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Past Successes and Future Challenges in Rural China’s Human Capital

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ABSTRACT
This paper describes the current level of human capital in China and seeks to identify a number of education-related challenges that may slow down the nation’s economy from transitioning to high-income status. Relying on recent census-based data from OECD for the rest of the world and using data from the 2015 Micro-Census for China, the authors show that the low levels of education of China’s labour force is really a problem that has its roots in the past (in the 1970s, 1980s, and 1990s). In recent years (since 2000), China has been investing heavily in education as shown by the increasing share of youth, including rural youth, attending high school. Despite this recent effort to raise the nation’s human capital, the education system still faces several challenges in trying to provide high-quality education for all youth. First, the government must figure out a way to overcome the relatively low rates of participation in high school by rural students. Second, there is concern that many vocational schools, especially those in rural areas, cannot deliver quality education. Finally, the paper will show that many rural students may be unprepared due to poor early childhood development outcomes.

Introduction

Human capital plays an important role in promoting sustained economic development. 1 Human capital is particularly vital for nations that hope to move from middle-income to high-income status, as these nations require a workforce that can think creatively, perform non-routine tasks, and innovate to achieve long-term growth. 2 Given that education is the main way to increase human capital, numerous studies have stressed the importance of educational attainment rates in assessing the potential for developing nations to successfully transition into developed

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In particular, researchers have stressed the importance of high school (and university) educational attainment for maximising both national and individual potential in middle-income status that are trying to transition to high income in. While high levels of educational attainment are necessary to increase human capital, they alone are not enough. Students must also learn while they are at school to develop high-level skills. Hanushek and Woessmann illustrated that the cognitive skills of a population—acquired through achievement (not just attendance) in schooling institutions—were related to individual earnings and economic growth. In order for students to achieve in the education system, and in order for economic growth to occur, the education that students receive must be of high quality.

Besides educational quality, other factors, such as health and parenting inputs, also influence student academic achievement, and hence, ultimate outcomes. Both early childhood developmental outcomes, as well as child health and nutritional outcomes, are strongly associated with short-term and long-term educational performance. This is particularly true of developing countries, where on average children complete fewer years of schooling and learns less per year of schooling than those in developed countries. Indeed, it is now well documented that children who grow up with poor health, malnutrition, and a lack of interactive parenting are also less likely to escape poverty.

In developing nations, when the educational outcomes of large portions of the population are poor due to the myriad reasons stated above, the nations meet a fate called the ‘middle-income trap’. This term refers to a stagnant condition in which nations that have reached middle-income levels of GDP (as defined by the World Bank) fail to achieve high-income status. The labour force in these nations do not acquire the human capital demanded in a higher-wage, higher value-added economy, and therefore these nations become outcompeted both by low-income countries in cheap manufacturing and by high-income countries in producing skill, knowledge, and capital-intensive products and services. As this paper will argue, in order to avoid falling into the middle-income trap, China must attain and maintain high levels of both educational quantity and quality as well as ensure that children receive necessary parental and nutritional inputs to become healthy and productive citizens in the future.


A number of scholars consider high school educational attainment to be a critical milestone for the workforce to attain in countries that are trying to transition to high income. This is because in high school, children not only strengthen general skills (which are needed for life-long learning), but they also begin to have opportunities for developing stronger specialisation and more advanced subject-specific skills. However, despite the importance of high school for the development of human capital, in some countries (like China) high school has not been a part of compulsory education. For these reasons, this paper focuses specifically on China's high school educational attainment rates compared with those of other nations. This paper identifies three challenges to increasing the human capital of China's rural youth: a.) disproportionately low high school attainment rates among rural students, despite recent gains; b.) poor-quality schooling at Vocational Education and Training (VET) schools; and c.) poor developmental and health outcomes of rural infants, toddlers, and elementary school-aged children.

**High school education and the ‘middle-income trap’**

While there are a number of reasons that nations in the world have become mired in a middle-income trap, this section focuses on a human capital explanation. Why are high levels of human capital necessary when a nation is still middle-income? A major consequence that middle-income countries encounter when they have labour forces with insufficient stocks of high school educational attainment is that they fall into a state of stagnated growth mentioned earlier known as the middle-income trap.

This paper refers to these nations ‘the Trapped’ in contrast with the so-called ‘Graduates’ who successfully make the transition. Although there are a number of possible causes of the ‘trap’, Khor et al. argue that the defining characteristic of trapped economies is that they have deficient levels of human capital. According to Khor, middle-income countries where wages are rising but where a large share of workers are deficient in human capital lose their comparative advantage, as they are outcompeted by both low-wage economies, which can manufacture goods at a lower cost, and advanced economies, which have sufficient human capital to produce high-skill innovations.

There are also consequences for individuals living in a nation stuck in the middle-income trap, and these problems on the individual level can aggregate to societal problems on the whole. Students caught in the transition who do not attain high school education and therefore do not develop the necessary skills to succeed in a high-skill, high-income economy encounter low wages and unemployment, contributing to economic slow-downs for society overall. Without desirable job prospects, a nation’s youth are more likely to become involved in informal micro-firms that can undermine the emergence of the formal economy, as well as

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organised crime/gangs. In some cases the rise of activity outside formal institutions may not only lead to an unpredictable and sometimes violent and unstable living environment, but may also create an atmosphere that is not conducive to investment and growth. Thus, in trapped nations, vicious cycles can appear where growth slows, increasing the unemployment rate among undereducated individuals, which then leads to more crime and instability, which then reduces investment, thereby further undermining growth.

If high levels of human capital are conducive for economies to graduate to high-income status and avoid the middle-income trap, how high must the educational attainment level of the workforce be to achieve this? Examining high school attainment rates in high-income countries, it becomes clear that the large majority of the labour forces (composed of all individuals aged 25–64) in these countries have attended high school (Table 1). According to the 2015 OECD, the average attainment rate of all high-income countries in 2015 was 78%. The rates of some of the most developed nations—the United States, Germany and Japan—are even higher, where over 90% of the labour force has attended high school. The idea is that in high-income countries, most jobs demand high-level skills and individuals who want to contribute to and thrive in the economy need to have at least the set of skills—such as math, critical thinking, science, and computer skills—that will allow them to be productively employed.

The importance of human capital in the transition from middle to high income can also be seen by examining educational attainment data of the graduates. Table 1 also shows the share of the labour force of countries that moved from middle income to high income over the past 50 years at the time that the nations were still middle income. Remarkably, in the case of those nations/territories that have successfully graduated, such as South Korea, Ireland, Israel, Taiwan, and Singapore, the levels of education of their labour forces were already high when they were still middle income. According to the empirical findings, in almost all high-income countries, including recent graduates, about three out of four of individuals in the labour force have attended high school.

<table>
<thead>
<tr>
<th>Table 1. Share of labour force with at least high school education</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Country</strong></td>
</tr>
<tr>
<td>High-income countries (2015)</td>
</tr>
<tr>
<td>United States</td>
</tr>
<tr>
<td>Germany</td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td><strong>High-income average (2015)</strong></td>
</tr>
<tr>
<td>The Graduates—pre-transition (1980)</td>
</tr>
<tr>
<td>The Graduates average (1980)</td>
</tr>
<tr>
<td>Middle-income countries (2015)</td>
</tr>
<tr>
<td>Turkey</td>
</tr>
<tr>
<td>Brazil</td>
</tr>
<tr>
<td>Argentina</td>
</tr>
<tr>
<td>Mexico</td>
</tr>
<tr>
<td>South Africa</td>
</tr>
<tr>
<td><strong>Middle-income average (2015)</strong></td>
</tr>
<tr>
<td>Low-income countries (2015)</td>
</tr>
<tr>
<td><strong>Low-income average (2015)</strong></td>
</tr>
</tbody>
</table>

Data Source: OECD, 2015

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17It is important to note that these rates show the percentage of the workforce in each country that has attended high school (attainment) but has not necessarily graduated.

By looking at the high school attainment rates vis-à-vis those of the nations trapped at middle income (also displayed in Table 1), the stark difference in levels of human capital between the two groups becomes clear. The average high school attainment rate in the trapped middle-income countries in 2015 was only 36%—significantly less than the high-income country average of 78% and half that of the 1980 pre-transition average of the graduates (72%). This means that before these graduates even achieved their high-income status, the share of their labour force with a high school education was already double the current average in middle-income countries.

Comparing the human capital of China with the rest of the world

The previous section established that the labour force human capital of middle-income nations lags significantly behind high-income nations, meaning that most middle-income countries are unprepared to transition to high-income status. It is yet unclear whether or not China, the world’s largest middle-income economy, is prepared to make the transition. This section examines how the human capital of China’s overall labour force compares with that in other nations. In fact, China’s overall human capital is one of the lowest in the middle-income world. As noted above, however, since the human capital of a labour force is an asset that is the result of an investment strategy implemented over the course of several decades, it will be shown that the current government is not responsible for the low level of human capital in China.

Comparing China’s human capital with that of other countries, China’s overall labour force (all individuals between 25 and 64) is still undereducated by international metrics of education quality. This is true even in comparison with the other middle-income economies. Table 2 utilises a report published by the Organization for Economic Cooperation and Development (OECD) entitled ‘Education at a Glance’ to acquire high school attainment rates in countries other than China. The China attainment numbers used in this table are calculated using the 2015 Micro-Census. This data is comparable because they were generated using similar data sources (that is, population censuses) and using similar methodologies (e.g., similar assumptions, cutoffs and definitions).

The international comparisons reveal that China is behind the other trapped middle-income countries, as well as both high-income countries and graduates, in terms of human capital. The share of the labour force in China that has attained high school education (30%) is less than 40% of the OECD average (76%) and less than half of the G20 average (64%). China’s labour force human capital, in high school attainment rates, is lower than that of all other BRICS countries, aside from India for which data is unavailable). It is even below that of Indonesia (31%), a poor country that just recently graduated to become a lower middle-income economy. The trend holds when comparing countries by age cohort as well (25–34; 35–44; etc.—Table 2). This reveals that China still has a long way to go until it can build up its labour force’s human capital so that it looks like that of a high-income nation.

Recent improvements in China’s human capital: measuring increases in high school attainment rates among rural students

Although the quality of human capital of China’s workforce is low on an international scale, this does not mean that China does not recognise this problem. As stated before, the low human

19 In addition, just as in Table 1, all of these numbers describe high school attainment rates (including all of those who had previously attended high school) and not graduation rates; OECD, ‘Education at a Glance 2018: OECD Indicators’, OECD Publishing, (11 September 2018), available at: https://www.oecd-ilibrary.org/docserver/eag-2018-en.pdf?expires=1547621929&id=id&accname=guest&checksum=A885D1B9D334620D4A3159B67ABB13F0 (accessed 16 January 2019).

capital of China's current labour force does not necessarily reflect the commitment of current or recent past leadership towards education. In fact, the Chinese government has announced in recent policy documents that it wants universal high school education by 2020.21

This section examines empirically whether or not current/recent education officials have been investing in youth as a way to raise the human capital of China's future labour force, as well as whether or not the government is making progress towards achieving universal high school education. To do so, this section closely examines changes in China's human capital over the last decade in terms of the share or quantity of 15–17 year olds attending high school. If the rate of youth that attend high school is rising, it would seem that China is trying to address the problem left by low investment in the past. The analysis is conducted using two sets of independent data:, statistics from the Ministry of Education (MOE), which is reported from school officials up through the different levels of government and data from the 2015 Micro-Census, which comes from large-scale, on-the-ground household surveys conducted around China by the National Bureau of Statistics.

Using either data source, it is clear that China's high school attainment rates were still low in 2005 (Table 3). However, high school attainment rates changed dramatically after 2005. Indeed, regardless of the data set, during the 10-year stretch between 2005 and 2015, China's high school attainment rates rose significantly. The MOE reports that the attainment rate in 2015 was 87%. The Micro-Census data reflects a rate of 80%. That means that, in only ten years, the attainment rate shown by the MOE increased by 64% (87%/53%). According to the Micro-Census, that rise was smaller, though still very large overall (51% = 80%/53%). Such a steep upward trend is by any measure evidence of a remarkable achievement.

China's education officials should be proud of the significant strides they have made in the direction of universal high school attendance. The data, however, also shows that the job of achieving universal high school education is not complete and that China will need to exert significant efforts if it wishes to ultimately realise this goal. Even by the most optimistic estimates, 13% of 15 to 17 year olds did not attend high school in 2015 (according to the MOE data). As

### Table 2. Share of the labour force that has attained at least some high school in China and benchmark countries in 2014 (Percentage, by age cohort)

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>China*</td>
<td>30</td>
<td>47</td>
<td>31</td>
<td>22</td>
<td>16</td>
</tr>
<tr>
<td>OECD</td>
<td>76</td>
<td>83</td>
<td>80</td>
<td>74</td>
<td>66</td>
</tr>
<tr>
<td>Other OECD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EU21</td>
<td>78</td>
<td>85</td>
<td>83</td>
<td>77</td>
<td>68</td>
</tr>
<tr>
<td>Mexico</td>
<td>34</td>
<td>46</td>
<td>33</td>
<td>28</td>
<td>20</td>
</tr>
<tr>
<td>Turkey</td>
<td>36</td>
<td>50</td>
<td>35</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>G20 Average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>64</td>
<td>73</td>
<td>66</td>
<td>60</td>
<td>51</td>
</tr>
<tr>
<td>Indonesia</td>
<td>46</td>
<td>61</td>
<td>48</td>
<td>40</td>
<td>28</td>
</tr>
<tr>
<td>Brazil</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>96</td>
<td>92</td>
</tr>
<tr>
<td>Russia</td>
<td>31</td>
<td>40</td>
<td>34</td>
<td>22</td>
<td>15</td>
</tr>
<tr>
<td>India</td>
<td>65</td>
<td>77</td>
<td>69</td>
<td>52</td>
<td>38</td>
</tr>
<tr>
<td>S. Africa</td>
<td>56</td>
<td>69</td>
<td>62</td>
<td>50</td>
<td>47</td>
</tr>
</tbody>
</table>

Data Source: All numbers except for China, from OECD, 2015; see footnote a, below, for the source of data used for China.

*High school attainment in China is calculated based on the data presented in this paper from the 1% National Population Sample Survey in 2015 (2015 Micro-Census), rather than from the OECD report.

b = missing data.

shown in the next section, the share of youth who do not attend high school poses a significant challenge to China improving its human capital, particularly because these children belong to one sub-group of its population in particular: those from rural areas.

Future challenges to raising China’s human capital

Sharp increases in attainment rates are evidence that China has made significant strides in the direction of universal high school education since 2005. Despite this accomplishment, China still faces three challenges that might hinder it from raising its human capital in the future. This section examines these three challenges. First, as noted in above, there remains a significant share of 15 to 17 year olds, anywhere from 13% to 20% depending on the data set, who do not attend high school. This section will show are predominately from rural areas. Second, a significant number of rural youth that now attend high school are attending vocational education and training schools. In this section, we will show that there are concerns with the quality of education in many VET schools, especially in rural areas. Finally, for China’s rural youth to be ready to attend high school and successfully learn, dramatic improvements must be made to overcome disadvantages in health, nutrition and early childhood development that rural children experience compared to their urban counterparts.

Challenges of increasing high school quantity

In considering how China will meet its goal of making education universal, a question naturally arises: which students are not attending high school? To answer this question, this sub-section looks at MOE-reported data and Micro-Census data to examine whether or not a disparity in attainment rates exists between urban and rural students. However, since neither of these datasets included breakdowns of attainment rates by residency status, urban-rural ratio estimates are taken from the China Family Panel Survey (CFPS), which reports each individual’s Hukou (or residence registration) status. These data are shown in Table 3.
The data show that the remaining problem of low high school attainment is concentrated in the rural areas of China. According to both data sources (MOE and Micro-Census), virtually 100% of students with urban Hukou are attending high school. In fact, the rates of high school attainment of urban China are higher than those reported for the United States and Germany.\(^{22}\) The same is not true for students with rural Hukou. The MOE data show that 83% of rural 15–17 year olds attended high school, while the Micro-Census data report that number to be 77%. In simplest terms, the gap between urban and rural high school attainment rates means that for China to achieve universal high school attainment, effort must be targeted at getting the rest of China’s rural youth into high school.

While rural high school attainment rates are low relative to those of urban youth, it does not mean that there has not been success in the past decades in raising the high school participation rates of rural youth. In fact, the record of increase in the rate of rural participation appears to be quite remarkable. The percentage of rural students attending high school in 2005 was only 43%. Considering that the 2015 rates are 83% (according to the MOE) and 77% (according to the Micro-Census), respectively, that means that the percentage of rural 15–17 year olds attending high school has increased between 34 (77–43%) and 40 (83–43%) percentage points in the last ten years! This surge is much higher than the rise in urban attendance. Therefore, even though there is still an urban-rural gap in high school attainment, that gap narrowed significantly between 2005 and 2015.

**Challenges of increasing high school quality**

Another question that arises pertains to the second aspect of education discussed in the introduction of this paper is whether the students who attend high school are actually learning? This question of educational quality is just as important as that of educational quantity in determining whether or not China’s youth are learning the relevant and advanced skills and knowledge they need to succeed in a high-wage, high-skill economy.

Under the presumption that VET schools are not providing rural students with all of the skills they need to succeed, this sub-section now examines what percentage of the overall increase in attainment rates since 2005 are due to increases in VET enrolment (See more details on the assumptions in Online Supplementary). From Table 3, when looking at the MOE data, it is clear that trends in attainment rates in both academic high schools (AH) and VET schools have contributed to the overall rise in high school attainment rates. In 2005, 32% of individuals between 15 and 17 years old attended AH. During the same year, 21% of this age cohort attended VET. In other words, of the 53% of individuals that were in high school in this year, 60% (32 divided by 53) were in AH. The MOE data then reflect that between 2005 and 2015, more than half of the rise in high school attainment (19 percentage points of the 34 percentage points) came from the increase in AH school attainment rates. While the rise in VET was marginally lower (15 percentage points), because the baseline percentage was lower, the share of the rise that was from VET was still considerable and the share nearly doubled (from 21 to 36%).

To the extent that the assumptions about the relative and absolute quality of AH and VET hold true, this means that the rise in quality of China’s high school level education is both strong and weak at the same time. On the one hand, assuming that AH is providing high-quality instruction, there are literally millions more children that are learning higher levels of math and science, computers, critical thinking and foreign language (skills that will be necessary for the labour force in the coming decades) than ever before. On the other hand, since VET also contributes to a large portion of the increase in high school attainment, there appears to be a share of rural high school students that might not be learning the skills they need in the future.

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\(^{22}\)OECD, ‘Education at a Glance 2018: OECD Indicators’, \textit{OECD Publishing}, (11 September 2018), available at: https://www.oecd-ilibrary.org/docserver/eag-2018-en.pdf?expires=1547621929&id=id&accname=guest&checksum=A885D189D334620D4A3159867ABB13F0 (accessed 16 January 2019); Please note that the data we use for the US and Germany have several differences from the data we use for China, which we obtained from different sources. The US and Germany data reflect rates of current school enrollment (instead of rates of having ever attended high school). In addition, these rates are for youth aged 15–19 instead of youth aged 15–17.
Where it all begins: early developmental and health issues in rural China

This sub-section examines the third challenge that may prevent China from increasing the human capital of rural children, which is whether these students are simply unable to learn due to problems they encounter early on in their childhood and primary school years. To further examine this argument, this sub-section will discuss three sets of problems that are undermining the human capital of rural China’s youth in three different stages of rural growth: developmental delays in infants (ages 0–3), anaemia in young children of preschool age (ages 4–6), and poor vision and intestinal worms among primary school students (ages 7–12).

Developmental delays (ages 0–3)

Early childhood development (ECD) has long-lasting effects into adulthood. Previous studies have shown the healthy development of infants and toddlers to have a direct influence on later life outcomes, such as higher levels of educational attainment, employment, and income.23 Children who are developmentally delayed, on the other hand, are more likely to place greater a burden on society, including higher rates of welfare and unemployment, higher propensities to participate in crime, and a higher likelihood of teen pregnancies.24 One would expect those that are developmentally delayed as children to both have lower levels of educational attainment and have a lower ability to learn when they are in school. Overall, findings in both developed and developing countries show that malnutrition, poor health and the lack of interactive parenting investments are factors that are systematically associated with developmental delays in infants.25

This sub-section reports the results of a large-scale survey of developmental delays using the Bayley Scales of Infant and Toddler Development (BSID), a widely used ECD test that measures infant development across four different areas: cognition, language, social-emotional development, and motor skills (fine and gross). Measures of developmental outcomes come from samples of randomly chosen infants and toddlers aged 24–36 months from four major rural sub-populations in rural China.


China. These include western China rural communities; resettlement migration villages (locations to where families were relocated from more impoverished rural areas as a method of poverty reduction); central China rural communities; and migrant communities (made up by rural residents who moved to urban areas for work). In total, these four sub-populations together make up approximately 69% (26% in western rural communities + 29% in central rural communities + 13% in migrant communities + 1% in resettlement villages) of all rural infants and toddlers in China, and approximately 49% of all of China’s 0–3 year olds.

Early developmental delays in cognition, language, motor, and social-emotional skills are defined as Bayley scores less than 1 standard deviation below the mean. Technically, the delay of children in rural China is defined by comparing them to US peers of the same age. Studies that conducted BSID on toddlers of urban China show the proportions of early developmental delay ranges from 5 to 16%, which is close to the rate of developmental delay in the US.

Table 4 shows that rates of developmental delays among infants and toddlers in the four sub-populations are high. Across all measures of development, these rates exceed the normal rate that should be expected in a healthy population (15%). Overall, 50% of infants and toddlers suffer from cognitive delays. Infants and toddlers in the western rural communities are the worst off (73%), followed by those in central rural communities (51%), resettlement migration villages (50%), and migrant communities (41%).

Social-emotional delays are even higher. Across the full sample, 58% of infants and toddlers have delayed social-emotional skills. Once again, the highest rate, 68%, is in the western rural communities. Resettlement migration villages have the second-highest rate (61%), followed by central rural communities (58%) and migrant communities (53%). This means that over half of infants and toddlers in each of the four sub-communities have delayed social-emotional skills.

Language delays were less prevalent than cognitive and social-emotional delays, though these were more than twice the normal rate found in a healthy population. Thirty-three percent (33%) of the sample suffered from some kind of language delay. Despite the high rates of delays across the other three indices, motor delays in these communities were not high in comparison to rates in healthy populations. Nonetheless, these results reaffirm that there is a large urban-rural gap in terms of early childhood development in China.

Anaemia (ages 3–6)
The literature has found strong links between subpar nutrition and poor cognitive and schooling outcomes. Due to inadequate feeding practices, children who live in the poorest regions of developing countries often do not have appropriate diets in terms of micronutrients and

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Table 4. Developmental outcomes of infants and toddlers aged 24 to 36 months

<table>
<thead>
<tr>
<th></th>
<th>Full sample</th>
<th>Western China rural communities</th>
<th>Resettlement migration villages</th>
<th>Central China rural communities</th>
<th>Migrant Communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive delay</td>
<td>0.50</td>
<td>0.73</td>
<td>0.50</td>
<td>0.51</td>
<td>0.41</td>
</tr>
<tr>
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<td>(0.50)</td>
<td>(0.45)</td>
<td>(0.50)</td>
<td>(0.50)</td>
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<tr>
<td>Language delay</td>
<td>0.33</td>
<td>0.52</td>
<td>0.39</td>
<td>0.35</td>
<td>0.20</td>
</tr>
<tr>
<td>(1 = yes)</td>
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<td>(0.50)</td>
<td>(0.49)</td>
<td>(0.48)</td>
<td>(0.40)</td>
</tr>
<tr>
<td>Social-emotional delay</td>
<td>0.58</td>
<td>0.68</td>
<td>0.61</td>
<td>0.58</td>
<td>0.53</td>
</tr>
<tr>
<td>(1 = yes)</td>
<td>(0.49)</td>
<td>(0.47)</td>
<td>(0.49)</td>
<td>(0.50)</td>
<td>(0.50)</td>
</tr>
<tr>
<td>Motor delay</td>
<td>0.13</td>
<td>0.13</td>
<td>0.21</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>(1 = yes)</td>
<td>(0.34)</td>
<td>(0.34)</td>
<td>(0.41)</td>
<td>(0.35)</td>
<td>(0.20)</td>
</tr>
<tr>
<td>Any one type of delay</td>
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<td>0.90</td>
<td>0.81</td>
<td>0.78</td>
<td>0.67</td>
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<tr>
<td>(1 = yes)</td>
<td>(0.42)</td>
<td>(0.30)</td>
<td>(0.40)</td>
<td>(0.41)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>Any of two types of delay</td>
<td>0.48</td>
<td>0.69</td>
<td>0.55</td>
<td>0.49</td>
<td>0.39</td>
</tr>
<tr>
<td>(1 = yes)</td>
<td>(0.50)</td>
<td>(0.46)</td>
<td>(0.50)</td>
<td>(0.50)</td>
<td>(0.49)</td>
</tr>
<tr>
<td>Any of three types of delay</td>
<td>0.23</td>
<td>0.38</td>
<td>0.27</td>
<td>0.25</td>
<td>0.14</td>
</tr>
<tr>
<td>(1 = yes)</td>
<td>(0.42)</td>
<td>(0.49)</td>
<td>(0.45)</td>
<td>(0.43)</td>
<td>(0.35)</td>
</tr>
<tr>
<td>Four types of delay</td>
<td>0.06</td>
<td>0.08</td>
<td>0.08</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>(1 = yes)</td>
<td>(0.23)</td>
<td>(0.28)</td>
<td>(0.27)</td>
<td>(0.24)</td>
<td>(0.19)</td>
</tr>
<tr>
<td>Observations</td>
<td>372</td>
<td>165</td>
<td>62</td>
<td>65</td>
<td>80</td>
</tr>
</tbody>
</table>

Data Source: Authors’ survey

Notes: This paper calculates overall summary statistics using sampling weights for each observation. The proportions for each subpopulation in rural China are 37.7% for western China rural communities, 1.4% for resettlement migration villages, 42.0% for central China rural communities and 18.8% for migrant communities. We calculate the sampling weights using the following formula: sampling weight = proportion of subpopulation in total population/proportion of subpopulation in sample. The subpopulation proportions in the sample are the following: 86.0% for western China rural communities, 4.0% for resettlement migration villages, 3.8% for central China rural communities, and 6.1% for migrant communities. Therefore, the sampling weight is 0.44 for western China rural communities (equivalent to 37.3%/86%), 0.35 for resettlement migration villages (equivalent to 1.4%/4%), 11.1 for central China rural communities (equivalent to 42%/3.8%), and 3.08 for migrant communities (equivalent to 18.8%/6.1%).

macronutrients. Similar results have been repeated for rural China’s young children. The inadequate intake of micronutrients results in high rates of iron-deficiency anaemia among these children, which can have long-lasting detrimental effects on neurodevelopment. This sub-section uses both child anaemia status and anthropometric data, including wasting, underweight status, and stunting acquired through surveys in June 2017 to assess the nutritional status of approximately 1,500 children aged 3 to 6 years old in rural areas of western China.


Table 5 shows that 18% of the sample was anaemic. This rate is in line with those reported in several previous studies, which have found the anaemia rates of 3- to 6-year-old children in rural China to be 19% and 24%. This rate, however, is much higher than rates found in developed countries like the United States, where the prevalence among similarly aged children have been found to be as low as 3%^33.

Fortunately, however, data also indicate that the vast majority of rural toddlers do not suffer from macronutrient deficiencies (which is reflected by low rates of stunting, being underweight, and wasting across the sample). A small minority showed any of these indicators of malnourishment: stunted children accounted for approximately 2% of the sample, as did underweight children. Wasted infants made up about 4% of the sample.

Poor vision and intestinal worms (ages 6–12)

In addition to issues during early childhood that inhibit the cognitive capabilities of rural youth such as developmental delays and poor nutrition, poor vision and intestinal parasites also hinder these children from succeeding academically. Table 6 summarises several studies that have been conducted across China related to vision problems among primary school-aged children, revealing that a substantial percentage of these children are visually impaired, and only a small minority wear corrective lenses. The prevalence of poor vision among the different samples ranged from 9t to 46%. Of these, between 15 and 28% of them wore corrective lenses. This means that 15–35% of children in these samples cannot see clearly and do not wear corrective lenses. These studies echo the results of previous studies conducted in rural China, showing that reduced vision due to uncorrected myopia is indeed a public health problem among school-aged children.

Next, Table 7 highlights the high prevalence of soil-transmitted helminthes (STH) among primary school-aged children in rural China. The results show that 42% of 2,240 sample


children in seven of the poorest counties in a southwestern province were infected by some kind of STH infection at baseline. Thirteen percent of the total sample was co-infected with two kinds of STH. These findings reflect the results of other recent studies, which found the rate of prevalence to be 37–42%. Like the case of myopic children, STH-infected children cannot maximise their learning in school and have worse health, cognitive, and schooling outcomes.\(^{36}\)


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**Table 6. Poor vision of rural students in China.**

<table>
<thead>
<tr>
<th>Study</th>
<th>Prevalence</th>
<th>Corrected (Share of Those with Poor Vision that Have Glasses)</th>
<th>Age/Grade</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(^a)</td>
<td>24%</td>
<td>15%</td>
<td>9–12 years old Grades 4 and 5</td>
<td>19,934 students in rural schools of northwestern provinces</td>
</tr>
<tr>
<td>2(^b)</td>
<td>27%</td>
<td>23%</td>
<td>10–12 years old Grade 5</td>
<td>4,225 students in migrant schools of eastern coastal provinces</td>
</tr>
<tr>
<td>3(^c)</td>
<td>9%</td>
<td>12%</td>
<td>mean 10.6 years Grades 4 and 5</td>
<td>10,234 students in rural schools of southwestern and southeastern provinces</td>
</tr>
<tr>
<td>4(^d)</td>
<td>46%</td>
<td>28%</td>
<td>10–12 years old Grades 4–6</td>
<td>2,613 students in western rural schools</td>
</tr>
</tbody>
</table>

Notes: \(^a\) The definition of poor vision is uncorrected visual acuity \(\leq 6/12\) in either eye.


Discussion and conclusion

This paper has shown that China’s low level of labour force human capital lags behind that of other middle-income countries and prevents it from transitioning to high-income status. Using high school attainment rates to represent human capital, China is far from reaching the threshold necessary to graduate to high-income status. As of 2015 only 30% of China’s workforce has attended high school, which is less than half that of high-income nations overall. This rate is even less than the average among middle-income countries (36%), placing China behind other middle-income nations status such as Turkey, Mexico, and Indonesia.

However, the low level of China’s labour force human capital does not mean that the current government has not been committed to raising human capital in recent years. On the contrary, between 2005 and 2015, the overall high school attainment rate increased significantly, from 53 to 87% according to the MOE (a rise of 64%) or from 53 to 80% according to the Micro-Census (a rise of 51%). That means that in only a decade, China was able to put literally tens of millions of more students into high school.

In addition to looking at China’s recent achievements in raising its human capital, this paper also explored the remaining challenges that China faces in trying to accumulate human capital to one day facilitate the nation’s transition to a high-income economy. First, although high school attainment rates have improved considerably since 2005, 13 to 20% of the nation’s youth still do not attend high school. This problem chiefly lies in rural areas.

Besides an urban-rural gap in high school educational quantity, a gap in quality also exists. Because much of the increase in high school attainment among rural youth over the past decade is due to the expansion of vocational education and training schools (VET), it is unclear whether some students attending high school are actually learning as much as they could. Previous literature has also shown that a large share of poor-quality VET schools lies in rural areas, meaning that many rural students may not be learning as much as they could if the quality of VET schools were improved.

Finally, rural students also encounter a host of problems much earlier in life, including high rates of developmental delays during infancy and toddlerhood, which prevents them from succeeding academically and professionally. Among a sample of infants and toddlers 24–36 months old across four major rural subpopulations (which altogether represent 69% of all of rural China), 50% had cognitive delays, 33% suffered from language delays, and 58% exhibited social-emotional delays.

In addition to developmental delays, nutritional and health problems also prevent rural Chinese youth from maximising their potential. High anaemia rates among four to six year olds indicate that young children in the countryside do not have adequate diets. Surveys also show that of students with poor vision, only between 15 and 28% of them wore corrective lenses. Meanwhile, 42% of rural children in surveys conducted by the research team are infected by soil-transmitted helminths. The existing literature has shown that these nutritional and health issues can significantly impair the ability of rural youth to succeed in school and in life.

Despite the clear barriers that rural youth face in achieving the same levels of educational success as their urban counterparts, recent empirical research has shown that simple and cost-effective interventions early in life could improve outcomes for these children. One recent study conducted in rural China found that providing weekly training to rural parents in interactive parenting practices significantly increased the cognitive development outcomes of children in the treatment group, reflecting the results of similar studies in other developing countries.37 Another RCT conducted in rural China showed that providing children with chewable vitamins

has been shown to both increase haemoglobin levels and improve math test scores.\textsuperscript{38} A third study discovered that providing free glasses and teacher incentives maintained classroom wear of spectacles in the large majority of vision-impaired children over a school year when compared to a control group.\textsuperscript{39} Finally, distributing a 400-mg dose of albendazole accompanied with educational training about STH infection and prevention significantly reduced parasite infection among school-aged children in a fourth study, conducted in Guizhou province.\textsuperscript{40} Simple interventions like these could be the key to affording rural children the chance to start off on the right foot and maximise their success in the classroom.

This paper has shown that China must significantly raise its level of human capital if it wishes to attain high-income status. Although China has made great strides in increasing the share of rural youth attending high school over the past decade, rural youth still lag behind urban youth in terms of high school attainment rates, the quality of education in VET schools, and early childhood developmental and health outcomes. China will need to pay more attention to these areas if it wishes to increase the human capital of its youth and prepare them to become productive citizens in the future.

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### Disclosure statement

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\textsuperscript{40}Chengfang Liu et al., ‘Effect of Deworming on Indices of Health, Cognition, and Education Among Schoolchildren in Rural China: A Cluster-Randomized Controlled Trial’, \textit{American Journal of Tropical Medicine and Hygiene} 96(6), (2017), pp. 1478–1489.

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