

The Impact of Education on Chinese Economic Growth

Yize Wang^{1,a,*}

¹*School of Social Science, University of Manchester, M13 9PL, United Kingdom*

a. yize.wang@student.manchester.ac.uk

**corresponding author*

Abstract: Chinese traditional culture has consistently exerted a profound influence on everyday life in China and its educational system. Despite significant advancements in technology, the Chinese continue to employ traditional cognitive approaches in acquiring advanced knowledge. This traditional mindset has notable implications for the Chinese economy. This paper will explore the historical development and current state of the Chinese educational system. Through an analysis of the Chinese educational landscape, this paper will discuss its present impact on the Chinese economy. Additionally, this paper will examine its future implications, focusing particularly on the training of creative individuals and the related industries such as artificial intelligence (AI). A comparative analysis between China and the United States will be conducted to shed light on these areas.

Keywords: Chinese economy, Chinese educational system, artificial intelligence.

1. Introduction

The current discourse surrounding the interplay between education and economic growth has yielded numerous structured explanations. This article endeavors to delineate the landscape of Chinese education over the past few years and elucidate its predominant influence on economic development within China. Readers can attain a foundational comprehension of the nexus between education and China's economic trajectory through this exploratio. Furthermore, the narrative prompts deeper reflection on necessary reforms within the educational sphere to optimize its impact on economic progress.

Since A.D. 587, under Emperor Wen of the Sui Dynasty, a significant shift occurred in the method of selecting governing individuals. The traditional reliance on recommendations or hereditary positions gave way to rigorous examinations testing proficiency in the Four Books and Five Classics . However, during the Ming and Qing Dynasties, particularly through the eight-part essay format, examinations imposed constraints on candidates' freedom and creativity [1]. Consequently, traditional Chinese beliefs uphold academic pursuit as the primary pathway for social advancement, epitomized by the adage: "The worst of all things is to be without knowledge, and the best of all things is to be well-read." This essay examines the impact of China's educational system on its economy.

2. Contemporary Chinese Education System

In contemporary China, the landscape of education has taken a peculiar turn. The competitive fervor begins as early as kindergarten, where parents initiate a relentless push for their children to acquire an array of skills and interest, often neglecting the child's individual preferences. More importantly,

the cost of education skyrocketed in recent decades. The cost of educating a child can be divided into two parts: implicit cost and explicit cost. This pressure to excel is often accompanied by explicit costs, wherein parents invest heavily in various activities. While some opt for conventional pursuits like piano, painting, or chess, a segment of the emerging middle class steers towards less mainstream activities such as horse riding or golf, wishing their children will one day puncture the social class boundary and coming a members of upper class. In the year 2018, a majority of students, constituting over 60% of the demographic, engaged in extracurricular activities. These activities incurred an average cost of 9211 RMB, representing approximately 12.84% of their annual income [2].

Conversely, there exists a subset of parents who veer towards unconventional choices. Most of these parents are what this paper calls “upstart”, because they come from an era of rapid economic growth in China, leveraging the trends of the time to amass significant wealth. However, they often lack a deeper understanding of society and have not received higher education. In a notable instance from 2019, an extracurricular institution claimed to teach a skill dubbed "Quantum Wave Speed Reading," promising children the ability to absorb hundreds of thousands of words in minutes through heightened perception known as "HSP high perception." However, this endeavor was later exposed as a scam. The fees associated with these activities vary significantly, ranging from 6 thousand RMB for a half-year duration to thirty thousand RMB for lifelong participation. Through a private channel, it was learned that an undisclosed parent had once expended seventy thousand RMB [3].

After children enter primary school, an additional hidden cost arises the expenditure on housing within specific school districts, if parents seek to ensure their children receive a better education in junior high schools. Purchasing a residence within the boundaries of a desired school district grants residents' children admission to the associated school. An empirical investigation from Hangzhou, China figured out that as one-level of quality of educational facilities increased, the price of second-hand houses increased by 817 yuan per square meter and the price of low-priced and small house will increased by 1000 yuan per square meter, because of more obvious value-added effect[4]. This decision places children under the weight of expectations and subjects them to the pressures stemming from intense competition among classmates.

During junior high school studies, students primarily focus on academic pursuits in preparation for the Senior High School Entrance Examinations (SHSEE), which are crucial for admission to prestigious local senior high schools. Parents emphasize the importance of securing enrollment in these schools for future university admissions prospects, motivating students to dedicate themselves fully to their studies. Those who do not pursue this path may opt for vocational schools to acquire technical skills like hairstyling or nursing. Chinese parents, particularly those with higher education, struggle to accept the possibility of their children failing to gain university admission or lacking upward social mobility. The average extracurricular tuition fee is RMB 120,000, with some households spending up to RMB 300,000, significantly impacting their socio-economic status [5]. The effectiveness of these expenditures depends on the cognitive abilities of parents, who must make informed decisions about advantageous educational investments for their children.

Upon entering senior high school, students encounter various challenges. Firstly, there are limited subject choices available. Despite recent reforms in the college entrance examination system, allowing candidates to choose from five out of nine subjects, the selection remains narrower compared to education systems in the United States and the United Kingdom. Secondly, competition is intense, especially in provinces like Henan, which has the highest proportion of senior students nationally [6]. The demanding schedule persists for nearly three years, prompting many students to supplement their education with extracurricular tuition classes during breaks. In 2018, the extracurricular academic tutoring has been risen to 455 billion and it was forecasted to reach 611.1 billions in 2022 [7]. Wealthier families often invest in their children's education by enrolling them in international schools, where the annual cost can exceed one hundred thousand RMB per student,

excluding extracurricular fees. Even among talented students admitted to prestigious universities, the primary motivation is often securing certification for employment opportunities rather than pursuing personal interests. This leads to a significant disparity in the number of students opting for majors perceived to enhance job prospects versus less popular disciplines.

3. The Effect of Education on Chinese Economic Growth

The impact of Chinese education is significant, raising questions regarding its capacity to sustain economic growth currently and in the future. In 2023, education expenses accounted for 17.1% of the average annual income in China, totalling 8464 RMB per year, against an average household income of 39218 RMB. China allocates the largest proportion of its total annual expenditure to education, accounting for 7.9%. In contrast, most other countries typically allocate only 1-2% of household expenditure to education. Even South Korea, which ranks second in educational spending, allocates only 5.3% of its total annual expenditure to education. Disparities are notable: top quartile families spend 10.6% of their income on education, while bottom-quartile families allocate 56.8%. As education expenses rise, disposable income decreases, affecting living standards and domestic consumption[8]. This may lead to surplus supply, prompting the need to export excess production, leveraging China's pricing advantage. However, if China's population advantage diminishes, so too will its pricing edge. Thus, incentivizing domestic consumption becomes crucial for bolstering consumer purchasing power. Moreover, another side effect of this educational emphasis is the creation of an economic bubble due to overinvestment in the real estate sector. A considerable portion of funds is directed towards real estate instead of being allocated to improving education systems that foster not only knowledge acquisition but also creativity and other essential qualities for individual development.

The influence of China's educational system on the nation's economic prospects is both enduring and significant. These seemingly education-induced side effects and excessive competitive pressures have led to an increasing number of children losing their motivation to learn. A pertinent example of societal educational neglect is evident in the phenomenon of aimless youth, epitomized by individuals residing in LongHua District, Shenzhen, colloquially referred to as "SanHeDaShen," who predominantly spend their time in cyber cafes. Engaged in a cycle of part-time work in factories when finances are low, followed by returns to cybercafes, these individuals find themselves trapped in a purposeless cycle, squandering their time and potential. If individuals adhere to the traditional mindset of securing a regular job, purchasing a house with a mortgage, marrying, raising children, and similarly educating them, they may find themselves trapped in a cycle. However, should they encounter any crisis such as illness or economic downturn, this delicate balance could collapse, leading to the dissolution of the family unit.

The People's Republic of China was established in 1949 amid a backdrop of numerous challenges, including economic restructuring and recovery from prolonged conflicts. Until 1978, China operated primarily under a planned economy, focusing on industrialization and striving to catch up with the industrialized nations of that era. The pivotal year of 1978 marked the beginning of China's reform and opening-up policy, a transformative phase that opened the doors to substantial foreign investment and collaboration. During this period, China's primary objectives were twofold: to elevate the living standards of its population and to stimulate its domestic economy. As a result, the immediate focus was on rapid economic development and infrastructural growth. Consequently, many college graduates possessed technical expertise in fields such as applied physics and chemistry, thereby significantly contributing to China's economic advancement.

4. The Lag of AI and Creativity

However, following nearly two decades of prosperity, the advent of the artificial intelligence (AI) era has supplanted the digital technology era. Following the experience of the pandemic, it was anticipated that the global economy would plunge into recession. Contrarily, the US economy has exhibited a trajectory of recovery. Several factors can elucidate this phenomenon. Apart from economic growth driven by robust domestic consumption and supply increases, investment in AI has also played a pivotal role. After decades of leveraging digital technology, the global economy was in dire need of another innovative breakthrough. AI emerges as the most promising avenue for significant technological advancement that can bolster the economy. Notably, in 2016, about 90% of commercial investments in AI were allocated to R&D and deployment of AI technologies [9]. Within the US stock market, the so-called "Magnificent Seven," including companies like NVIDIA, Microsoft, and Meta Platforms, commanded a substantial portion of market capitalization. A common thread among these seven companies is their strong focus on AI as a core component of their business operations. In 2023, the stock of these "Magnificent Seven" surged by 71%, while the remaining stocks in the S&P 500 index grew by a mere 6%, contributing to an overall 19% increase in the S&P 500 index [10]. Historically, rapid economic growth has consistently been accompanied by significant technological advancements. Conversely, in China, Kweichow Moutai, a prominent liquor manufacturer, holds the largest market share. The stark disparity in AI adoption and focus between Chinese and US technology companies is becoming increasingly evident.

5. The Hardware Disparity in the AI Field Between China and the United States

To elucidate the disparities between Chinese AI capabilities and global standards, it is instructive to examine both hardware and research dimensions. On the hardware front, AI infrastructure primarily consists of GPUs (Graphics Processing Units), TPUs (Tensor Processing Units), and NPUs (Neural Processing Units). In China, Huawei stands as the leading company producing these components and can design chips up to 7 nm. However, due to technology restrictions imposed by the US, Huawei faces limitations in chip manufacturing capabilities. In contrast, NVIDIA, the foremost US-based company, leads in the production of AI-related hardware components. A critical factor in chip production is lithography, which determines the intricacy and efficiency of semiconductor manufacturing. The technological gap between China and other leading nations is evident in the limitations of their lithography machinery. Sanctions from the US and restrictions by ASML, a Dutch company that supplies lithography machines, have constrained Chinese technology firms to produce chips with a minimum lithography size of 7nm. In contrast, the most advanced chips globally are now being manufactured at 3nm lithography size. Despite efforts by Chinese technology companies to reverse-engineer and understand the intricacies of lithography machinery, doing so entails substantial economic and time investments. Thus, the technological gap in lithography machinery serves as a significant barrier to China's AI hardware development [11].

The historical economic strategies provide a rationale for China's relative shortcomings in AI hardware development when compared to technologically advanced Western countries. The emphasis during the early stages of reform was largely on economic growth and infrastructure, with less attention directed towards cutting-edge technological advancements. Consequently, there has been a prevailing inclination towards industrialized approaches in talent development, causing China's AI hardware capabilities to face challenges in keeping pace with those of developed Western nations.

6. The Research Disparity in the AI Field Between China and the United States

From an AI research perspective, studies indicate a relatively smaller disparity and a comparable research structure between China and the US. Metrics such as research volume, citation impact, and

sources of citations support this observation. However, when evaluating research quality, differences become evident in metrics like PP-top20% values and the proportion of publications in top-tier venues. While the US maintains a lead in these quality indicators, China has been proactive in addressing this disparity and has shown efforts to narrow the gap. Over time, these efforts have begun to yield positive results, indicating China's commitment to enhancing the quality of its AI research output. As for students who pursuing knowledge in robotics and AI, there remains a palpable gap between Chinese AI capabilities and those of Western counterparts[12]. The duration and manner in which China will engage with the technological advancements driven by AI remains uncertain. The core issue is Chinese individuals may not be able to ask probing questions, thinking creatively. Under the current education system, most of students lack creativity. One explanation is the limited emphasis on exploring creative subjects such as the arts. In China, art students are evaluated primarily through examinations that assess their technical skills rather than encouraging them to demonstrate creativity through original works of art. Non-art students have very limited access to art at all. The Chinese education system lacks emphasis on arts education, especially at the secondary level, making arts subjects least prioritized. Despite this, arts are vital for fostering creativity, offering avenues to express ideas and emotions. Artistic pursuits, whether in painting, music, literature, or dance, inspire imagination and diverse perspectives, enhancing creative skills. Engaging with art cultivates aesthetic sensibilities and an appreciation for detail, which can further stimulate creative thinking in daily life and work. Additionally, arts intersect with disciplines like STEM, promoting interdisciplinary thinking and creative problem-solving. Art also serves as a platform for free expression, helping individuals find their voice and fostering confidence, which in turn enhances creative thinking. The overall lack of emphasis on arts education in China's educational system significantly constrains the innovative potential of its citizens. Without exposure to arts education, individuals may lean towards linear, logical, and traditional modes of thinking, often lacking the diversity, non-linearity, and creativity inherent in artistic and interdisciplinary approaches. It is obvious that the Chinese education system effectively identifies students with strong academic abilities, facilitating their study and research based on a solid foundation. However, it falls short of fostering creativity, an essential quality for generating innovative ideas.

7. Conclusion

In conclusion, the Chinese educational system bears significant implications for both present and future economic growth in China. A primary concern arises from the potential scarcity of innovators equipped with the creative acumen necessary to generate novel ideas crucial for stimulating economic progress. Moreover, the considerable investment in education-related expenditures, including extracurricular tuition, poses a risk of diminishing consumption levels within the economy. Additionally, the inflated housing market observed in proximity to prestigious school districts, largely fueled by parental aspirations for their children's education, has engendered economic distortions reminiscent of a housing bubble. These intertwined factors necessitate a nuanced examination of the Chinese educational landscape to discern its multifaceted impact on both current economic dynamics and future growth prospects. However, there are notable challenges stemming from governmental restrictions that limit access to crucial data necessary for comprehensive research. This obstacle underscores the necessity for further examination of the tangible impact of education on economic development, particularly in the coming decade. Such investigations must grapple with the uncertainty surrounding the applicability of existing theories to future scenarios. It is imperative to determine whether current frameworks adequately explain forthcoming trends, or if adjustments are required to comprehend the evolving relationship between education and the economy.

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