the Cultural Revolution, and a knot but no discontinuity at 1966, which allows the trend to change for those who turned 11 in 1977, the end of the Cultural Revolution. Although the table is not presented here, all features of this model are statistically significant. Moreover, the cost of the Cultural Revolution was mainly felt by those who turned 11 between 1966-1968, when the

disruption of schooling was greatest. The literacy scores of such students dropped about four percentile points relative to those who were age 11 in the year before the beginning of the Cultural Revolution, a decline the equivalent of about one year of schooling. In the same sense that reading scores in U.S. schools are calibrated to "grade level," with reports phrased as "the students at such and such a school read two years below grade level," we can say that the cost of the Cultural Revolution, at least at the outset, was to reduce literacy scores by about one grade level–a strong effect.

SUMMARY AND CONCLUSIONS

Literacy in China is strongly socially structured. Of course, as elsewhere, literacy is a skill mainly acquired in school. Thus, as education has expanded over the 20th century in China, literacy has increased as well. But the level of schooling is not the sole determinant of literacy. There are also dramatic differences in the quality of schooling, particularly between urban and rural areas. Although we have no direct measures of school quality, such differences are well established and account, at least in part, for differences in the level of literacy between those with the same amount of education who attended school in villages, towns, and cities. In addition to school effects, however, there are individual, family, environmental, life course, and historical effects. First, in still another manifestation of male dominance in China, males tend to be more literate than females with the same amount of schooling, whether through greater engagement with written materials after leaving school or for some other reason. Second, those from families invested in reading (as indicated by many books in the household and newspaper reading on the part of the father) are more literate than their equally well educated classmates

whose families were less prone to read–who had less "cultural capital." Third, the advantage of urban residence clearly reflects more than differences in the quality of schooling, since even controlling for the level of schooling and the other factors in the model, permanent residents of cities start out (at age 20) with an advantage in literacy over permanent village residents equivalent to that of an extra year of schooling, and this advantage increases over time to the equivalent of about three years of extra schooling because over the life course the literacy of city dwellers increases and that of village dwellers decreases. Similarly, while equally well educated manual and nonmanual workers start out (at age 20) equally literate, the literacy of nonmanual workers increases over the life course while that of manual workers declines. In both cases, the most plausible interpretation is that it is differential engagement with the written word–reading and writing–that creates the increasing gap over the life course. The old adage, "Use it or lose it," clearly applies here. Finally, literacy is responsive to historical events, specifically the Cultural Revolution, which created a massive disruption of the educational system. Among otherwise similar people, particularly people with identical levels of schooling, the cohort that was, or should have been, in school during the Cultural Revolution ended up, as adults, with a level of literacy a full year lower than similarly educated people who were in school prior to or after the Cultural Revolution.

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Table 1. Characters Used in the Literacy Scale, with the Per Cent Responding Correctly to Each Item (items listed in order of their inclusion in the questionnaire). [N=5,962]

Character	Pinyin (description)	Pct. responding correctly
	yiwan (ten thousand)	80.9
	xingming (full name)	77.7
	liangshi (grain)	76.4
	hanshu (function)	49.1
	sinue (wreak havoc or wanton massacre)	34.2
	diaozhu (carve)	38.0
	chichu (walk slowly)	1.4
	chuanmiu (erroneous)	1.7
	qimao (octagenerian)	1.7
	taotie (glutton)	.6

Table 2. Percentage Distribution of Number of Correct Responses to the 10-Character Vocabulary Scale, and Percentile Midpoints, Chinese Adults Age 20-69 in 1996.

Number of correct responses	Percentage	Cumulative percentage	Percentile Midpoint
0	19.0	19.0	9.5
1	3.0	22.0	20.5
2	2.0	24.0	23.0
3	23.2	47.2	35.6
4	12.6	59.8	53.5
5	11.7	71.5	65.6
6	25.1	96.6	84.1
7	2.2	98.8	97.7
8	.7	99.5	99.1
9	.4	99.9	99.7
10	.1	100.0	99.9

Table 3. Descriptive Statistics for an Analysis of the Determinants of Literacy, Chinese Adults Age 20-69 in 1996.

	Mean	S.D.
Continuous variables		
Number of characters recognized (out of 10)	3.6	2.2
Percentile transformation of characters recognized	50.0	28.3
Years of schooling	6.4	4.1
Father's years of schooling	3.1	3.7
Age (N=4,768)	39.6	12.1
	Percentage	
Male	51.9	
Father ever read newspaper when respondent age 14	23.3	
Number of books in household when respondent 14		
None	21.1	
1-10	21.3	
11-20	19.6	
21-50	20.3	
51-100	10.8	
101-500	6.0	
501 or more	.9	
Total	100.0	
Residential status and size of place of residence at 14		
Rural *hukou*, village residence	77.6	
Rural *hukou*, town residence	3.0	
Rural *hukou*, city residence	1.3	
Urban *hukou*, village residence	1.4	
Urban *hukou,* town residence	5.7	
Urban *hukou*, city residence	11.0	
Total	100.0	
Current occupation is nonmanual (N=4,768)	17.7	

Table 4. Mean Years of School Completed, Mean Number of Characters Identified, and Mean Level of Literacy (Percentile Transformation of Number of Characters Identified), by Selected Variables, Chinese Adults Age 20-69 in 1996.

	Years of schooling	Number of characters identified	Literacy percentile
Male	7.3	4.1	56.0
Female	5.5	3.1	43.5
Father ever read newspaper when respondent age 14?			
Yes	9.2	5.1	69.2
No	5.6	3.2	44.2
Number of books in household when respondent 14			
None	2.2	1.4	23.2
1-10	5.5	3.2	43.5
11-20	7.2	4.0	54.3
21-50	8.2	4.6	61.5
51-100	9.2	5.1	69.5
101-500	10.2	5.5	74.6
501 or more	11.2	6.3	84.7
Residential status and size of place of residence at 14			
Rural *hukou*, village residence	5.7	3.2	44.6
Rural *hukou*, town residence	7.6	4.2	57.5
Rural *hukou*, city residence	8.8	4.9	66.4
Urban *hukou*, village residence	7.9	4.5	61.6
Urban *hukou,* town residence	8.7	4.9	67.5
Urban *hukou*, city residence	9.6	5.4	73.6

Table 5. Coefficients for Models of the Determinants of Literacy (Percentile Transformation of Number of Characters Recognized), Chinese Adults Age 20-69 in 1996.

	Model 1		Model 2		Model 3		Model 4		Model 5	
	b	s.e.	b	s.e.	b	s.e.	b	s.e.	b	s.e.
Years of schooling	5.46	.06	4.93	.09	4.42	.11	4.88	.09	4.40	.11
Father's yrs. of schooling			.82	.15	.50	.16	.45	.16	.25[f]	.16
Male			3.85	.56	4.28	.52	4.00	.56	4.37	.52
Residence at age 14 (reference category is rural registration *(hukou),* residence in village)[a]										
R. *hukou*, town residence			3.34	1.15	2.86[d]	1.23	2.80[e]	1.18	2.50[f]	1.27
R. *hukou*, city residence			5.84	1.36	5.19	1.41	5.65	1.32	5.10	1.37
U. *hukou*, village residnce			5.62[c]	2.31	5.72[d]	2.31	5.34[e]	2.32	5.52[f]	2.32
U. *hukou,* town residence			6.84	1.24	6.42	1.25	6.21	1.22	6.00	1.23
U. *hukou*, city residence			7.99	.79	7.70	.80	7.23	.78	7.20	.78
Number of books in household at age 14 (reference category is none)[b]										
1-10					4.56	.94			4.57	.94
11-20					7.02	1.00			6.90	1.00
21-50					9.31	1.13			8.98	1.12
51-100					11.44	1.11			11.00	1.12
101-500					10.91	1.91			10.15	1.97
501 or more					13.45	2.70			12.65	2.70
Fr. newspaper reader: R 14							4.16	.65	3.08	.66
Constant	15.02	.48	12.42	.60	10.29	.54	12.96	.61	10.66	.53
R^2	.639		.656		.668		.659		.669	

[a] Wald tests on the set of coefficients for residence are significant for all models at beyond the .0005 level.

[b] Wald tests on the set of coefficients for number of books are significant for all models at beyond the .0005 level.

[c] All coefficients are significant at .01 or beyond except that marked (p=.018).

[d] P-values for marked coefficients, going down the column, are .024 and .017.

[e] P-values for marked coefficients are .022 and .026.

[f] P-values for marked coefficients are .136, .054, and .021.

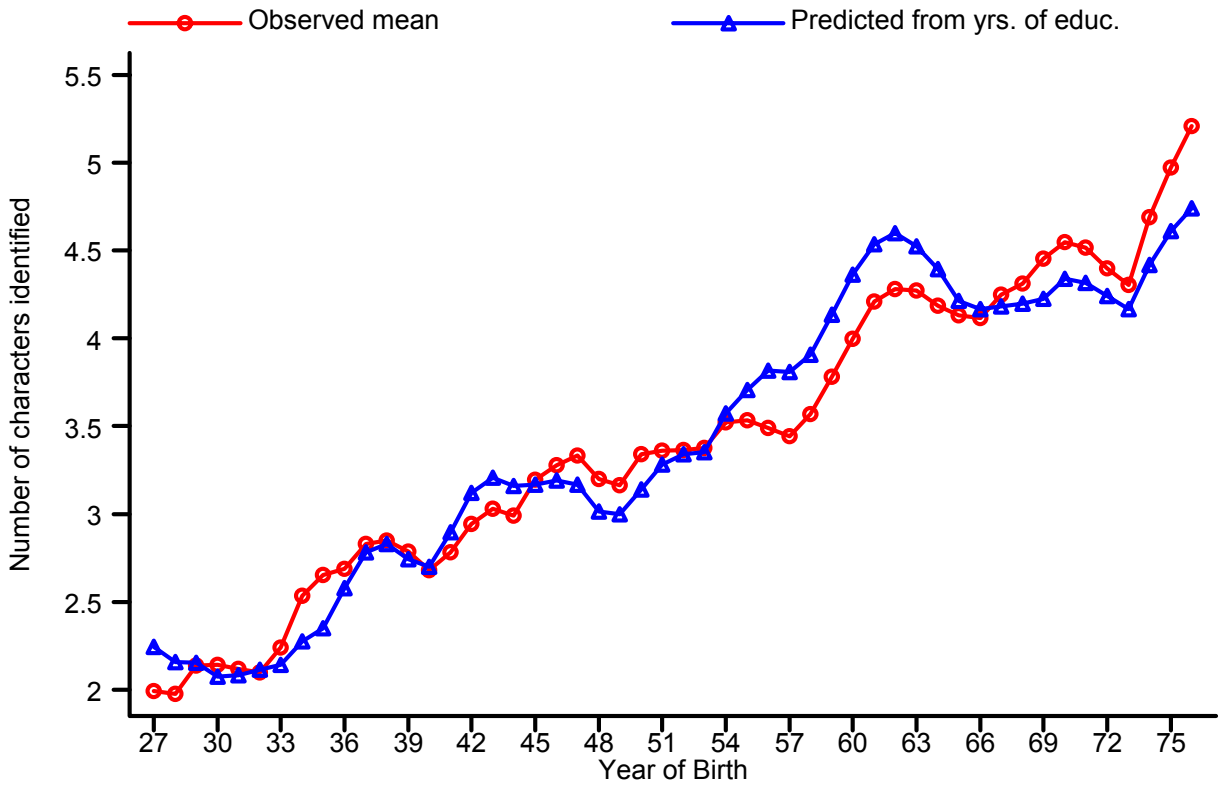

Fig. 1. Number of Characters Identified by Year of Birth and Number of Characters Identified Predicted from the Mean Years of Schooling of Each Cohort, Chinese Adults Age 20-69 in 1996.

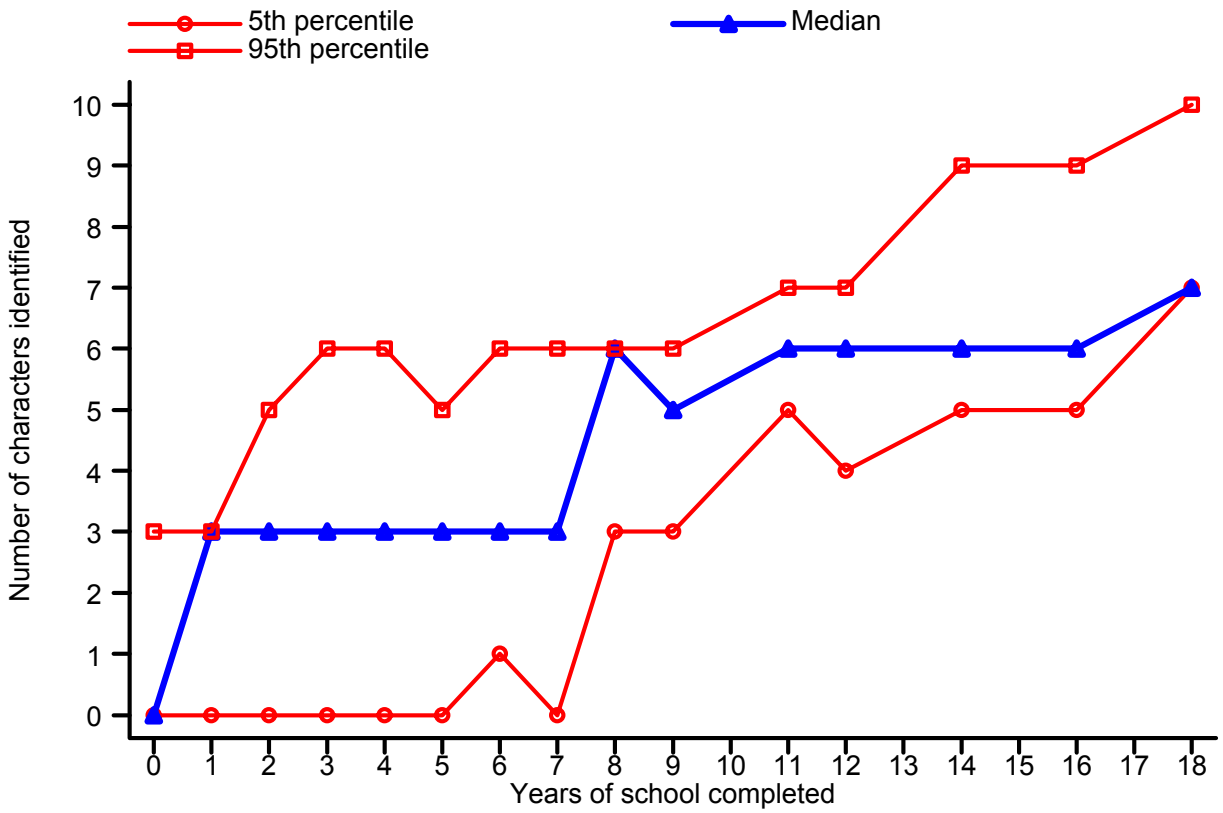

Fig.2. Number of Characters Identified by Years of School Completed, Chinese Adults Age 20-69 in 1996. (The red lines [circles and squares] show the 5th and 95th percentiles at each year of schooling and the blue line [triangles] shows the median.)

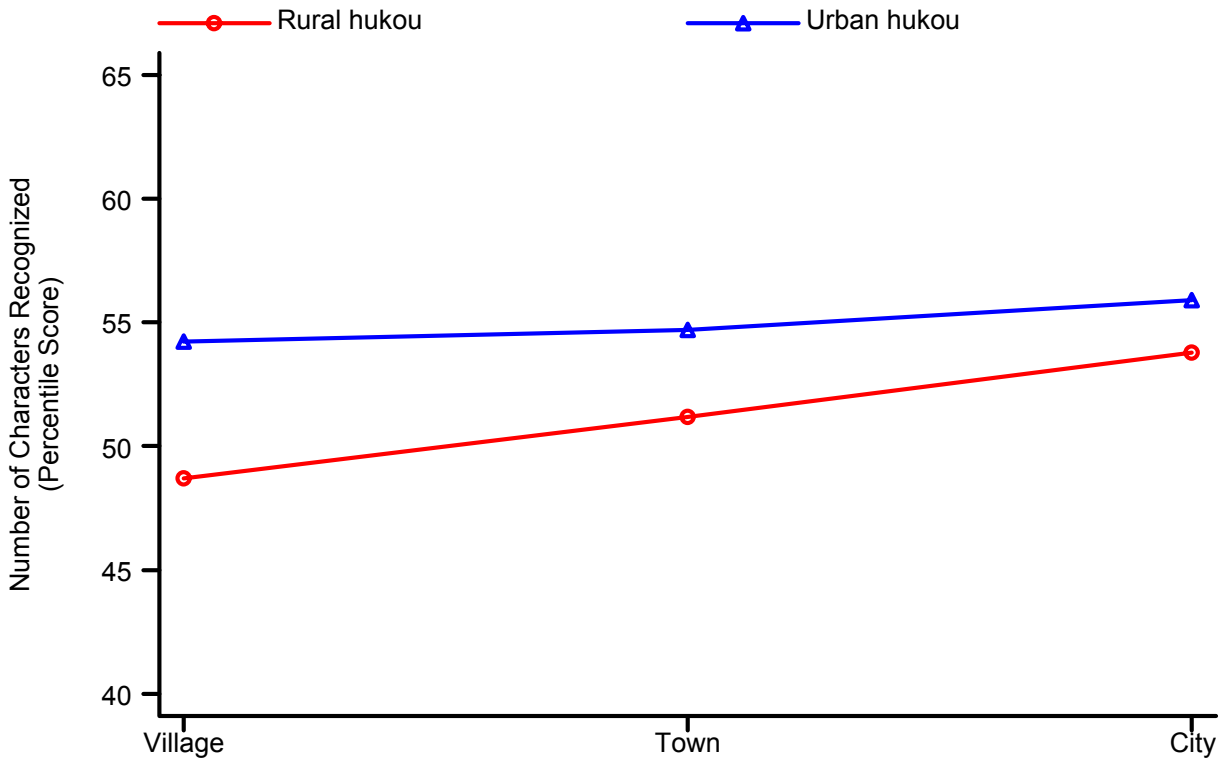

Fig. 3. Percentile Transformation of Number of Characters Identified by Type of Place of Residence at Age 14, Chinese Adults Age 20-69 in 1996, All Remaining Variables in Table 5, Model 5, Set at Their Mean.

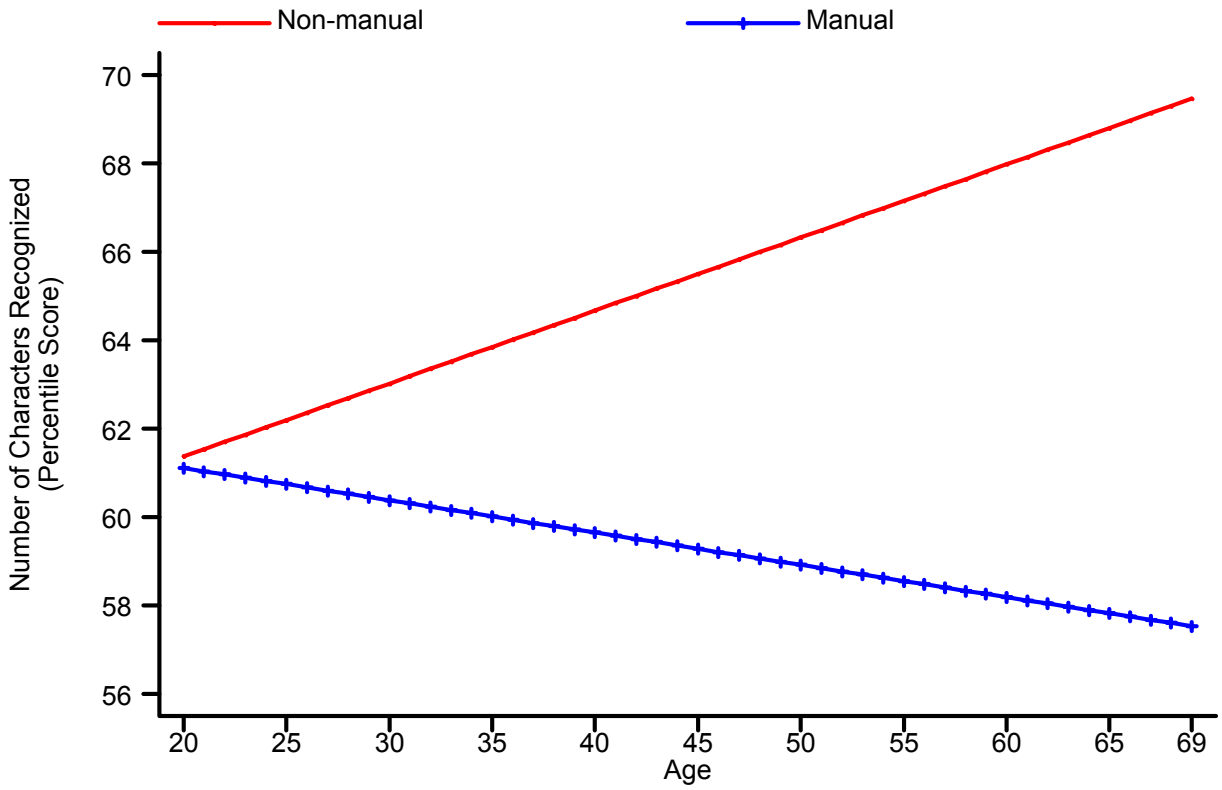

Fig. 4. Percentile Transformation of Number of Characters Identified by Age, for Nonmanual and Manual Workers, Controlling for Education (Evaluated at Nine Years of Schooling) and All Remaining Variables Shown in Table 5, Model 5 (Set at Their Means), Chinese Adults Age 20-69 in 1996 [N=4,768].

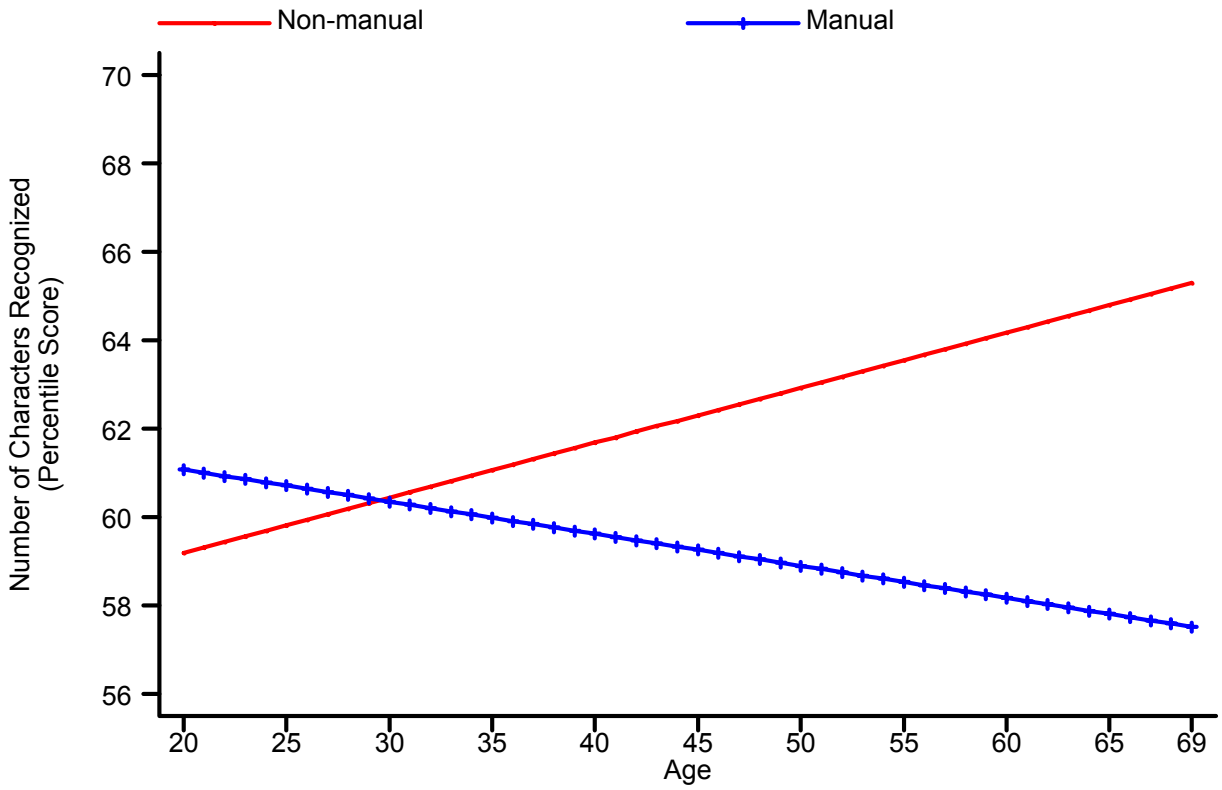

Fig.5. Percentile Transformation of Number of Characters Identified by Age, for *Permanent* Nonmanual and Manual Workers (Those Who Have Been Nonmanual or Manual Workers, Respectively, Throughout Their Working Lives), Controlling for Education (Evaluated at Nine Years of Schooling) and All Remaining Variables Shown in Table 5, Model 5 (Set at Their Means), Chinese Adults Age 20-69 in 1996 [N=3,121].

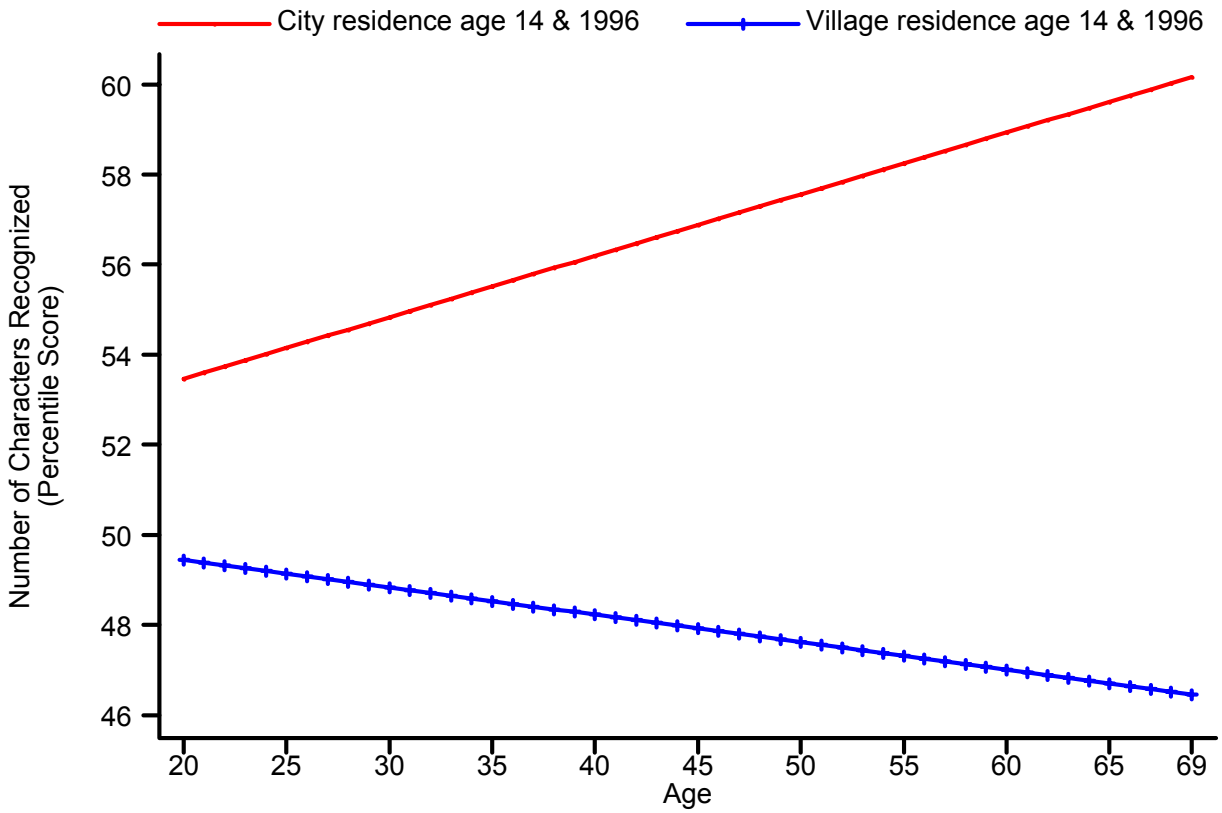

Fig. 6. Percentile Transformation of Number of Characters Identified by Age, for People Living in Cities at Age 14 and in 1996 (the Date of theSurvey) and People Living in Villages at Age 14 and in 1996, All Remaining Variables Shown in Table 5, Model 5 (Set at Their Means), Chinese Adults Age 20-69 in 1996.

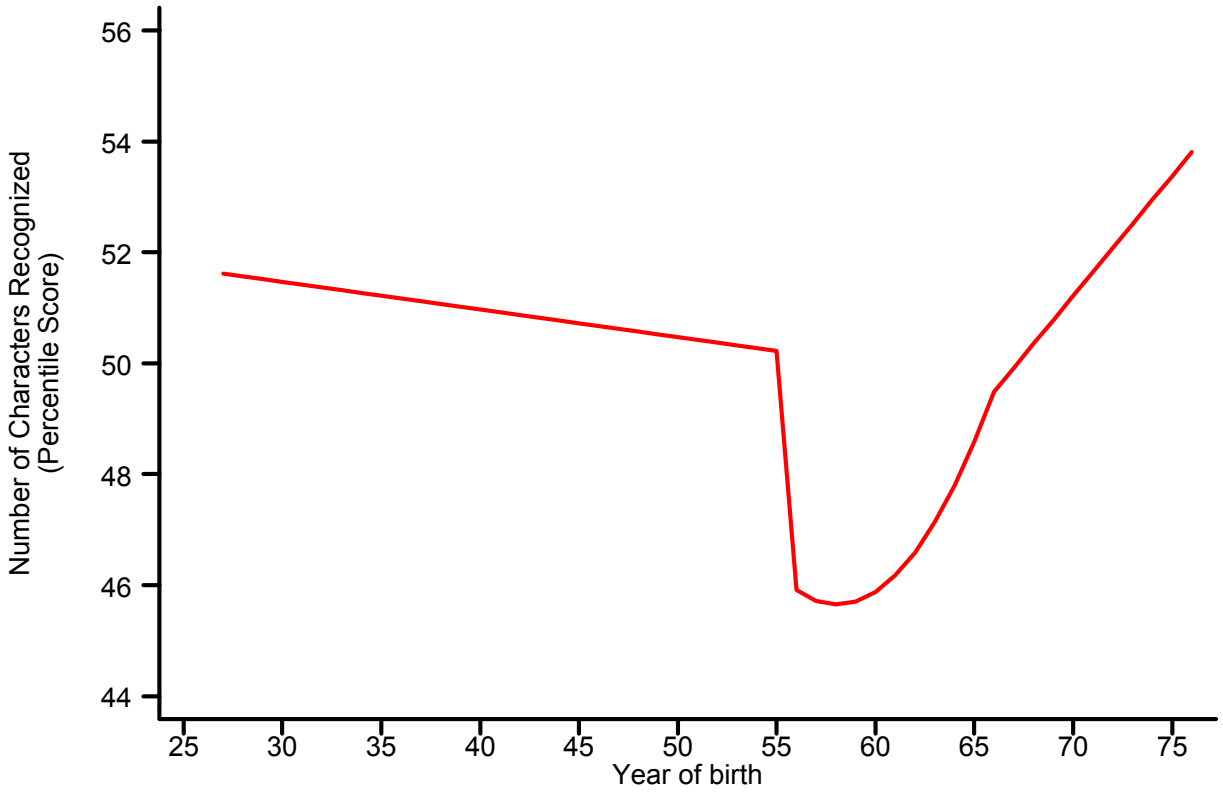

Fig. 7. Percentile Transformation of Number of Characters Identified, Before, During, and After the Cultural Revolution, All Remaining Variables Shown in Table 5, Model 5 Set at Their Means, Chinese Adults Age 20-69 in 1996 [Spline Function, with a Discontinuity at 1955, a Knot at 1966, and a Curve Between 1955 and 1966].