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Is There a Surplus of College Graduates in China? Exploring Strategies for Sustainable Employment of College Graduates

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Abstract: In 2019, China achieved a milestone in higher education with a gross enrollment rate surpassing 50%, signifying the internationally recognized phase of "universalization". In 2023, the escalating number of college graduates amounted to 11.58 million, an increase of 0.8 million over the last year, reaching a new high in scale. Despite this remarkable progress, the employment rate of college graduates has remained low and stagnant over the past two decades. This paradox highlights the pressing need to address the employment challenges faced by a growing number of college graduates in China. The existing supply structure of college graduates, including education levels, academic disciplines, spatial distribution, and core competencies, is inconsistent with the demand structure of the labor market. This mismatch emphasizes the necessity for both the supply and demand sides to collaborate in resolving the college graduate employment problem. By advancing the industrial structure, optimizing the configuration of higher education, and fostering a culture of innovation, a harmonious integration of the higher education system with economic development, market demands, and long-term planning can be achieved. The strategies proposed in this study offer practical solutions to promote sustainable employment for college graduates in China.

Keywords: college graduates; sustainable employment; higher education; supply and demand; innovation

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1. Introduction

Competition among major powers revolves around the contest for talent, resources, and systems. Since the initiation of the reform and opening-up policy, China has made notable accomplishments in talent cultivation. The Higher Education Enrollment Expansion Policy, implemented at the end of the 20th century, has led to a wave of mergers, renaming, and upgrading of colleges and universities. This policy has, to a certain extent, realized the economies of both scale and scope in higher education. The large-scale expansion of higher education over the past two decades can be attributed to the collective efforts of the government, society, and the public. The government has formulated long-term development plans for the country, emphasizing the importance of education. Society has demonstrated a demand for enhanced competitiveness in both domestic and foreign markets, necessitating the development of a skilled and educated workforce. The public, recognizing the value of individual human capital, has had high expectations for personal growth and the appreciation of their own capabilities [1]. With the fast-growing economy, the above three factors have triggered the rapid popularization of higher education in China [2].

In 2019, China achieved a significant milestone in higher education with a gross enrollment rate surpassing 50%, entering the phase of "universalization" [3]. Moreover, in 2023, the number of college graduates reached a new record high of 11.58 million, representing an increase of 0.8 million compared to the previous year [4]. However, despite the expanding number of college graduates, the initial employment rate has experienced

a downward trend, dropping from an initial rate of 90% at the beginning of the century to a range of 70–80% [5]. In June 2023, the youth unemployment rate in China reached a historic high of 21.3% [6]. On the one hand, the increasing scale of college graduates year after year has resulted in intensified competition for limited job opportunities. On the other hand, the employment prospects for college graduates have been negatively impacted by the COVID-19 pandemic and the subsequent economic slowdown. These factors have collectively contributed to the exacerbation of the employment problem faced by college students. Simultaneously, China is facing a decline in fertility rates, leading to a slowdown in labor supply growth. From 2015 to 2022, the demand rate in China's labor market, as indicated by the ratio of job vacancies to job seekers, has consistently exceeded one, showing a situation where demand outweighs supply [7]. This situation highlights the challenges and obstacles that both employers and graduates encounter in the labor market.

During the period of China's 14th five-year plan, the external environment for national development has become increasingly complex, emphasizing the urgent need to transform the driving force behind economic growth. In this context, the caliber and composition of the labor force will play a pivotal role in driving sustainable economic growth. Enhancing human capital becomes an essential determinant in attaining sustainable economic development. However, the rapid advancement of the fourth industrial revolution has brought large changes to job structures and skill requirements in the market, which has resulted in prominent issues such as the mismatch between China's talent structure and market demand, disparities in talent levels and distribution, and the pressing need to optimize the talent development environment [8]. As the Chinese proverb goes, "Planting trees may take a decade, but nurturing talents may require a century". Population quality is the foundation of national prosperity. The talent strategy and education system currently in place will directly influence the scale and caliber of the future labor force, ultimately shaping the destiny of the nation.

In this paper, based on the macro data released by the official website of the government and relevant agencies, we embarked on an exploratory study to investigate the issue of sustainable employment for Chinese college graduates. Our research was guided by the following questions:

1. What is the extent of oversupply of college graduates in China?
2. What are the main challenges and barriers faced by college graduates in securing sustainable employment?
3. How to alleviate the employment dilemma of college graduates and achieve sustainable employment?

The preceding section provides background information on the research topic. The following sections are arranged as follows: Section 2 presents a literature review on the issue of sustainable employment. Section 3 outlines the conceptual framework of this study. Sections 4 and 5 constitute the main body of the paper, addressing the phenomenon of oversupply in the total number of Chinese college graduates and the structural imbalances. Section 6 discusses recommendations for promoting sustainable employment of college graduates from both the supply and demand sides. Section 7 addresses the limitations of the study and suggests directions for future research. Section 8 presents the overall conclusion.

2. Literature Review

The literature review furnishes a survey of previous studies undertaken regarding sustainable employment and the employment status of Chinese college graduates.

2.1. Sustainable Employment

To comprehend the origins of sustainable employment, we can trace them back to the foundational human capital theory, which was introduced by Theodore W. Schultz, an American economist, in the 1960s. Schultz proposed a comprehensive theory of human capital, suggesting that it encompasses the knowledge and skills embodied in individuals,

which are acquired through investments in education made by the government, enterprises, and individuals themselves [9]. According to Schultz, human capital is considered a factor of production and is governed by the principles of supply and demand within the labor market. He posited that in the long run, the supply and demand for labor will naturally reach an equilibrium. Furthermore, human capital theory argues that highly educated workers will eventually secure employment opportunities that align with their educational attainment, thereby realizing the objective of "maximizing their talents".

However, during the 1970s, developed countries, including the United States, experienced a period of rapid expansion in higher education. Consequently, a significant influx of graduates with higher education degrees entered the job market, surpassing the capacity of the labor market to absorb such a large number of highly educated individuals. It was Richard B. Freeman, an American scholar, who first recognized the social issues arising from the rapid growth of higher education. He pointed out that the supply of higher education in the United States exceeded the societal demand, leading to an oversupply of highly educated individuals [10]. This realization occurred during a time when the West was grappling with an economic crisis triggered by the oil crisis. The discrepancy between educational prosperity and economic circumstances highlighted the need to explore strategies and frameworks that would ensure an enduring relationship between educational opportunities and the demands of the labor market.

The concept of sustainability originally pertained to the ways in which individuals and institutions manage the environment [11]. In 1972, the United Nations provided a comprehensive definition of sustainability as a guiding principle that emphasizes meeting the present needs without compromising the needs of future generations [12]. In the 21st century, by linking the concept of sustainability to employment, this implies that one should strive to organize work in ways that their human resources are nurtured rather than exploited, enabling their continued deployment in the future [13,14]. Recent studies have developed systematic analytical frameworks for sustainable employment, with a specific emphasis on exploring skill frameworks, notably highlighting the cultivation of job seekers' e-learning abilities [15]. The primary goal is to equip graduates with the essential skills and qualities needed to excel in future competitions, while also ensuring their optimal placement in job roles that align with their employability [16–20]. Therefore, sustainable employment can be defined as the extent to which workers possess the capacity to continue working both now and in the future [21].

The above definition underscores the significance of ensuring employment practices, conditions, and the cultivation of job skills that foster long-term employability, well-being, and the ongoing contributions of workers to the labor force, with sustainable employment examined more from an individual perspective. As far as this research is concerned, we recognize the importance of fostering employment stability, promoting career development, and establishing mechanisms that align educational investments with the evolving needs of the economy. The examination of sustainable employment aimed to address the challenges arising from the imbalance between educational achievements and economic realities, ultimately striving for a more sustainable and balanced employment ecosystem for college graduates.

2.2. Sustainable Employment of College Graduates in China

In the late 1990s, China experienced a period of rapid economic growth as a result of the reform and opening-up policies. Concurrently, higher education also witnessed a significant expansion. Guided by national education plans and reforms, the population underwent a considerable improvement in cultural quality, leading to the accumulation of a valuable stock of human capital for social and economic development, as well as the cultivation of a highly educated labor force for the market. However, the rapid growth of higher education also gave rise to a set of challenges and issues that garnered attention and sparked discussions among domestic scholars.

Domestic scholars' viewpoints on sustainable employment crisis of college graduates in China can be roughly categorized into two groups. The first group argues that the crisis stems from the contradictions within the economic transition. This perspective considers it as a deep-rooted internal issue, wherein economic transition leads to labor market segmentation, deviations in industrial structure, and imbalances in educational structure [22–24]. Such in-coordination poses a barrier to achieving sustainable employment, and this can be addressed by rebalancing the relationship between higher education and industrial development to enhance employment alignment [25]. Additionally, establishing a robust social insurance system is essential for a healthy and functioning labor market [26]. The second group attributes this issue to external factors, such as the expansion-oriented policies in higher education or changes in the external economic environment. They argue that the exogenous expansion of higher education has led to an excessive number of graduates, resulting in a shortage of suitable positions in the labor market in the short term [27,28]. Alternatively, scholars like Xu Tao emphasize the significant changes occurring in the external environment, specifically the emergence of new economic forms and employment patterns, which have resulted in a mismatch between job seekers and available positions for college graduates [29].

Additionally, according to research by Li XiaoGuang et al., the issue of "employment difficulty" for highly educated labors has been a hot topic of social concern since the first batch of expanded enrollment students entered the labor market in 2003 [30]. As they transition from schools to the labor market, college graduates become part of the highly educated labor force. Therefore, it is important to clarify that in this article that "highly educated labor force" and "college graduates" simply reflect the variation in terminology used in different data statistics, while the statistical criteria remain unchanged, referring to job seekers with a diploma or higher education level, including those with an associate's degree or above.

In summary, in the context of China's economic transition and upgrading, facing the expanding scale of college enrollment and the increasingly severe employment situation, the employment issue of college graduates is not caused by a single factor, so the realization of sustainable employment cannot solely rely on the efforts of individual job seekers. Instead, comprehensive improvements are needed in various aspects, including the scale, level, structure, and quality of higher education, to align with the expectations and needs of the labor market.

3. Conceptual Framework

In the field of economics, maintaining a balance between supply and demand is crucial to avoid production shortages or surpluses, which can lead to economic inefficiency. Education is now integrated into the entire economic process. This study took an integrated perspective by examining both the supply and demand sides of the labor market to address the employment issue of college graduates. Creating a conducive ecosystem for sustainable employment among Chinese college graduates necessitates collaborative efforts from both the supplier and demander perspectives. Overall, this paper serves as a valuable reference for policymakers, educational institutions, and other stakeholders involved in tackling the employment dilemma of college graduates in China in order to support their sustainable employment and long-term success in the evolving labor market. Figure 1 provides a visual representation of the conceptual framework employed in this study.

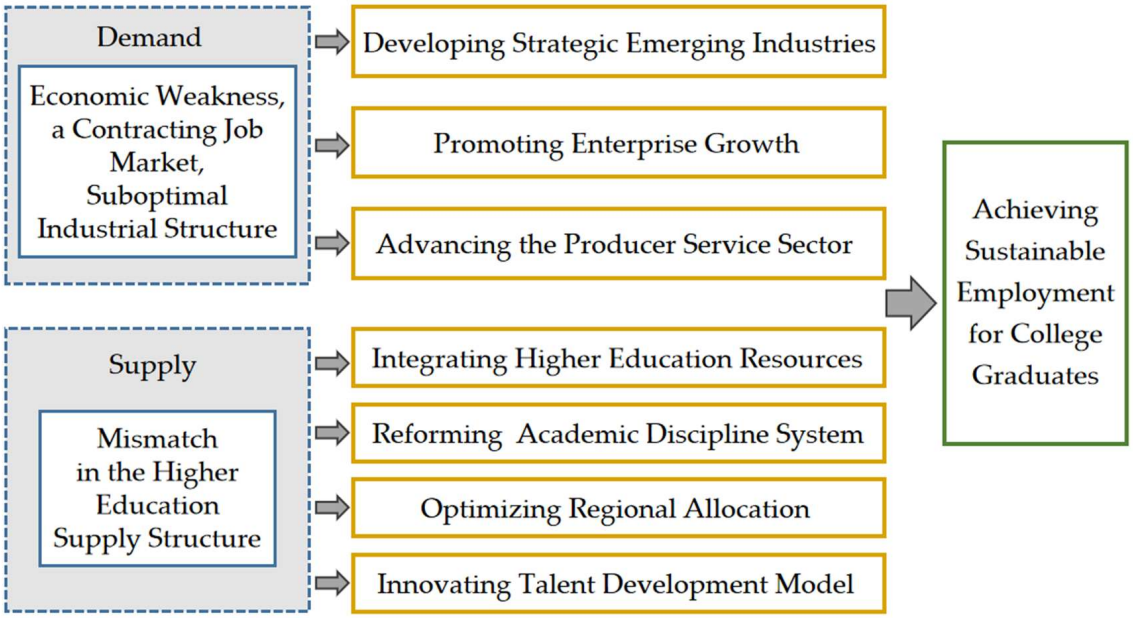


Figure 1. Conceptual framework for the sustainable employment of college graduates.

4. China's Labor Market Is Unable to Accommodate a Large Number of College Graduates

4.1. Mismatch between the Economic Development Level and Scale of Higher Education

According to Martin Trow's classification [31], higher education can be divided into three phases: elite (less than 15%), massification (15–50%), and universalization (more than 50%), based on the gross enrollment rate. Indeed, the relationship between quantity and quality is a crucial consideration in the development of higher education. The notion that quantity serves as the foundation for quality improvement in higher education has become the theoretical basis for post-industrial countries to formulate higher education policies in order to drive economic development, social mobility, and innovation.

China implemented a higher education expansion policy in 1999. Within only 20 years, marked by a significant surge in the number of college graduates, China's higher education system has transitioned into the phase of universalization. Comparatively, it took longer for the top five developed countries, such as Britain (26 years), Germany (26 years), the United States (30 years), and Japan (40 years), to undergo a similar transformation [32]. However, the rapid progress of higher education in China has been largely driven by policy decisions rather than solely adapting to natural economic development. In other words, the expansion of higher education in China has been a deliberate effort by the government to increase access and educational attainment levels. Figure 2 shows the number of college graduates per USD 100 million GDP and the GDP per capita of the world's top 10 economies in 2021. It is believed that the number of college graduates needs to be in line with the development of the country's GDP [33]. Obviously, the number of college graduates in China is too large to exceed its GDP development level. Compared to countries like Britain, France, Germany, and the United States, China has a much larger number of college graduates per unit of GDP. The expansion of higher education has outpaced the demand for college-graduate-level skills within the labor market, potentially resulting in an overall surplus of college graduates.

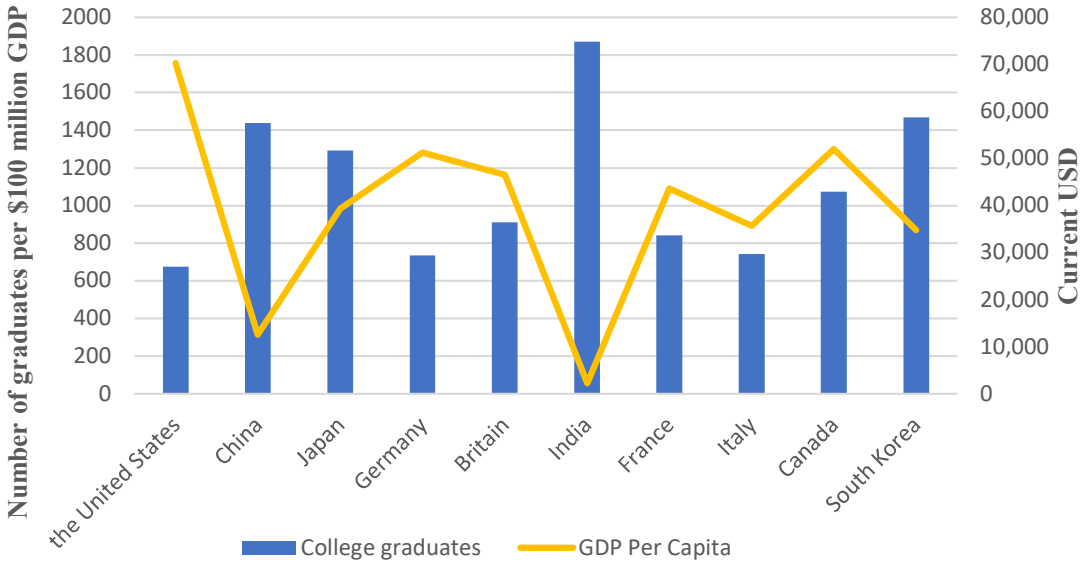


Figure 2. Number of college graduates per USD 100 million GDP and the GDP per capita in the world's top 10 economies in 2021. China's data comes from China Labor Statistical Yearbook 2022, published by China Statistics Press Co., Ltd. (Beijing, China). International data come from the ILO (International Labour Organization (Genevois, Switzerland)). Some graduate data in Japan and India are missing.

4.2. Reduced Absorption Capacity of Highly Educated Labor in the Job Market

Figure 3 highlights a concerning trend in China's employment landscape. Over the past two decades, China's overall employment growth rate of the national labor force has been declining, and it entered negative growth in 2018. Of particular significance is the employment growth rate of the highly educated labor force, which began to slow down gradually in 2003 and 2010, and showed negative growth in 2005, 2006, 2017, 2020 and 2021. In 2020, for example, the employment growth rate of the highly educated labor force was −3%, indicating a huge decline. In fact, the employment of the highly educated labor force decreased by approximately 5.38 million in that year [34]. Meanwhile, it is worth highlighting that the cumulative count of college graduates in 2020 exceeded 8.7 million [3].

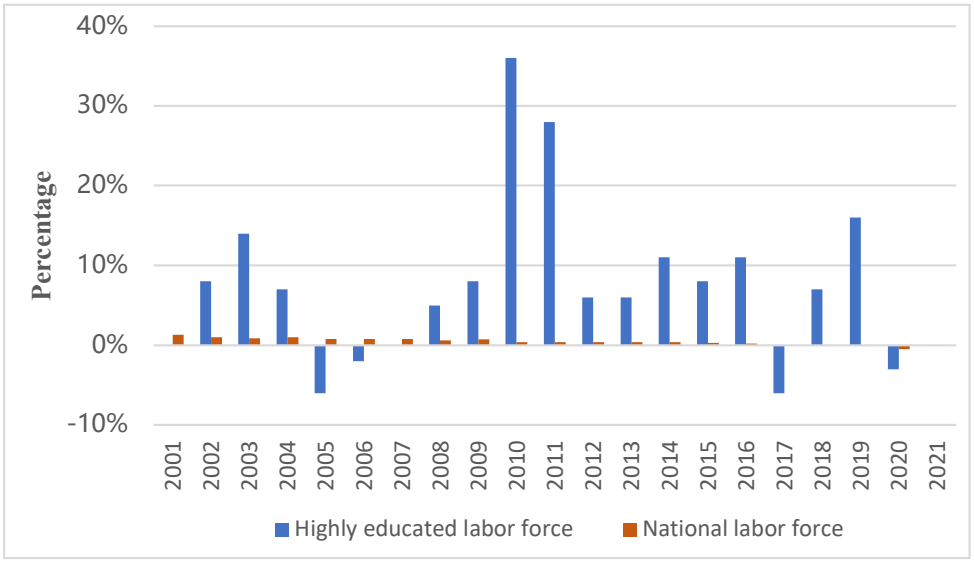


Figure 3. Employment growth rate of national labor force and highly educated labor force between 2001 and 2021. The data come from the National Bureau of Statistics of China.

As shown in Table 1, the employment elasticity coefficient for the entire nation exhibits a consistent decline during the initial four five-year plans. This decline suggests a diminishing role of economic growth in stimulating employment expansion. The employment elasticity coefficient for the highly educated labor force initially demonstrates an upward trend, followed by a subsequent decline, ultimately dipping below 0 in 2021. Concurrently, GDP continues to experience growth, implying that while the scope of higher education is expanding rapidly, the labor market's capacity to accommodate highly educated individuals is diminishing. This phenomenon suggests the existence of an "employment crowding-out effect" resulting from economic growth. Presently, the labor market lacks the ability to absorb a huge number of highly educated workers, leading to an excessive total number of college graduates.

Table 1. Employment growth rate, GDP growth rate, and coefficient of employment elasticity between 2001 and 2021.

Year	Employment Growth Rate (%)		GDP Growth Rate (%)	Employment Elasticity Coefficient	
	National Labor Force	Highly Educated Labor Force		National Labor Force	Highly Educated Labor Force
2001–2005	2.50	24.15	68.70	0.04	0.35
2006–2010	1.50	54.50	85.50	0.02	0.64
2011–2015	0.16	34.70	45.70	0.01	0.76
2016–2020	−1.50	12.70	36.50	−0.04	0.35
2020–2021	−0.01	−0.5	8.1	−0.12	−0.06

Data come from the National Bureau of Statistics of China and China Labor Statistical Yearbook 2002–2022, published by China Statistics Press Co., Ltd. All data were collated and calculated. Employment elasticity coefficient = employment growth rate/GDP growth rate.

4.3. Tertiary Industry with Declining Labor Absorptive Capacity

Amid the global shift from an "industrial economy" to a "knowledge-based economy, the reliance on extensive growth driven by increasing inputs of production factors, such as fixed assets and labor force, is gradually shifting towards intensive growth centered around technological advancements. In practical economic operations, economic growth arises partially from the significant impact of technological innovations and partially from the swift transformations in the foundational production framework [35]. Empirical studies have demonstrated that the tertiary industry possesses the highest capacity for employment absorption and serves as the primary avenue for both developed countries and less developed countries to accommodate highly educated labor force [36–39]. The degree of deviation in the industrial structure serves as an indicator to gauge the alignment between industrial development and employment. The closer the absolute deviation value is to zero, the more robust the alignment between the industrial composition and the employment structure.

Table 2 presents the deviation in GDP composition, employment composition, and industrial structure among countries in the year 2021. China demonstrates a relatively modest share of the tertiary industry output value, accounting for approximately 54% of its GDP. In contrast, developed countries typically achieve a higher proportion of 70% or even 80% during the same period. Additionally, a large deviation exists between the employment structure and the industrial structure within China, and the employment structure noticeably lags behind the advancement of the industrial structure.

Table 2. GDP Composition, Employment Composition, and Industrial Structure Deviations in 2021.

Location	GDP Composition (%)			Employment Composition (%)			Industrial Structure Deviations		
	I	II	III	I	II	III	I	II	III
China	7	39	54	23	29	48	−0.7	0.34	0.13
United States	1	19	81	1	20	80	0	−0.05	0.01
Germany	1	29	70	1	28	71	0	0.04	−0.01
Britain	1	19	80	1	17	82	0	0.12	−0.02
France	2	19	79	2	20	78	0	−0.05	0.01
Japan	1	29	70	3	24	73	−0.67	0.21	−0.04

China's data come from the National Bureau of Statistics of China. International data come from OECD (Organization for Economic Co-Operation and Development). In the table, I, II, and III, respectively, represent the primary, secondary, and tertiary industries. Industrial structure deviations = (share of GDP for a specific industry in the calculation period/share of employment in the same industry during the period) − 1.

Table 3 exhibits the employment growth rate, economic growth rate, and employment elasticity coefficient of China, categorized by industry from 2001 to 2020. Firstly, the employment elasticity coefficient of the primary industry has consistently remained negative since the beginning of the 21st century, indicating that as the primary industry undergoes appreciation or development, the number of employed individuals in this sector decreases. Secondly, the employment elasticity coefficient of the secondary industry initially increases and then declines, consistently maintaining a negative value over the past five years, which indicates that as urbanization and industrialization progress, the secondary industry's capacity to absorb the labor force has become saturated during the new economic transition period. Thirdly, the employment elasticity coefficient of the tertiary industry displays a fluctuating decline, signifying a gradual reduction in its ability to absorb employment in recent years.

Table 3. Employment growth rate, economic growth rate, and employment elacticity coefficient in China categorized by industry between 2001 and 2020.

Year	Employment Growth Rate (%)			Industry Economic Growth Rate (%)			Employment Elasticity Coefficient		
	I	II	III	I	II	III	I	II	III
2001–2005	−8.12	9.4	16.2	42.1	76.9	68.9	−0.19	0.12	0.24
2006–2010	−12.6	15.6	9.1	68.6	80.9	95.5	−0.18	0.19	0.1
2011–2015	−19.5	0.4	18.2	28.2	28	68.9	−0.69	0.01	0.26
2016–2020	−15.3	−3.4	8.4	22.1	29.7	44.2	−0.69	−0.11	0.19

Data come from the National Bureau of Statistics of China and China Labor Statistical Yearbook 2002–2021, published by China Statistics Press Co., Ltd. In the table, I, II, and III, respectively, represent the primary, secondary, and tertiary industries. All data were collated and calculated. Employment elasticity coefficient = employment growth rate/industry economic growth rate.

A substantial enhancement in efficiency within the primary and secondary sectors will lead to an expansion of employment opportunities in the tertiary sector, predominantly impacting both low-skilled and high-skilled labor forces [40]. This is attributed to the tertiary industry's relatively complex structure with internal differentiation. The sector encompasses both low-end service sectors, such as catering, as well as producer services characterized by a relatively high level of technological sophistication, such as information, finance, education, scientific research, and technical services, which in turn necessitates a highly educated labor force. In several advanced economies, the share of tertiary industry in GDP has reached an impressive 70–80%, with the producer services economy constituting 70% of the overall tertiary industry [41]. Yet, in China, the output value of producer services accounted for less than 40% of the tertiary industry in 2021, reflecting a marginal increase of mere 1.4% compared to the previous year [42]. Generally speaking, the producer services within China's tertiary industry currently lacks sufficient strength to drive employment,

which is unfavorable for absorbing highly educated labor force. Consequently, this situation impacts the employment prospects of college graduates, leading to the emergence of an oversupply of individuals holding college degrees.

5. Mismatch between Market Supply and Demand Leads to Structural Employment Conflicts among College Graduates

5.1. Degraded Use of Academic Qualifications in the Labor Market

Figure 4 presents the data regarding the higher education graduate numbers and their growth rates in China from 2011 to 2021. When considering the academic level, there has been a consistent upward trend in the overall number of graduates with higher academic qualifications across all levels. Significantly, there has been a notable rise in the number of graduates at the ordinary undergraduate level. Since surpassing the number of ordinary college graduates in 2013, the total count of ordinary undergraduate graduates has maintained its leading position. In addition, a consistent yearly increase has been observed in the count of international students who have returned to China upon completing their education, reaching unprecedented levels. Over the past decade, the number of Chinese higher education graduates has consistently risen at an average annual growth rate of 4.5%.

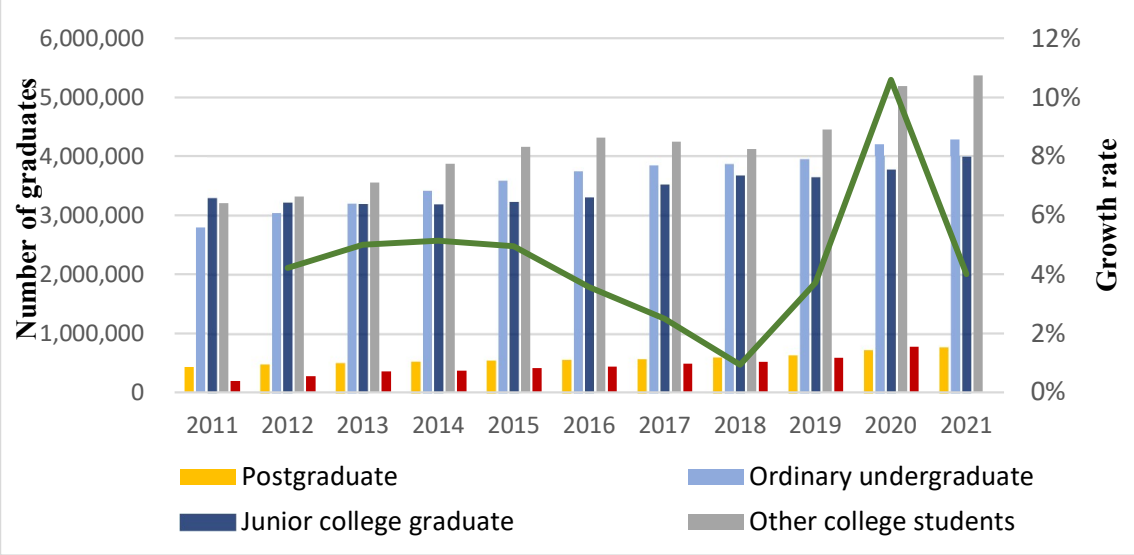


Figure 4. The number and growth rate of higher education graduates in China between 2011 and 2021. Data come from the National Bureau of Statistics of China. Other college students include adult undergraduate students and online undergraduate students. Data of returned students in 2021 are missing.

Figure 5 presents the data regarding the proportion of the highly educated labor force and their growth rates in China from 2011 to 2021. From Figure 5, it can be observed that the proportion of the highly educated labor force in the Chinese labor market has not consistently been in a growth state. It even declined in 2020, yet the growth rate of college graduates in the same year marked the highest in nearly a decade. Moreover, over the past decade, the highly educated labor force only grew by an average of 1% per year, which is much lower than the growth rate of higher education graduates. As a result, there has been a massive increase in the supply of the highly educated labor force, giving rise to a phenomenon known as "diploma inflation".

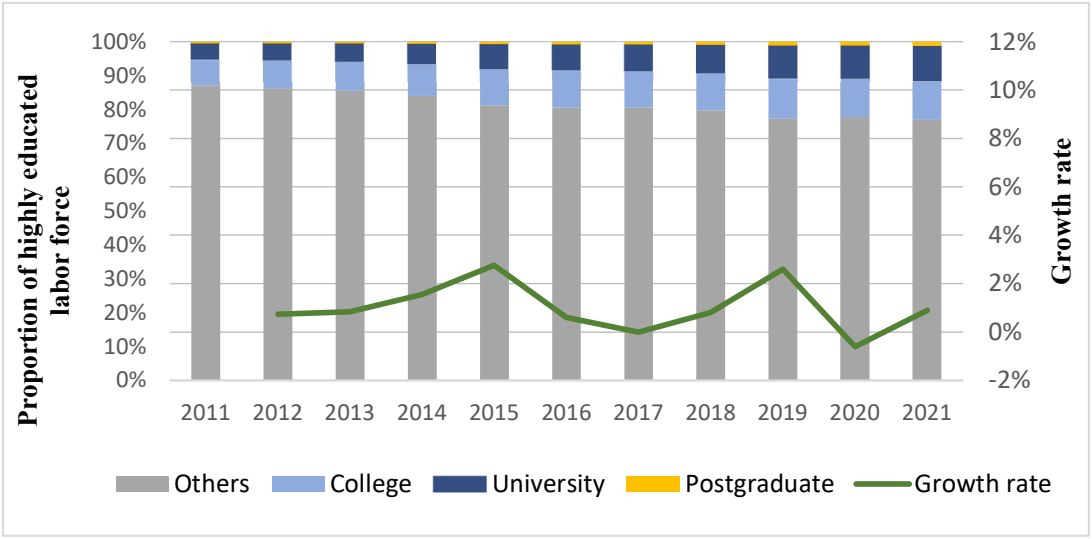


Figure 5. The proportion and growth rate of highly educated labor force in China between 2011 and 2021. Data come from China Labor Statistical Yearbook 2012–2022 published by China Statistics Press Co., Ltd. (Beijing, China).

Consequently, because of the significant influx of fresh graduates in recent years, the overall educational level of the labor market has been elevated. In similar circumstances, recruiters often prefer to hire job seekers with higher educational qualifications. This has led to a common occurrence of "overqualified and underutilized" or "misallocation of talent", ultimately resulting in a wastage of educational resources.

5.2. Unreasonable Structure of Academic Specialties

Figure 6 illustrates the distribution of graduates across various subjects and the corresponding initial employment rates from 2013 to 2021. The graph indicates that the proportion of fresh undergraduates in each subject remains relatively stable over time. Conversely, the initial employment rates of graduates in different subjects exhibit notable fluctuations within the labor market, reflecting the dynamic demand in the forefront of the labor market. It is noteworthy that the proportion of graduates in each subject does not undergo timely adjustments in response to the employment rates. For instance, the employment rate for graduates in the field of literature and art appears to be relatively low, yet the proportion of graduates from this discipline remains high in comparison to other subjects. This discrepancy suggests a potential imbalance between the supply of graduates and the corresponding demand within the labor market for specific subjects.

China's higher education system has long been characterized by centralized control, limiting the autonomy of universities in decision making. Each year, the central government strictly regulates the professional enrollment plans of universities. Moreover, the process of updating subject catalogues and establishing new specialties is relatively slow. Since 1987, there have been five major revisions, averaging one update every eight years or so. Regrettably, remnants of the former Soviet model, such as the continued segregation of arts and sciences and overspecialization, still persist. The current economic landscape has undergone tremendous transformations; nevertheless, universities face difficulties in promptly and systematically adjusting their majors to align with market demands.

The example of law illustrates a phenomenon where a major that was once popular in the early 21st century experienced a decline in employment rates in recent years. This decline led to the addition of law as a "national controlled distribution" major in the Catalogue of Undergraduate Majors in Ordinary Higher Education Institutions (2012). Yet, because of the rigid constraints of enrollment plans, the proportion of law graduates has not been adjusted with their employment rate in time. Engineering, for another example, has maintained a leading position in terms of employment rates because of its practicality

and technical nature. In spite of this, it is important to note that the employment situation within engineering majors can still vary markedly. Currently, digital jobs in high-end manufacturing, such as industrial robots, industrial internet, and artificial intelligence, have emerged as a growing demand sector. There is currently a substantial deficit of digital talent in China, estimated to be between 25 million and 30 million individuals, and this disparity continues to grow. Over the next three years, it is projected that the supply–demand ratio of digital talent in the field of intelligent manufacturing will increase from 1:2.2 to 1:2.6 [43]. Therefore, graduates specializing in computer and electronic information fields enjoy comparatively high employment prospects. Whereas, within the context of "green transition", the employment outlook for graduates in certain traditional engineering disciplines, such as geology and mineral resources, is less optimistic. These graduates are witnessing a continuous decline in job opportunities and professional relevance, compelling many of them to seek alternative career paths in different industries.

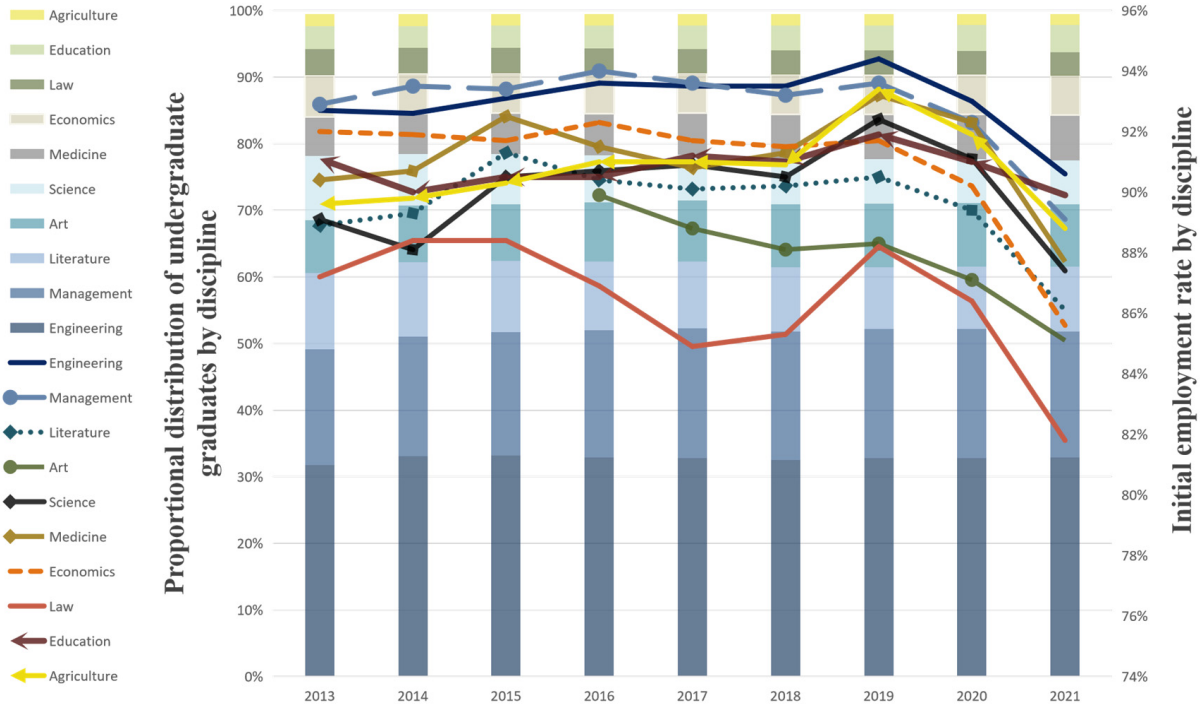


Figure 6. Proportional distribution of undergraduate graduates by discipline and initial employment rate between 2013 and 2021. Data come from official website of the Ministry of Education of the People's Republic of China (MOE) and China Undergraduate Employment Report (2014–2022), published by MyCOS Institute. The proportion of disciplines was calculated. Data on initial employment rates for arts graduates in 2013–2015 are missing.

On the one hand, the market demand for certain professions is reaching saturation levels, while the number of graduates in these fields remains relatively constant each year. On the other hand, new industries and professions are continuously emerging, generating fresh demands for talent. In this case, there exists a recruitment dilemma as job seekers struggle to effectively meet these new talent requirements. The prevailing higher education system in China primarily relies on administrative allocation, which results in a certain degree of inadequacy in talent development within universities. This not only impacts the composition of the workforce but also leads to long-term challenges in sustaining employment opportunities for college graduates.

5.3. Unbalanced Spatial Distribution of College Graduates

According to Figure 7, the distribution of graduation locations and initial employment locations of fresh graduates in recent years can be observed. The distribution of

graduates from 2015 to 2021 has remained relatively stable. In contrast, there have been considerable changes in the distribution of initial employment locations for these graduates. There has been a downward trend in the North China and Northeast regions in terms of initial employment, while the Southwest and Western regions have seen an upward trend. The North China, Yangtze River Delta, and Central Plains regions have the highest proportions of graduates, while the initial employment places of graduates are primarily concentrated in the Yangtze River Delta, Pearl River Delta, and North China regions, accounting for over 60% of the graduates. The Pearl River Delta and Yangtze River Delta regions serve as the main destinations for graduates' employment, while the Central Plains, Northeast, and Northwest regions are the main destinations for graduates to migrate to for employment opportunities.

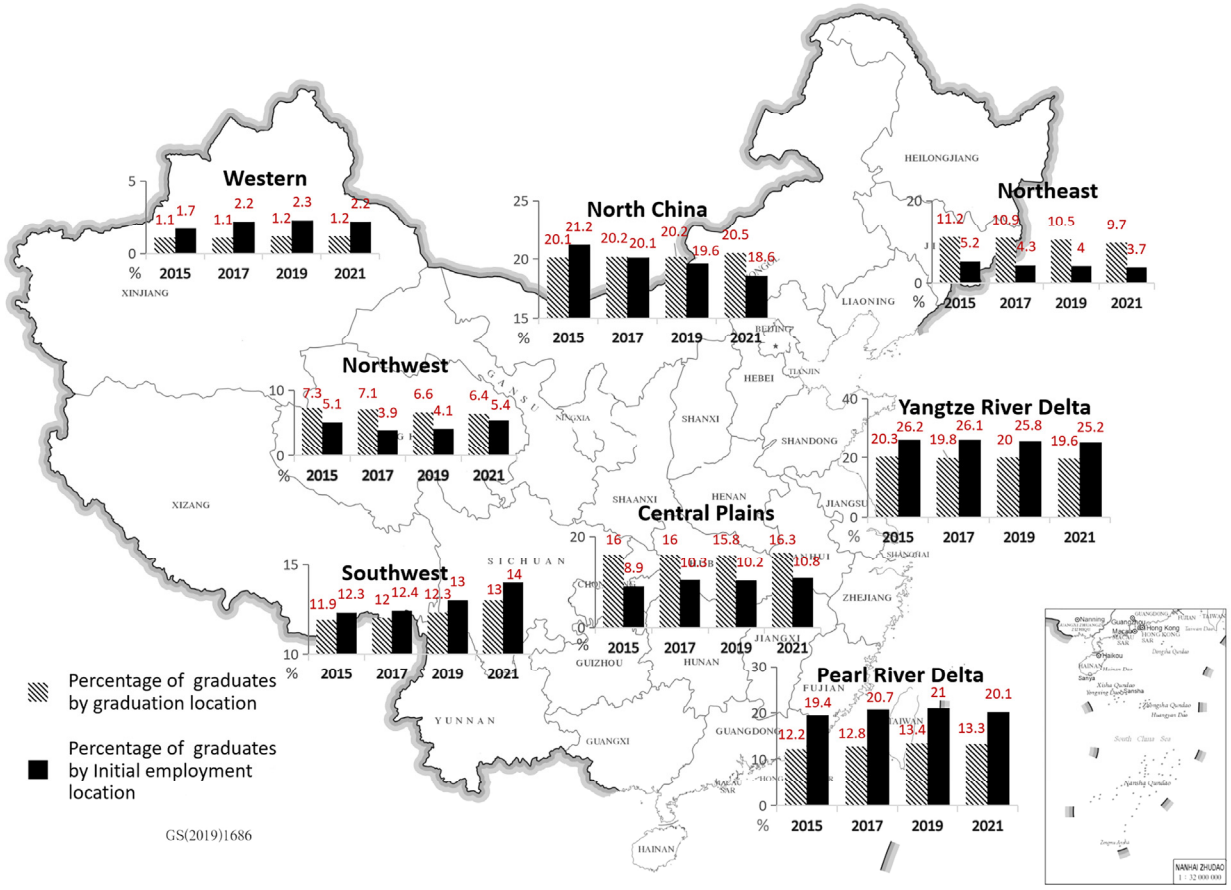


Figure 7. Distribution of graduation locations and initial employment locations of fresh graduates. Data come from China Undergraduate Employment Report (2014–2022) published by MyCOS Institute. The figure is drawn by the author. The values in the above figure represent the number of graduates in the region as a percentage of the country. The Yangtze River Delta includes Shanghai, Jiangsu, Zhejiang, Anhui, and Jiangxi. North China includes Beijing, Tianjin, Shandong, Hebei, Inner Mongolia, and Shanxi. The Pearl River Delta includes Guangdong, Guangxi, Fujian, and Hainan. The Southwest includes Sichuan, Chongqing, Guizhou and Yunnan. The Central Plains includes Henan, Hubei, and Hunan. The Northeast includes Heilongjiang, Jilin, and Liaoning. The Northwest includes Shaanxi, Gansu, Ningxia, and Qinghai. The Western includes Tibet and Xinjiang.

Figure 8 presents the average employment rates of college graduates in the aforementioned regions from 2015 to 2021. Taking the average employment rates over the past 7 years and arranging them in descending order, the sequence of regions is as follows: Yangtze River Delta, Pearl River Delta, North China, Southwest, Central Plains, Western, Northwest, and Northeast. Basically, regions with higher average employment rates for graduates also serve as the primary destinations for graduates, while simultaneously, regions with the

lowest average employment rates for graduates also function as the main sources of outflow for graduates. Overall, the flow of college graduates in China is predominantly from inland regions to coastal areas, reflecting a migration pattern from economically underdeveloped areas in the central and western regions to economically developed areas in the east. First- and second-tier cities in the Yangtze River Delta, Pearl River Delta, and North China are favored employment destinations. In contrast, Central Plains, Northwest, and Northeast witness talent drain, highlighting objective realities.

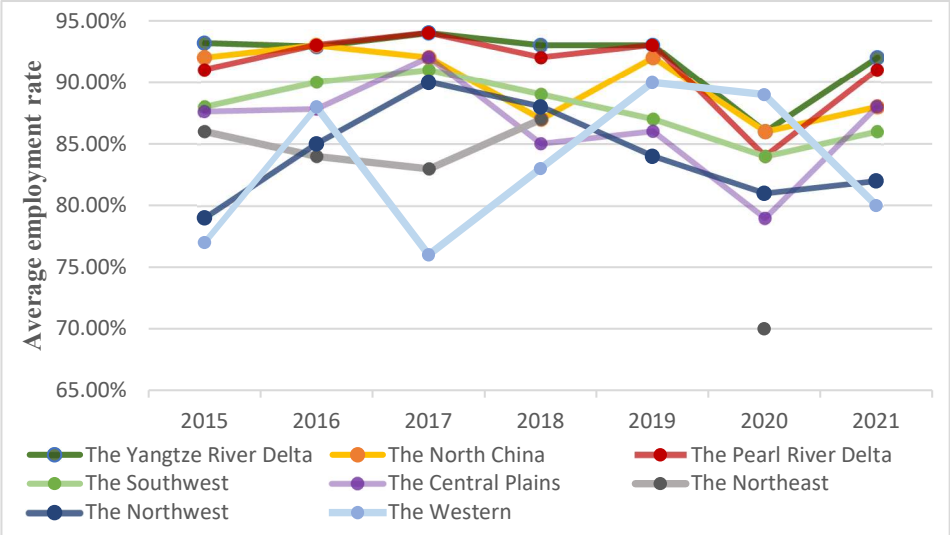


Figure 8. Average employment rate of graduates by region between 2015 and 2021. Data come from the official websites of provincial and municipal governments. The regional average employment rates are compiled and calculated by the author. The regional classification criteria are outlined in Figure 7. Because of significant values below the national average, data for certain provinces in the Northeast region for the years 2019–2021 have not been disclosed.

The issue of unbalanced spatial distribution is almost prevalent worldwide, the root cause lies in the mismatch between local higher education development and local industrial growth [44]. The extent to which disciplinary structure aligns with industrial structure determines the driving force of higher education in fostering economic development [45]. While enrollment plans for higher education institutions are regulated at the national level, industrial development follows economic laws. The developed regions offer favorable economic conditions, comprehensive public services, and a high-quality cultural environment, which strongly attract graduates. As individuals naturally aspire for upward mobility, it is common for graduates to seek opportunities in regions with more refined industrial structures. This situation results in a long-term lack of returns on higher education investments in underdeveloped areas, widening the gap in human capital. Ultimately, this leads to an imbalanced regional employment structure for college graduates.

5.4. Mismatch between the Capability of College Graduates and Market Demand

Currently, the digital economy is driving qualitative and quantitative changes in the job market, while China's higher education system still predominantly reflects the characteristics of the "industrial economy". In 2020, China encountered a digital talent gap of nearly 11 million people, highlighting a widespread shortage of high-quality digital talent and skilled digital workers [46]. As digitalization rapidly advances across industries, this talent demand gap is projected to further widen. This poses challenges in meeting the urgent demand for cultivating high-tech, interdisciplinary, and versatile talent required for the development of the digital economy, necessitating adaptations in the education system, subject offerings, curriculum content, and teaching methods [47,48].

With the increasing prevalence and deepening of digitalization, it is anticipated that the worldwide labor market will undergo remarkable transformations. By 2027, approximately 69 million new jobs are expected to emerge in fields such as digital marketing, artificial intelligence, content creation, renewable energy, and others. Meanwhile, it is projected that 83 million jobs, including those of accountants, payroll clerks, executive secretaries, etc., will be lost. This could potentially lead to a net reduction of fourteen million jobs in the global labor markets over the next five years if the current pace of change continues [49]. The upheaval in the labor market is triggered by the adoption of cutting-edge technology. Given the unstoppable trend of technology replacing manpower, hence, compared to machines, job seekers must leverage their comparative advantages in areas such as consultation, communication, reasoning, decision making, and management. In addition to professional skills, job seekers should possess deeper core competencies that encompass leadership, creativity, and problem-solving abilities.

As indicated in Table 4, there is a mismatch between the capabilities of Chinese college graduates and the employment capability demands of the labor market. Among the employment capability demands of the global labor market, analytical thinking, creativity, leadership, technological literacy, and other capabilities rank in the top 10. However, Chinese college graduates often lack these essential skills. Higher education institutions bear the primary responsibility of cultivating and supplying talent to society. Nonetheless, their ability to respond to market demands for vocational skills and other relevant information lags behind, exacerbating structural contradictions within the labor market, particularly among individuals with high academic qualifications.

Table 4. Comparison between the capability of college graduates and the demand of labor market.

	Employment Capability Demand in the Global Labor Market TOP 10	**Scores of College Students' Capability Index in China LAST 10**
1	Analytical thinking	Financial literacy
2	Creativity	Foreign language proficiency
3	Resilience, flexibility, and agility	Problem solving
4	Motivation and self-awareness	Computer skills
5	Curiosity and lifelong learning	International perspective
6	Technological literacy	Creativity
7	Dependability and attention to detail	Negotiation and decision making
8	Empathy and active listening	Statistical and data processing
9	Leadership and social influence	Leadership
10	Quality control	Critical thinking

International data come from The Future of Jobs Report 2023, published by the World Economic Forum. China's data come from The National Survey Report on Employment of College Graduates 2022, published by Peking University Press.

6. Discussion on Promoting Sustainable Employment of College Graduates

In the early stages, the expansion of higher education in China was mainly driven by a mechanical growth approach of "stock determines increment", with a focus largely on improving education levels while overlooking structural issues [50]. As China's economy transitions from high-speed growth to high-quality development, a structural deviation emerges between the talents nurtured through higher education and the market demand. To achieve sustainable employment, it is important to gradually address the employment contradiction of college graduates from both the supply and demand perspectives.

6.1. Promoting Sustainable Employment on the Demand Side

First and foremost, it is essential to prioritize the cultivation of strategic emerging industries. Strategic emerging industries, such as big data, artificial intelligence, and new energy, driven by major technological breakthroughs, embody the current trends of the knowledge economy and low-carbon economy [51]. They necessitate substantial

investments in intangible assets, with a particular emphasis on intellectual resources [52]. The declining ability of traditional industries to absorb employment is an irreversible trend, and the emergence of strategic emerging industries will further expand the social division of labor, create new occupations, and enhance the employment prospects of college graduates. By this token, the fundamental solution to tackling the employment challenges of college graduates lies in the iterative upgrading of industries achieved through the development of strategic emerging sectors.

Secondly, we also need to cultivate a conducive societal environment that fosters innovation and entrepreneurship, thereby facilitating the rapid growth of enterprises, especially those in the technology-based sector. As key market players and primary labor demanders, enterprises hold a dominant position in employment choices and possess significant influence, while as employers, they bear the responsibility of providing continuous training and development opportunities for talent, serving as an extension of university education. Therefore, the emphasis should be shifted towards the employers as the demand side, establishing professional qualification certification systems in various industries, strengthening intellectual property protection, and creating a stable, fair, transparent, and predictable business environment. These actions will effectively drive enterprise innovation and the creation of additional emerging job positions.

Thirdly, it is imperative to actively promote the growth of the producer services industry. It is worth noting that each incremental percentage point in the total economic volume of producer services is anticipated to generate employment opportunities for more than two million individuals, thereby expanding the scope of employment for highly skilled labor [53]. Recognizing human capital and knowledge capital as the principal factors of input, producer services permeate the upstream, midstream, and downstream of manufacturing enterprises, serving as a pivotal catalyst in expediting the integration of secondary and tertiary sectors [54]. We can offer employment opportunities for college graduates across various aspects of the manufacturing industry's supply chain, including strategic planning, procurement, logistics, finance, information technology, and management [55].

6.2. Promoting Sustainable Employment on the Supply Side

Firstly, the focus of higher education development efforts should shift from elevating academic degree levels to establishing medium-sized higher education institutions with distinct characteristics and resource integration. This involves differentiation between application-oriented universities and research-oriented ones through construction, demarcation, and resource consolidation. On the one hand, there is a need to provide sustained support for the advancement of high-level research universities, thereby facilitating the development of globally renowned academic institutions. On the other hand, it is imperative to establish application-oriented universities entrusted with the responsibility of spearheading regional industrial transformation and upgrading. The above two measures can simultaneously address the cultivation of research-oriented talent and applied talent, promoting scientific and technological innovation while meeting employment demands.

Secondly, it is indispensable to undertake reforms in the academic discipline system and establish a flexible adjustment mechanism for it. Discipline and specialization development should align with real-world challenges, societal requirements, and market demands in order to effectively address the ongoing trend of technological integration and industrial transformation [56]. Colleges and universities should prioritize the practicality of knowledge generation and promptly initiate the establishment of new disciplines in fields such as engineering, medicine, agriculture, and liberal arts. By fostering the growth of interdisciplinary, boundary-pushing, and comprehensive disciplines, institutions can overcome rigid administrative constraints and facilitate dynamic adjustments in response to evolving needs.

Thirdly, optimizing the spatial distribution of higher education is crucial to ensuring the equitable development of regional structures. The spatial distribution of human capital has consequences for productivity, prices, and inequality [57–59]. Achieving regional

balance in higher education involves more than just aiming for an equal distribution of colleges and universities. It entails promoting the concentration of high-quality higher education resources in central regions while also considering fairness to fully leverage the benefits of factor aggregation. Moreover, encouraging collaborative education initiatives among universities across the eastern, central, and western regions can also contribute to mitigating brain drain in disadvantaged areas and reducing regional disparities.

Lastly, integrating the higher education talent cultivation system with market demand is essential to assist graduates in smoothly entering the labor market. The higher education system is closely interconnected with the economy and society, and the supply of college graduates should be guided by the demands of the employment market [60]. In the era of the digital economy, there is a growing demand for interdisciplinary talent who possess both technical expertise and business acumen. Colleges and businesses can collaborate in areas such as professional program planning, curriculum design, faculty team establishment, construction of training facilities, and organization of skill competitions. Guided by market and industry demands, such collaborations aim to promote the integration of education, research, and industry, enhance the cultivation of students' innovation and entrepreneurship abilities, and broaden avenues for their employment.

7. Limitations and Future Research

This study exhibits several inherent limitations, offering a springboard for future research endeavors. The first limitation lies in the scope of the study. Indeed, the article primarily focuses on the macro-level exploration of employment issues. Future research should delve deeper into specific industry sectors and address the sustainable employment challenges faced by college graduates, considering factors such as technological advancements, market demands, and skill requirements. By conducting in-depth research and analysis at the industry level, policymakers, educational institutions, and businesses can obtain valuable insights into the distinctive challenges and opportunities within each sector. This will enable the development of more targeted and effective strategies to promote sustainable employment for college graduates, encompassing the evaluation of curriculum design, internships, entrepreneurship programs, and other initiatives that enhance graduates' employability and long-term career prospects. Additionally, future research can also scrutinize the efficacy of existing policies and initiatives aimed at promoting sustainable employment for college graduates.

The second limitation can be attributed to the constraints within the research perspective and methodology. This article predominantly dwells on the exploration of macro-level phenomena and potential factors, without delving into a comprehensive analysis of the underlying drivers behind the employment challenges faced by Chinese college graduates. Consequently, the article refrains from employing causal inference or other forms of empirical methods, resulting in a statistical significance deficit. Future research can employ regression models or structural equation models and conduct hypothesis testing to investigate the mechanisms influencing the sustainable employment of college graduates.

The third limitation is rooted in the study's exclusive concentration on the Chinese social context and the challenges confronted by college graduates within China. As such, the proposed strategies and recommendations may not directly translate to other national contexts. Therefore, future research endeavors should delve into analogous concerns across various national contexts to foster a holistic comprehension of sustainable employment and discern context-specific strategies.

8. Conclusions

Since 2010, the labor supply and demand dynamics in China have experienced a prominent shift from oversupply to undersupply, marking a decisive turning point [61]. In order to sustain long-term economic growth, it is urgent to optimize the allocation of labor resources. China's economy is undergoing a critical transition driven by innovation, characterized by rapid technological advancements, swift industry transformations, and

the emergence of new occupations. Under the circumstances, it is crucial to recognize that sustainable employment should not be viewed solely as an individual challenge, but the role of policy mechanisms is pivotal in providing a fundamental solution to this issue.

Based on publicly available government data, this study, by calculating the number of college graduates per USD 100 million GDP, employment elasticity coefficient, and industrial structure deviation, reveals that the Chinese labor market is currently insufficient to accommodate a large influx of highly educated labor, resulting in an oversupply of college graduates. This study contends that concealed beneath the surface of an excess in the total number of college graduates lies a structural contradiction in the mismatch between supply and demand within the highly educated labor market. Furthermore, this study delves into an analysis of the reasons behind this mismatch from four perspectives: the educational levels, academic disciplines, spatial distribution, and core competencies of Chinese college graduates.

In the context of this research, we acknowledge the significance of fostering employment stability, promoting career development, and establishing mechanisms that align educational investments with the evolving needs of the economy. The study on sustainable employment aimed to tackle the challenges arising from the discrepancy between educational achievements and economic realities. To navigate the challenges and promote sustainable economic growth, it is essential for educational institutions, policymakers, and enterprises to acknowledge the collaborative nature of this endeavor. Enhancing monitoring of the employment situation and implementing multiple measures are critical steps to facilitate the sustainable employment of college graduates. Educational institutions should use industry-education integration as a window to strengthen communication and dialogue with society, promoting the organic alignment between the talent supply chain and the industrial supply chain. The government should actively seek functional transformation, delegate power to society, create an open and orderly job market, and engage in effective macroeconomic regulation of employment [62]. As employers, enterprises should collaborate with the government and universities to relay real-time signals of talent demands in the job market and provide subsequent training for talent development.

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