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Population Quality-based Demographic Dividend,Industrial Transformation and Sustainable Development of the Chinese Economy and Society

Population Quality-based Demographic Dividend, Industrial Transformation and Sustainable Development of the Chinese Economy and Society

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Abstract: China is faced with a decreasing labor supply and therefore is losing its cost advantage. However, benefiting from continuous improvement of population quality, China's population quality-based demographic dividend begins to replace the quantity-based dividend to play a dominant role in economic development. Thus, in supply-side structure, rather than essential factors, it paves the way for the sustainable development of the Chinese economy. With the addition of the successful industrial transformation and upgrading, China still has the advantage to overcome the middle income trap and maintain the momentum of economic growth.

Keywords: population quality; demographic dividend; industrial transformation; middle-income trap

In 2015, Lou Jiwei, then Chinese Finance Minister, during his speech at the Tsinghua Distinguished Speaker Forum on the Chinese Economy held at Tsinghua University, predicted that there was a more than 50% chance that China, within five or ten years, would slip into the middle-income trap. His prediction was mainly based on the harsh reality of China's population and economy: the mode of its population reproduction had been changed; China had entered an era wherein the fertility rate was falling, and the growth of the labor force was accordingly impacted. The demographic dividend that had sustained China's economic growth reached the peak and then declined, the labor supply was decreasing, and China's cost advantage no longer existed. Consequently, the industrial structure and the "world factory"-style extensive growth predominated by low-end industries were struggling. China's future industrial development and sustained economic growth faced serious

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challenges. Lou's prediction widely aroused public concern and turned out to be highly controversial in academia. This paper explores this issue from the perspective of the relationship between population and economy.

Admittedly, Lou's prediction was indeed based on the population situation that affects China's sustained economic growth. All official statistics have revealed that Chinese population is undergoing a new trend. Take the working-age population as an example. According to statistics from the National Bureau of Statistics, from 2012 China's population at working age peaked after years of steady growth and began to shrink. The years of 2012, 2013, 2014 and 2015 saw China's workforce (aged 15-59) reduced respectively by 3.45 million, 2.44 million, 3.71 million and 4.87 million. As for the proportion of the workforce in the entire population, in 2015 the 15 to 64-year-olds accounted for 66.7% of the population, a 4.5 percent decrease from the 71.2% in 1990. What is noteworthy is that the decrease in the workforce was not caused by rising mortality rates, but rather by the reduction of new entries into the labor pool. This indicated an aging working population. Even though the change in the quantity of the entire workforce might not have been acutely felt in the demographics, the "shortage of rural migrant workers" and "difficulties in recruiting workers" had already been painfully felt in the Chinese labor market. The demographic dividend that has sustained Chinese economic growth had changed radically and China's low cost advantage had vanished. It is now inevitable that China must transform and upgrade its industrial structure and alter its economic growth pattern.

Yet is it probable that the Chinese economy will slip into the middle-income trap? This paper provides a optimistic answer by holding that while the harsh situation of the Chinese population and economy cannot be denied, confidence in development must be built, as the Chinese economy is entering a new stage of development and climbing onto a higher-level platform in respect to its economic elements and structure, the quality of the Chinese population is being improved, the demographic dividend is being changed, and active efforts are being made to transform and upgrade industries. All these improvements will enable the Chinese economy to continuously overcome the middle-income trap.

1. Significant improvements in the quality of the Chinese population

The effects of population changes are not only represented by the changes of population quantity, but also by the changing population quality and structure. In terms of population quality, when a certain input of resources is ensured, the decrease of population necessarily signifies more investment in population quality. This rule also applies to a family, at the micro level, and a country, at the macro level. Since the reform and opening-up, Chinese population quality has seen steady enhancements owing to the continuous increase of investments in public health and education. Table 1 reflects the changes in the Chinese population quality by using three internationally recognized measures: average life expectancy, average schooling years and the gross enrolment ratio of higher education.

Table 1 The Variation Trend of Population Quality of China

Year	Average life expectancy	Average schooling years	Gross enrolment ratio of higher education
1990	69.03	6.22	3.4
1991	69.18	6.25	3.5
1992	69.34	6.26	3.9
1993	69.51	6.47	5
1994	69.70	6.74	6
1995	69.93	6.72	7.2
1996	70.20	6.79	8.3

Year	Average life expectancy	Average schooling years	Gross enrolment ratio of higher education
1997	70.52	7.01	9.1
1998	70.89	7.09	9.8
1999	71.30	7.18	10.5
2000	71.73	7.11	12.5
2001	72.18	7.62	13.3
2002	72.61	7.73	15.0
2003	73.03	7.91	17.0
2004	73.42	8.01	19.0
2005	73.77	8.03	21.0
2006	74.07	8.04	22.0
2007	74.34	8.19	23.0
2008	74.58	8.27	23.3
2009	74.80	8.38	24.2
2010	75.01	8.21	26.5
2011	75.20	8.85	26.9
2012	75.39	8.94	30.0
2013	75.59	9.05	34.5
2014	75.8	9.28	37.5

Sources: The figures concerning average life expectancy are from the World Health Organization's annual *World Health Reports*. The average schooling years= (population having received primary school education*6+population having received junior high school education*9+population having received senior high school education*12+population having received college education or above*16) /sampled above−6−year−old population. The figures are from *China Compendium of Statistics 1949–2008* and *China Statistical Yearbooks*. The figures concerning gross enrolment ratio for higher education are from *Educational Statistics Yearbooks of China*.

According to this table, Chinese life expectancy in 1990 was 69 and rose to 75.8 in 2014. That was an increase of 6.5 years within a period of merely 24 years, reflecting the general improvement of the health of the Chinese people. The average schooling year of China, as investment in Chinese education steadily increased, was undergoing a continuous growth. In 1990, Chinese average schooling years was only 6.22; yet in 2014, this figure leaped to 9.28. The gross enrolment ratio of higher education in China was only 3% in 1990, yet it rocketed to 37.5% in 2014. The latter two measures' progress indicate that Chinese population were being better educated.

The improvement of public health and education has produced an accumulation of human capital, and a positive influence on economic growth. This has been verified by a large number of research and extensive economic practices. It is generally accepted that human capital can impact economic growth through its factor productivity, knowledge effect and industrial structure.

First, from the perspective of factor productivity, human capital is a direct boost of economic growth and can be counted as the most important impetus for modern economic growth. Gregory Mankiw (2009), a famous American economist, holds that human capital, physical capital, technical knowledge and natural resources are the four factors for economic growth. Thus, on condition of constant physical capital, technical knowledge and natural resources, the increase of human capital can promote economic growth. Moreover, as science and technology make steady progress, human capital will become an increasingly important economic factor. Increases of investments in human capital will strengthen the workforce's ability to learn and adapt, shorten the time needed to master new techniques and knowledge, continuously increase work-related skills, and raise productivity while also improving the productivity of other economic factors, thereby increasing national production, or easing the falling tendency of the marginal productivity of the other economic factors. This phenomenon is known as the "external effect of human capital".

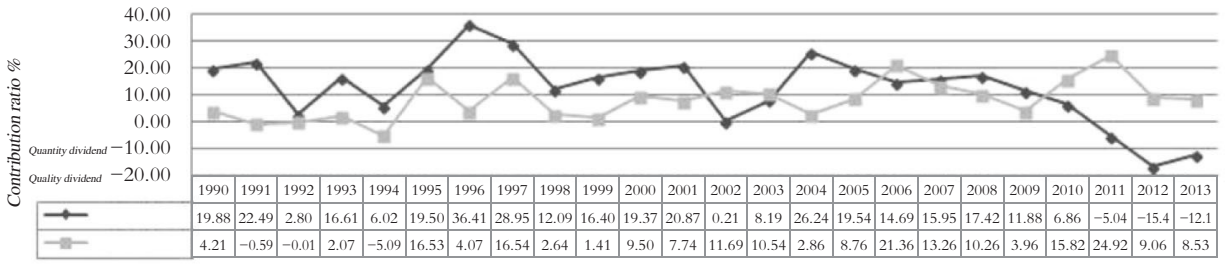
Second, the human capital's knowledge effect has a significant, positive impact on economic growth. Gary Becker (1975), one of the major representatives of Human Capital Theory, holds that the knowledge effect on human capital is composed of the demand effect of progress of knowledge, the income effect and the substitution effect. The

demand effect refers to the fact that any useful new knowledge arising in economic growth will demand new forms of physical capital, or new working skills, or both. The income effect means those having received higher education and training, with more knowledge and better capabilities will prove more productive, for they boast better judgment and can always grab opportunities to make money through investments. The last effect means that new resources could be created through the progress of knowledge, and they will complement or replace the originals.

Third, the human capital has a promotion effect on industrial structural transition. Human capital plays a crucial part in the process of the transformation and upgrading of the industrial structure. The upgrading of the industrial structure does not equal an increase of quantity of resource factors, but rather means better quality of resource factors, even new content and new working mechanisms for those factors. Whether the workforce, as the most important and active factor of all, can adapt to change and transform the economic growth from an exogenous growth pattern to an endogenous growth pattern, will directly decide the outcome of industrial upgrading. Regarding this process, modern human capital theory, advocated by economists like Paul Michael Romer (1986), Robert Lucas (1998), Jr. and Edmund Phelps (1966), studies how the improvements in population quality and the accumulation of human capital might contribute to endogenous economic growth and industrial transformation by analyzing knowledge spillovers, learning by doing, research in education and conducting development work. It holds that enhancements in population quality lay the foundation for industrial transformations, for in some sense the upgrading of a country's industrial structure is decided by the quality of its workforce (Glaeser, 1999). During the early days of industrialization, due to the relatively low level of productivity, there was a robust demand for a workforce suited for labor-intensive industries like textiles and handicrafts. Industrial development did not depend on high-level skills and thus did not need many technical workers. However, in the mid-term of industrialization, as equipment improved and technology was becoming increasingly important, workers with only basic skills could no longer meet the industrial requirements. Industrial development demanded more in human capital through advances in workers' technologies, skills and knowledge. In the latter stage of industrialization, the demand for a high-tech and highly knowledge-intensive workforce continued growing. To shift the industrial focus to high-tech and highly knowledge-intensive trades is inseparable from the supply of knowledge-armed talents, high-tech talents and innovative talents. The process of industrial transformation requires a quality workforce and human capital. Workers without the skills required by new technologies and industries will be driven out of the labor market, while workers with a better education and more skills, who can well adapt to the new technologies and industries, will become not only a new production factor, but also an impetus for new industrial development.

2. Population quality-based demographic dividend begins to play a dominant role

The demographic dividend is in fact age structure which arises when the traditional population reproduction method is being modernized, and which is favorable for the country's economic growth. This favorable structure is measured by both population quantity and quality. Demographic dividends may not come solely from an increase in population quantity, but also from



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Quantity dividend	19.88	22.49	2.80	16.61	6.02	19.50	36.41	28.95	12.09	16.40	19.37	20.87	0.21	8.19	26.24	19.54	14.69	15.95	17.42	11.88	6.86	−5.04	−15.4	−12.1
Quality dividend	4.21	−0.59	−0.01	2.07	−5.09	16.53	4.07	16.54	2.64	1.41	9.50	7.74	11.69	10.54	2.86	8.76	21.36	13.26	10.26	3.96	15.82	24.92	9.06	8.53

Figure 1 "Population quality–based demographic dividend" offsetting the "population quantity–based demographic dividend"
Notes: The dependency ratio, due to the influence of censuses made in 1990, 1995, 2000, 2005 and 2010, as well as the sample surveys of 1% population, saw unusual peaks in these years. Therefore, when the factor contribution rate was calculated, the dependency ratio in each of these years was replaced by the average of the ratios of the prior year and the subsequent year.

enhancement of the population quality. Quality is a very favorable factor for economic growth because it can be lastingly beneficial. A population quantity-based demographic dividend is merely a window of opportunity. It is not necessarily permanent and economic growth may grab the opportunity and close the window. Economic growth must not count on a quantity-based window of opportunity. In contrast, population quality-based demographic dividends can be accumulated with long lasting positive effects. Meanwhile, it is a potential substitute for quantity-based demographic dividend, namely that reduction on one side would lead to increase on the other side. Exploiting a population quality-based demographic dividend can offset the decline in the population quantity-based demographic dividend. Essentially, a quality-based demographic dividend is a more reliable and enduring factor for economic growth.

Understanding the traits of demographic dividend is highly meaningful for analyzing its relationship with economic growth. The population quantity-based demographic dividend used to be the focus, and was the basis for most economic judgments, as Lou Jiwei's mentioned above. However, it will be the population quality-based demographic dividend that will justify our never-slackening confidence in the future development of the Chinese economy.

This paper adds human capital factors to the Solow Growth Model, draws on Yu Changlin's (2006) algorithm, and calculates the contributions of the population quality-based demographic dividend and the population quantity-based dividend to China's economic growth, as shown in Figure 1. Figure 1 explicitly displays the trajectory of changes in the contribution rates of the dividends from population quality and population quantity between 1990 and 2013. The latter is attained by summing up the contribution rate of the labor force and that of the dependency ratio, while the former is attained by summing up the contribution rates of education and health as human capital.

Figure 1 reveals that: (1) the rate of the population quantity-based demographic dividend's contribution to economic growth between 1990 and 2000 was clearly high, while during 2001-2010, the rate slipped. But the rate of the population quantity-based demographic dividend's contribution to GDP per capita remained around 20% on average. After 2010, the rate of the population quantity-based demographic dividend's contribution to economic growth began to decline obviously, and even plunged to below zero. (2) The rate of the population quality-based demographic dividend's contribution to economic growth,

however, witnessed a gradual increase after 1990 in spite of fluctuations. But the pace of growth was generally slow before 2000, and the rate remained lower than that of the population quantity-based demographic dividend's contribution. After 2000, the population quantity-based demographic dividend experienced a obvious rise, and particularly after 2010 began to present itself as an increasingly important impetus for economic growth. (3) After 2010, the population quality-based demographic dividend surpassed the population quantity-based demographic dividend in boosting economic growth and proved more beneficial. Basically, the population quality-based demographic dividend began to replace the population quantity-based demographic dividend as the predominant force for China's economic growth. This change is historically significant, and indicates that, at least for the workforce supply, the Chinese economy had evolved into a new pattern and format that is suited for the modern development of China and marks the inevitable trend of the Chinese economy. It is because of this change that more confident and optimistic visions should be held regarding the future of the Chinese economy.

3. Industrial transformation making smooth progress

Chinese academia has yet to reach a consensus on the connotation of industrial transformation. Pan Weizhi (2004) held that industrial transformation is a process in which the predominant role of the three industries; primary, secondary, and tertiary in the national economy is radically altered. It is a production factor substitution and a rearrangement of production factors. Xu Zhenbin (2004) held that industrial transformation refers to the transformation from an old industrial pattern and structure to a new pattern and structure in which industrial development is led by the high-tech industry, supported by basic industries including manufacturing, and helped by the all-round development of the service industry. Scholars like Xu Feng (2010) held that industrial transformation in nature is the industrial adjustment and optimization of a country or a region, in which technologies and scientific progress act as the primary factor. That would require the cultivation and development of new industries, transformation and upgrading of old industries, as well as formation and development of new predominant industries. According to Chen Hongjin (2013), industrial transformation refers to the changes of the components of the national economy of a country (or region), such as the industrial scale, organizations, and technologies. Upgrading the industrial structure is the most important part of industrial transformation. It emphasizes the transition of the economy from labor-intensive industries to capital-and-technology-intensive industries, from low added value to high added value, and from extensive industry to intensive industry. Based on the current literature: industrial transformation mainly refers to the industrial structure of an economy transitioning from a low level to a high level. The transition is realized though changes in the proportions of the three industries and by the changes in technical levels and technological content.

3.1 China's industrial transformation

3.1.1 The changed proportions of the three industries

Table 2 displays the changes in China's industrial structure over the past 25 years.

Table 2 Changes in China's Industrial Structure

Year	GDP (unit: RMB 100m)	Output value of the primary industry (unit: RMB 100m)	Output value of the secondary industry (unit : RMB 100m)	Output value of the tertiary industry (unit: RMB 100m)	Proportion of the primary industry in GDP	Proportion of the secondary industry in GDP	Proportion of the tertiary industry in GDP
1990	18668	5062	7717	5888	0.271	0.413	0.315
1991	21781	5342	9102	7337	0.245	0.418	0.337
1992	26923	5867	11700	9357	0.218	0.435	0.348
1993	35334	6964	16454	11916	0.197	0.466	0.337
1994	48198	9573	22445	16180	0.199	0.466	0.336
1995	60794	12136	28679	19978	0.200	0.472	0.329
1996	71177	14015	33835	23326	0.197	0.475	0.328
1997	78973	14442	37543	26988	0.183	0.475	0.342
1998	84402	14818	39004	30580	0.176	0.462	0.362
1999	89677	14770	41034	33873	0.165	0.458	0.378
2000	99215	14945	45556	38714	0.151	0.459	0.390
2001	109655	15781	49512	44362	0.144	0.452	0.405
2002	120333	16537	53897	49899	0.137	0.448	0.415
2003	135823	17382	62436	56005	0.128	0.460	0.412
2004	159878	21413	73904	64561	0.134	0.462	0.404
2005	184937	22420	87598	74919	0.121	0.474	0.405
2006	216314	24040	103720	88555	0.111	0.479	0.409
2007	265810	28627	125831	111352	0.108	0.473	0.419
2008	314045	33702	149003	131340	0.107	0.474	0.418
2009	340903	35226	157639	148038	0.103	0.462	0.434
2010	401202	40534	187581	173087	0.101	0.468	0.431
2011	489301	46163	227039	216099	0.094	0.464	0.442
2012	540367	50902	244643	244822	0.094	0.453	0.453
2013	595244	55329	261956	277959	0.093	0.440	0.467
2014	643974	58344	277572	308059	0.091	0.431	0.478
2015	676708	60863	274278	341567	0.090	0.405	0.505

Source: *China Statistical Yearbooks*

Since the 1990s, China has experienced significant changes in its industrial structure. In 1990, the primary industry claimed 27.12% of GDP; in 1996, the percentage dropped below 20%; by 2011, the percentage sank below 10%; and in 2015, the primary industry, in an unceasing downward trend, only assumed 9% of GDP. Chinese secondary industry, on the other hand, took a slightly fluctuating course of an increase and then a decrease. In 1990, Chinese industry assumed 41.3% of GDP and its share in GDP kept growing at a low speed. After 2000, its share in GDP remained around 45%. Since 2008, its proportion has decreased, and by 2015, Chinese industry accounted for 40.5% of GDP, almost returning to its proportion in 1990. This is not necessarily a bad thing. Slight changes allow stability. The 40% or so is a reasonable figure for China as a developing country with a vast territory that is still in mid-term industrialization. Moreover, according to the table, the service industry kept growing. In 1990 the Chinese service industry contributed 31.5% of GDP; in 2001 the percentage surpassed 40% and kept increasing; by 2015, the Chinese service industry had claimed 50% of GDP.

3.1.2 The changes in industrial technologies and technological content

The industrial transformation of China is not

only reflected by the changes of the proportions of the three industries but also displayed by the increase of industrial technical levels and revenues for high-tech industries.

Table 3 Changing Tendency of Industrial Technologies and Technological Contents

Year	GDP (unit: RMB 100m)	Research and experimental development funds (unit: RMB 100m)	Sales revenue of hi–tech industries (unit: RMB 100m)	The proportion of research and experimental development funds in GDP(%)	The proportion of sales revenue of hi–tech industries in GDP(%)
1995	60794	348.69	3917	0.57	6.44
1996	71177	404.48	4497	0.57	6.32
1997	78973	509.16	5618	0.64	7.11
1998	84402	551.12	6580	0.65	7.80
1999	89677	678.91	7820	0.76	8.72
2000	99215	895.66	10033	0.90	10.11
2001	109655	1042.49	12015	0.95	10.96
2002	120333	1287.64	14614	1.07	12.14
2003	135823	1539.63	20412	1.13	15.03
2004	159878	1966.33	27846	1.23	17.42
2005	184937	2449.97	33921	1.32	18.34
2006	216314	3003.1	41584	1.39	19.22
2007	265810	3710.24	49714	1.40	18.70
2008	314045	4616.02	55729	1.47	17.75
2009	340903	5802.11	59567	1.70	17.47
2010	401202	7062.58	74483	1.76	18.56
2011	489301	8687.01	87527	1.78	17.89
2012	540367	10240	102284	1.90	18.93
2013	595244	11843.1	116049	1.99	19.50
2014	643974	13015.6	127368	2.02	19.78

Source: *China Statistical Yearbooks* and *China Statistical Yearbooks on Science and Technology*

Table 3 clearly displays the inprovements in the technical level and technological content of Chinese industries. Take Chinese research and experimental development funds for example, in 1995, China invested very little in technology research and development, only RMB 34.8 billion, a mere 0.57% of GDP. That also indicates the low scientific added value of Chinese industries at the time. By 2012 Chinese expenditures on research and development had reached RMB 1 trillion, and by 2014 it had reached RMB 1.3 trillion, surpassing 2.02% of GDP. Moreover, the rapid growth of the sales revenue in high-tech industries also reflects the optimization of the industrial structure. In 1995 only RMB 391.7 billion was created as sales revenue of Chinese high-tech industries. Yet in 2014 the amount rose to RMB 12.74 trillion. The speed of the increase of revenue far outpaced that of GDP, and the share of hi-tech industrial revenue in GDP rose from 6.44% in 1995 to 19.78% in 2014. Therefore, the two indicators—Chinese expenditure on research and experimental development, and sales revenue of Chinese high-tech industries—reveal not only the trend of the transition of China's industrial structure, but also the upward tendency of Chinese industrial technologies, technological content and industrial upgrading.

3.1.3 Distribution of the workforce in the three industries

The distribution of the workforce in the three industries also indicates the characteristics of China's industrial structure.

Table 4 Distribution of the Workforce in the Three Industries

Year	Working population at working age	Workforce placed in the primary industry (unit: 10 thousand persons)	Workforce placed in the secondary industry (unit: 10 thousand persons)	Workforce placed in the tertiary industry (unit: 10 thousand persons)	Percentage of workforce placed in the primary industry	Percentage of workforce placed in the secondary industry	Percentage of workforce placed in the tertiary industry
1990	64749	38914	13856	11979	60.1	21.4	18.5
1991	65491	39098	14015	12378	59.7	21.4	18.9
1992	66152	38699	14355	13098	58.5	21.7	19.8
1993	66808	37680	14965	14163	56.4	22.4	21.2
1994	67455	36628	15312	15515	54.3	22.7	23.0
1995	68065	35530	15655	16880	52.2	23.0	24.8
1996	68950	34820	16203	17927	50.5	23.5	26.0
1997	69820	34840	16547	18432	49.9	23.7	26.4
1998	70637	35177	16600	18860	49.8	23.5	26.7
1999	71394	35768	16421	19205	50.1	23.0	26.9
2000	72085	36043	16219	19823	50.0	22.5	27.5
2001	72797	36399	16234	20165	50.0	22.3	27.7
2002	73280	36640	15682	20958	50.0	21.4	28.6
2003	73736	36204	15927	21605	49.1	21.6	29.3
2004	74264	34830	16709	22725	46.9	22.5	30.6
2005	74647	33442	17766	23439	44.8	23.8	31.4
2006	74978	31941	18894	24143	42.6	25.2	32.2
2007	75321	30731	20186	24404	40.8	26.8	32.4
2008	75564	29923	20553	25087	39.6	27.2	33.2
2009	75828	28890	21080	25857	38.1	27.8	34.1
2010	76105	27931	21842	26332	36.7	28.7	34.6
2011	76420	26594	22544	27281	35.7	29.5	35.7
2012	76704	25773	23241	27690	33.6	30.3	36.1
2013	76977	24171	23170	29636	38.5	30.1	38.5
2014	77253	22790	23099	31364	29.5	29.9	40.6

Source: *China Statistical Yearbooks*

Table 4 reveals that in 1990 as many as 60.1% of the Chinese population were working in the primary industry. As Chinese industrialization and urbanization accelerated, that percentage was rapidly reduced. As of 2000, it had fallen to 50%. In 2008 the percentage of the workforce occupying the Chinese primary industry was further reduced to below 40%. As of 2014, it had fallen below 30%. This trajectory of change clearly indicates the transition of China's industrial structure. By contrast, the percentage of the workforce occupied in the secondary industry experienced a steady increase. In 1990, it was 21.4%. After that it experienced a slow, steady upward inclination. As of 2011 the percentage of the workforce in the secondary industry was close to 30% and has been holding near that number ever since. It is noteworthy that since 1990 the percentage of the workforce in China's tertiary industry has also grown. In 1990 merely 18.5% of the working population worked in the tertiary industry; in 2004 the percentage surpassed 30%; in 2014 it reached a high proportion exceeding 40%.

3.2 The impact of industrial transformation on the population-economy relationship

Industrial transformation generates economic growth and signifies positive change in the population-economy relationship.

3.2.1 Industrial transformation as a process of optimizing the economic structure and redistributing industrial resources

To distribute industrial resources with low productivity and low added values to industries with high productivity, obvious technological advantages and high added values is an effective way for sustainable economic growth.

Since internal growth rates vary among industries, the industrial transformation can redistribute economic resources. Where industrial resources with low growth rates are transferred to those with high growth rates, there must be a continuous expansion of economic size. For example, the Chinese economy's shift from labor-intensive industries to hi-tech industries with higher industrial added values and economic performance is apparently helpful for expanding economic size.

The core of the industrial transformation is the improvement of total factor productivity. The transformation and upgrading of the manufacturing industry enables production factors like capital and labor to move from industries with low productivity to those with higher productivity, thereby boosting sustainable economic growth. If the extensive growth model counts on more factor input to achieve economic growth, then the intensive growth model depends on the improvement of the factor efficiency. Therefore, by means of improving the total factor productivity, the industrial transformation and upgrading can drive economic growth. Moreover, economic growth generally begins in one certain industry which exploits, develops and uses some pioneering technology. Through the "forward and backward linkage effect", this more advanced industry then connects with other related industries and a system of predominant industries is formed. When the advanced technologies of the predominant industries in manufacturing begin to influence related industries in the national economy, and the predominant industries begin to lose their advantages in technologies and production rate, then the old predominant industries will be replaced by the industries that have adopted more advanced technologies, thereby promoting economic growth.

3.2.2 Industrial transformation as a boost to economic growth and sign of the relationship between population and economy

According to Table 4 which displays the changes in the Chinese employment structure, though there is some degree of inconsistency between the current Chinese employment structure and the industrial structure, their basic trends are the same. Both are marked by a gradually reduced share of the primary industry, a steady and reasonable share of the secondary industry and a gradually increasing share of the tertiary industry. The primary industry embodies more labor-intensive industries and emphasizes the quantity of the workforce, while not quite caring about the quality of the workforce; while the secondary and tertiary industries, especially the hi-tech industries, more embody technology-intensive industries and require a smaller number of workforce while setting high standards for workforce quality. Interpreted through population economics, that exactly exhibits how the changes of the quantity and quality of the Chinese population and then of the Chinese workforce can adapt to the industrial transformation. This good adaptability lays the foundation for the sustained economic growth, and also indicates a great chance for China to overcome the middle-income trap in its future economic growth.

4. Conclusion

In recent decades the quality of the Chinese population has seen remarkable improvements. It will continue to act as a human capital and to

secure sustainable economic growth as a new factor and force. The contribution rate of the population quantity-based demographic dividend in Chinese economic growth is decreasing while the population quality-based demographic dividend is increasing, replacing the quantity-based demographic dividend and rising to become the dominant force in economic growth. The decreasing population quantity-based demographic dividend and the increasing population quality-based demographic dividend are boosting Chinese industrial transformation by balancing quantity and quality, and demand and supply, thereby laying the foundation for the sustained growth of the Chinese economy by restructuring the supply side rather than working on production factors and making it possible for China to overcome the middle income trap.

As long as China continues to accumulate human capital, fully leverages its population quality-based demographic dividend and further accelerates its industrial transformation and upgrading, it will be able to overcome the middle income trap and achieve sustained economic growth. Such confidence is necessary and justified.

(Translator: Xu Qingtong; Editor: Xiong Xianwei)

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