China Human Capital Report Series

Human Capital in China
2019

Principal Investigator
Haizheng Li

China Center for Human Capital and Labor Market Research
Central University of Finance and Economics
Beijing, China

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National Natural Science Foundation of China

and

Central University of Finance and Economics

Research Team Members

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Yiting Xu	Doctoral Student, CHLR (2018- present)
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Shujia Zhao	Project Coordinator (2018- present)
Jing Xiao	Graduate Coordinator (2010- 2018)
Beiwen Sun	Executive Assistant to Director (2011-2016)
Hao Deng	Graduate Coordinator / Executive Assistant to Director (2008-2011)
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Hanqing You, Chao Zhang, Junwu Zhang, Haibo Zhao, Xiang Zheng

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Graduate Student, Georgia Institute of Technology： Chongyu Lu, Yuxi Xiao

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Graduate Students, CHLR

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Invited commentator of the Human Capital Report for Each Year[1]

Invited commentator of the Tenth Human Capital Report (December 9, 2018)

Guoen Liu	Professor of Economics, Peking University National Development Research Institute; Director of China Center for Health Economic Research
Zhuo Chen	Professor, University of Georgia, USA

Invited commentator of the Ninth Human Capital Report (December 9, 2017)

Junjie Hong	Professor and Dean, School of International Economics and Trade, University of International Business and Economics
Weiguo Yang	Dean, School of Labor and Human Resources, Renmin University of China

Invited commentator of the Eighth Human Capital Report (December 10, 2016)

Min Tang	State Council Counselor; Vice President of Youcheng Entrepreneur Foundation for Poverty Alleviation
Boqing Wang	Founder of MyCOS; Vice President of China International Talent Professional Committee

[1] The first and the fifth Human Capital Report do not invite commentator.

Invited commentator of the Seventh Human Capital Report (December 12, 2015)

Gary Jefferson	Professor of Brandeis University, USA
Scott D. Rozelle	Professor of Stanford University, USA
Shi Li	Professor of Beijing Normal University
Tao Xin	Professor of Beijing Normal University

Invited commentator of the Sixth Human Capital Report (October 12, 2014)

Shujie Han	Director of Editorial Department of China Human Resources Development Magazine
Martina Lubyova	Director of the Institute of Prediction, Slovak National Academy of Sciences
Peter F. Orazem	Professor of Iowa State University, USA
Jeffrey S. Zax	Professor, University of Colorado, Boulder

Invited commentator of the Fourth Human Capital Report (December 12, 2012)

Weizhong Hou	Professor of Economics, California State University, Long Beach
Weiping Li	Chief Expert of the Academy of Human Resources and Social Security
Tao Yang	Professor, Darden School of Business, University of Virginia, USA
Yansui Yang	Professor, School of Public Administration, Tsinghua University

Invited commentator of the Third Human Capital Report (October 28, 2011)

Desheng Lai	Professor and Dean, School of Economics and Business Administration, Beijing Normal University
Yang Du	Professor, Institute of Population and Labor Economics, Chinese Academy of Social Sciences
Zhaoming Gui	Professor, School of Management, Wuhan Institute of Technology

Invited commentator of the Second Human Capital Report (October 15, 2010)

Ardo Hansson	Chief Economist, World Bank in China
Danling Zhao	Deputy Inspector, Personnel Department, Ministry of Education
Yuetian Li	Deputy Director, Policy Research Division, Ministry of Human Resources and Social Security
Guoqiang Long	Minister of Foreign Economic Research, Development Research Center of the State Council

Pictures of Project Team for Each Year

2009 Project Team Student Members

(In the middle, Professor Barbara Fraumeni, the late Nobel Laurent Professor Kenneth Arrow, Professor Dale Jorgenson and his wife Linda.)

2010 Project Team Student Members

(This picture was taken at the 2009 release of the 1st China Human Capital Report.)

2011 Project Team Student Members

(The following pictures are photos of Professor Barbara Fraumeni and the project team student members.)

2012 Project Team Student Members

2013 Project Team Student Members

2014 Project Team Student Members

2015 Project Team Student Members

2016 Project Team Student Members

2017 Project Team Student Members

2018 Project Team Student Members

2019 Project Team Student Members

A Brief Introduction to

China Center for Human Capital and Labor Market Research

Established in March 2008, the China Center for Human Capital and Labor Market Research (CHLR) at the Central University of Finance and Economics (CUFE) is an integral part of the Advantageous Program Platform in Economics and Public Policy at the CUFE. It is an international research center for the study of human resources and labor markets, focusing on China and related economies.

We are grateful to our advisory board for their contributions to our program. Current members of the advisory board include Nobel Laureate James Heckman and Professor Dale W. Jorgenson of Harvard University, founder of the income-based method for measuring human capital.

The major research in the Center is related to the broad area of human capital and labor markets, including but are not limited to human capital and skill measurement, human capital investment, human capital mobility, human capital and innovation, and health economics. The main research project at the Center level is China human capital measurement.

All faculty and research fellows of the CHLR hold a Ph.D. degree in economics from major universities in North America and Europe, and some are senior professors at U.S. universities. Currently the Center has 6 full-time faculty members, 5 special-term professors, and 5 senior research fellows.

The CHLR has Master's, doctoral and post-doctoral programs. The Center's graduate programs are internationally oriented. The curriculum and instruction are rigorously designed following research universities in the United States. All courses are taught in English. As of 2019, 1 post-doctoral student, 8 doctoral students and 111 master students have graduated. Currently, the Center has 39 students, with 33 Master's students and 6 doctoral students.

The Impact of the Human Capital Project

The research project, "China's Human Capital: Measurement and Index Construction," is conducted by the China Center for Human Capital and Labor Research Center (CHLR) and funded by the National Natural Science Foundation of China and the Central University of Finance and Economics. The project aims at establishing China's first scientific and systematic human capital measurement metrics, quantitatively describing China's human capital distribution, trend and dynamics. It constructs important measurements for further evaluating human capital and its contribution to economic development and provides policy-makers with important information on the nation's human capital development.

The project is part of the international effort to establish comparable national human capital measurement across nations and to eventually incorporate human capital into the National Income and Product Accounts (NIPA) system.

The project is led by Professor Haizheng Li (Georgia Institute of Technology). The research team includes Professor Barbara Fraumeni (a pioneer scholar in developing the Jorgenson-Fraumeni method of human capital calculation), all full-time and special-term professors, graduate students, and administrative staff at the CHLR. Since the inaugural issue of the China Human Capital Report 2009, the project has generated great impact both at home and abroad.

I. Papers published based on China Human Capital Report (in reverse chronological order):

- “Regional Distribution and Dynamics of Human Capital in China 1985-2014”, Barbara M. Fraumeni, Junzi He, HaizhengLi, Qinyi Liu , has been accepted by Journal of Comparative Economics, 2019, forthcoming.
- “Physical Capital Estimates for China's Provinces, 1952-2015 and Beyond,” Holz, A. Carsten and Yue Sun, China Economic Review, Volume 51, 2018, 342-357.
- "Advanced human capital structure and economic growth - the formation and narrowing of the gap between the eastern, central and western regions" , Zhiyong Liu, Haizheng Li, Yongyuan Hu and Chenhua Li, Economic Research, Volume 3, 2018, 50-63,.
- “Regional Distribution and Dynamics of Human Capital in China 1985-2014: Education, Urbanization, and Aging of the Population”, Haizheng Li, Junzi He, Qinyi Liu, Barbara M. Fraumeni, Xiang Zheng, NBER, No. w22906, 2016.
- "Identifying Human Capital Externality: Evidence from China", Yunling Liang, Zhiqiang Liu, Haizheng Li , Journal of Management Science and Engineering, Volume 1, 2016, 75-93.
- “Human Capital Estimates in China: New Panel Data 1985-2010,” Haizheng Li, Qinyi Liu, Bo Li, Barbara Fraumeni, and Xiaobei Zhang, China Economic Review, Volume 30, pp.397-418, 2014.
- “Regional Difference in perspective of the quality of labor force human capital,” Haizheng Li, Tang Tang, Journal of Central University of Finance and Economics, in Chinese, Volume 1(8), pp. 72-80, 2015.
- “China’s Human Capital Measurement: Method, Results and Application,” Haizheng Li, Bo Li, Yuefang Qiu, Dazhi Guo, Tang Tang, Journal of Central University of Finance and Economics, in Chinese, Volume 1(5), pp. 69-78, 2014.
- “Regional Distribution and Development of Human Capital in China,” Haizheng Li, Na Jia, Xiaobei Zhang, Barbara Fraumeni, Economic Research Journal, in Chinese, Issue 7, pp. 49-62, 2013.
- “Human Capital in China, 1985-2008,” Haizheng Li, Yunling Liang, Barbara Fraumeni, Zhiqiang Liu and Xiaojun Wang, Review of Income and Wealth, Volume 59(2), pp. 212-234, 2013.
- “Human Capital Measurement and Index Construction in China,” Haizheng Li, Yunling Liang, Barbara Fraumeni, Zhiqiang Liu, Xiaojun Wang, Economic Research Journal, Issue 8, 2010. (Reprinted in China Social

Science Digest, 2010, No. 12.)

- "Human Capital Index in China," Haizheng Li, Barbara Fraumeni, Zhiqiang Liu, Xiaojun Wang, National Bureau of Economic Research (NBER), working paper, 2012 (http://papers.nber.org/papers/w15500).

II. Books/Book Chapters published based on China Human Capital Report:

- "Senior Expert to Review the Results and Analysis of Human Capital Accounts," Report to the World Bank, Barbara Fraumeni, 2017.
- "Human Capital and Physical Capital Comparison of Beijing," Haizheng Li, Yue Sun, Yuefang Qiu, Dazhi Guo, in: Beijing Human Resources Development Report 2015-2016, Beijing Human Recourses Bluebook Series, edited by Minhua Liu, Social Science Literature Press, Beijing, China, in Chinese, 2016.
- "Human Capital Comparison among Beijing, Tianjin and HebeiProvince," Haizheng Li, Dazhi Guo, Yuefang Qiu, in: Beijing Human Resources Development Report 2013-2014, Beijing Human Recourses Bluebook Series, edited by Miao Yu, Social Science Literature Press, Beijing, China, in Chinese, 2014.
- "The Rural-Urban Disparity of Human Capital in China," Haizheng Li, Xiaobei Zhang, Na Jia, Yunling Liang, Chinese Economists Society Presidential Forum, in: Economic Reform and Future Development Directions, edited by Yanling Yang and Kunwan Li, Nankai University Press, pp.209-227, 2012.
- "Human Capital In Beijing-A Measurement Based on the Jorgenson-Fraumeni Income Approach," Haizheng Li, Na Jia, Xiaobei Zhang, in: Beijing Human Resources Development Report 2010-2011, Beijing Human Recourses Bluebook Series, edited by Zhiwei Zhang, Social Science Literature Press, Beijing, China, in Chinese, pp. 57-79, 2011.
- "Human Capital Index in China," Haizheng Li and Barbara Fraumeni, in: The Changing Wealth of Nations, Washington, DC: World Bank, Chapter 6, pp. 105-114, 2010.

III. Invited Speeches and Presentations:

- The Human Capital Project Working Paper "Unobserved Human Capital and

Regional Inequality: Evidence from China" was presentation at the international conference "Challenges to Asia and Global Economy," Haizheng Li , organized by Korea University, Seoul, South Korea, May 31, 2019.

- The Tenth International Symposium on Human Capital, Plenary Session Presentation, "Measuring China's Human Capital-2018," Beijing, China, December 9, 2018.
- The Society for Economic Measurement 2018 Conference, cosponsored by the Xiamen University, the University of Kansas, Carnegie Mellon University, and the Center for Financial Stability, keynote speech, "Human Capital Metrics and Their Impacts on Economic Development," Haizheng Li, Xiamen, China, June 8-10, 2018,
- The Fifth World KLEMS Conference in Harvard University, invited plenary session presentation, "Human Capital Measures and Its Effect on Economic Convergence in China," Haizheng Li, Boston, USA, June 4-5, 2018.
- The Ninth International Symposium on Human Capital, Plenary Session Presentation, "Measuring China's Human Capital-2017," Beijing, China, December 10, 2017.
- The 61st World Statistics Conference, "Regional Distribution and Dynamics of Human Capital in China 1985-2014: Education, Urbanization, and Aging of the Population," Haizheng Li, Marrakech, Morocco, July 18, 2017.
- The Eighth International Symposium on Human Capital, Plenary Session Presentation, "Measuring China's Human Capital-2016," Beijing, China, December 10, 2016.
- The 2016 China Conference of the Chinese Economists Society, "Regional Distribution and Trend of China's Human Capital 1985-2012: The Impact of Urbanization, Education, and Population Aging," Haizheng Li ,Shenzhen, China, June 12, 2016.
- The Seventh International Symposium on Human Capital, Plenary Session Presentation, "Measuring China's Human Capital-2015," Haizheng Li , Beijing, China, December 12, 2015.
- Keynote Speaker, The 5th Changqing Expert Lecture, "Human capital and pre-college education," Haizheng Li, Beijing, China, June 16, 2015.
- Keynote Speaker, Shaanxi Normal University, International Symposium: Human Capital and Challenge of economic growth in China, "Rural human capital in China and the economic growth in future," Haizheng Li, Xi'an,

Shaanxi, June 6-7, 2015.

- The 6th International Symposium on Human Capital and Labor Markets and the Release of the China Human Capital Report, Plenary Session Presentation, “Human Capital in China 2014,” Haizheng Li, Beijing, China, 2014.
- Invited presentation, University of Chicago, Symposium on China's Economy and Governance, “Reginal Distribution of Human Capital in China,” Haizheng Li, Chicago, USA, August 27, 2014.
- Keynote Speaker, The 26th Annual Meetings of the Chinese Economics Society of Australia, “Regional Distribution and Growth of China’s Human Capital 1985-2010: Urbanization, Education, and Aging,” Haizheng Li, Monash University, Melbourne, Australia, July 6-9, 2014.
- The Chinese Economists Society (CES) President Forum, “Reform of China’s Graduate Education,” Guangzhou, China, June13, 2014.
- Invited Speaker, Fudan University and The Chinese University of Hong Kong, Shanghai-Hong Kong Development Institute conference on “Human Capital Distribution and Trend in China: Where does Shanghai Stand?” Haizheng Li , Shanghai, China, May 28, 2014.
- The Third World KLEMS Conference: Growth and Stagnation in the World Economy, invited presentation, “Human Capital Estimates in China: New Panel Data 1985-2010,” Haizheng Li , Tokyo, Japan, May 19-20, 2014.
- American Economic Association Annual Meeting, “Human Capital Estimates in China, New Panel Data 1985-2010,” Haizheng Li , Philadelphia, USA, January 3-5, 2014.
- Invited Speaker, International Symposium on "Labor Aspect of Corporate Social Responsibility and Public Policy," organized by the United Nations ILO Training Centre in Turin and Nanjing University of Finance and Economics, “Human capital per labor of China,” Haizheng Li , Nanjing, China, May10-13, 2013.
- Invited Speaker, University of Southern California, US-China Institute conference on “The State of the Chinese Economy: Implications for China and the World,” Los Angles, “Human Capital in China,” Haizheng Li , February 24-25, 2011.
- Invited speaker, The Chinese Economists Society (CES) President Forum, “Human Capital and Its Contributions,” Haizheng Li, Nankai University, Tianjin, China, December 10, 2010,

- Invited Speaker, High-Level Working Group on Skills and Human Capital hosted by the Lisbon Council, "Measuring Human Capital in China," Haizheng Li , Brussels, November 16, 2010.
- Invited plenary session presentation, The 31st IARIW General Conference of the International Association for Research in Income and Wealth, "Human Capital in China," Haizheng Li , St. Gallen, Switzerland, August 23-28, 2010.
- Invited Speaker, The 25th Anniversary of the Sino-US Exchange on Economics Education (Ford Class) Renown Scholar Forum, Renmin University of China, "Human Capital in China," Haizheng Li , Beijing, China, July 23, 2010.
- Plenary Session Chair and co-organizer, Beijing municipal government conference, "World Talent, World City," Haizheng Li , Beijing, May 28, 2010.

IV. Related Funded Projects:

- The Central University of Finance and Economics-University of Electronic Science and Technology of China Joint Data Research Center (CEDC) established a collaboration relationship with CHLR to build large-scale database on human capital measurements, 2019.
- National Natural Science Foundation of China, "Research on Human Capital Measurement in China: Expansion and Deepening," 2018-2021.
- National Natural Science Foundation of China, "Research on Human Capital Measurement in China: Improvement and Application," 2013-2016.
- European Union project (2012-2015), invited participation, "Lifelong Learning, Innovation, Growth and Human Capital Tracks in Europe," 2012-2015 (study human capital, skills and outcomes with other eight research teams from various countries/regions).
- Ministry of Education, "A Study of the Contribution Rate of Human Capital to Economic Growth," invited project, May 2010.
- OECD Director of Statistics Directorate, Mr. Paul Schreyer, officially recommended to the Director of China National Bureau of Statistics that the CHLR human capital research team participate in the OECD human capital consortium as China's officially designated representative, 2010.
- National Natural Science Foundation of China (NSFC), "China Human

Capital Measurement and Index," 2010-2012.

- State Councilor Yandong Liu visited the CHLR in October 2009 and complimented the Center's achievement in human capital research.
- The "China Human Capital Report" series has been requested by the Ministry of Education as a reference since 2009.
- "China Human Capital Report 2009" was requested by the Organization Department of the Central Committee of Communist Party as a reference for policy making, 2009.

Acknowledgement

We thank all the invited discussants and participants at the international symposium series on human capital hosted by the China Center for Human Capital and Labor Market Research since 2009 for their valuable suggestions. We are grateful for the comments and suggestions from scholars at numerous international and domestic conferences, as well as from anonymous referees.

We are especially grateful to the founder of the income-based method for measuring human capital, Professor Dale W. Jorgenson at Harvard University, for his support of this project.

This project and its related conferences have benefited tremendously from the supports of the administration at the Central University of Finance and Economics (CUFE). President Yaoqi Wang, former President Guangqian Wang, current and former Vice President Jianping Shi, Haitao Ma, Junsheng Li, and Lifen Zhao helped coordinate with various offices to ensure the success of the project. Many offices at the CUFE provided important administrative support that facilitated this research.

The School of Economics at Georgia Institute of Technology, especially the current Chair Professor Laura Taylor and the former Chair Patrick McCarthy, they offered strong support for the project.

Improvements in the 2019 Report

- Calculated labor-force human capital by including or not including students [2]
- Added new survey data CLDS [3] 2014 in estimating the Mincer equations.
- Added general secondary professional education data and adult secondary professional education data into the high school enrollment.
- Revised the method for calculating enrollment age distribution, from 6 age groups to 3 age groups.
- Updated 2015 1% Demographic Sampling Survey data for 11provinces.
- Updated national and provincial human capital estimation for 1985-2017.
- Updated survey data CFPS[4]2016 and CHNS[5]2015.

[2] Data on labor-force human capita that included student can be download from the database website.
[3] China Labor-force Dynamics Survey
[4] Chinese Family Panel Studies
[5] China Health and Nutrition Survey

Brief Description

Abbreviations

- Provinces:

BJ=Beijing	TJ=Tianjin	HeB=Hebei
SX=Shanxi	NMG=Inner Mongolia	LN=Liaoning
JL=Jilin	HLJ=Heilongjiang	SH=Shanghai
JS=Jiangsu	ZJ=Zhejiang	AH=Anhui
FJ=Fujian	JX=Jiangxi	SD=Shandong
HeN=Henan	HuB=Hubei	HuN=Hunan
GD=Guangdong	GX=Guangxi	HaN=Hainan
CQ=Chongqing	SC=Sichuan	GZ=Guizhou
YN=Yunnan	XZ=Tibet	SaX=Shaanxi
GS=Gansu	QH=Qinghai	NX=Ningxia
XJ=Xinjiang	HK=Hong Kong	TW=Taiwan

- HC: Human capital
- LFHC: Labor force human capital

Definition and Description

- Total human capital: age 0-55 for females and age 0-60 for males
- Labor force human capital: age 16 or older unretired individuals excluding students.

Contents

Executive Summary

We estimate China's human capital stock and describe its distribution and dynamics at the national and provincial levels from 1985 through 2017. A variety of human capital indices are constructed and reported.

In addition to the traditional education-based metrics, we apply the widely used Jorgenson-Fraumeni income-based approach (hereinafter referred to as "J-F method"), which provides a more comprehensive measurement of human capital. We present both education-based and J-F measures for males and females, and by rural and urban areas.

We incorporate the Mincer model into the J-F framework to estimate income where the needed data are unavailable. Estimation of the Mincer model is implemented by combining micro survey data with provincial level aggregate data to fill in for missing micro-level observations.

We organize our estimates into a China human capital database that contains provincial panel datasets on human capital, physical capital, living-cost-adjustment indices, and other useful provincial data (raw and processed). The database is available for public use and can be downloaded free of charge at：

http://humancapital.cufe.edu.cn/rlzbzsxm.htm

The Main Findings of the 2019 Report

(All real values are based on 1985 prices unless otherwise specified. The annual average growth rate calculates the simple growth rate for each year firstly, then average it to reflect the annual change in growth rate.)

I) Traditional Human Capital Measures

1. In 2017, the average age of the labor force at the national level is 37.8 years. The five provinces with the oldest labor force were Liaoning, Jilin, Heilongjiang, Chongqing, and Hunan, and the five provinces with youngest labor force were Guangdong, Guizhou, Hainan, Xinjiang and Tibet.

2. In 2017, the average years of schooling of the labor force at the national level was 10.2. The five provinces with highest years of schooling were Beijing, Shanghai, Tianjin, Jiangsu and Liaoning, and the five provinces with the lowest years of schooling were Gansu, Yunnan, Guizhou, Qinghai and Tibet.

3. In 2017, the proportion of the labor force with high school education or higher was 37.51%, 20.5% in rural areas and 50.32% in urban areas.

4. In 2017, the proportion of labor force with college education or above was 17.6%, 5.5% for the rural areas and 26.7% for the urban areas.

II) The J-F based human capital measures

5. The J-F measure of China's total human capital reached RMB 1934.3 trillion in current value in 2017, with RMB 1587.4 trillion (82.1%) in urban and RMB 346.9 trillion (17.9%) in rural areas.

6. Human capital per capita was RMB 1721 thousand in current value in 2017, RMB 2349 thousand for urban residents and 774 thousand for rural residents. Males' average human capital was RMB 2175 thousand and females' was 1206 thousand.

7. In 2017, the five provinces with highest human capital stock were Shandong, Jiangsu, Henan, Guangdong and Zhejiang, and the five provinces with lowest human capital stock were Gansu, Hainan, Ningxia,

Qinghai and Tibet.

8. The five provinces with highest human capital per capita were Shanghai, Beijing, Tianjin, Zhejiang and Jiangsu, and the five provinces with lowest level were Heilongjiang, Xinjiang, Tibet, Yunnan, Gansu and Qinghai.

9. The five provinces with highest average labor force human capital per capita were Beijing, Tianjin, Shanghai, Zhejiang and Jiangsu, and five provinces with the least were Guizhou, Yunnan, Gansu, Qinghai and Tibet.

10. China's total real human capital stock in 2017 was 10.4 times its level in 1985, having grown at an average annual rate of 7.7%. The average annual growth rate during the decade 2008-2017 was 7.4%.

11. From 1985 to 2017, rural human capital grew at an average annual rate of 3.7%, and urban human capital grew at 10.3%; while during the decade 2008-2017, the growth rate was 8.4% for urban areas but only 3.7% for rural areas. This decline in the average annual growth of rural human capital largely reflects China's rapid urbanization.

12. Urban human capital surpassed the rural human capital in 1992 and has remained higher since then.

13. Human capital per capita grew from 39,780 yuan to 345,790 yuan in real value, at an average annual rate of 7.1% over the period 1985-2017 and at a rate of 7.1% over the years 2008-2017.

14. The average annual growth rate of human capital per capita during the period of 1985-2017 was 6.4% for urban and 5.4% for rural areas. For the years 2008-2017 the growth rates were 5.7% and 6.2%, respectively.

III) Hong Kong and Taiwan

15. In 2017, the average age of labor force was 39.1 years in Hong Kong and 38.2 years in Taiwan.

16. In 2017, the average years of schooling of the labor force were 12.4 years in Hong Kong and 13.6 years in Taiwan.

17. In 2017, the proportion of the labor force with high school education or above was 76.5% in Hong Kong and 87.9% in Taiwan.

18. In 2017, the proportion of the labor force with college education or above was 43.0% in Hong Kong and 54.5% in Taiwan.

19. In Hong Kong, the average annual growth rate of J-F based total human capital between 1985 and 2017 was 4.2%, and for human capital per capita it was 3.6%; while over the years 2008-2017, the rates were 4.0% and 4.2%, respectively.

20. In Taiwan, during 1985-2017, the average annual growth rate of J-F based total human capital was 1.7%, and for human capital per capita it was 1.6%; while over the years 2008-2017, the rates were -1.5% and -0.8%, respectively.

Chapter 1 Introduction

Since the concept of human capital was introduced to modern economic analysis by Schultz (1961) and Becker (1964), it has been widely used in academic studies and policy analysis. An Organization for Economic Co-operation and Development (OECD) publication defines human capital as "The knowledge, skills, competencies and attributes embodied in individuals that facilitate the creation of personal, social and economic well-being" (OECD, 2001, page 18). Human capital has been called probably "the most important and most original development in the economics of education" in the second part of the 20th century (Coleman, 1990, page 304). Human capital according to a recent report accounts for 54% of total capital on average between 1990 and 2010 (UNU-IHDP and UNEP, 2014, page 29).

It is generally believed that human capital is an essential source of economic growth and innovation, and an important factor for sustainable development and reducing poverty and inequality. Detailed analyses of human capital in many advanced economies, including the United States, all show that human capital is a key source of economic growth.[6] The Stiglitz Commission report (Stiglitz, et. al. 2009). noted the importance of human capital as a "beyond Gross Domestic Product" measure of economic and social progress.

The Chinese economy has grown at a dramatic rate since the start of economic reforms, and human capital has played a significant role in the Chinese economic miracle (see, for example, Fleisher and Chen, 1997, and Démurger, 2001), with strong impacts on both productivity growth and reducing

[6] In particular, we refer to studies that expand and refine measures of human capital in total wealth and relate these measures to economic growth. Such studies include Jorgenson-Fraumeni (J-F) accounts for Canada (Gu and Ambrose 2008), New Zealand (Li, Gibson, and Oxley 2005), Norway (Greaker and Liu 2008), Sweden (Alroth 1997), and the United States (Jorgenson and Fraumeni 1989, 1992a, 1992b, and Christian 2010,2014,2015).

regional inequality. (Fleisher, Li and Zhao, 2009).

Despite its critical role in the Chinese economy, there has been almost no comprehensive measurement of the total human capital stock in China until 2009, with the first China Human Capital Report issued by this Center. Human capital measures for China are central to any understanding of the global importance of human capital for a number of reasons. Measures of human capital facilitate a deeper understanding of the contribution of human capital to growth, development, and social well-being in empirical and theoretical research, not only in China, but in the world at large, in part because of dramatic changes in its magnitude and composition. These changes have reflected;

1. First, China has undergone substantial demographic changes in the past 65 years that included
   (1) The encouragement of large families;
   (2) Subsequently discouragement of population growth the one-child policy;
   (3) dramatic improvements in health and longevity;
   (4) Massive interregional migration and urbanization.
2. Second, there has been a massive elimination of illiteracy and, more recently, a rapid expansion of education at higher levels. It is difficult to find a natural experiment based on such substantial changes in the magnitude and composition of a critical source of economic growth anywhere in human history or across nations.

Until the inception of this Project, only imperfect representations of human capital, such as measures of formal education and workforce experience have been available for China. Developing comprehensive measures of human capital in China provides the necessary groundwork for China's joining the international OECD initiative to facilitate international comparison of human capital accumulation and growth across nations.

Additional benefits of developing human capital measures include the

provision of useful information for policy makers' assessment of how education, health, and family support policies of central and local governments affect the accumulation of human capital. In the area of schooling, for example, there has been a remarkable increase in the educational attainment of the Chinese population, which in 1985 was largely concentrated in the "no schooling" and "primary school" categories (Figure 4.2.5). By 2010 the largest population group was found in the "junior middle" school category (Figure 4.2.7). Policy makers need a clear view of the current gap that remains in the overall education status between the rural and urban areas, especially those with high school education and above. Our measures illustrate the significance of this gap and point to the long-term gains of bringing human-capital investment to the areas where it is still needed desperately.

There is an ongoing international effort in developed countries to measure a nation's total human capital stock and to develop Jorgenson-Fraumeni (J-F) national human capital accounts. Our work is part of this movement. The U.S. Bureau of Economic Analysis has recently supported research on human capital (Abraham 2010 and Christian 2010,2015). Statistics Canada (Gu and Wong 2008), the Australian Bureau of Statistics (Wei 2008), and Statistics Norway (Greaker and Liu 2008) have established similar research programs on the measurement of human capital using agency researchers. In addition, seventeen countries (Australia, Canada, Denmark, France, Italy, Japan, Korea, Mexico, Netherlands, Norway, New Zealand, Poland, Spain, the United Kingdom, the United States, Romania, and Russia), and two international organizations, Eurostat and the International Labor Organization, joined an OECD consortium to develop human capital accounts.[7] [8] The work of this consortium will

[7] See Liu (2011).

[8] J-F human capital accounts have been constructed for several other countries independent of the consortium efforts. These countries include Argentina (Coremberg,

facilitate cross-country comparisons. Developed countries have obviously realized the importance of monitoring human capital accumulation, while most developing and emerging countries, including China, are only beginning to embark on such projects.

Although systematic measures of the total human capital stock in China have not been completed, there are a few studies on human capital measurement published in Chinese journals. For example, Zhang (2000) and Qian and Liu (2004) calculated China's human capital stock based on total investment (the cost side); others, such as Zhu and Xu (2007) and Wang and Xiang (2006), estimated human capital from the income side. Zhou (2005) and Yue (2008) used weighted averages of some human capital attributes to construct a measure. Most studies generally measure only parts of human capital based on some education characteristics such as average years of education, for example, Cai (1999), Hu (2002), Zhou (2004), Hou (2000), Hu (2005).

The limitations of past studies have precluded implementation of internationally recognized methods for human capital estimation based on China's data. The methodology used studies preceding the work reported here has been limited by data availability, feasibility of parameter estimation, and some technical treatment difficulties. It is for these and related reasons that we have no measures of changes of human capital in rural and urban areas and for males and females. .

We construct a comprehensive measure of human capital in China by applying the methods used in other countries after modifying them to fit China's particular situation. We estimate total human capital at the national level and provincial level, for males and females, for urban and rural areas from 1985 to 2017. Our estimates include nominal values, real values, indexes, and quantity

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2010), India (Gundimeda, Sanyal, Sinha, and Sukhdev, 2007), New Zealand (Le, Gibson, and Oxley, 2005), and Sweden (Ahlroth and Bjorkland, 1997). O'Mahony and Stevens (2004) applied J-F methodology to evaluate government provided education in the United Kingdom.

measures. We adopt, where possible, the Jorgensen-Fraumeni (J-F) lifetime income based approach as discussed above.

Adapting and implementing the J-F approach to China's data to estimate the human capital series involves combining micro-level survey data to mitigate the lack of comprehensive earnings data in China. In particular, we apply the well-known Mincer equation to estimate earnings from available household surveys where comprehensive data are not available. By obtaining imputed earnings for the entire population, we are thus able to integrate the changes of returns to education and experience (on-the-job-training) that are reflected in incomes during the course of economic transition into our estimates of the human capital stock.

In separating the calculation of human capital for urban and rural areas, we capture changes caused by rapid urbanization and the large scale rural-urban migration that has taken place since the beginning of economic reform. This framework is important for any transitional economy because of concomitant changes in economic structure and distribution of the population which in part reflect investments in migration—an important component of human capital often missed in ongoing research.

The rest of this report is arranged as follows. Chapter 2 discusses our methodology for human capital measurement. Chapter 3 describes the J-F method and its application and modifications for China. Chapter 4 reports China's population and education dynamics. Chapter 5 reports descriptive statistics of some indicators for the national and provincial labor population. The national estimates of human capital are reported in Chapter 6. Chapter 7 presents the cross-province comparison results. The disaggregated human capital results for 31 provinces, Hong Kong and Taiwan are presented in Chapters 8-40.

Chapter 2 Methodology

In general, human capital can be produced by education, training, and child bearing and rearing, as well as by job turnover and migration that help to realize the full potential value of human capital. Like physical capital, the human capital stock can be valued using two methods: i) it can be valued as the sum of investment, minus depreciation, added over time to the initial stock; ii) it can be valued as the net present value of the income flow it will be able to produce over an expected lifetime. The first method - the perpetual inventory method--is used in the cost approach, for example, Kendrick (1976); while the second method is used in the income-based approach, for example Jorgenson and Fraumeni (1987, 1992a, 1992b). When human capital is measured using the perpetual inventory approach, only costs or expenditures are included in investment. When physical capital is measured in this way, investments are valued at their purchase price which is not generally available for human capital.

These and other measures of human capital have been used by researchers in many studies:

(1) The lifetime income approach of Jorgenson and Fraumeni (1989, 1992a, 1992b);

(2) The cost approach of Kendrick (1976);

(3) The indicator approach as exemplified by The Lisbon Council's estimates (2006);

(4) The attribute approach as exemplified by Laroche and Merette (2000);

(5) The World Bank residual approach (2006).

The approach of Jorgenson-Fraumeni is discussed further in the next section.

2.1 Jorgenson-Fraumeni income-based approach

The Jorgenson-Fraumeni (J-F) method estimates human capital stock as the expected future lifetime income of all individuals. If human capital could be traded in the market like physical capital, the asset price would be the net present value of the individuals' lifetime labor income.[9] The lifetime income approach can reflect the importance of long-term investments, such as education and health, in human capital accumulation.

The J-F income-based approach is the most widely used method in estimating human capital stock, and it has been adopted by a number of countries in constructing human capital accounts. The advantages of this approach are that it has a sound theoretical foundation and that the data and parameters are relatively easier to obtain than they are for other approaches.

When estimating lifetime income to calculate human capital, an important issue is that income (or implicit income) can be generated from both market and nonmarket activities. Market activities of individuals produce goods and services, foster innovation and growth through managerial and creative activities, and generate income that allows for the

[9] In China, the labor market may still be at a stage where wage income does not fully reflect the marginal productivity of labor. Therefore, in the studies involving wages, there may be a certain degree of distortion. When estimating human capital using wage income, one must recognize that this problem may exist. Therefore, our study is clearly limited by the current development level of the labor market mechanism in China. The income approach is the most commonly used method for measuring human capital. Even in the United States and other developed countries, wages do not fully reflect the marginal productivity, because its labor market is not perfectly competitive. Even so, wages are still representative of the human capital gains from an individual perspective, and still a measure of human capital in that sense. With the improvement of market mechanism in China, this limitation will gradually decrease. According to estimates of the current literature, wages are generally lower than the marginal productivity (see Fleisher, Li and Zhao, 2010). Therefore, from this perspective, our calculation can be interpreted as a conservative estimate of human capital.

acquisition of market goods and services. Nonmarket activities include household production, e.g., cooking, cleaning, and care-giving. Investment is generated from both market and nonmarket activities. Because household production activities are difficult to quantify and value and require time-use estimates, we have opted to exclude them in this first approximation to estimating China's human capital.[10]

2.2 Cost approach

Kendrick is an early pioneer in the construction of human capital accounts. Kendrick (1976) estimates both tangible and intangible human capital. Tangible human capital includes child rearing costs. Intangible human capital includes education, training, medical, health and safety expenditures, and mobility costs. Human capital stocks are created using a perpetual inventory method where investment expenditures are cumulated and existing stocks are depreciated. Implementation of a Kendrick approach for China is difficult because Kendrick's human capital investment is the sum of a long list of human capital related costs, and reliable data on such information is only available for the most recent decades.

Tangible human capital investment includes child-rearing costs including expenditures on food, shelter, health, schooling, and so on. The cost of parental time is not included in this measure. Intangible human capital investment in formal and informal education includes both private and government costs.

[10] Among the most recent human capital estimates, i.e., Mira and Liu (2010), Gu and Ambrose (2008), Greaker and Liu (2008) and Christian (2010), only Christian, for the United States, includes a full set of nonmarket activities and estimates human capital for those too young to go to school or to perform market work.

Private formal education costs include net rental for the private education sector's plant and equipment and students' expenditures on supplies. Estimation of opportunity cost depends on a student's imputed foregone compensation. Government formal education costs include all types of expenditure, including those for construction. Personal informal education expenditures include a portion of outlays for radio, TV, records, books, periodicals, libraries, museums, and similar activities. Business and institutional expenditures include a portion of those for media expenditures. Religious education expenditures are imputed from figures on religious class attendance and imputed interest on plant and equipment of religious organizations. Government expenditures include those for library, recreation costs and military education expenditures.

Intangible human capital investment in training values initial nonproductive time and nonwage costs and includes explicit training expenditures. Both specific and general training is measured, as well as military training. A substantial fraction of medical, health and safety expenditures, which are split between investment and preventive expenditures, are by governments. Annual rental costs for plant and equipment are imputed when not available.

Kendrick considers his human capital mobility investment estimates to be tentative. These include unemployment, job-search, hiring, and moving costs, for both residents and immigrants. Depreciation is estimated using the depreciation methodology most widely used at the time of his research, which is a double declining balance formula with a switch to a straight-line method.

Kendrick's estimate of the stock of nominal human capital is about five times Gross Domestic Product. However, the J-F human capital estimate is substantially larger than Kendrick's.[11] The Kendrick approach covers detailed aspects of human capital formation from the cost side and provides a very complete menu for summing up all related costs to estimate the value of human capital. Yet, the data requirements are enormous, for example, we may need to

[11] See table 37 of Jorgenson-Fraumeni (1989).

get government statistics ninety years back to do the calculation. This is impossible, given the People's Republic of China was only 61 years old in 2010.

Additionally, the Kendrick approach gives no clear rationale for some important assumptions, such as for the split of health expenses between investment and preventative costs. For all these reasons, we do not adopt this approach for our calculation.

2.3 Indicator approach

An example of the indicator approach is the Human Capital Index of The Lisbon Council. It is a human capital input cost, or cost of creation approach. This index has been constructed for the 13 European Union (EU) states and 12 Central and Eastern European states.[12] The Human Capital Endowment measure is an input to two of the other three components of the overall European Human Capital Index. The Human Capital Endowment measure sums up expenditures on formal education and the opportunity cost of parental education, adult education, and learning on the job. Parentally provided education includes teaching children to speak, be trustful, have empathy, take responsibility, and develop other values and attitudes that will contribute to their earnings and well-being as adults. The Human Capital Utilization Index is the endowment measure divided by total population and the Human Capital Productivity Measure is Gross Domestic Product (GDP) divided by the endowment employed in the country.

Finally, the Demography and Employment measure estimates the number of people who will be employed in the year 2030 in each country by examining

[12] See Ederer (2006) and Ederer *et. al.*(2007). The 2006 paper states that the index was developed by the German think tank Deutschland Denken. In addition the paper states that it is part of a research project undertaken by several individuals in the think tank and with the institutional support of Zeppelin University.

at economic, demographic, and migratory trends.[13]As it has cost components and index components, it is best viewed as a blend of a cost approach and an indicator approach. Since the technical details for this approach have not been released, we do not apply it here in our calculation.[14]

2.4 Attribute-based approach

The attribute-based approach is usually considered to be a variant of the income-based approach (Le, Gibson and Oxley 2003, 2005). However, it constructs an index value of human capital instead of a monetary value as reported in other income-based methods. The primary advantage of an index value is that it nets out the effect of aggregate physical capital on labor income, and thus this measure more nearly captures the variation in quality and relevance of formal education across time and country.

Based on the pioneer work of Mulligan and Sala-i-Martin (1997), Koman and Marin (1997) applied the attribute-based method to Austria and Germany. However, our method is akin to Laroche and Merette (2000) in that we also incorporate work experience into the model along with formal education. That is, we also emphasize informal channels, such as work experience, in the accumulation of human capital.

Specifically in the attribute-based method, the logarithm of human capital per capita in a country at any time is computed using the following formula：

$$\ln\left(\frac{H}{L}\right)=\sum_{e}\sum_{a}\omega_{e,a}\ln\left(\rho_{e,a}\right) \qquad (1)$$

[13] Ederer (2006), p. 4 and p. 20.

[14] We have discussed with Dr. Ederer a possible collaboration to apply The Lisbon Council methodology to China in the future.

$$\omega_{e,a} = \frac{e^{\sum_s \left(\beta_s e+\gamma_s Exp+\delta_s Exp^2\right)\varphi_{s,a}} L_{e,a}}{\sum_e \sum_a e^{\sum_s \left(\beta_s e+\gamma_s Exp+\delta_s Exp^2\right)\varphi_{s,a}} L_{e,a}} \qquad (2)$$

where e and a denote years of formal schooling and age, respectively. $\rho_{\varepsilon,a}=L_{\varepsilon,a}/L$ is the proportion of working age individuals of age a with e years of schooling. The variable $\omega_{\varepsilon,a}$ is the efficiency parameter defined as proportion of wage income of workers of age a with e years of schooling in the total wage bill of the economy. *Exp* represents work experience, which is defined as *a-e-6*, a gender index and $\varphi_{\varepsilon,a}$ is the share of men and women of age a in the population. Parameters β, γ and δ are estimates from a standard Mincer equation. The parameter β is often considered to be the rate of return to one more year of formal education.

In order to implement this method, we need to construct a population data set by age, gender and educational attainment for each year we study. Secondly, we need to estimate a Mincer equation by gender for each year, one for each gender. It is feasible to calculate a human capital measure based on this approach. The major issue is that in this setup, the measurement is actually a Cobb-Douglas formula, in which the proportions of different education groups are not "perfect substitutes." When the share of one education group increases, it could cause the total measurement to decline. For example, if we increase the proportion of population with higher education, the measurement should increase as overall education increases, but it could decline in the Cobb-Douglas formulation, as occurred in our experimental calculation. Since we believe that an education-based human capital measurement should be a monotonically increasing function of overall education, we do not report the results of the attribute-based approach. In our future work we plan to modify the structure, using, for example, average years of schooling.[15]

[15] This suggestion was confirmed as a reasonable modification by email

2.5 Residual approach

The World Bank (2006) uses a residual approach to estimate human capital for 120 countries. Due to data and methodological limitations, total wealth in the year 2000 is measured as the net present value of an assumed future consumption stream. The value of produced capital stocks is estimated with the perpetual inventory method. Produced capital includes both structures and equipment. Natural capital is valued by taking the present value of resource rents. Natural capital includes nonrenewable resources, cropland, pastureland, forested areas, and protected areas. Intangible capital is equal to total wealth minus produced and natural capital. Intangible capital is an aggregate which includes human capital, the infrastructure of the country, social capital, and the returns from net foreign financial assets. Net foreign financial assets are included because debt interest obligations will affect the level of consumption. Intangible capital represents more than 50% of wealth for almost 85% of the countries studied.

Using a net present value approach to estimate total wealth requires assumptions about the time horizon and the discount rate. The World Bank chooses 25 years as the time horizon as it roughly corresponds to one generation. It chooses a social discount rate rather than a private rate as governments would use a social discount rate to allocate resources across generations. The social discount rate is set at 4%, which is at the upper range of estimates reviewed for industrialized countries. The same rate is used for all countries to facilitate comparisons across countries.

A Cobb-Douglas specification is employed to estimate the marginal returns and contribution of three types of intangible capital in the model. The model's independent variables include years of schooling per capita of the working population, human capital abroad, and governance/social capital. Human capital

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communication with Dr. Reinhard Koman.

abroad is measured by remittances by workers outside the country. Governance/social capital is measured with a rule of law index. Although the marginal return to human capital in the aggregate is the highest of the three included intangible capital components, the contribution decomposition demonstrates that the relative contributions can differ significantly across countries (World Bank, 2006, chapter 7).

2.6 Conclusion

To sum up, taking into account data availability, we believe that the J-F income approach is most suitable for measuring China's human capital. Moreover, this method is widely used internationally, so using it facilitates comparisons of China's human capital level with those of other countries'. At the same time, it is easier to calculate and implement scientifically and accurately in China. For all these reasons we will use the method of J-F to measure human capital in China.

Chapter 3 J-F Method and its application for China

The J-F approach imputes expected future lifetime income based on the probabilities of survival, educational enrollment, and employment. Expected future wages and income are estimated from currently observed wages and income of a cross-section of individuals who are older than a given cohort at the time of the observation. Future income is augmented with a projected labor income growth rate and discounted to the present with a discount rate. Estimation is conducted in a backward recursive fashion, from those aged 60, 59,58, and so forth to those aged 0,[16] and modified to China with various needed assumptions about the method and parameters.[17]

3.1 Estimate lifetime income by backward recursion

To apply the J-F income-based approach, we need actual data-or estimates of individual's annual market labor income per capita. Lifetime income is calculated according to whether an individual is in school, works, or is retired. It is calculated by a backward recursion, from the fifth stage backward to the first stage, from the oldest individuals to the youngest and modified as needed to accommodate China data availability. The equations used for calculating the lifetime expected income are as follows.

The first stage is for no school and no work (0-4 years old):

[16] The J-F inclusion of nonmarket lifetime income and expected lifetime income for youngsters produces human capital estimates that are notably higher than those in the studies mentioned above who have adopted the J-F methodology.

[17] The J-F for China does not include nonmarket income.

$$mi(y,s,a,e) = sr(y,s,a+1) * mi(y,s,a+1,e) * [(1 + G)/(1 + R)], \quad (1)$$

where the subscript y, s, a, and e denote year, sex, age and educational attainment respectively, where e is set equal to zero in the first stage, sr is the survival rate, defined as the current year probability of becoming one year older, mi is the lifetime market labor income per capita, G is the real income growth rate, and R is the discount rate.[18] The market income of individuals who do not attend school when they are older is discounted and projected from that of someone with no education who works when they are 16. For example, for an infant who never attends school when older, but works at age 16:

$$mi(y,s,a,e) = sr(y,s,age1to16) * mi(y,s,a+16, 0) * [(1 + G)/(1 + R)]^{16}$$

where $mi(y,s,a+16,0)$ is the market income of someone who is 16 in the current year and $sr(y,s,age1to16)$ is the cumulative survival probability:

$$sr(y,s,age1to16)=sr(y,s,a+1)*sr(y,s,age+2)*sr(y,s,age+3)*\ldots*sr(y,s,age+16) \quad (2)$$

The second stage is for someone going to school but not working (5-15 years old). The equation for students varies depending with the level of enrollment. For those enrolled in the first year of primary, junior middle, or senior middle school, because of data constraints, lifetime income depends on the percentage of students enrolled in the current first level who subsequently enrolled in the first year of the next level several years later.19 How many years later varies as primary school takes six years to complete, while junior and senior middle school take 3 years to complete. For someone enrolled in the first year of primary school:

[18] Survival probability is available for every year for every age, e.g., the probability that someone lives from age 50 to 51 can be different in 2000 and 2001. Jorgenson and Fraumeni only had one set of survival probabilities for all years, so that the probability of survival for a specific age is constant over time.

[19] Jorgenson and Fraumeni had enrollment probabilities by individual level, e.g., 1, 2 3, …., 16, and for graduate school: 17 or more.

mi(*y*,*s*,*a*,*primary1*)=[*senr*(*y*,*s*,*a*,*primary1tojunior1*)**mi*(*y*,*s*,*a*+6,*junior1*)+*notenr(y,s,a,primary1tojunior1)*mi*(*y*,*s*,*a*+6,*primary completed*)]*
$[(1+G)/(1+R)]^6$ (3)

where the first part of the right-hand side expression before the plus sign is relevant for those who go onto junior middle school and the rest of the expression is relevant for those who do not.[20] Senr(y,s,a,primary1tojunior1) is the average ratio of the number of students in junior middle grade 1, six years later when the student is six years older, to the number of students in primary grade 1, mi(y,s,a+6,junior1) is the lifetime income of someone in the current year who is six years older and enrolled in junior middle school grade 1, notenr(y,s,a,primary1tojunior1) is the probability that someone who does not enroll in junior middle school lives to complete primary school, and mi(y,s,a+6,primary completed) is the lifetime income of someone in the current year who is six years older who completes primary school, but is not enrolled in junior middle school 1. There is no need to adjust senr(y,s,a,primary1tojunior1) by a survival rate as anyone who is enrolled in the next level has survived to that point. The term notenr is adjusted by survival rates:

*notenr(y,s,a,primary1tojunior1)=sr(y,s,a+1)*sr(y+1,s,a+2)*sr(y+2,s,a+3)* sr(y+3,s,a+4)*sr(y+4,s,a+5)*sr(y+5,s,a+6)-senr(y,s,a,primary1tojunior1)*

(4)

For a student who was enrolled in the second year of primary school, the current year equation becomes:

mi(*y*,*s*,*a*,*primary2*)=[*senr*(*y*,*s*,*a*,*primary2tojunior1*)**mi*(*y*,*s*,*a*+5,*junior1*)+*n*

[20] Jorgenson and Fraumeni used enrollment probabilities for individuals who were older in a given year, say 2000, rather than using the actual enrollment the number of years later it would take to finish a level, e.g., 2006, to finish primary school. Here actual enrollments in 2006 are used as enrollment probabilities are changing significantly over time in China, whereas they are changing little over the time it takes to complete a level in the United States.

$otenr(y,s,a,primary2tojunior1)*mi(y,s,a+5,primary\ completed)]*$

$[(1+G)/(1+R)]^5$ (5)

and:

$notenr(y,s,a,primary2tojunior1)=sr(y,s,a+1)*sr(y+1,s,a+2)*sr(y+2,s,a+3)*$

$sr(y+3,s,a+4)*sr(y+4,s,a+5)-senr(y,s,a,primary2tojunior1)$ (6)

where senr(y,s,a,primary2tojunior1) is the average ratio of the number of students in junior middle school grade 1 five years later when the student is five years older to the number of students in primary grade 2 and mi(y,s,a+5,junior1) is the lifetime income of someone in the current year who is five years older and enrolled in junior middle school 1, and notenr (y,s,a,primary2 tojunior1) is the probability that someone who does not enroll in junior middle school five years later lives to complete primary school. The equations for subsequent ages and primary levels follow a similar pattern.

For someone enrolled in the first year of junior middle or senior middle school, the equations follow a similar pattern except that the number of years until they enter the first year of the next level is three. They are specified as equation (7) to (12).

$mi(y,s,a,junior1)=[senr(y,s,a,junior1tosenior1)*mi(y,s,a+3,senior1)+note$
$nr(y,s,a,junior1tosenior1)*mi(y,s,a+3,juniorcompleted)]*[(1+G)/(1+R)]^3$

(7)

$mi(y,s,a,junior2)=[senr(y,s,a,junior2tosenior1)*mi(y,s,a+2,senior1)+note$
$nr(y,s,a,junior2tosenior1)*mi(y,s,a+2,juniorcompleted)]*[(1+G)/(1+R)]^2$

(8)

$mi(y,s,a,junior3)=[senr(y,s,a,junior3tosenior1)*mi(y,s,a+1,senior1)+$
$notenr(y,s,a,junior3tosenior1)*mi(y,s,a+1,junior\ completed)]*[(1+G)/(1+R)]$

(9)

$mi(y,s,a,senior1)=[senr(y,s,a,senior1tocollege1)*mi(y,s,a+3,college1)+$
$notenr(y,s,a,senior1tocollege1)*mi(y,s,a+3,seniorcompleted)]*$
$[(1+G)/(1+R)]^3$ (10)

$mi(y,s,a,senior2)=[senr(y,s,a,senior2tocollege1)*mi(y,s,a+2,college1)+$

*notenr(y,s,a,senior2tocollege1)*mi(y,s,a+2,seniorcompleted)]**
[(1+G)/(1+R)]^2 (11)

*mi(y,s,a,senior3)=[senr(y,s,a,senior3tocollege1)*mi(y,s,a+1,college1)+*
*notenr(y,s,a,senior3tocollege1)*mi(y,s,a+1,seniorcompleted)]*[(1+G)/(1+R)]*
(12)

The third stage is for school or work (16-26 years old), as it is assumed that anyone who goes to school does not work, even part-time.[21] This stage ends at age 26 because of data limitation, and the age distribution of college and above are calculated by senior age distribution. For individuals who work:

$$mi(y,s,a,e) = ymi(y,s,a,e) + sr(y,s,a+1) * mi(y,s,a+1,e) * [(1 + G)/(1 + R)] \quad (13)$$

where *ymi* denotes annual market income per capita.

Since there is no level above college or university, the equations for those enrolled in higher education are different than those for lower levels. We assume that anyone who begins the first year of college or university completes all years of that level if they survive.

$$mi(y,s,a,higher1)=sr(y,s,a+1)*sr(y,s,a+2)*sr(y,s,a+3)*senr(y,s,a,higher)* mi(y,s,a+3,highercompleted)*[(1+G)/(1+R)]^3 \quad (14)$$

where

$$senr(y,s,a,higher1)=enroll(y+3,s,a+3,higher1)/ (sr(y,s,a+1)*sr(y-1,s,a)*sr(y-2,s,a-1)*enroll(y-3,s,a-3,senior1)) \quad (15)$$

The multiplication by the three survival rates in equation (14) determines

[21] As students in the United States frequently work as well as go to school, particularly when they are enrolled in higher education, Jorgenson and Fraumeni allowed individuals to work and go to school. As students in China rarely work, we assume that no students work.

whether an individual enrolled in the first year of college or university survives until he graduates, assumed to be in three years, then to receive the higher lifetime income in the first year after completion of the degree: *mi*(*y*,*s*,*a*+3,*highercompleted*) is the lifetime income of someone in the current year who is three years older and has completed college or university. For someone who survives to enroll in the second year of higher education:

$$mi(y,s,a,higher2)=sr(y,s,a+1)*sr(y,s,a+2)*senr(y,s,a,higher2)* mi(y,s,a+2,highercompleted)*[(1+G)/(1+R)]^2 \quad (16)$$

Equations for the last enrollment year parallel this equation, except that the level of enrollment varies and the number of years until higher education is completed is reduced to one.

$$mi(y,s,a,university1)=sr(y,s,a+1)*sr(y+1,s,a+2)*sr(y+2,s,a+3)* sr(y+3,s,a+4)*mi(y,s,a+4,universitycompleted)*[(1+G)/(1+R)]^4 \quad (17)$$

$$mi(y,s,a,university2)=sr(y,s,a+1)*sr(y+1,s,a+2)*sr(y+2,s,a+3)* mi(y,s,a+3,universitycompleted)*[(1+G)/(1+R)]^3 \quad (18)$$

$$mi(y,s,a,university3)=sr(y,s,a+1)*sr(y+1,s,a+2)* mi(y,s,a+2,universitycompleted)*[(1+G)/(1+R)]^2 \quad (19)$$

$$mi(y,s,a,university4)=sr(y,s,a+1)*mi(y,s,a+1,university\ completed) *[(1+G)/(1+R)] \quad (20)$$

$$mi(y,s,a,college1) = sr(y,s,a+1)*sr(y+1,s,a+2)*sr(y+2,s,a+3)* mi(y,s,a+3,collegecompleted)*[(1+G)/(1+R)]^3 \quad (21)$$

$$mi(y,s,a,college2)=sr(y,s,a+1)*sr(y+1,s,a+2)* mi(y,s,a+2,college\ completed)*[(1+G)/(1+R)]^2$$

(22)

$$mi(y,s,a,college3) = sr(y,s,a+1) * mi(y,s,a+1,collegecompleted) * [(1+G)/(1+R)] \quad (23)$$

The fourth stage is for individuals who are working but not in school (26-59 years old for males and 26-54 years old for females). The equation for this stage is the same as equation 13.

The final stage is for retirement, or no school or work (older than 59 years old for males and older than 54 years old for females):

$$mi_{y,s,a,e} = 0 \quad (24)$$

Let $L_{y,s,a,e}$ stand for the population in the respective categories; the expected lifetime income in a country, i.e., the total human capital stock, can be written as:

$$MI(y) = \sum_{s}\sum_{a}\sum_{e} mi_{y,s,a,e} \cdot L_{y,s,a,e} \quad (25)$$

Similar equations can be applied to estimate lifetime nonmarket labor income,[22] which can be added to lifetime market labor income to obtain total lifetime labor income:

$$LIFE(y) = \sum_{s}\sum_{a}\sum_{e} (mi_{y,s,a,e} + nmi_{y,s,a,e}) \cdot L_{y,s,a,e} \quad (26)$$

3.2 Estimate current income using Mincer models

A critical component of the income approach is the estimation of future potential earnings for all individuals in the population. To apply the J-F

[22] Nonmarket activities include household production, e.g., cooking, cleaning, and childrearing and other nonmarket activities such as education and health-related activities. In our calculation we exclude the nonmarket lifetime income because it is difficult to quantify.

income-based approach, we first need real world data or their estimates for individual's annual market labor income per capita. We conduct estimation and make projection based on the basic Mincer (1974) equation. It has been shown that there are significant differences in the structure of the earning equation across gender and between the rural and urban population. To ensure our income estimates as accurate as possible, we estimate the parameters for the rural and urban population by gender and year using survey data in selected years and derive their imputed values for missing years over the period from 1985 to 2017.

The data used for estimating the parameters of the earning equation come from six well-known household surveys in China. The first is the annual Urban Household Survey (UHS) conducted by the National Statistical Bureau of China over the period from 1986 to 1997. The second data set we used is the China Health and Nutrition Survey (CHNS) for the year of 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009, 2011. The third data set is the Chinese Household Income Project (CHIP) for the year of 1988, 1995, 1999, 2002, 2007,2013. The fourth data set is the China Household Finance Survey (CHFS) for the year of 2010 and 2012. The fifth data set is the Chinese Family Panel Studies (CFPS) for the year of 2010, 2012，2014 and 2016. The sixth data set is the China Labor-force Dynamic Survey (CLDS) for the year of 2014, this is a new data set we added this year. CHIP (except 2009), CHNS, CHFS, CFPS and CLDS cover both urban and rural population, but UHS covers only the urban population.

UHS is a representative sample of the urban population. The sample size varies from year to year, ranging from small number of respondents of 4,934 in 1986 to large number of respondents of 31,266 in 1992. Individual earnings are annual wage income, which include basic wages, bonuses, subsidies and other work-related income. Years of schooling are calculated using the information on the level of education completed: primary school equals 6 years of

schooling, junior middle school equals 9 years of schooling, senior middle school equals 12 years of schooling, vocational school equals 11 years of schooling, community college equals 15 years of schooling, and college and above equals 16 years of schooling. Suppose that schooling begins at age 6, work experience is estimated as age minus years of schooling minus 6. As the minimum legal working age is 16 and the retirement ages are 60 and 55 for males and females respectively, we restrict our sample to individuals who are currently employed and are between 16 and 60 years old for male workers and between 16 and 55 for female workers. Self-employed and temporary job holders are excluded, so are those who did not report wage income or educational attainment. Appendix B.3.1 provides a complete description of the income and education definitions and sampling standards. Table B.1.1 of Appendix B lists the descriptions of all the statistics.

The Chinese Household Income Project (CHIP) survey, reports income, consumption, job, production and other related information for the urban and rural populations. Appendix B.3.2 provides a complete description of the income and education definitions and sampling standards. Table B.1.3 of Appendix B includes the descriptions of all the statistics.

CHNS is an international project that aims to learn more about the impacts of China's transitional economy and society on social economy, population and health behaviors in urban and rural areas. Appendix B.3.3 provides a complete description of the income and education definitions and sampling standards. Table B.1.2 of Appendix B lists the descriptions of all the statistics.

CHFS is a nationwide survey conducted by the Survey and Research Center for China Household Finance in Southwestern University of Finance and Economics. The main purpose of the survey is to collect information on household financial information at the micro level, which includes housing assets, financial wealth liabilities, credit constraints, income, consumption,

social security, insurance coverage, intergenerational transfer payments, demographic characteristics, employment payment habits, and other relevant information. The rural sample of this database includes 22 provinces. The urban sample in this database also includes 22 provinces. The survey was conducted in 2011and 2013. Information of the statistics on household income starts from the year of 2010. The urban sample includes only personal income data, comprising wage income and social security income. Rural income includes personal income and household income. Personal income primarily consists of wage income and social security income. Rural household income is mainly net agricultural income. As family income is calculated at the household unit, we need to allocate the income to individual household members to obtain personal income. Family net income of agricultural production is divided by the number of workers engaged in agricultural household production. Years of education is determined by the level of education according to the survey. Work experience is calculated as age minus years of education minus 6. We restrict the sample to males 16-60 years old and females16-55 years old who reported information on education and income status. AppendixB.3.4 gives the complete definitions of income, education, other variables and also the sample selection criteria of CHFS. Table B.1.5 of Appendix B lists the descriptive statistical indicators of CHFS.

CFPS is a nationwide longitudinal survey conducted by the Institute of Social Science Survey (ISSS) at Peking University. The survey focuses on economic, as well as non-economic well-being of Chinese children and adults. A wide range of domains are covered, including economic activities, education outcomes, family dynamics and relationships, migration, and health. In the 2010 survey, CFPS interviewed around 15,000 families with over 40,000 individuals. Information on household income is the total income in the recent year. Urban income includes wage income and social security income. Rural income includes agriculture production income and social security income. We

restrict the sample to males of 16-60 years old and females of 16-55 years old. AppendixB.1.4 contains the complete definitions of income, education, other variables and also the sample selection criteria of CFPS. Table B.1.4 of Appendix B lists the descriptive statistical indicators of CFPS.

CLDS is a nationwide longitudinal survey conducted by the social science survey center (CSS) of Sun Yat-Sen University. CLDS conducted a trial survey in Guangdong province in 2011, completed the first nationwide survey in 2012, completed the first follow-up survey in 2014, and conducted the second follow-up survey in 2016. Due to the limitations of data quality and availability, this report only uses 2014 survey data. Information on household income is the total income in the recent year. Rural income mainly includes agricultural production income and agricultural government subsidies. We restrict the sample to males of 16-60 years old and females of 16-55 years old. AppendixC.2.7 contains the complete definitions of income, education, other variables and also the sample selection criteria of CLDS. Table C.1.6 of Appendix B lists the descriptive statistical indicators of CLDS.

We use the Taiwan Family Income and Expenditure Survey covering both urban and rural population for the analysis of Taiwan. The survey is completed by the national research center of Taiwan. We restrict our sample to individuals who are currently employed and are between 16 and 60 years old for male workers and between 16 and 60 for female workers. Individual income includes main job income, minor job income, other income, and current transfers from enterprise.

The data sources for the analysis of Hong Kong are the Hong Kong 1% Sample Population Census 1981, the Hong Kong 1% Sample Population By-Census 1986, the Hong Kong 5% Sample Population Census 1991, 2001 and 2011, and the Hong Kong 5% Sample Population By-Census 1996 and 2006 collected by Hong Kong Census and Statistics Department. The main purpose of the survey is to collect information on population, society and

economic characteristics in Hong Kong. Work experience is estimated as age minus years of schooling minus 6. We restrict our sample to individuals who are currently employed and are between 15 and 65 years old for male workers and between 15 and 60 for female workers. Individual income includes main job income and minor job income.

3.2.1 Estimating current income using Mincer models at the national level

We first estimate the basic Mincer equation:

$$\ln(inc) = \alpha + \beta \cdot e + \gamma \cdot Exp + \delta \cdot Exp^2 + u \qquad (27)$$

Where ln(inc) is the logarithm of earnings, e is years of schooling, Exp and Exp2 represent years of work experience and experience squared respectively, and u denotes a random error. The coefficient α is the estimate of the average log earnings of individuals with zero years of schooling and work experience, β is the estimate of the return to an extra year of schooling, and γ and δ measure the return to investment in on-the-job training.

Equation (10) has been widely adopted in empirical research on the determination of earnings. It has been estimated on a large number of data sets for numerous countries and time periods. Many studies have applied the model to Chinese data and found evidences that are consistent with the human capital theory. Notable studies include Liu (1998), Maurer-Fazio (1999), Li (2003), Fleisher and Wang (2004), Yang (2005), and Zhang *et al.* (2005). Following the convention of literature, we estimate equation (10) by ordinary least squares[23].

We use UHS, CHIP, CHNS，CHFS, CFPS and CLDS to estimate

[23] Griliches (1977) finds that accounting for the endogeneity of schooling and ability bias does not alter the estimates of earnings equation. Ashenfelter and Krueger (1994) also conclude that omitted ability variables do not cause an upward bias in the estimated parameters of equation (1).

parameters of the basic Mincer equation, and obtain the fitted values for the intercept, return to education, and coefficients on experience.

The intercept measures the base wage for the population without schooling or working experience. Figure 3.2.1 shows the intercept gap between urban and rural population during 1985-2017. The intercept in urban is higher than that in rural. Meanwhile, the intercept for males is higher than the intercept for females in urban areas, while there is no big difference between males and females in rural areas.

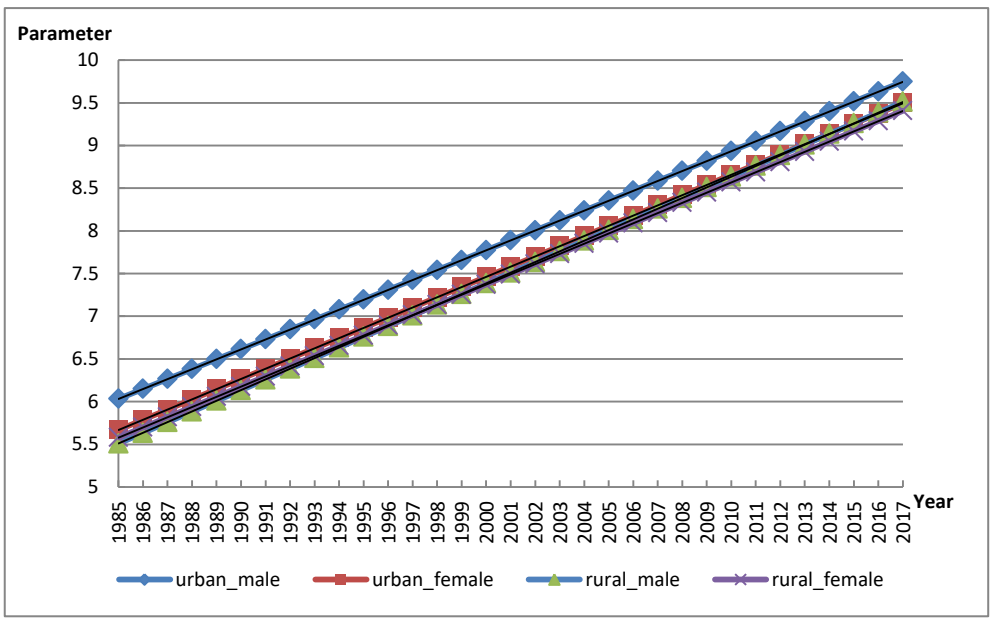


Figure 3.2.1 Mincer Intercepts by Gender and Location

Regression parameter of years of schooling and quadratic term of years of schooling measures return rate to education. Considering the current development of Chinese economy and education, we assume that return rate to education grows as nonlinear trend. Figure 3.2.2 shows the trend of the return to education for males and females in rural and urban areas. the trends of returns to schooling are different in rural and urban. In urban area, it is positive and firstly increasing and then decreasing over the sample years, while in rural area, it continuously increases. Besides, we also find that the return rate to education for males was lower than that for female in urban areas, and the return rate to education for males is higher than that of females in rural areas. When the Soviet-type wage grid was replaced by market wages (Fleisher, Sabirianova, Wang 2005), increasing return rate to education has been a common phenomenon. But many studies recently show that return rate to education in urban areas follows a decreasing trend due to the increased enrollment. Wang, Fleisher, Li (2009) also find that female rates of return dominate male returns, and they argued that rising returns to education have been an ubiquitous phenomenon in transitional economies.

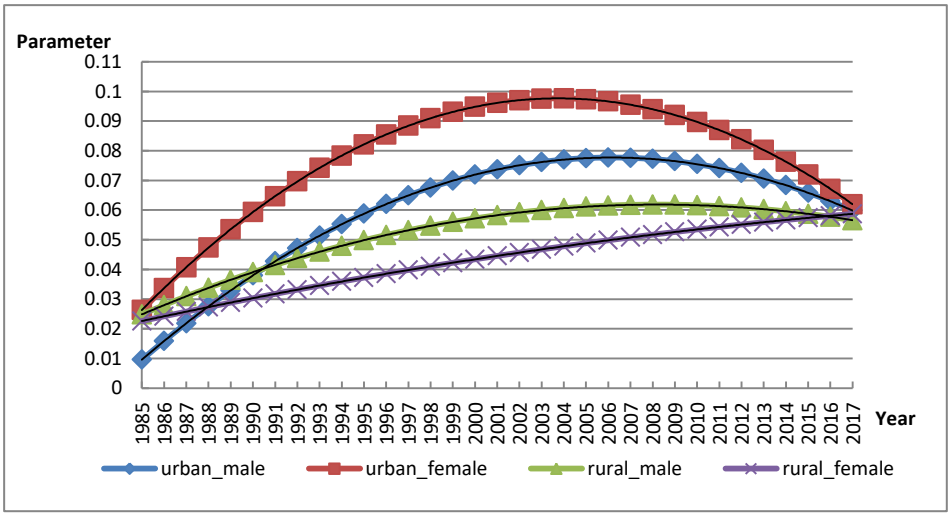


Figure 3.2.2 Rates of Return to Education by Gender and Location

We find that earnings increase with work experience but at a decreasing

rate—a pattern found in most existing studies. Figures 3.2.3-3.2.6 show the trends of return rate to experience by gender and region. If the curve shifts downward it means that the rate of return to experience is decreases over time. Most of the following figures show such trends. In urban areas, return to experience for males is higher than that for females overall. In rural areas, the return to experience for males is higher than that for females in their middle years of age.

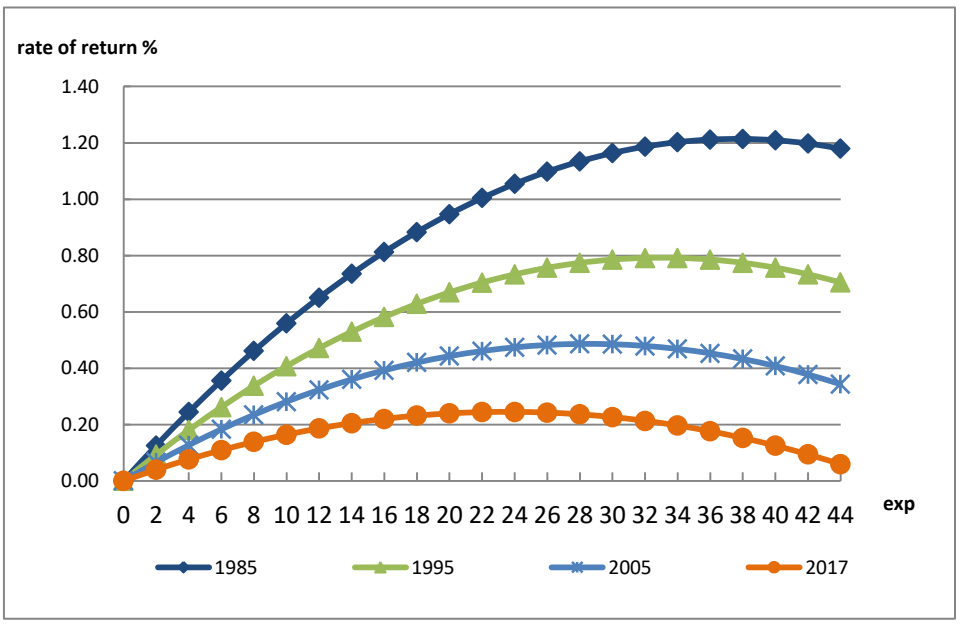


Figure 3.2.3 Return to Experience for Urban Males

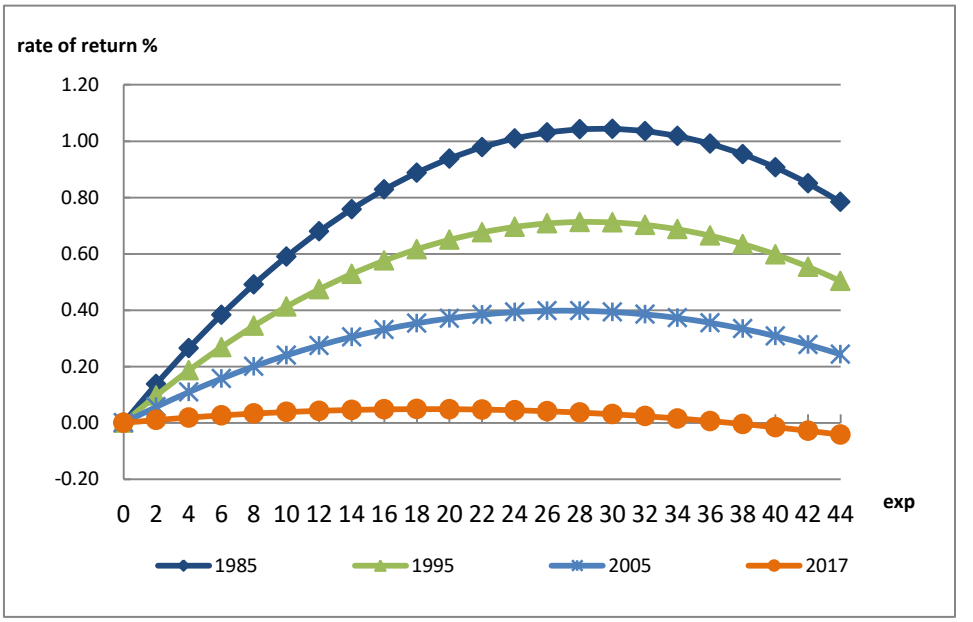


Figure 3.2.4 Return to Experience for Urban Females

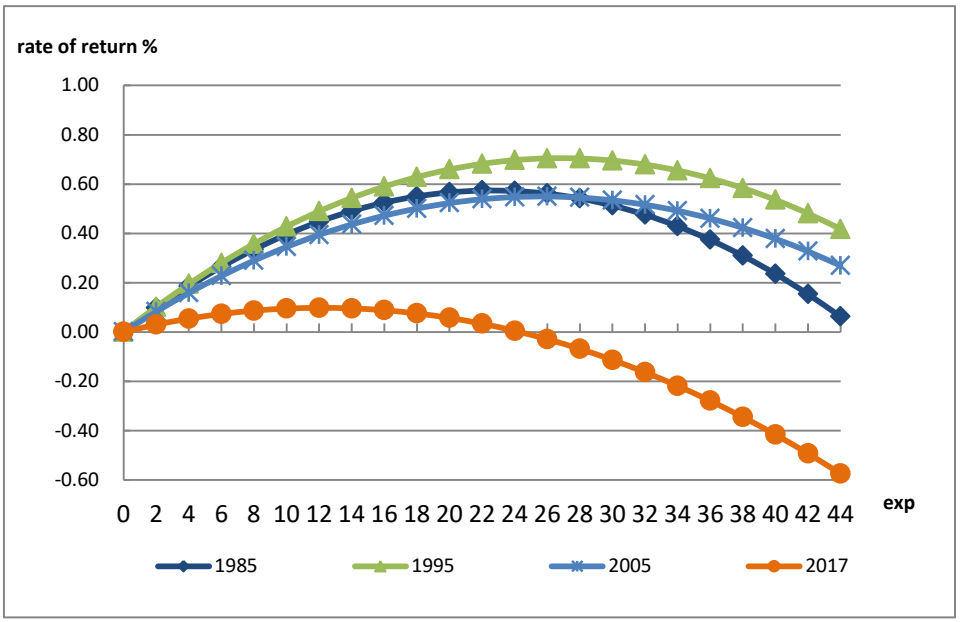


Figure 3.2.5 Return to Experience for Rural Males

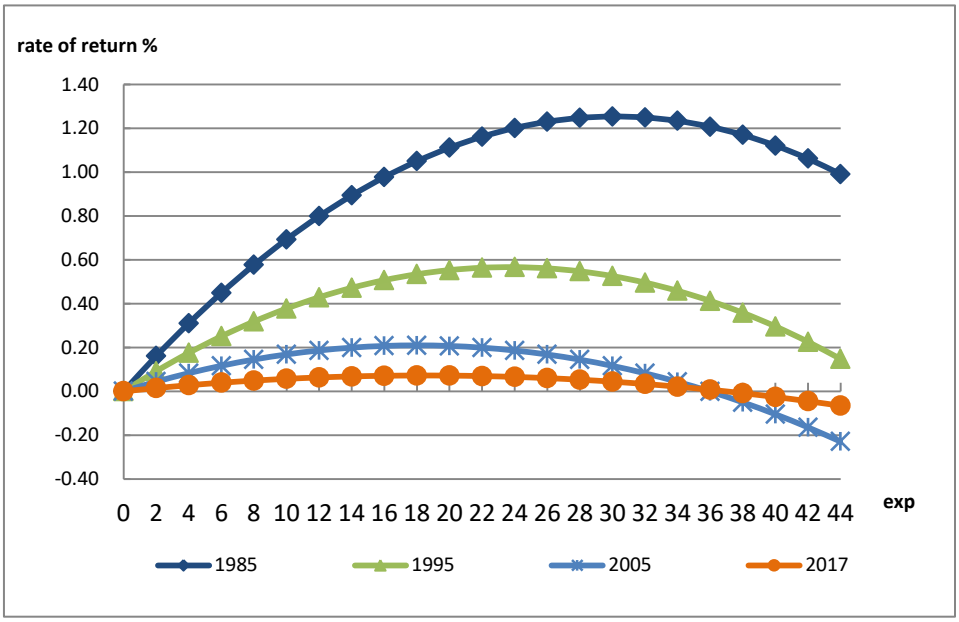


Figure 3.2.6 Return to Experience for Rural Females

3.2.2 Estimating current income using Mincer models at the provincial level

As for the estimation at the province level, based on the Mincer equation, we use macro data for adjustments. We estimate the following Mincer equation:

$$\ln(inc) = \beta_0 + \beta_1 \cdot \ln(Avwage) + \beta_2 \cdot Sch + \beta_3 \cdot Sch \cdot Avgdp + \beta_4 \cdot Sch \cdot Ratio + \beta_5 \cdot Exp + \beta_6 \cdot Exp^2 + \mu \quad (28)$$

Where ln(inc) is the logarithm of earnings, Sch is years of schooling, Exp and Exp2 represent years of work experience and experience squared respectively, and u denotes a random error. Avwage represents the average employee nominal salary for the rural and urban population. It could reflect earning gap between different provinces. Avgdp stands for nominal GDP per capita. Ratio means the primary industry employment ratio of the total working population. The parameters of Sch·Avgdp and Sch·Ratio could reflect the job

market situation of the educated population. We add Avwage into the intercept term, an interaction term of Avgdp and Sch, and an interaction term of the first industry employment ratio of the total working population and Sch into the equation. Adding these additional variables into the conventional Mincer equation not only makes better use of the existing data and helps solve the missing data problem in parameter estimations, but also makes the estimation results more realistic.

In the model, $\beta_0 + \beta_1 \cdot \ln(Avwage)$ is the logarithm of the base wage for the population without schooling or working experience $\beta_2 + \beta_3 \cdot Avgdp + \beta_4 \cdot Rc$ represents the return to education, β_5 and β_6 measure the return to experience. For Shanghai, it only has urban parameter estimates. Moreover, we assume males have different returns to experience in urban and rural areas, but they share the same parameter for Exp and Exp2 across all provinces; we use the same way in estimations for females.

As in the national Mincer parameter estimation, provincial data used for estimation also come from UHS, CHIP, CHNS， CHFS, CFPS and CLDS. We use ordinary least squares (OLS) to estimate equation (11). When all data sets are available for a sample year, we drop CHNS and use UHS, CHIP, CHFS, CFPS and CLDS due to the relatively low quality of CHNS income measures. The estimates are weighted for obtaining a larger and representative sample making estimates more accurate. We adopt the same sampling standards as in the national estimation. We use the fitted trend lines to generate imputed values of the parameters for each gender by year over the period from 1985 to 2016. Graphs show that when we plot each of the parameter estimates against time, they are generally trended. We adopt the linear trend model to obtain the fitted values of parameters, that is $Y = \alpha_0 + \alpha_1 \times time + \mu$. Under the assumption that the effect of Avwage, Sch, Exp, Exp2 on income growth grows at a fixed rate, we use the linear trend fitting method for all the parameters.

3.3 Other data and parameters used

Besides annual population data with age, sex and educational attainments, which are adjusted by the age distribution of education and survival rate, the J-F method requires additional information on lifetime income, enrollment rate, employment rate, growth rate of real wage, and discount rate. We will briefly discuss how we construct these supplemental data sets in this section. Some parameters have to be set at values appropriate for China. Detailed information can be found in the appendices.

3.3.1 Age distribution

We use data from the China Educational Statistical Yearbook: 2003-2017 to estimate the age distribution (1982-2017) of new enrollments. We have the data of new enrollment in primary school by age, region, and sex, and the data of new enrollment in junior middle school by age, grade, sex and region from 2003 to 2017. Detailed information can be found in the appendices.

For Hong Kong, we have data of the number of first grade students in school by age, sex, and education from 1990 to 2017. Thus, we could compute age distribution by using the number of students of first grade in school. The data before 1990 is replaced by the data in 1990.

For Taiwan, we have data of the number of first grade students in school by age, sex, and education from 1985 to 2017. Thus, we compute age distribution by using the number of students of first grade in school.

3.3.2 Survival rate

We obtain survival rates (1-death rate) by age, sex and region. With population and death rate, both by age and gender, from the population sampling data for each year, the number of deaths of those aged 65 and over for each year can be calculated. Dividing the number of deaths by the

corresponding total population gives the death rate of those aged 65 and over. Since there is no population sampling data for 1983-1985, 1987, 1988 and 1991-1993, the death rates of the missing years are fitted by using the other available data of the closet year.

For Hong Kong, the data sources of growth rate are Hong Kong Life Tables. We get the survival rate (1-death rate) by age and sex. With population and death rates, both by age and gender, from the population sampling data for each year, the number of deaths of those aged 65 and over for each year can be calculated. Dividing the number of deaths by the corresponding total population gives the death rate of those aged 65 and over.

For Taiwan, the data sources of growth rate are Taiwan Life Tables. We obtain survival rates (1-death rate) by age and sex. With population and death rate, both by age and gender, from the population sampling data for each year, the number of deaths of those aged 65 and over for each year can be calculated. Dividing the number of deaths by the corresponding total population gives the death rate of those aged 65 and over.

3.3.3 Enrollment rate

Following J-F as previously described, an individual may be categorized into one of the following six statuses at any time: no school or work (age 0-4), school only (age 5-15), work and school (age 16-26), work only (26 to retirement), and retirement (age 60+ for male and 55+ for female). Each status implies a different pattern of age-income profile, and therefore the method of computing lifetime income will be different.

We first estimate a standard Mincer equation (i.e., a regression of annual income on years of schooling, working experience, and working experience squared) with microeconomic data sets (the China Household Income Project, the China Health and Nutrition Survey, and the Urban Household Survey). We use annual employment rates by age, sex, and educational attainment (from the

China Population Statistical Yearbook and the China Population Census) to convert annual income into annual market income. Then the lifetime income for each age/sex/educational category can be calculated using the method described in the previous section.

For the in-school population, we derive the number of individuals in each educational level with data on new enrollment, mortality rate and attrition rate. We consider the following five categories of schooling: no schooling, primary school, junior middle school, senior middle school and college and above, or for six categories of schooling where we divide college and above into college (less than 4 years) and university (at least 4 years) and above. We compute lifetime income for each grade at each educational level, taking into account how likely the individual will continue into the next grade and the next educational level. For the five categories of schooling estimation, college and above is the highest educational level. For the six categories of schooling estimation, college or university and above are the highest educational levels. We do not allow for the possibility that one can go to college and then to university.

Because data are not available for some age groups and some educational levels, additional imputations and assumptions are needed and are described in Appendix A.

The imputation of two components of the J-F human capital estimates is described in this section: 1) the number of years until an educational category is completed, and 2) the probability of advancing to the next higher educational category. We assume that all students complete an educational level (if they continue) in the same number of years: 6 for primary, 3 for junior middle, and 3 for senior middle school. It is also assumed that no drop-outs return to school, no grades are skipped, and that education continues without a break. These assumptions are also made by J-F. The probability of advancing to the next higher educational level is estimated as the average ratio of the sum of all

students of any age in a year who are initially enrolled to the sum of all students of any age initially enrolled in the next higher educational level 'X' years later. "X" depends on the number of years it takes to complete an educational level. These imputations and assumptions allow for the appropriate discounting of a future higher income level.

In each case, continuing students are tracked from their age of initial enrollment, through individual grade levels, until they advance to the next higher level. The number of years discounted until they realize higher level of lifetime income depends on the number of years it takes to advance given the current grade of enrollment.

Then, we treat the terminal educational level as a probabilistic event, and therefore lifetime income is a forecast based on the contemporary information set, except that the probability of advancing depends on initial enrollments at a higher educational level in the subsequent years. For example, the lifetime income of a student who is in the first year of junior middle school, assuming that the student will live to finish junior middle school and go onto senior middle school, depends upon an adjusted lifetime income of someone who is currently three years older and whose educational attainment is senior middle school. The adjustments include those for three years of labor income (wage) growth and three years of discounting.

3.3.4 Employment rate

To calculate employment rate, $\mathrm{empr}(y, s, a, e)$ by age, sex and educational for individuals older than 16, we use the data from census years of 1987, 1995, 2000, 2005 and 2010 and replace middle years' employment rates by the average of these years.

We assume that the employment rate of college graduates is the same as that of university graduates.

The formula used to calculate the employment rate is:

$$empr(y,s,a,e) = [employed(y,s,a,e)]/pop(y,s,a,e)$$

The data sources of employment rate are listed in the table below:

Data	Sources
The employed by age,sex and education in 1987	"China Population Census 1987"
Population by age, sex and education in 1987	"China Population Census 1987"
The employed by age, sex and education in 1995	"China Population Census 1995"
Population by age, sex and education in 1995	"China Population Census 1995"
The employed by age, sex and education in 2000	"China Population Census 2000"
Population by age, sex and education in 2000	"China Population Census 2000"
The employed by age group, sex and education in 2005	"China Population and Employment Statistics Yearbook 2006"
Population by age, sex and education in 2005	"China Population Census 2005"
The employed by age group, sex and education in 2010	"China Population and Employment Statistics Yearbook 2011"
Population by age, sex and education in 2010	"China Population Census 2010"

Note: The 1% sample population in 1995 is converted into the whole population by the actual sampling percentage of 1.04%.

Employed individuals in China Population Census 2000 for each province, autonomous region and municipality directly under the central government are aggregated to the whole population by the actual sampling percentage of 9.5%. To divide the age group data in 2005 and 2010 we assume that the employment rate in each age in the same age group has the same increasing rate. For example, the employment rate of a 25-year-old individual in 2005 equals to the employment rate of a 25-year-old individual in 2000 times the growth rate of the employment rate of the individual's corresponding age group (25-29) between 2000 and 2005.

For Taiwan, employment rate $\mathrm{empr(y,s,a,e)}$ includes data by age, sex

and education for individuals older than 15 from 1985 to 2016. The formula used to calculate the employment rate is:

$$empr(y, s, a, e) = [employed(y, s, a, e)]/pop(y, s, a, e)$$

For Hong Kong, employment rate $\mathrm{empr(y, s, a, e)}$ includes data by age, sex and education for individuals older than 15 from 1990 to 2016.

The formula used to calculate the employment rate is:

$$\mathrm{empr(y, s, a, e)} = [\mathrm{employed(y, s, a, e)}]/\mathrm{pop(y, s, a, e)}$$

The data before 1990 is replaced by the data in 1990.

3.3.5 Growth rate

To measure lifetime earnings for all individuals in the population, we need to project income for future years and discount the income back to the present. We use the following method to estimate the real income growth rates for urban and rural areas respectively.[24]

The data used to calculate rural growth rate are rural CPI and average pure income of rural residents. Calculation method: rural real income is equal to average pure income of rural residents divided by rural CPI. Rural growth rate in period T-1 is equal to the income gap between rural real income in period T and T-1 divided by rural real income in period T-1.

The data used to calculate the urban growth rate are urban CPI and average wage of urban employees. Calculation method: urban real wage is

[24] In China, there are also growth rates of real annual income in urban areas reported in the series of the *China Statistical Yearbook*, but this income only includes labor wages for those who work in or get paid from the state-owned, urban collective, joint venture, joint-stock, foreign and Hong Kong, Macao and Taiwan invested companies and their subsidiaries. Thus, this cannot reflect the overall income level in China, as Chinese enterprises have other ownership forms.

equal to average wage of urban employees divided by urban CPI. The urban growth rate in period T-1 is equal to the income gap between urban real wage in period T and T-1 divided by urban real wage in period T-1.

Our calculations show that for the 33-year period from 1985 to 2017, the growth rate is on average 6.19% and 8.17% annually in the rural and urban sectors, respectively. Those growth rates will be used in the J-F calculation.[25]

We use the same method to calculate the provincial income growth rates for Beijing, Tianjin, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Chongqing, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia and Xinjiang; their growth rates for urban and rural areas are shown in Figure 3.3.1. We assume that the growth rate in each province grows at a fixed annual rate.

Table3.3.1 Provincial Growth Rate

Province	Urban	Province	Rural
Beijing	9.44%	Zhejiang	7.19%
Shanghai	9.26%	Fujian	7.09%
Tianjin	8.68%	Henan	6.97%
Anhui	8.67%	Shandong	6.62%
Zhejiang	8.66%	Hebei	6.58%
Inner Mongolia	8.46%	Jiangsu	6.56%
Shandong	8.41%	Jilin	6.48%
Hubei	8.37%	Guangxi	6.43%
Xizang	8.34%	Tianjin	6.41%
Guizhou	8.18%	Jiangxi	6.41%
Hebei	8.16%	Anhui	6.35%
Hainan	8.12%	Heilongjiang	6.29%

[25] Those rates are considerably higher than the growth rate of 1.32% (Jorgenson and Yun, 1990) used in the OECD human capital calculation because the Chinese economy has grown much faster. Although the rate is based on 32-year moving average, it is still unclear whether it can represent long-run growth rate in China.

Jiangsu	8.12%	Guangdong	6.07%
Sichuan	8.11%	Inner Mongolia	6.04%
Chongqing	8.07%	Chongqing	5.98%
Jiangxi	7.99%	Shaanxi	5.98%
Yunnan	7.95%	Ningxia	5.90%
Fujian	7.94%	Hubei	5.88%
Jilin	7.91%	Liaoning	5.85%
Guangxi	7.90%	Sichuan	5.79%
Henan	7.83%	Shanxi	5.71%
Liaoning	7.76%	Hainan	5.45%
Shaanxi	7.72%	Yunnan	5.37%
Guangdong	7.71%	Guizhou	5.37%
Heilongjiang	7.68%	Gansu	5.36%
Ningxia	7.67%	Hunan	5.27%
Xinjiang	7.63%	Xinjiang	4.96%
Shanxi	7.41%	Qinghai	4.92%
Hunan	7.37%	Beijing	4.86%
Gansu	7.03%	Xizang	4.59%
Qinghai	6.07%		

For Hong Kong, the data used to calculate growth rate is the average wage index and we can adjust it to real wage index. Calculation method: growth rate in period T-1 is equal to the income gap between real wage index in period T and T-1 divided by real wage index in period T-1. The result shows that, growth rate on average is 2.96% annually in Hong Kong.

As for Taiwan, the data sources of growth rate are listed in the table below:

Data	**Sources**
Consumer Price Index (1960-2016, 2010=100)	Taiwan Directorate General of Budget, Accounting and Statistics
Regular salary (1980-2016)	Taiwan Directorate General of Budget, Accounting and Statistics

The formula used to calculate the growth rate is:

$$real\ regular\ salary\ = \frac{regular\ salary}{Consumer\ Price\ Index(rebase\ 1978 = 100)}$$

$$= \frac{the\ growth\ rate\ of\ real\ regular\ salary\ at\ year\ T-1}{real\ regular\ salary\ at\ year\ T - real\ regular\ salary\ at\ year\ T-1}$$

The result shows that, the growth rate on average is 2.59% annually in Taiwan.

3.3.6 The discount rate

The discount rate that is used to value future income into present term should reflect the rate of return that one expects from investments over a long time horizon. We adopt the discount rate of 4.58% which is also used by Jorgenson and Fraumeni (1992a). This is also the rate adopted by the OECD consortium (OECD 2010).This discount rate was derived by Jorgenson and Yun (1990) based on the long-run rate of return for the private sector of the U.S. economy. It should also reflect the time value of currency. As in the case of other calculations using discount rate, the result will be sensitive to the choice of the discount rate. We also use alternative discount rates for the purpose of comparison, including the average interest rate on the 10-year government bonds issued to individual investors in China over the period from 1996 to 2007, net of the average rate of inflation over the same period, 3.14%[26], the average

[26] The details could be found in the *China Human Capital Index Analysis Report* 2009 Version. However, the ideal discount rate should include market risk, and someone may question that coupon rate does not reflect it. We used the yield to maturity of the 10-year book-entry bonds issued to individual investors that are circulated in the stock exchange market and commercial banks as a comparison and found that the difference of the results is minor.

benchmark lending rate over 5 years in China from 1996 to 2009, 5.51%[27], and the social discount rate based on the method from the World Bank, 8.14%.[28] However, we used the discount rate of 4.58% in this report.

[27] The People's Bank of China sets and adjusts the benchmark lending rate, which plays a key role in the money market. We excluded the serious inflation period from 1993 to 1995, and started from 1996 to avoid negative discount rates.

[28] We calculated the average growth rate of individual consumption over the period from 1985 to 2008 based on World Bank's method. More details are available in "*Where is the wealth of nations? Human capital and economic growth in China*", and from the World Bank, "A Social Discount Rate for the United Kingdom" in *Environmental Economics: Essays in Ecological Economics and Sustainable Development*, ed. D. W. Pearce, 268–285. Cheltenham: Edward Elgar Publishing.

Chapter 4 China population and education dynamics

4.1 Population imputation

To implement the estimation of human capital as outlined in Chapter 3, we use the following procedures to estimate annual population data by age, sex, and educational attainment, Data sets are available for years 1987, 1995, 2005 and 2015 from the 1% Population Sampling Survey and for years 1982, 1990, 2000 and 2010 from the Population Census. These sources contain disaggregated data for urban and rural populations categorized by age and gender. For all other years, we combine birth rate, mortality rate by age and sex and enrollment at different levels of education and regions to impute yearly population by age, sex and educational attainment for urban and rural areas. We define the levels of educational attainment as: illiterate (no schooling), primary school (Grade 1-6), junior middle school (Grade 7-9), senior middle school (Grade 10-12), and college and above. Since the year 2000, the availability of additional statistical information has made it possible to separate the population at the level of college and above into two categories: college, and university and above.

We use the following perpetual inventory formula to impute population by age, sex and educational attainment in the missing years:

$$L(y,e,a,s)=L(y-1,e,a,s)*(1-\delta(y,a,s))+IF(y,e,a,s)-OF(y,e,a,s)+EX(e,a,s) \quad (13)$$

$L\ (y, e, a, s)$ is the population in year y at education level e, with age a and sex s. $\delta\ (y, a, s)$ is the mortality rate in year y, with age a and sex s. $IF\ (y, e, a, s)$ and $OF\ (y, e, a, s)$ are inflow and outflow of this particular group. For example, inflow includes individuals who achieved this level of education in a given year, while outflow includes those who achieved the next level of education in that

year. *EX (e, a, s)* is a discrepancy term.[29] Thus,

$$IF(y,e,a,s) = \lambda(y,e,a,s) \cdot ERS(y,e,s) \quad (14)$$

$$OF(y,e,a,s) = \lambda(y,e+1,a,s) \cdot ERS(y,e+1,s) \quad (15)$$

$$\sum_a \lambda(y,e,a,s) = 1 \quad (16)$$

Where ERS is the matriculation at level *e*, and λ is the age distribution at education level *e*. In order to obtain an accurate estimate for λ, we use Macroeconomic data sets (China Education Statistical Yearbook, 2003-2017). Details can be found in Appendix A.

4.2 Trend of population and education distribution

We present several features of China's population growth, based on the imputed population by educational attainment, age, sex, and location (i.e. urban and rural). During our sample period, China's total population increased from 1.004 billion in 1982 to 1.393 billion in 2017. The urban population increased by 596 million, while the rural population decreased by 221 million (Figure 4.2.1).

[29] For example, the discrepancy can be caused by migration, but we do not have the data.

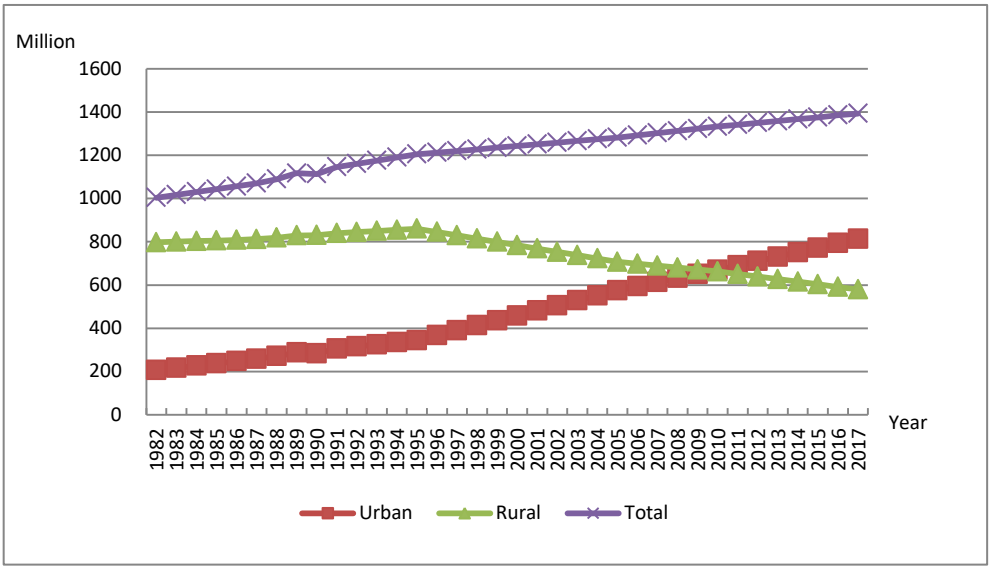


Figure 4.2.1 Population in China by Region 1982-2017

Figures 4.2.2-4.2.4 show the trend of national, urban and rural population classified by educational attainment from 1982 to 2017. The illiterate population fell by half from 396 million in 1982 to 196 million in 2000, but it was relatively stable from 2000 to 2017. The number of primary school graduates increased from 357 million in 1982 to the peak of 465 million in 1995, then declined gradually to 339 million in 2017. This decline is expected as more primary school graduates continue to receive higher education, which is reflected by the rapid growth of junior middle school graduates.

The number of junior middle school students grew most among all education levels, increasing from 178 million in 1982 to 489 million in 2017. Senior middle school graduates increased from 67 million in 1982 to 212 million in 2017, while college and above increased from only 6 million in 1982 to 179 million in 2017. The numbers of those who have achieved these two education levels have grown rapidly rate since the mid-1980s, especially after the implementation of college expansion plan in 1999. Although the proportions of the population who have achieved these two education levels

are still small, the number of those 16 years is much more than the population of these two education levels in 1980s and 1990s. Moreover, the growth of these groups in rural areas is much slower than that in the urban areas.

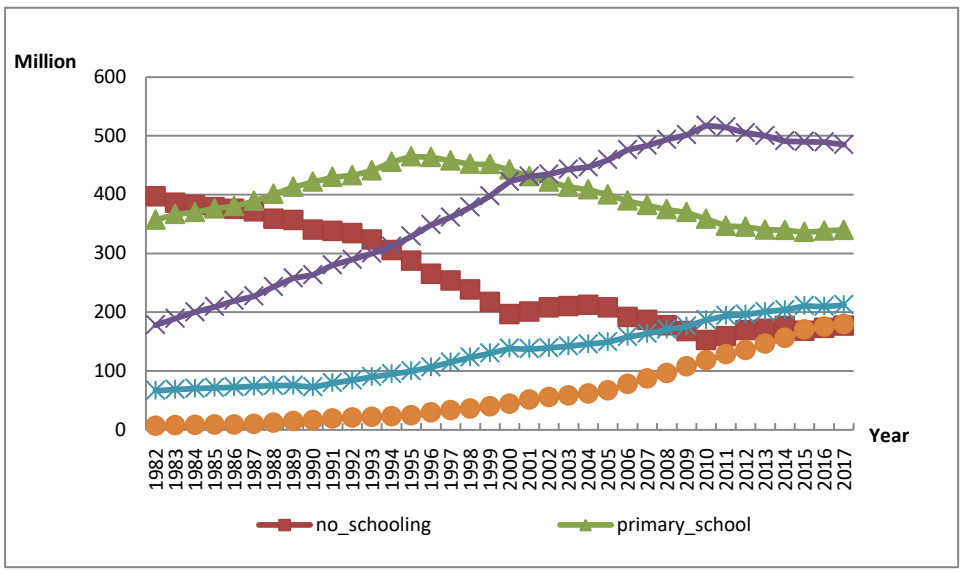


Figure 4.2.2 Population by Education Attainment in China 1982-2017

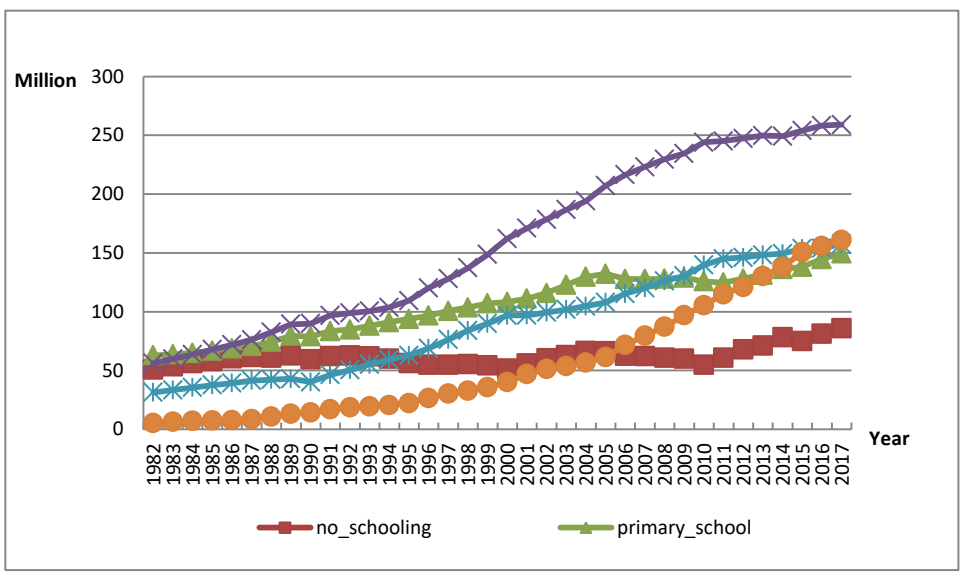


Figure 4.2.3 Urban Population by Educational Attainment 1982-2017

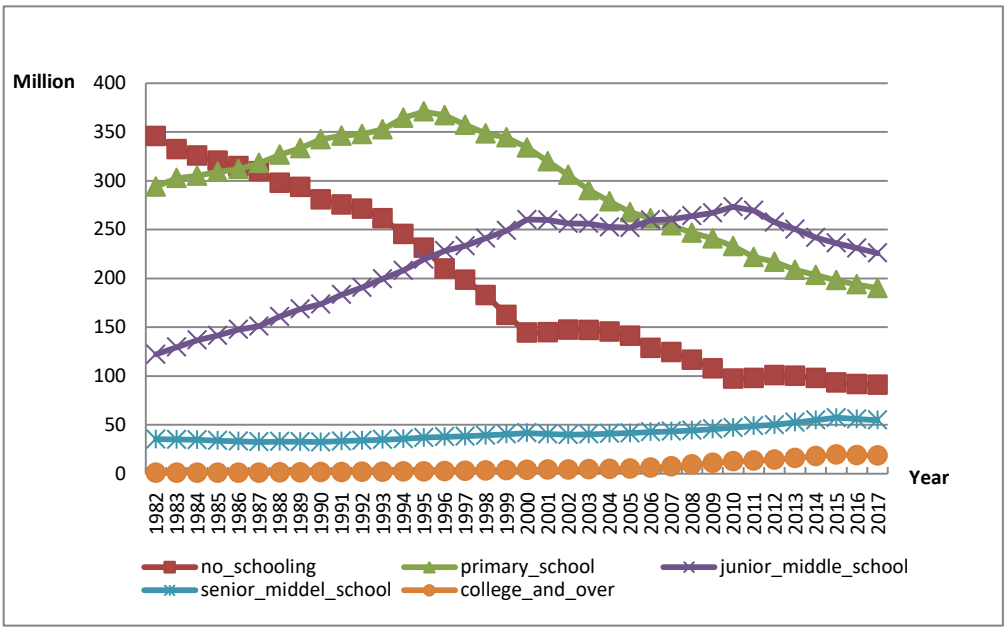


Figure 4.2.4 Rural Population by Educational Attainment 1982-2017

Figures 4.2.5 to 4.2.8 illustrate the increase in educational attainment over the years 1985, 1995, and 2010 categorized by gender and region. In 1985, among the five education levels, the proportion of the illiterate population and those just receiving primary education dominated the distribution. The 1995 distribution is dominated by people with primary and junior middle education while by 2010, junior middle had become the dominant education level. Female educational attainment has increased relative to that of males; the number of illiterate females decreased faster than that of illiterate males, and the gender gap at high education levels also shrank considerably.

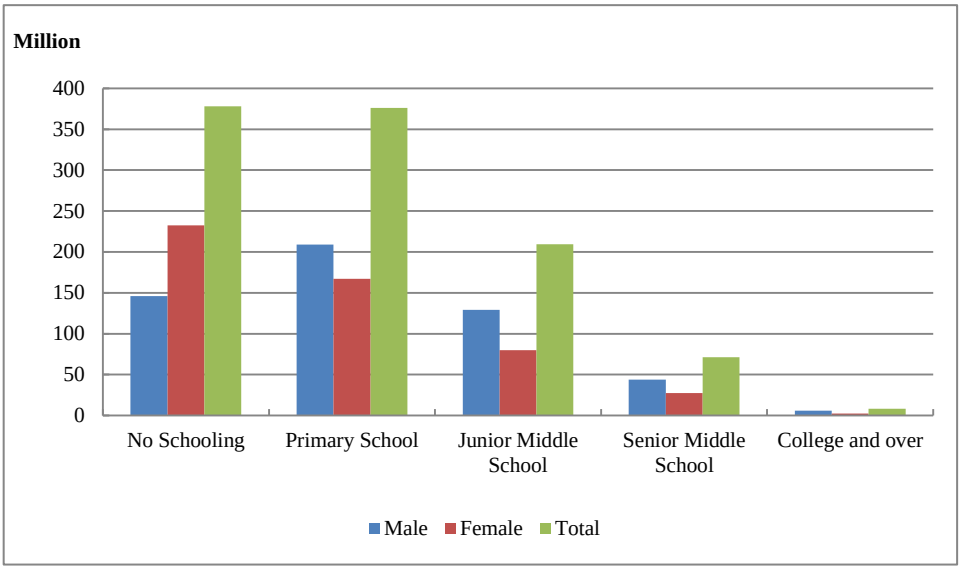


Figure 4.2.5 Population of Different Educational Levels by Gender, 1985

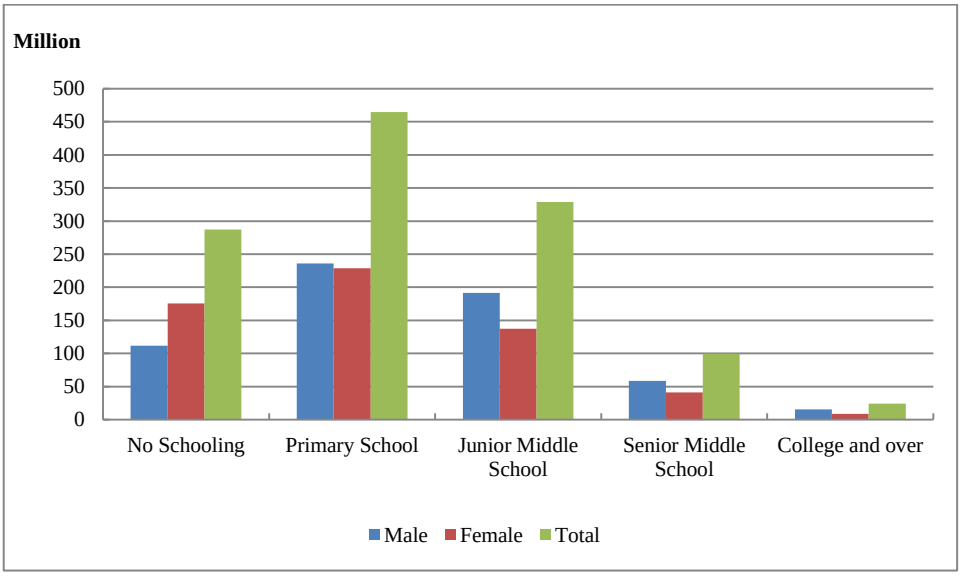


Figure 4.2.6 Population of Different Educational Levels by Gender, 1995

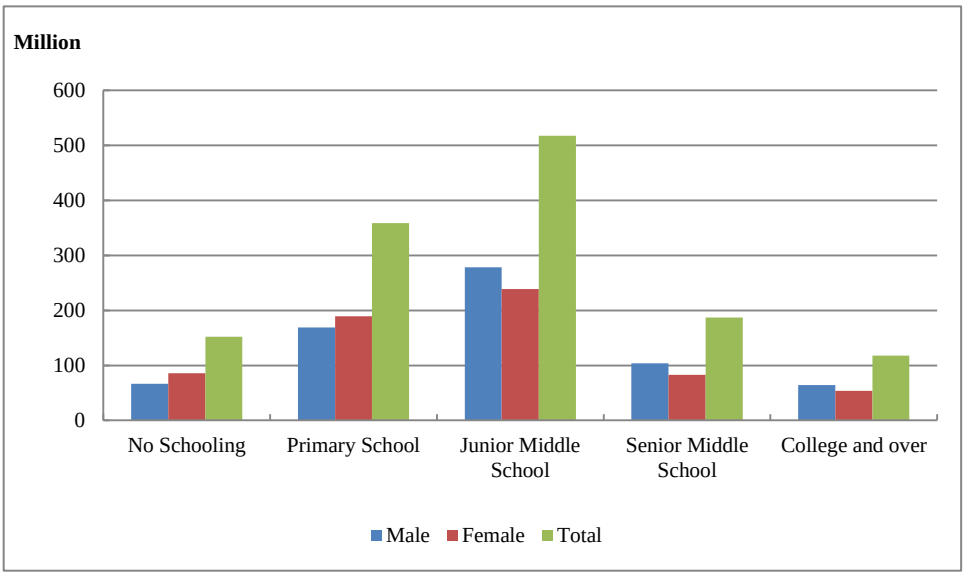


Figure 4.2.7 Population of Different Educational Levels by Gender, 2010

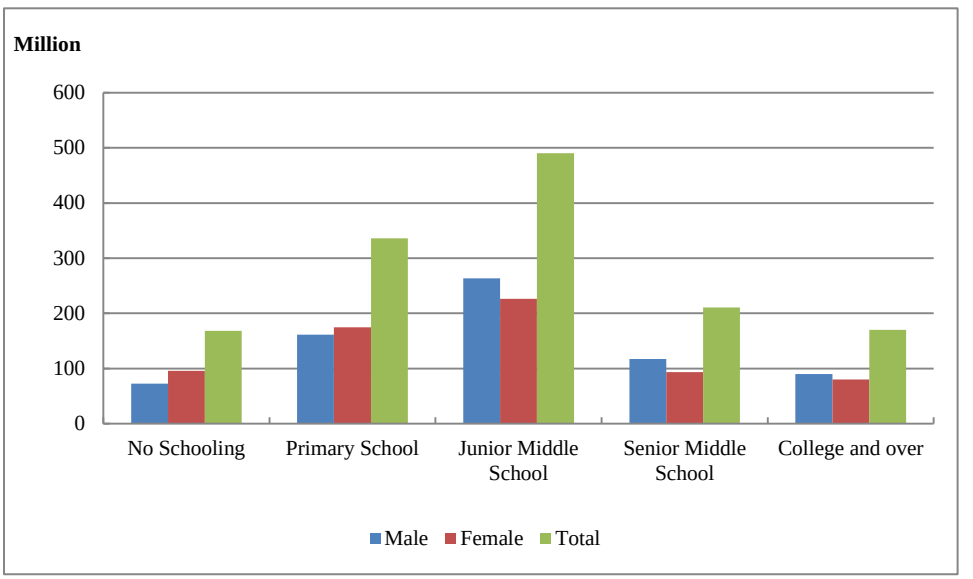


Figure 4.2.8 Population of Different Educational Levels by Gender, 2015

Chapter5 Age and Education of the Labor Force

We present calculations of the degree of population aging, education status and higher education penetration of the labor force across provinces in China.

5.1 Definition of the Labor Force and Education Levels

Definition of the Labor Force:

Male: population 16-59 years old out of school

Female: population 16-54 years old out of school

Definitions of educational attainment levels are shown in Table 5.1.1 and Table 5.1.2.

Table5.1.1 Levels of Educational Attainment before 2000

Level	Illiterate	Primary School	Junior Middle	Senior Middle	College and Above
Years of Schooling	0	6	9	12	15

Table5.1.2 Levels of Educational Attainment since 2000

Level	Illiterate	Primary School	Junior Middle	Senior Middle	College	University and Above
Years of Schooling	0	6	9	12	15	16

5.2 Average Age of the National Labor Force

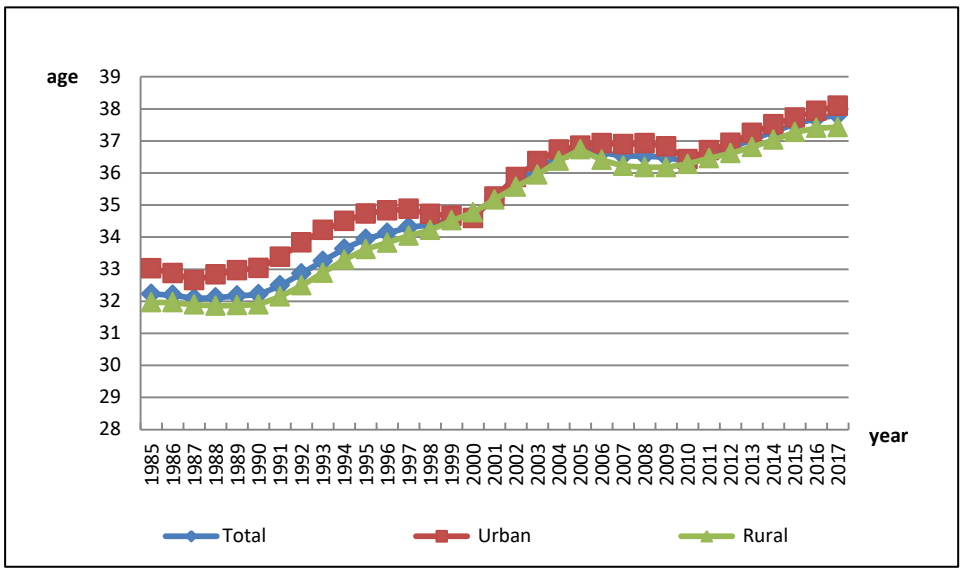


Figure5.2.1 Average Age of the National Labor Force (By census data and 1% sample data)

Figure 5.2.1 shows the average age of the labor force, based on the 1982, 1990, 2000, 2010 census data and 1987, 1995, 2005,2015 1%-sample data. The age structures and education levels of those 1%-sample data are unreasonable. Taking the 2005 1%-sample data as an example, the population with high school and higher education level in 2000 is 182.2 million while that in 2005 is 215.6 million, indicating a population increase of 33.4 million. Reported high school enrollment increased by 55.98 million between 2001 and 2005, implying a number of deaths equal to 22.59 million, which accounts for 12.40% of the population with that education level in 2000. Also, from the 1%-sample data of 2005, the population of men at the age between 20 to 24 is 38.2 million while that in 2010 is 50.8 million, which suggests a population increase of 12.7 million. There should be a population decrease in 2010 when the death factor is taken into

consideration. It seems that there is unreasonable data of age structures and education levels in 2005.

Therefore, we use only census data to generate the new result.

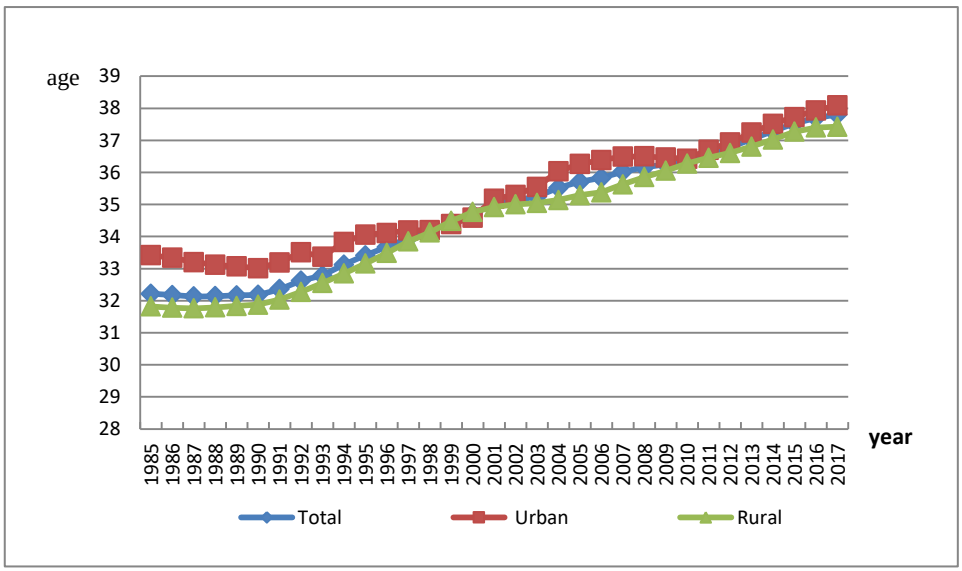


Figure5.2.2 Average Age of the National Labor Force (By census data)

Figure 5.2.2 shows the upward trend in average age of the labor force from 1982 to 2017 in Mainland China. The average age increases in both rural and urban areas.. After 1995, the urban labor force average age fell beneath that of rural areas due to rural-urban labor force immigration.

Table 5.2.1 Average Age of the National Labor Force（1985-2017）

Unit：Year (of age)

Year	Average Age of the Labor Force		
	Total	**Urban**	**Rural**
1985	32.21	33.42	31.82
1986	32.17	33.34	31.78
1987	32.13	33.21	31.76
1988	32.14	33.12	31.79
1989	32.17	33.07	31.84

Year	Average Age of the Labor Force		
	Total	**Urban**	**Rural**
1990	32.18	33.01	31.88
1991	32.36	33.20	32.04
1992	32.62	33.51	32.28
1993	32.78	33.37	32.55
1994	33.12	33.82	32.85
1995	33.41	34.06	33.16
1996	33.67	34.11	33.49
1997	33.95	34.19	33.85
1998	34.15	34.20	34.12
1999	34.45	34.39	34.49
2000	34.70	34.59	34.76
2001	35.02	35.18	34.92
2002	35.12	35.30	35.01
2003	35.25	35.55	35.04
2004	35.52	36.04	35.14
2005	35.71	36.26	35.29
2006	35.83	36.39	35.38
2007	36.02	36.49	35.63
2008	36.16	36.50	35.85
2009	36.25	36.46	36.05
2010	36.35	36.43	36.28
2011	36.58	36.71	36.46
2012	36.78	36.93	36.61
2013	37.04	37.24	36.80
2014	37.29	37.52	37.03
2015	37.52	37.73	37.27
2016	37.70	37.93	37.40
2017	37.80	38.09	37.42

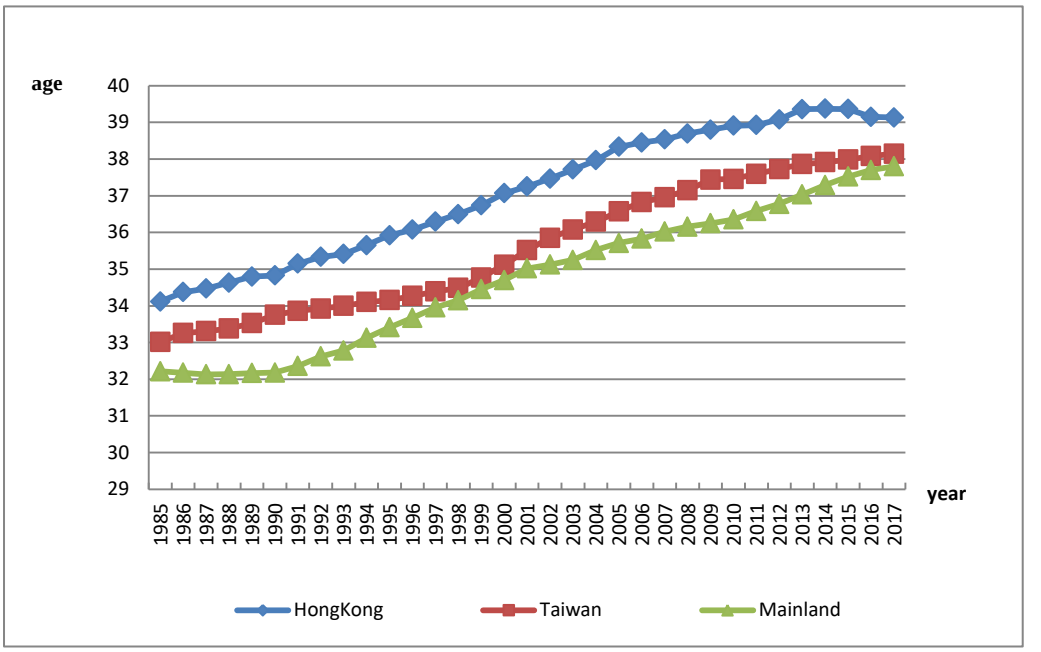


Figure5.2.3 Average Age of the Labor Force in Mainland, Hong Kong and Taiwan

in Mainland, Hong Kong and Taiwan. The average age of the labor force in Hong Kong increased from 34.11 in 1985 to 39.13 in 2017, while that of Taiwan increased from 33.01 in 1985 to 38.15 in 2017. The labor force average age of Taiwan lies between that of Hong Kong and Mainland China.

Table5.2.2 Average Age of the Labor Force in Mainland, Hong Kong and Taiwan

Unit：Year (of age)

Year	Average Age of the Labor Force		
	Hong Kong	Taiwan	Mainland
1985	34.11	33.01	32.21
1986	34.37	33.26	32.17
1987	34.47	33.31	32.13
1988	34.63	33.38	32.14
1989	34.80	33.53	32.17

Year	Average Age of the Labor Force		
	Hong Kong	Taiwan	Mainland
1990	34.83	33.75	32.18
1991	35.15	33.86	32.36
1992	35.33	33.92	32.62
1993	35.41	34.00	32.78
1994	35.65	34.10	33.12
1995	35.92	34.16	33.41
1996	36.07	34.27	33.67
1997	36.29	34.39	33.95
1998	36.50	34.49	34.15
1999	36.74	34.77	34.45
2000	37.07	35.12	34.70
2001	37.25	35.51	35.02
2002	37.46	35.85	35.12
2003	37.72	36.08	35.25
2004	37.97	36.29	35.52
2005	38.33	36.57	35.71
2006	38.45	36.83	35.83
2007	38.53	36.95	36.02
2008	38.69	37.15	36.16
2009	38.80	37.44	36.25
2010	38.91	37.46	36.35
2011	38.93	37.60	36.58
2012	39.08	37.73	36.78
2013	39.36	37.86	37.04
2014	39.37	37.91	37.29
2015	39.36	37.99	37.52
2016	39.15	38.08	37.70
2017	39.13	38.15	37.80

5.3 Average Years of Schooling of the National Labor Force

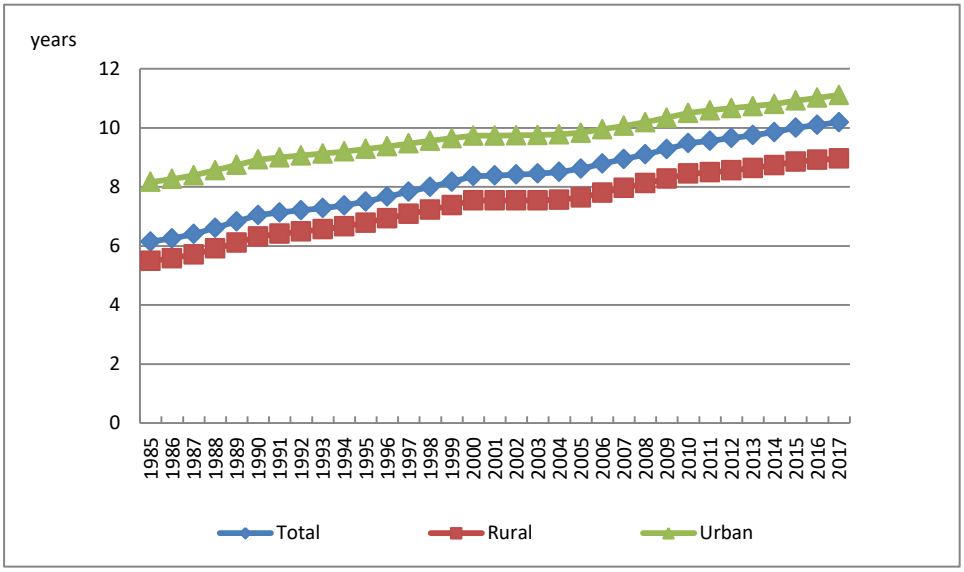


Figure5.3.1 Average Years of Schooling of the National Labor Force (by census data and 1%-sample data)

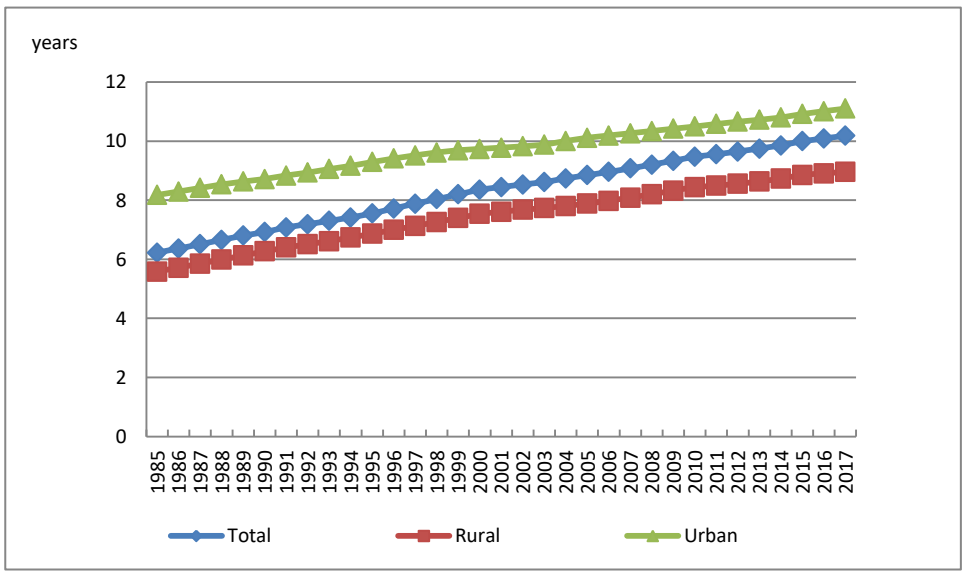


Figure5.3.2 Average Years of Schooling of the National Labor Force (by census data)

Figure 5.3.1 shows average schooling years of the national labor force., Although we use census data and the 1%-sample data to obtain this result, there exists unreasonable data of age structures and education levels in 1987,

1995 and 2005. Thus we use only census data to obtain the modified data shown in figure 5.3.2. Figure 5.3.2 shows the upward trend in average schooling years of the national labor force from 1985 to 2017. The national average years of schooling increased from 6.23 years in 1985 to10.19 in 2017. The rural average years of schooling increased from 5.59 in 1985 to 8.96 in 2017 while the urban average years increase from 8.18 to 11.11 during the same period.

Table5.3.1 Average Years of Schooling of the National Labor Force (1985-2017)

Unit: Year

Year	Average Years of Schooling		
	Total	**Urban**	**Rural**
1985	6.23	8.18	5.59
1986	6.36	8.29	5.71
1987	6.51	8.42	5.85
1988	6.66	8.54	5.99
1989	6.80	8.64	6.13
1990	6.92	8.72	6.27
1991	7.08	8.84	6.40
1992	7.19	8.94	6.51
1993	7.30	9.06	6.61
1994	7.42	9.17	6.74
1995	7.55	9.30	6.87
1996	7.72	9.42	7.00
1997	7.88	9.52	7.13
1998	8.04	9.62	7.27
1999	8.20	9.69	7.40
2000	8.36	9.73	7.54
2001	8.45	9.78	7.61
2002	8.53	9.83	7.68
2003	8.62	9.88	7.74
2004	8.74	10.01	7.81
2005	8.85	10.12	7.89
2006	8.96	10.19	7.98

Year	Average Years of Schooling		
	Total	Urban	Rural
2007	9.08	10.27	8.09
2008	9.20	10.34	8.20
2009	9.34	10.43	8.33
2010	9.48	10.50	8.45
2011	9.56	10.59	8.49
2012	9.65	10.67	8.56
2013	9.75	10.73	8.64
2014	9.85	10.80	8.73
2015	10.00	10.92	8.86
2016	10.09	11.02	8.91
2017	10.19	11.11	8.96

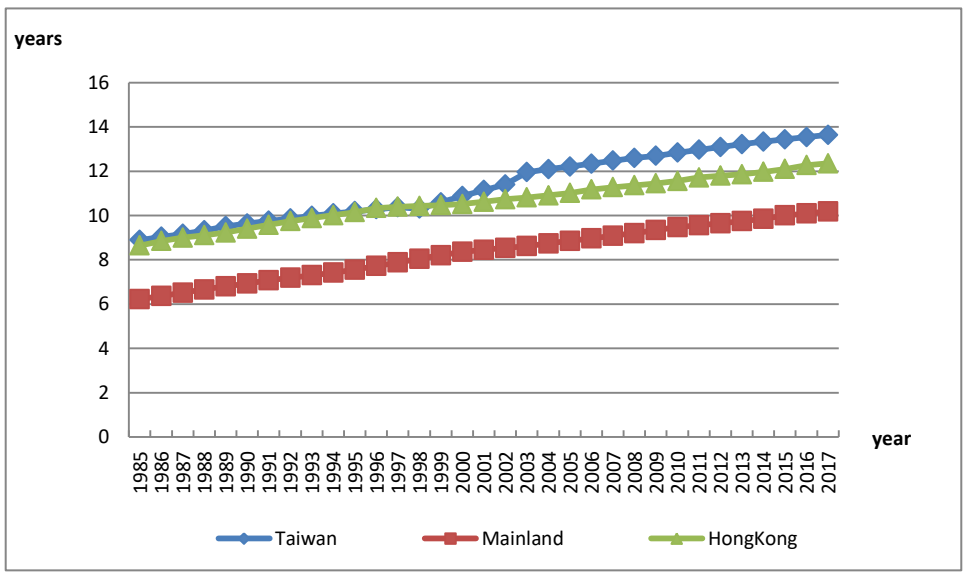


Figure 5.3.3 Average Years of Schooling of the Labor Force in Mainland, Hong Kong and Taiwan

Figure5.3.3 and Table 5.3.2 show the trends of average years of schooling of the labor force in Mainland, Hong Kong and Taiwan. The labor force average years of schooling of Hong Kong increased from8.65 in 1985 to 12.35 in 2017 while that of Taiwan increased from 8.89 in 1985 to 13.64 in 2017. The labor force years of schooling of Hong Kong and

Taiwan are similar in 1985-2000, and both of them are significantly higher than in the Mainland.

Table5.3.2 Average Years of Schooling of the Labor Force in Mainland, Hong Kong and Taiwan

Unit: Year

Year	Average Years of Schooling		
	Hong Kong	**Taiwan**	**Mainland**
1985	8.65	8.89	6.23
1986	8.84	9.03	6.36
1987	9.00	9.17	6.51
1988	9.11	9.32	6.66
1989	9.23	9.51	6.80
1990	9.40	9.64	6.92
1991	9.58	9.76	7.08
1992	9.75	9.86	7.19
1993	9.88	9.98	7.30
1994	10.01	10.09	7.42
1995	10.15	10.19	7.55
1996	10.33	10.28	7.72
1997	10.39	10.37	7.88
1998	10.43	10.31	8.04
1999	10.46	10.59	8.20
2000	10.51	10.88	8.36
2001	10.62	11.14	8.45
2002	10.73	11.40	8.53
2003	10.81	11.96	8.62
2004	10.91	12.09	8.74
2005	11.02	12.21	8.85
2006	11.18	12.34	8.96
2007	11.28	12.48	9.08
2008	11.36	12.60	9.20
2009	11.45	12.69	9.34
2010	11.56	12.84	9.48
2011	11.72	12.97	9.56
2012	11.80	13.09	9.65
2013	11.86	13.22	9.75

Year	Average Years of Schooling		
	Hong Kong	Taiwan	Mainland
2014	11.97	13.33	9.85
2015	12.10	13.43	10.00
2016	12.28	13.54	10.09
2017	12.35	13.64	10.19

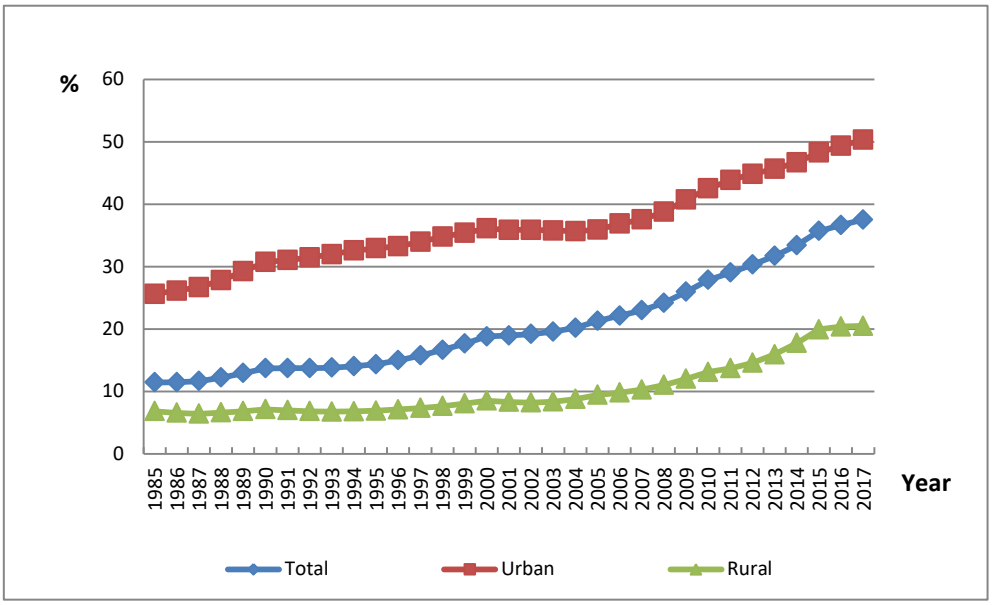


Figure5.3.4 Proportions of High School and Above in the Labor Force (By census data and 1% sample data)

Figure 5.3.4 shows the proportions of workers with education level high school and above in the labor force. We use census data and 1%-sample data to obtain this result, but because of data anomalies discussed above, we also use only census data to obtain modified results reported in Figure 5.3.5.

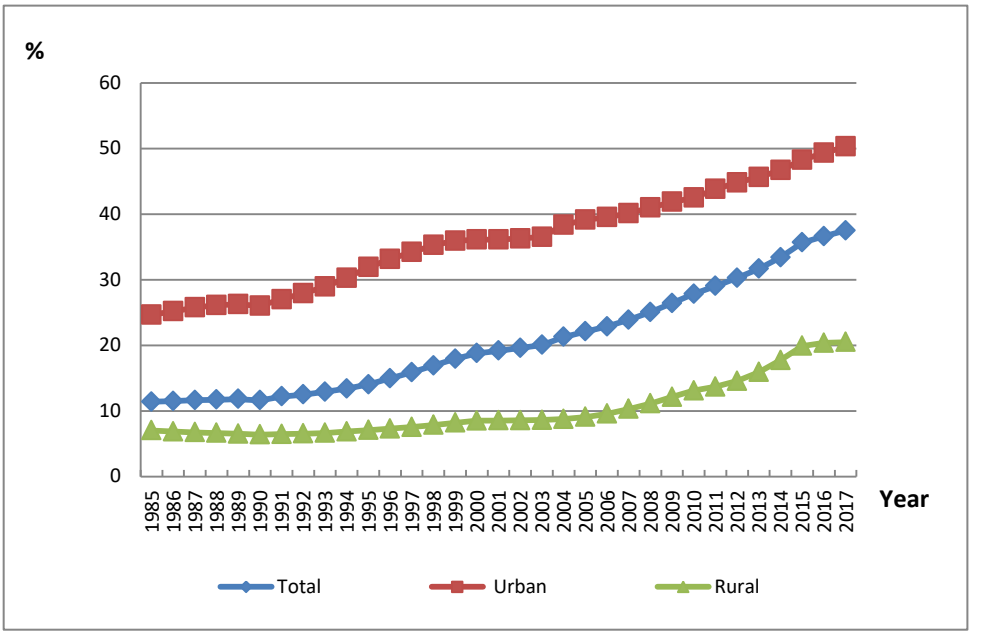


Figure5.3.5 Proportions of High School and Above in the Labor Force (By census data)

Figure 5.3.5 shows the upward trend in the proportions of high school and above in the labor force. The national proportion of workers with at least high-school education increased from 11.4% in 1985 to 37.51% in 2017, and in the rural proportion it increased from 7% in 1985 to 20.5% in 2017, while the comparable data for the urban population increased from 24.68% to 50.33%.

Table5.3.3 National Proportions of High School and Above of the National Labor Force (1985-2017)

Unit: %

Year	Proportions of High School and Above		
	Total	**Urban**	**Rural**
1985	11.40	24.68	7.04
1986	11.50	25.20	6.88
1987	11.64	25.77	6.75
1988	11.73	26.15	6.64

Year	Proportions of High School and Above		
	Total	Urban	Rural
1989	11.82	26.26	6.52
1990	11.63	26.04	6.40
1991	12.20	27.01	6.49
1992	12.51	27.94	6.54
1993	12.92	28.95	6.65
1994	13.41	30.30	6.86
1995	14.05	31.92	7.08
1996	14.97	33.17	7.30
1997	15.91	34.22	7.55
1998	16.92	35.28	7.86
1999	17.94	35.95	8.20
2000	18.79	36.12	8.53
2001	19.19	36.16	8.56
2002	19.59	36.29	8.57
2003	20.07	36.53	8.63
2004	21.29	38.38	8.78
2005	22.12	39.17	9.08
2006	22.87	39.53	9.57
2007	23.90	40.14	10.30
2008	25.07	41.00	11.15
2009	26.45	41.89	12.15
2010	27.85	42.52	13.11
2011	29.04	43.84	13.70
2012	30.29	44.84	14.57
2013	31.67	45.65	15.92
2014	33.41	46.70	17.74
2015	35.69	48.29	19.93
2016	36.64	49.34	20.38
2017	37.51	50.33	20.50

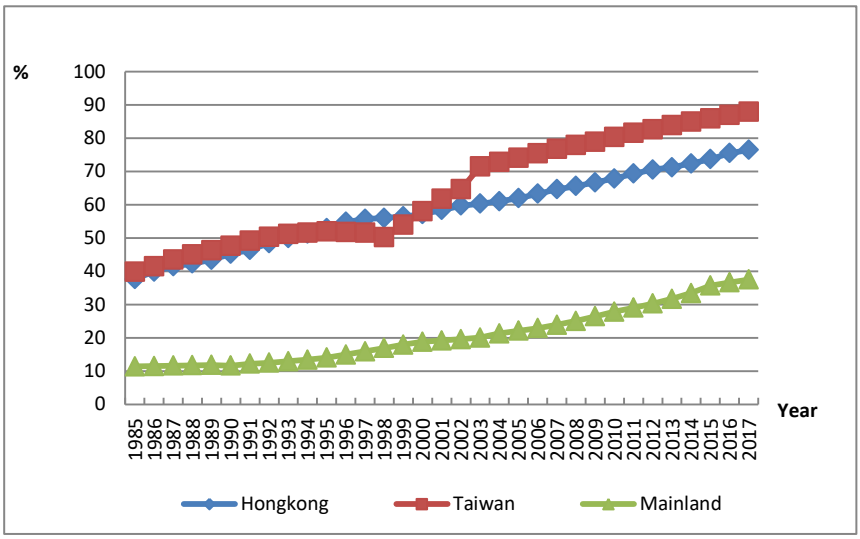


Figure 5.3.6 Proportions of High School Education and Above in the Labor Force of Mainland, Hong Kong and Taiwan

Figures 5.3.6 and Table 5.3.4 show the trends in proportions of population with high school educational attainment and above in the labor forces of Mainland, Hong Kong and Taiwan. The proportion in Hong Kong increases from 37.64% in 1985 to 76.47% in 2017 while that of Taiwan increases from 39.83% in 1985 to 87.92% in 2017. The proportion in Hong Kong is greater than that in Taiwan before 2001, but smaller since 2001; the proportions in both regions always exceed that in Mainland China.

Table5.3.4 Proportions of High School Education and Above in the Labor Force of Mainland, Hong Kong and Taiwan

Unit: %

Year	Proportions of High School Education and Above		
	Hong Kong	Taiwan	Mainland
1985	37.64	39.83	11.40
1986	39.87	41.50	11.50
1987	41.48	43.53	11.64
1988	42.31	45.06	11.73
1989	43.42	46.31	11.82

Year	Proportions of High School Education and Above		
	Hong Kong	Taiwan	Mainland
1990	45.20	47.65	11.63
1991	46.40	49.14	12.20
1992	48.44	50.34	12.51
1993	49.91	51.17	12.92
1994	51.31	51.63	13.41
1995	52.89	51.95	14.05
1996	54.84	51.79	14.97
1997	55.67	51.56	15.91
1998	56.04	50.23	16.92
1999	56.49	53.96	17.94
2000	57.17	58.05	18.79
2001	58.41	61.77	19.19
2002	59.73	64.65	19.59
2003	60.32	71.48	20.07
2004	61.02	72.88	21.29
2005	61.94	74.13	22.12
2006	63.27	75.48	22.87
2007	64.66	76.82	23.90
2008	65.62	77.90	25.07
2009	66.70	78.95	26.45
2010	67.88	80.33	27.85
2011	69.37	81.58	29.04
2012	70.55	82.67	30.29
2013	71.21	83.86	31.67
2014	72.38	84.98	33.41
2015	73.67	85.93	35.69
2016	75.50	87.02	36.64
2017	76.47	87.92	37.51

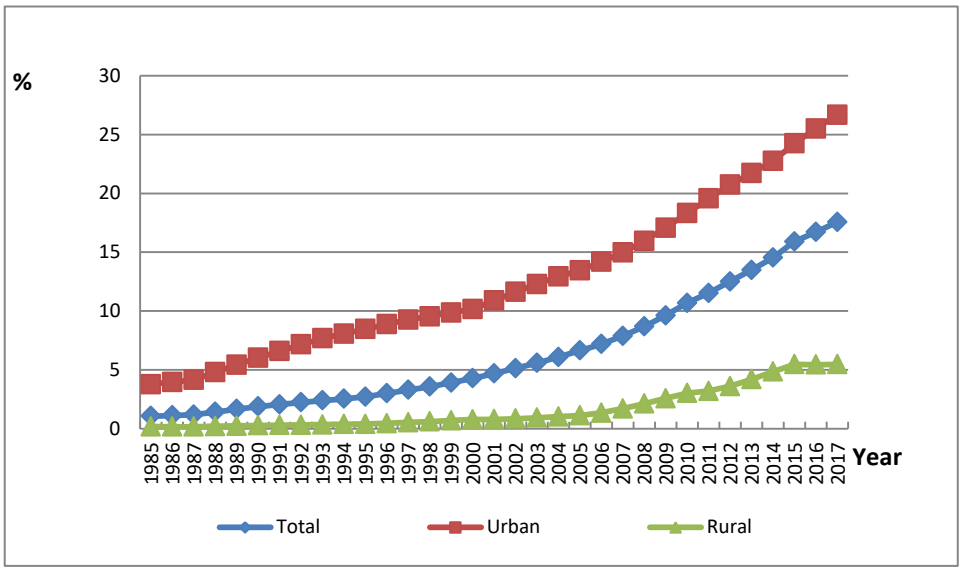


Figure 5.3.7 National Proportions of College Education and Above of the National Labor Force (By census data and 1%-sample data)

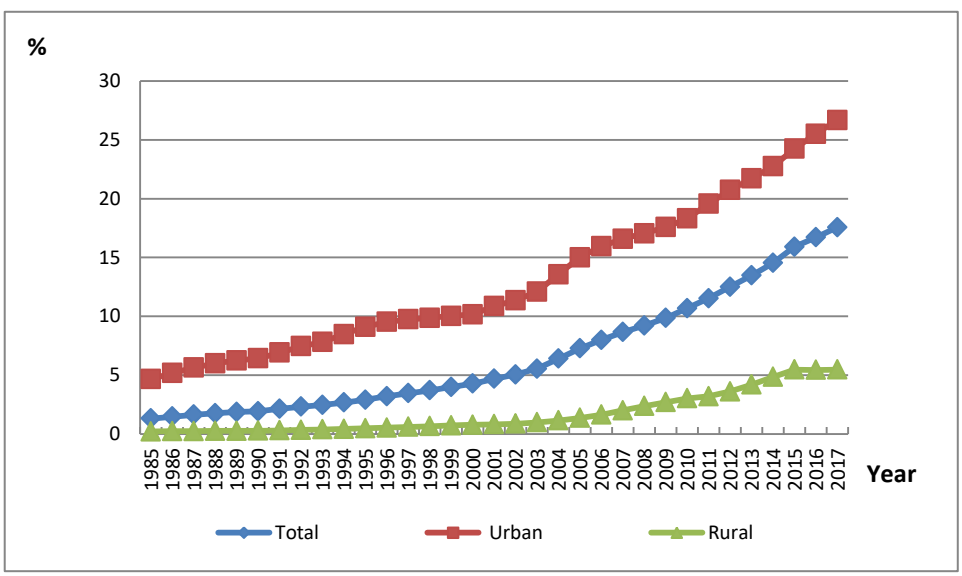


Figure 5.3.8 National Proportions of College Education and Above of the National Labor Force (By census data)

Figure 5.3.7 shows proportion workers with education of college and above in labor force. We use census data and the 1%-sample data to obtain these results, but again because of unreasonable data of age structures and education levels in 1987, 1995 and 2005,2015, we report modified results in Figure 5.3.8. Figure 5.3.8 shows national proportion of workers with schooling of college and above in the labor force increased from 1.3% in 1985 to 17.57% in 2017. Among the rural proportion it increased from 0.2% in 1985 to 5.46% in 2017 while in the urban proportion the proportion increased from 4.65% to 26.69%. The trend is consistent with the improvement and expansion of higher education in China.

Table 5.3.5 National Proportions of College and Above of the National Labor Force (1985-2017)

Unit: %

Year	Proportions of College and Above		
	Total	**Urban**	**Rural**
1985	1.30	4.65	0.20
1986	1.47	5.18	0.22
1987	1.62	5.63	0.23
1988	1.75	5.99	0.25
1989	1.87	6.24	0.26
1990	1.91	6.42	0.27
1991	2.14	6.91	0.30
1992	2.32	7.45	0.33
1993	2.46	7.81	0.37
1994	2.67	8.47	0.42
1995	2.89	9.10	0.47
1996	3.20	9.52	0.53
1997	3.46	9.74	0.59
1998	3.70	9.87	0.65
1999	3.98	10.03	0.72
2000	4.26	10.16	0.77
2001	4.68	10.85	0.81

Year	Proportions of College and Above		
	Total	Urban	Rural
2002	5.04	11.36	0.87
2003	5.53	12.09	0.98
2004	6.39	13.56	1.14
2005	7.27	15.00	1.35
2006	7.99	15.94	1.63
2007	8.65	16.58	2.00
2008	9.21	17.05	2.36
2009	9.85	17.58	2.69
2010	10.68	18.31	3.01
2011	11.52	19.57	3.19
2012	12.50	20.74	3.60
2013	13.47	21.72	4.19
2014	14.53	22.75	4.84
2015	15.90	24.25	5.46
2016	16.71	25.51	5.44
2017	17.57	26.69	5.46

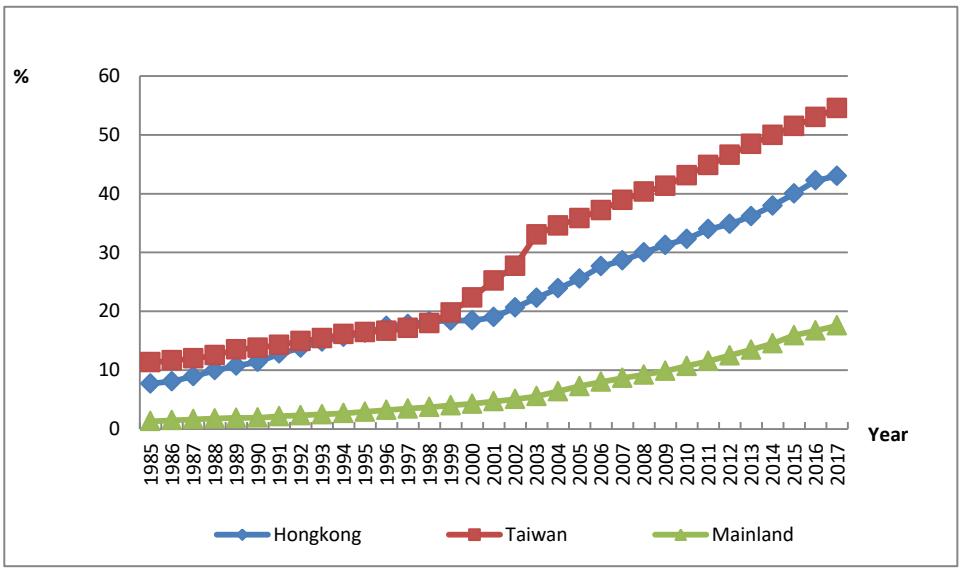


Figure 5.3.9 Proportions of College Education and Above in the Labor Force of Mainland, Hong Kong and Taiwan

Figures 5.3.9 and Table5.3.6 show the trends in the proportions of workers with college educational attainment and above in the labor force of Mainland, Hong Kong and Taiwan. The proportion in Hong Kong increased from 7.70% in 1985 to 43.01% in 2017, while that in Taiwan increased from 11.32% in 1985 to 54.54% in 2017. The proportion in Taiwan is greater than that of Hong Kong in general, and the proportions in these two areas are always much greater than that in Mainland China.

Table5.3.6 Proportions of College Education and Above in the Labor Force of Mainland, Hong Kong and Taiwan

Unit: %

Year	Proportions of College Education and Above		
	Hong Kong	**Taiwan**	**Mainland**
1985	7.70	11.32	1.30
1986	8.06	11.65	1.47
1987	8.94	11.98	1.62
1988	9.95	12.52	1.75
1989	10.73	13.52	1.87
1990	11.38	13.80	1.91
1991	12.78	14.27	2.14
1992	13.80	14.90	2.32
1993	14.84	15.43	2.46
1994	15.63	16.11	2.67
1995	16.32	16.46	2.89
1996	17.47	16.66	3.20
1997	17.82	17.13	3.46
1998	18.27	17.96	3.70
1999	18.43	19.77	3.98
2000	18.44	22.33	4.26
2001	18.98	25.20	4.68
2002	20.62	27.73	5.04
2003	22.29	33.05	5.53
2004	23.90	34.58	6.39

Year	Proportions of College Education and Above		
	Hong Kong	Taiwan	Mainland
2005	25.51	35.84	7.27
2006	27.63	37.21	7.99
2007	28.62	38.92	8.65
2008	30.02	40.33	9.21
2009	31.27	41.30	9.85
2010	32.31	43.14	10.68
2011	33.96	44.84	11.52
2012	34.82	46.60	12.50
2013	36.17	48.44	13.47
2014	37.96	50.00	14.53
2015	39.99	51.48	15.90
2016	42.24	53.02	16.71
2017	43.01	54.54	17.57

5.4 Average Age of the Labor Force at the Provincial Level

Table 5.4.1 shows the comparison of average age of the labor force in 2017 among all provinces in China in descending order. In general, the average age of the labor force is between 34 and 40 years in 2017, and the three northeast provinces of China (Liaoning, Jilin and Heilongjiang) ranked at the oldest, while Tibet is the youngest.

Table 5.4.1 Average Age of the Labor Force at Provincial Level (2017)

Unit: Year (of age)

Rank	Province	Average Age		
		Sub-Total	Urban	Rural
1	Liaoning	39.51	39.78	38.95
2	Jilin	39.29	39.74	38.81

Rank	Province	Average Age		
		Sub-Total	Urban	Rural
3	Heilongjiang	39.28	39.43	39.06
4	Chongqing	39.15	39.54	38.41
5	Hunan	38.57	39.12	37.98
6	Zhejiang	38.48	38.15	39.18
7	Inner Mongolia	38.24	37.98	38.64
8	Shanghai	38.23	38.23	-
9	Sichuan	38.23	38.69	37.77
10	Jiangsu	38.20	38.08	38.45
11	Shandong	38.00	37.76	38.24
12	Hebei	37.95	37.99	37.91
13	Tianjin	37.82	37.75	38.17
14	Mainland	37.80	38.09	37.42
15	Hubei	37.80	37.82	37.77
16	Jiangxi	37.75	38.43	37.06
17	Fujian	37.71	37.69	37.74
18	Henan	37.31	37.98	36.72
19	Guangxi	37.22	37.71	36.82
20	Shannxi	37.22	36.94	37.54
21	Gansu	37.21	37.78	36.80
22	Qinghai	37.14	038.6	35.77
23	Ningxia	36.90	38.11	35.43
24	Beijing	36.90	36.77	37.64
25	Anhui	36.83	36.43	37.26
26	Shanxi	36.76	36.94	36.56
27	Yunnan	36.74	37.45	36.20
28	Guangdong	36.38	36.75	35.56
29	Guizhou	36.07	37.65	35.15
30	Hainan	36.04	36.74	35.30
31	Xinjiang	35.97	36.79	35.30
32	Tibet	34.38	35.54	34.11

5.5 Education Indicators at the Provincial Level

Table 5.5.1 shows the provincial rankings of average years of

schooling of the labor force in 2017. In general, the provinces with better economic development have more schooling; leading examples are Beijing, Shanghai and Tianjin; in contrast, underdeveloped provinces, such as Guizhou, Qinghai and Tibet, rank at the bottom in terms of educational attainment. Average schooling years of the urban labor force exceeds that of the rural labor force in each province, and the urban-rural gap is greater in the less-developed provinces. For example, the urban-rural differential in Tibet is 4.35 years while the gap in Beijing is only 2.79.

Table 5.5.1 Average Years of Schooling of the Labor Force at Provincial Level (2017)

Unit: Year

Rank	Province	Average Years of Schooling		
		Sub-total	Urban	Rural
1	Beijing	12.84	13.23	10.44
2	Shanghai	11.86	11.86	-
3	Tianjin	11.04	11.37	9.38
4	Jiangsu	10.81	11.35	9.64
5	Liaoning	10.76	11.63	8.99
6	Shannxi	10.55	11.64	9.34
7	Hunan	10.46	11.36	9.50
8	Hubei	10.37	11.39	9.01
9	Guangdong	10.34	10.76	9.38
10	Shanxi	10.27	11.31	9.06
11	Mainland	10.19	11.11	8.96
12	Zhejiang	10.15	10.60	9.23
13	Heilongjiang	10.12	11.22	8.62
14	Jilin	10.12	11.39	8.75
15	Chongqing	10.12	10.79	8.85
16	Hebei	10.11	11.00	9.17
17	Shandong	10.09	11.33	8.84
18	InnerMongolia	10.09	11.03	8.63
19	Hainan	10.06	10.80	9.26
20	Henan	10.01	10.87	9.25

Rank	Province	Average Years of Schooling		
		Sub-total	Urban	Rural
21	Fujian	9.95	10.53	8.87
22	Jiangxi	9.92	10.76	9.07
23	Xinjiang	9.89	11.56	8.50
24	Ningxia	9.71	10.91	8.26
25	Anhui	9.69	10.83	8.46
26	Sichuan	9.69	10.89	8.53
27	Guangxi	9.62	10.75	8.67
28	Gansu	9.43	11.33	8.11
29	Yunnan	8.95	10.41	7.82
30	Guizhou	8.79	10.11	8.02
31	Tibet	8.18	9.93	6.52
32	Qinghai	5.72	9.26	4.91

Table5.5.2 shows the 2017 provincial rankings for the proportion of worker with high school education and above in the total, rural and urban labor forces. Beijing, Shanghai and Tianjin have the highest average years of schooling, while Qinghai and Tibet are at the bottom, as they are in average years of schooling.

Table5.5.2 The Proportion of High School Education and Above of the Labor Force at Provincial Level (2017)

Unit：%

Rank	Province	The proportion of high school education and above		
		Sub-total	Urban	Rural
1	Beijing	71.44	76.28	41.49
2	Shanghai	58.54	58.54	-
3	Tianjin	47.76	53.31	19.84
4	Jiangsu	45.85	53.65	28.85
5	Hunan	42.61	55.98	28.22
6	Shannxi	41.70	56.24	25.33
7	Liaoning	41.26	54.88	13.36
8	Guangdong	40.73	47.32	25.83

Rank	Province	The proportion of high school education and above		
		Sub-total	Urban	Rural
9	Hubei	38.60	54.43	17.52
10	Chongqing	38.12	47.70	20.08
11	Mainland	37.51	50.33	20.50
12	Zhejiang	37.30	42.95	25.58
13	InnerMongolia	36.68	50.72	14.93
14	Ningxia	36.60	50.57	19.60
15	Shanxi	36.38	53.33	16.48
16	Fujian	36.05	43.29	22.73
17	Jilin	34.50	54.71	12.62
18	Gansu	34.47	56.18	19.33
19	Hainan	33.97	46.55	20.49
20	Jiangxi	33.89	45.86	21.61
21	Henan	33.75	47.52	21.57
22	Hebei	33.52	47.79	18.24
23	Shandong	33.43	52.73	14.05
24	Heilongjiang	33.38	50.33	10.04
25	Sichuan	33.05	48.34	18.21
26	Xinjiang	32.61	58.01	11.59
27	Anhui	29.77	46.87	11.18
28	Guangxi	28.31	44.55	14.79
29	Qinghai	25.93	41.34	11.37
30	Yunnan	25.66	42.18	13.01
31	Guizhou	23.13	37.71	14.59
32	Tibet	13.01	38.79	7.13

Table 5.5.3 shows the provincial rankings for the proportion of workers with college education and above in the labor force in 2017. The rankings are consistent with the rankings of the proportion of workers with high school education in general. However, some provinces rank lower in their proportions of college graduates than of high-school graduates because of the factors such as quantity and quality of universities in the province, Liaoning is an example.

Table5.5.3 The Proportion of College Education and Above of the Labor Force at Provincial Level (2017)

Unit: %

Rank	Province	The proportion of college education and above		
		Sub-total	Urban	Rural
1	Beijing	50.55	55.95	17.09
2	Shanghai	37.40	37.40	-
3	Tianjin	25.58	29.22	7.29
4	Liaoning	22.90	32.09	4.07
5	Shannxi	22.61	35.34	8.27
6	Jiangsu	22.54	28.80	8.90
7	Zhejiang	19.85	25.16	8.86
8	Ningxia	19.59	30.20	6.68
9	Xinjiang	18.48	36.33	3.71
10	Hubei	18.43	29.14	4.17
11	Mainland	17.57	26.69	5.46
12	Fujian	17.41	23.43	6.31
13	InnerMongolia	17.18	25.18	4.77
14	Heilongjiang	16.65	26.51	3.07
15	Gansu	16.39	31.45	5.89
16	Hunan	16.18	26.14	5.47
17	Jilin	16.08	27.21	4.02
18	Chongqing	16.07	22.06	4.78
19	Shandong	15.80	28.88	2.66
20	Shanxi	15.75	26.76	2.83
21	Sichuan	15.19	25.74	4.96
22	Guangdong	15.10	19.56	5.03
23	Hebei	14.57	24.18	4.27
24	Hainan	13.66	20.56	6.27
25	Anhui	13.49	23.56	2.54
26	Jiangxi	13.38	21.57	4.99
27	Qinghai	13.25	22.68	4.34
28	Yunnan	12.64	23.96	3.98
29	Guangxi	11.91	21.98	3.52
30	Henan	11.84	20.53	4.16
31	Guizhou	10.65	21.40	4.36
32	Tibet	6.97	25.21	2.81

Chapter 6 National human capital

6.1 Trends in human capital

It is more meaningful to discuss the trends of the real value of human capital stock than the nominal value. We use the CPI as the deflator to calculate real values. Other published deflators are not available for recent years, while the CPI is updated year by year. Moreover, as can be seen in preceding chapters, results based on the CPI provide more conservative estimates than those based on capital stock deflators reported in the studies by Zhang (2004) and Holz (2006).

Discussions of human capital categorized by gender and by region are important in our report. Table 6.1.1 shows real human capital for the country as a whole based on 6-education categories, by gender, and by region. [30] From 1985 to 2017, human capital increased 10.37 times from 37.459 trillion Yuan to 388.554 trillion Yuan, an average annual growth rate of 7.71%, lower than the average annual growth rate of the economy. These measures reflect the exit of the aging low-educated population from the labor market and the entrance of younger individuals with higher expected education and higher income.

Both urban real capital and rural real capital increased in 1985-2017. Rural real human capital increased from 23.149 trillion Yuan to 72.425 trillion Yuan; urban real human capital grew from 14.310 trillion Yuan to 316.129 trillion Yuan. The corresponding annual growth rates are 3.74% for rural areas and 10.31% for urban areas. Before 1992, urban real human capital is smaller than rural real human capital, while beginning in 1992

[30] The sub aggregates may not sum to the total in all tables because of rounding.

urban human capital exceeds that in rural areas.

Table 6.1.1 National Real Human Capital by Gender and Region

Billions of 1985 Yuan

Year	National	Male	Female	Urban	Rural
1985	37459	19372	18087	14310	23149
1986	41209	22571	18638	16989	24220
1987	44437	25036	19400	19040	25396
1988	44409	25602	18807	19571	24838
1989	44065	25906	18160	20529	23536
1990	48989	29236	19753	23415	25575
1991	55871	33863	22008	27442	28429
1992	61875	38431	23444	31549	30326
1993	63745	40351	23394	33825	29920
1994	60402	38911	21491	33218	27183
1995	58356	37619	20738	32441	25916
1996	63961	41701	22260	37656	26305
1997	70324	45877	24447	42389	27935
1998	82152	53975	28178	51607	30546
1999	97581	63992	33588	63989	33592
2000	112149	72632	39517	75590	36559
2001	122474	78868	43607	82845	39629
2002	131734	85352	46382	89951	41783
2003	142749	92592	50158	98976	43774
2004	150261	96890	53371	105877	44384
2005	160513	103332	57180	114583	45930
2006	181055	117272	63784	130862	50194
2007	191399	124270	67129	140823	50576
2008	201835	131174	70661	150777	51058
2009	224166	146186	77980	168967	55199
2010	236026	153934	82092	178575	57451
2011	254980	166726	88255	197490	57490
2012	272150	178940	93210	213473	58676
2013	299988	198610	101378	239467	60521
2014	321488	213323	108166	257819	63669
2015	341940	228809	113131	273531	68409

Year	National	Male	Female	Urban	Rural
2016	364976	244717	120259	296631	68345
2017	388554	260809	127745	316129	72425

Note: Some discrepancy may exist when summing up male and female, urban and rural to get the national amount. This is caused by rounding.

Figure 6.1.1 shows the trend of urban and rural real human capital. Rural real human capital had little difference with urban real human capital before 1998, even higher than urban before 1990. However, since 1998, rural real human capital has shown a relatively lower growth rate compared to the accelerating growth rate of urban real human capital, and the gap between urban and rural also increased. There are several reasons for the more rapid growth of the urban than of the rural human-capital stock. Although in 1985 the rural population at 808 million was more than three times the size of the urban population at 251 million and thus had larger amount of human capital in the earlier years, by 2017, the population in rural China had fallen to 577 million, lower than the urban population of 813 million. This change was, to a large extent, a result of the rapid urbanization during the course of economic transition as well as the large scale rural-urban migration. These changes are magnified by the education gap between the urban and rural populations. Urban areas usually have a higher proportion of educated population than rural areas. As shown in the figure, the trend of natio human capital mostly depends on the trend of urban human capital

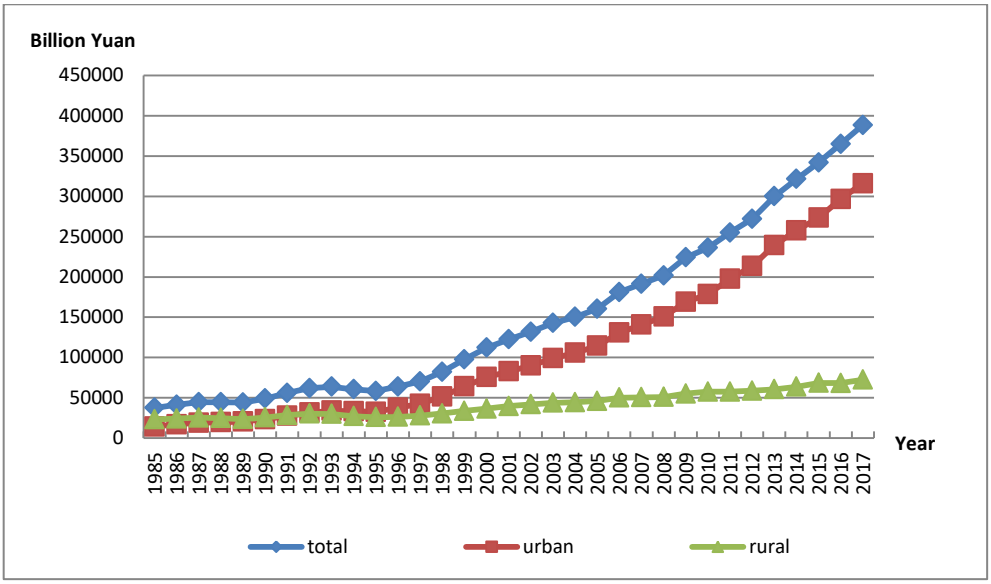


Figure 6.1.1 National Real Human Capital by Region,1985-2017

We report human capital indices (1985 = 100) by gender and region in table 6.1.2.

Table 6.1.2 National Real Human Capital Index (1985=100)

Year	National	Male	Female	Urban	Rural
1985	100	100	100	100	100
1986	110.01	116.52	103.05	118.73	104.63
1987	118.63	129.24	107.26	133.06	109.71
1988	118.56	132.16	103.98	136.77	107.30
1989	117.64	133.73	100.40	143.46	101.67
1990	130.78	150.92	109.21	163.63	110.48
1991	149.15	174.81	121.68	191.77	122.81
1992	165.18	198.39	129.62	220.48	131.00
1993	170.17	208.30	129.34	236.38	129.25
1994	161.25	200.86	118.82	232.14	117.43
1995	155.79	194.20	114.65	226.71	111.95
1996	170.75	215.27	123.07	263.15	113.63
1997	187.74	236.83	135.16	296.23	120.67
1998	219.31	278.63	155.79	360.65	131.95
1999	260.50	330.34	185.70	447.18	145.11

Year	National	Male	Female	Urban	Rural
2000	299.39	374.94	218.48	528.25	157.93
2001	326.96	407.13	241.09	578.95	171.19
2002	351.68	440.60	256.44	628.61	180.49
2003	381.08	477.98	277.31	691.68	189.09
2004	401.14	500.17	295.08	739.91	191.73
2005	428.51	533.42	316.14	800.74	198.41
2006	483.35	605.38	352.65	914.51	216.83
2007	510.96	641.51	371.14	984.12	218.48
2008	538.82	677.15	390.67	1053.68	220.56
2009	598.43	754.64	431.13	1180.80	238.45
2010	630.10	794.64	453.87	1247.95	248.18
2011	680.70	860.67	487.94	1380.13	248.35
2012	726.53	923.72	515.34	1491.83	253.47
2013	800.85	1025.26	560.50	1673.48	261.44
2014	858.25	1101.21	598.03	1801.73	275.04
2015	912.85	1181.16	625.48	1911.53	295.51
2016	974.34	1263.28	664.89	2072.96	295.24
2017	1037.29	1346.35	706.28	2209.22	312.86

6.2 Human capital per capita

An increase in real human capital can be caused by a number of factors, such as population growth, demographic changes (e.g., the size of retirement group), region migration or urbanization (e.g., an individual can achieve higher value of human capital by moving from a rural to an urban area), higher educational attainment, higher rates of return to education, and higher rates of return to on-the-job training. To further understand the underlying factors contributing to human-capital dynamics, we first calculate real human capital per capita, i.e., the ratio of real human capital to the non-retired population.

Table 6.2.1 shows the real human capital for the nation, and by gender and region based on 6-education group categories. The national real human

capital per capita grew 8.69 times, from 39.78 thousand Yuan in 1985 to 345.79 thousand Yuan in 2017, with an average annual growth rate of 7.13% The fast growth rate was caused by the rapid growth of economy, the expansion of education and the improvement of market economy. Moreover, real human capital per capita for the urban population was higher than that for the rural population in all years.

Table 6.2.1 National Real Human Capital Per Capita by Gender and Region

Thousands of 1985 Yuan

Year	National	Male	Female	Urban	Rural
1985	39.78	39.14	40.50	66.79	31.83
1986	43.31	45.20	41.22	76.34	33.22
1987	46.28	49.82	42.39	82.10	34.87
1988	44.93	49.30	40.10	79.54	33.46
1989	43.92	48.96	38.29	79.23	31.62
1990	48.34	54.59	41.33	87.94	34.23
1991	54.07	62.11	45.08	99.64	37.51
1992	59.96	70.66	48.04	112.88	40.31
1993	61.26	73.66	47.48	118.32	39.65
1994	57.63	70.72	43.16	114.03	35.92
1995	55.08	67.88	41.04	108.18	34.12
1996	59.18	73.55	43.33	115.69	34.83
1997	65.60	81.21	48.21	123.35	38.36
1998	76.29	94.96	55.42	141.74	42.86
1999	90.26	112.00	65.89	166.58	48.20
2000	102.96	126.05	77.02	186.46	53.46
2001	111.03	135.49	83.69	194.02	58.61
2002	121.18	148.92	90.24	204.98	64.45
2003	131.73	162.25	97.78	217.68	69.60
2004	139.41	171.37	104.15	225.93	72.86
2005	148.56	182.67	111.08	234.04	77.74
2006	163.55	201.65	121.39	253.98	84.82
2007	174.97	215.21	129.97	268.45	88.83
2008	183.46	225.00	136.64	278.55	91.36
2009	203.25	249.15	151.08	304.38	100.77

Year	National	Male	Female	Urban	Rural
2010	211.94	258.86	158.18	312.35	106.01
2011	224.66	274.63	167.19	332.05	106.43
2012	243.98	299.68	179.81	355.64	113.89
2013	269.11	332.67	195.82	389.92	120.90
2014	289.13	358.58	209.22	411.76	131.07
2015	307.09	384.08	218.50	428.12	144.15
2016	325.18	409.01	229.47	449.39	147.83
2017	345.79	436.40	242.85	467.89	161.66

Figure 6.2.1 shows the trend of urban and rural real human capital per capita. The urban real human capital per capita was considerably higher than rural human capital per capita with a widening gap. Based on Fleisher, Li and Zhao (2009), human capital is a significant contributing factor to economic growth, and the higher growth rate of per-capita human capital in urban areas is closely related to rural-urban and to regional growth in income gaps. It is worth noting that, although after 1997 rural human capital became less than the urban stock, the rural per capita stock has also been accelerating.

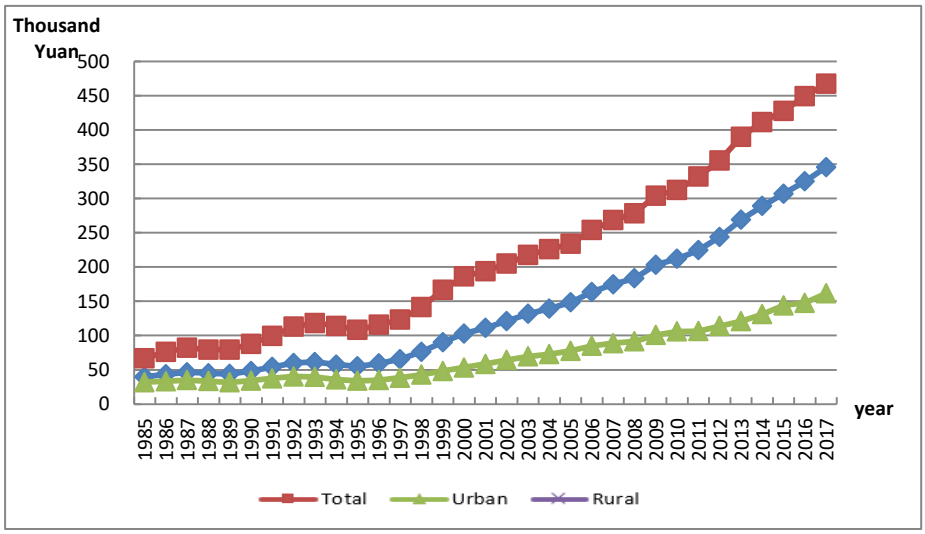


Figure 6.2.1 National Real Human Capital Per Capita by Region, 1985-2017

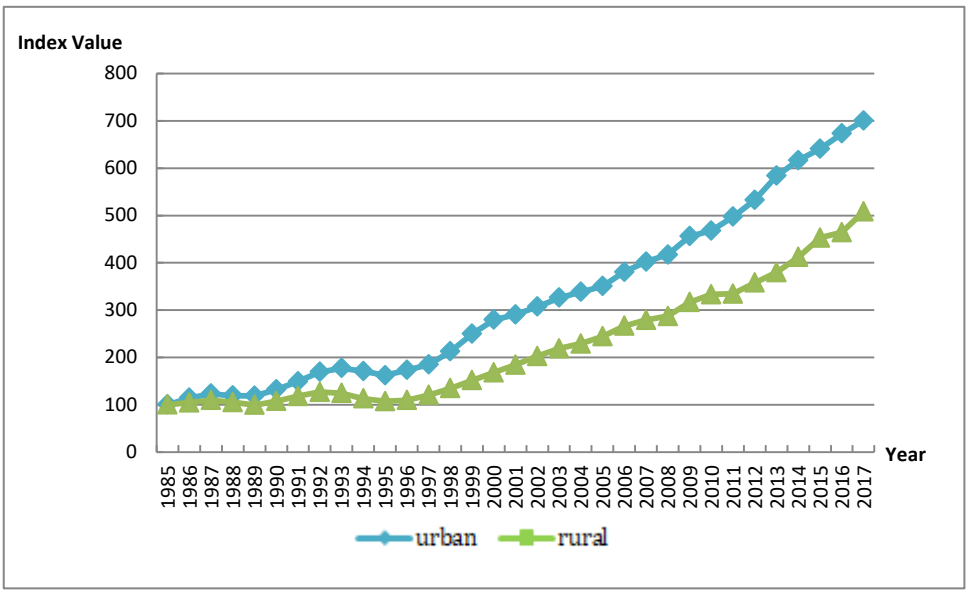


Figure 6.2.2 National Real Human Capital Per Capita Index by Region, 1985-2017

6.3 Labor force human capital

Labor force human capital represents the human capital of the population that is over 15 years old, non-retired and out-of-school. Labor force human capital is estimated in the same way as national human capital.

6.3.1 National labor force human capital

The national labor force human capital is reported in table 6.3.1. It is constructed using the methodology discussed in preceding chapters. The real values in this table are calculated by deflating the nominal values with the CPI using 1985 as the base year.

Table 6.3.1 National Nominal and Real Labor Force Human Capital and Nominal GDP

Year	Nominal labor force human capital (Billions of Yuan)	Real labor force human capital (Billions of 1985 Yuan)	Nominal GDP (Billions of Yuan)	Ratio of GDP to labor force human capital
1985	15433.80	15433.80	909.89	0.06
1986	18010.21	16917.00	1037.62	0.06
1987	21315.29	18657.96	1217.46	0.06
1988	25740.03	18949.53	1518.04	0.06
1989	30472.41	19000.07	1717.97	0.06
1990	35845.07	21687.22	1887.29	0.05
1991	41656.57	24330.20	2200.56	0.05
1992	47089.72	25831.62	2719.45	0.06
1993	53362.10	25499.31	3567.32	0.07
1994	60285.32	23199.55	4863.75	0.08
1995	68729.50	22551.20	6133.99	0.09
1996	79722.18	24102.32	7181.36	0.09
1997	90633.30	26597.22	7971.50	0.09
1998	104816.50	30932.97	8519.55	0.08
1999	120512.81	35969.28	9056.44	0.08
2000	141031.74	41785.35	10028.01	0.07
2001	155200.51	45607.73	11086.31	0.07
2002	167424.14	49519.49	12171.74	0.07
2003	183166.46	53495.71	13742.20	0.08
2004	199229.83	55934.12	16184.02	0.08
2005	224015.27	61631.27	18731.89	0.08
2006	260795.62	70681.89	21943.85	0.08
2007	290542.73	75079.81	27009.23	0.09
2008	324930.97	79241.67	31924.46	0.10
2009	367467.45	90149.89	34851.77	0.09
2010	426573.10	101149.77	41211.93	0.10
2011	475738.81	106934.46	48794.02	0.10
2012	506008.22	110780.44	53858.00	0.11
2013	545261.06	118487.20	59296.32	0.11
2014	587955.40	124802.74	64128.06	0.11

Year	Nominal labor force human capital (Billions of Yuan)	Real labor force human capital (Billions of 1985 Yuan)	Nominal GDP (Billions of Yuan)	Ratio of GDP to labor force human capital
2015	647933.19	135552.07	68599.29	0.11
2016	684284.44	140309.49	74006.08	0.11
2017	725273.09	146432.28	82075.43	0.11

A decrease in the ratio of nominal GDP to nominal labor force human capital over time may reflect growing productivity of human capital, but when its growth rate slows down may also reflect that the future growth of the GDP will diminish over time. Figure 6.3.1 shows the trend for the ratio. The level of nominal labor force human capital is much higher than that of nominal GDP, but the ratio's growth slows down in recent years, before

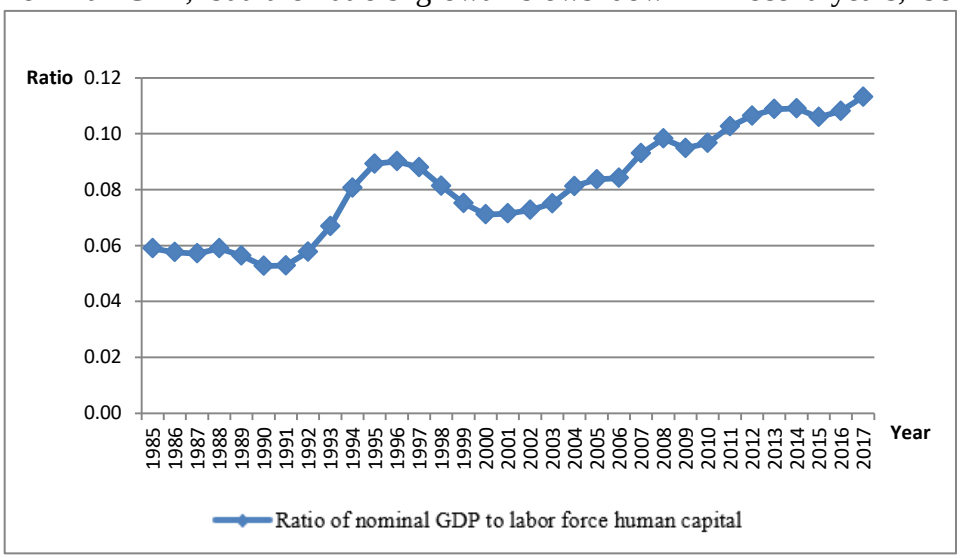


Figure 6.3.1 Nominal National Ratio of GDP to Labor Force Human Capital, 1985-2017

Tables 6.3.2 and 6.3.3 show the labor force human capital by gender and region based on the 6-education categories, respectively.

Table 6.3.2 National Nominal and Real Labor Force Human Capital by Gender

Year	Nominal labor force human capital (Billions of Yuan)			Real labor force human capital (Billions of 1985 Yuan)		
	National	Male	Female	National	Male	Female
1985	15434	8112	7321	15434	8112	7321
1986	18010	9882	8129	16917	9274	7643
1987	21315	12090	9225	18658	10554	8104
1988	25740	14992	10748	18950	10992	7957
1989	30472	18124	12349	19000	11279	7721
1990	35845	21741	14104	21687	13152	8535
1991	41657	25637	16020	24330	14960	9370
1992	47090	29399	17691	25832	16107	9724
1993	53362	33817	19545	25499	16147	9352
1994	60285	38568	21717	23200	14844	8356
1995	68729	44294	24435	22551	14547	8005
1996	79722	52065	27657	24102	15764	8339
1997	90633	60165	30468	26597	17687	8911
1998	104817	70239	34577	30933	20774	10159
1999	120513	80909	39604	35969	24217	11752
2000	141032	95343	45688	41785	28337	13448
2001	155201	104804	50396	45608	30902	14706
2002	167424	113419	54005	49519	33651	15868
2003	183166	123948	59218	53496	36307	17189
2004	199230	134029	65201	55934	37727	18208
2005	224015	150259	73757	61631	41432	20200
2006	260796	175960	84835	70682	47785	22897
2007	290543	196279	94263	75080	50798	24282
2008	324931	219508	105423	79242	53588	25653
2009	367467	248452	119016	90150	60993	29157
2010	426573	288382	138191	101150	68402	32748
2011	475739	322691	153048	106934	72531	34404
2012	506008	344233	161775	110780	75339	35441

Year	Nominal labor force human capital (Billions of Yuan)			Real labor force human capital (Billions of 1985 Yuan)		
	National	Male	Female	National	Male	Female
2013	545261	371688	173573	118487	80741	37746
2014	587955	402315	185640	124803	85339	39463
2015	647933	444685	203248	135552	92938	42614
2016	684284	466576	217709	140309	95538	44772
2017	725273	492278	232995	146432	99203	47229

Note: Some discrepancy may exist when summing up male and female, urban and rural to get the national amount. This is mainly caused by rounding.

Table 6.3.3 shows the nominal and real labor force human capital for urban and rural regions respectively. The national nominal and real labor force human capital both were increasing during 1985-2017. Although the national real labor force human capital for urban and rural areas both exhibit positive trends, the urban real labor force human capital surpassed its rural counterpart for the first time in 1998. The regional gap increased from almost -0.058 trillion Yuan in 1997 to over 60.045 trillion Yuan in 2017. In 2017, the national real labor force human capital was 2.39 times that that of the rural stock.

Table 6.3.3 National Nominal and Real Labor Force Human Capital by Region

Year	Nominal labor force human capital			Real labor force human capital (Billions of 1985 Yuan)		
	National	Urban	Rural	National	Urban	Rural
1985	15434	5946	9488	15434	5946	9488
1986	18010	7285	10725	16917	6808	10109
1987	21315	9090	12225	18658	7808	10850
1988	25740	11277	14463	18950	8025	10924
1989	30472	13805	16668	19000	8447	10553
1990	35845	16655	19190	21687	10061	11626
1991	41657	19466	22191	24330	11188	13142
1992	47090	22099	24990	25832	11696	14136
1993	53362	25165	28197	25499	11471	14028
1994	60285	28714	31571	23200	10471	12728

Year	Nominal labor force human capital			Real labor force human capital (Billions of 1985 Yuan)		
	National	Urban	Rural	National	Urban	Rural
1995	68729	33369	35360	22551	10419	12132
1996	79722	40252	39471	24102	11551	12551
1997	90633	47673	42960	26597	13270	13328
1998	104817	57375	47442	30933	16067	14866
1999	120513	68859	51654	35969	19536	16433
2000	141032	84529	56503	41785	23792	17994
2001	155201	94022	61179	45608	26280	19328
2002	167424	102873	64551	49519	29044	20475
2003	183166	113896	69270	53496	31870	21626
2004	199230	126413	72817	55934	34242	21692
2005	224015	147364	76651	61631	39288	22343
2006	260796	171890	88905	70682	45150	25532
2007	290543	193433	97109	75080	48621	26459
2008	324931	218291	106640	79242	51959	27283
2009	367467	250970	116498	90150	60252	29898
2010	426573	299660	126914	101150	69710	31439
2011	475739	337455	138284	106934	74552	32383
2012	506008	361414	144594	110780	77746	33035
2013	545261	390795	154466	118487	84154	34333
2014	587955	422382	165573	124803	88651	36151
2015	647933	468534	179400	135552	96885	38668
2016	684284	492759	191525	140309	99798	40511
2017	725273	518412	206861	146432	103239	43194

Figure 6.3.3 shows the trends of real labor force human capital for urban and rural areas, respectively. Before 1998, the real labor force human capital for the rural regions was higher than that for urban areas. After 1998, the real labor force human capital for urban areas increased more rapidly than that for rural areas, resulting in an increasing rural-urban gap. The reasons, as discussed previously include urbanization, migration and the education gap between the urban and rural populations.

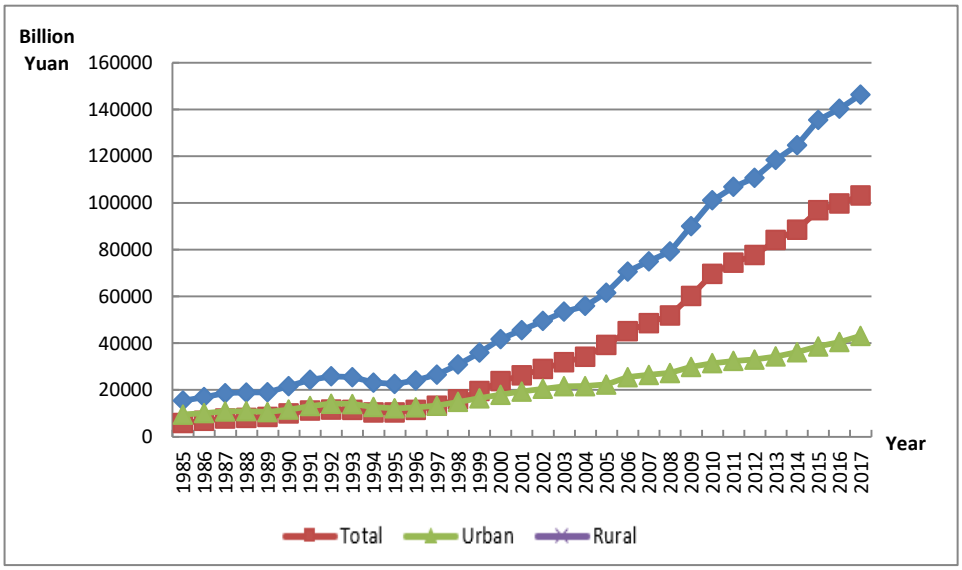


Figure 6.3.3 National Real Labor Force Human Capital by Region, 1985-2017

Figure 6.3.4 shows the national ratio of labor force human capital to total human capital by six education categories. The ratio reflects age structures as human capital for the young and often highly-educated population will be higher than that for the older and less-educated population. As is seen from the graph, before 1990, the ratio grew steadily, but it dropped dramatically after that, rebounding somewhat in 1998 and fluctuating subsequently. The overall decreasing trend may indicate that the proportion of young generation in total population is getting smaller, and the aging population phenomenon becomes dominant. This may reflect the constraints on future productivity growth in China.

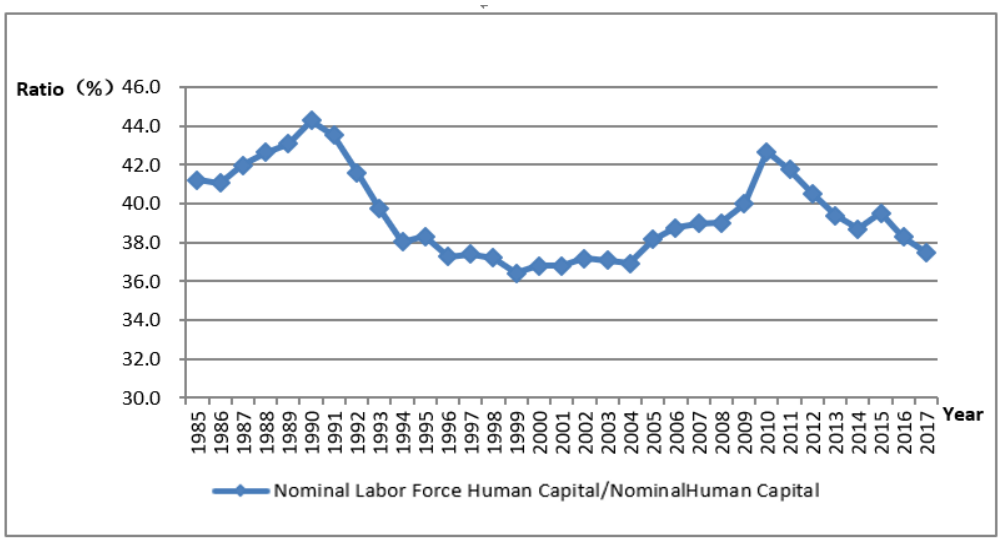


Figure 6.3.4 National Ratio of Labor Force Human Capital to Total Human Capital, 1985-2017

6.3.2 Average labor force human capital

To analyze the dynamic trends of the national labor force human capital more precisely, we calculate the average labor force human capital, in which the average labor force human capital is national labor force human capital divided by the number of the population that are over 16 years old, non-retired and out of school.

Table 6.3.4 shows that the average labor force human capital in nominal and real terms. The real values in this table are calculated by deflating the nominal values with the CPI using 1985 as the base year. The nominal results based on both education categories are increasing year by year; the real results based on both education categories are increasing in most years.

Table 6.3.4 National Nominal and Real Average Labor Force Human Capital

Year	Nominal average labor force human capital （Thousands of Yuan）	Real average labor force human capital （Thousands of 1985 Yuan）
1985	28.05	28.05

Year	Nominal average labor force human capital (Thousands of Yuan)	Real average labor force human capital (Thousands of 1985 Yuan)
1986	32.08	30.13
1987	36.89	32.29
1988	42.53	31.31
1989	48.89	30.49
1990	56.10	33.94
1991	63.21	36.92
1992	70.84	38.86
1993	79.37	37.93
1994	88.88	34.21
1995	99.60	32.68
1996	113.03	34.17
1997	129.14	37.90
1998	147.84	43.63
1999	167.86	50.10
2000	192.44	57.02
2001	209.32	61.51
2002	227.95	67.42
2003	248.61	72.61
2004	271.27	76.16
2005	301.27	82.89
2006	340.13	92.18
2007	382.06	98.73
2008	424.70	103.57
2009	476.28	116.84
2010	539.17	127.85
2011	591.90	133.05
2012	646.07	141.44
2013	698.56	151.80
2014	756.34	160.55
2015	824.64	172.52
2016	879.38	180.31
2017	943.98	190.59

Tables 6.3.5 and 6.3.6 report the average labor force human capital by gender and by region separately. From 1985-2017, the nominal and real average labor force human capital exhibit upward trends.

Table 6.3.5 National Nominal and Real Average Labor Force Human Capital by Gender

Year	Nominal average labor force human capital (Thousands of Yuan)			Real average labor force human capital (Thousands of 1985 Yuan)		
	National	Male	Female	National	Male	Female
1985	28.05	28.05	28.05	28.05	28.05	28.05
1986	32.08	33.58	30.43	30.13	31.51	28.62
1987	36.89	40.11	33.38	32.29	35.01	29.33
1988	42.53	47.18	37.39	31.31	34.59	27.68
1989	48.89	55.10	41.96	30.49	34.29	26.23
1990	56.10	64.25	46.93	33.94	38.87	28.40
1991	63.21	73.71	51.47	36.92	43.01	30.10
1992	70.84	84.08	56.15	38.86	46.07	30.86
1993	79.37	95.89	61.14	37.93	45.79	29.26
1994	88.88	109.05	66.91	34.21	41.97	25.74
1995	99.60	123.68	73.62	32.68	40.62	24.12
1996	113.03	141.75	81.82	34.17	42.92	24.67
1997	129.14	163.64	91.18	37.90	48.10	26.67
1998	147.84	188.58	102.75	43.63	55.77	30.19
1999	167.86	214.22	116.39	50.10	64.12	34.54
2000	192.44	246.80	131.84	57.02	73.35	38.81
2001	209.32	269.41	143.00	61.51	79.44	41.73
2002	227.95	294.95	154.33	67.42	87.51	45.35
2003	248.61	322.20	168.20	72.61	94.38	48.82
2004	271.27	351.42	184.68	76.16	98.92	51.57
2005	301.27	390.12	205.79	82.89	107.57	56.36
2006	340.13	440.03	231.24	92.18	119.50	62.41
2007	382.06	491.13	261.25	98.73	127.11	67.30
2008	424.70	542.32	292.57	103.57	132.40	71.19
2009	476.28	605.37	329.57	116.84	148.61	80.74

Year	Nominal average labor force human capital (Thousands of Yuan)			Real average labor force human capital (Thousands of 1985 Yuan)		
	National	Male	Female	National	Male	Female
2010	539.17	681.43	375.56	127.85	161.63	89.00
2011	591.90	749.25	410.25	133.05	168.41	92.22
2012	646.07	818.89	445.85	141.44	179.22	97.68
2013	698.56	886.86	480.23	151.80	192.65	104.43
2014	756.34	965.17	514.90	160.55	204.73	109.46
2015	824.64	1055.49	557.74	172.52	220.59	116.94
2016	879.38	1123.80	599.80	180.31	230.11	123.35
2017	943.98	1202.20	649.32	190.59	242.27	131.62

Table 6.3.6 reports the real average labor force human capital by region. The growth for urban region is much higher than that for rural and the urban-rural gap widens significantly. The average labor force human capital for urban areas was always higher than that for rural areas during 1985-2017.

Table 6.3.6 National Nominal and Real Average Labor Force Human Capital by Region

Year	Nominal average labor force human capital (Thousands of Yuan)			Real average labor force human capital (Thousands of 1985 Yuan)		
	National	Urban	Rural	National	Urban	Rural
1985	28.05	43.91	22.91	28.05	43.91	22.91
1986	32.08	51.74	25.51	30.13	48.36	24.05
1987	36.89	60.91	28.51	32.29	52.32	25.30
1988	42.53	70.46	32.46	31.31	50.14	24.52
1989	48.89	80.97	36.78	30.49	49.55	23.28
1990	56.10	93.23	41.63	33.94	56.32	25.22
1991	63.21	105.27	46.74	36.92	60.51	27.68
1992	70.84	118.34	52.22	38.86	62.63	29.54
1993	79.37	133.76	58.17	37.93	60.97	28.94
1994	88.88	150.21	64.70	34.21	54.78	26.08
1995	99.60	167.97	71.78	32.68	52.45	24.63
1996	113.03	188.48	80.07	34.17	54.09	25.46
1997	129.14	230.45	89.60	37.90	64.14	27.80

Year	Nominal average labor force human capital (Thousands of Yuan)			Real average labor force human capital (Thousands of 1985 Yuan)		
	National	Urban	Rural	National	Urban	Rural
1998	147.84	264.00	100.16	43.63	73.93	31.39
1999	167.86	296.78	110.92	50.10	84.20	35.29
2000	192.44	306.80	122.75	57.02	86.35	39.09
2001	209.32	326.16	134.21	61.51	91.16	42.40
2002	227.95	349.66	145.83	67.42	98.72	46.26
2003	248.61	374.99	159.06	72.61	104.93	49.66
2004	271.27	401.92	172.18	76.16	108.87	51.29
2005	301.27	437.87	186.55	82.89	116.74	54.38
2006	340.13	487.75	212.81	92.18	128.12	61.12
2007	382.06	542.19	238.71	98.73	136.28	65.04
2008	424.70	596.85	264.84	103.57	142.07	67.76
2009	476.28	662.40	293.50	116.84	159.03	75.32
2010	539.17	745.85	321.52	127.85	173.51	79.65
2011	591.90	814.28	350.38	133.05	179.89	82.05
2012	646.07	875.39	384.37	141.44	188.31	87.82
2013	698.56	931.14	421.36	151.80	200.51	93.66
2014	756.34	987.10	464.14	160.55	207.18	101.34
2015	824.64	1051.96	514.03	172.52	217.53	110.79
2016	879.38	1108.54	561.05	180.31	224.51	118.67
2017	943.98	1168.07	626.63	190.59	232.61	130.84

6.4 International comparison

The Jorgenson-Fraumeni lifetime earnings approach is now used by the World Bank in its Changing Wealth of Nation's series to measure human capital for 141 countries (Lange, Wodon, and Carey, 2018). Table 6.4.1 shows the ratio of labor force human capital to GDP by category, where the human capital and GDP estimates are the web published World Bank figures. The category figures are created by weighting individual country ratios by the share of the

population in the country in total population for the category. If human capital and GDP figures are added across countries, as opposed to being population weighted, a number of country figures would be under-estimated relative to figures for the United States. An alternative approach is to use Purchasing Power Parities (PPIs) adequately reflect the differential buying power of country currencies. For example, PPI adjusted human capital and GDP figures between 1995 and 2014 for China are 2.7 to 3.5 times higher than those in local currency units, which are converted to constant 2014 US dollars (PPI source: online OECD data). Population weights are used in table 6.4.1 as PPIs are not available for a number of the 141 countries or only for certain years. The human capital to GDP ratios are calculated in constant 2014 US dollars, but since the GDP deflator is applied to nominal human capital to construct constant 2014 US dollar human capital in the World Bank report, nominal ratios are identical to 2014 constant US dollar ratios. The percent that each category's population is in the total population for all 141 countries is indicated in the table.

The 141 countries account for 93 percent of World Bank web published world population estimates in all five years shown, those for which World Bank human capital is available. World Bank human capital income is constructed for individuals aged 15 to 65 (Lange, Wodon, and Carey, 2018, p. 118). All categories, with the exception of Europe & Central Asia, experience a decrease in the ratio between 1995 and 2014, but the decrease is not always monotonic. China and India, who have larger populations than any other country, both experience a significant decline in the ratio over time.

Table 6.4.1 Population Weighted Ratio of Labor Force Human Capital to GDP

Country Category	1995	2000	2005	2010	2014	# of countries
Advanced	11.2	11.0	10.4	10.2	10.2	23
	17%	16%	16%	15%	15%	
East Asia & the Pacific	12.4	10.7	7.7	8.0	7.9	14
	32%	31%	31%	30%	30%	

Country Category	1995	2000	2005	2010	2014	# of countries
Europe & Central Asia	5.8	5.9	5.9	6.5	6.3	24
	7%	6%	6%	5%	5%	
Latin America & the	9.1	9.1	8.7	8.4	8.2	22
Caribbean	9%	9%	9%	9%	9%	
Middle East & North	5.7	5.5	5.5	5.4	5.6	16
Africa	3%	3%	4%	4%	4%	
South Asia	7.0	7.2	7.2	6.4	6.3	6
	23%	24%	24%	25%	25%	
Sub-Saharan Africa	8.1	7.8	7.3	7.5	8.0	36
	10%	10%	11%	12%	13%	
141 countries	9.6	9.0	7.9	7.7	7.7	141
	100%	100%	100%	100%	100%	

Table Note:The Advanced category includes: Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Greece; Iceland; Ireland; Italy; Japan; Luxembourg; Netherlands, Norway, Portugal; Spain; Sweden; Switzerland; Turkey; United Kingdom; and United States.

The Europe & Central Asia category includes: Albania; Armenia; Azerbaijan; Belarus; Bosnia & Herzegovina; Bulgaria; Croatia; Estonia; Georgia; Hungary; Kazakhstan; Kyrgyz Republic; Latvia; Lithuania; Macedonia; Moldova; Poland; Romania; Russian Federation; Slovak Republic; Slovenia; Tajikistan; Turkmenistan; and Ukraine.

The Latin American & the Caribbean category includes: Argentina; Belize; Bolivia; Brazil; Chile; Colombia; Costa Rica; Dominican Republic; Ecuador; El Salvador; Guatemala; Guyana; Haiti; Honduras; Jamaica; Mexico; Nicaragua; Panama; Paraguay; Peru; Uruguay; and Venezuela, RB. Haiti is missing online World Bank data for GDP in 1995, accordingly it is not included in the ratios for 1995.

The Middle East & North America category includes: Bahrain; Egypt; Arab Republic; Iraq; Jordan; Kuwait; Malta; Morocco; Qatar; Saudi Arabia; Tunisia; United Arab Emirates; Yemen, Republic; Djibouti; Lebanon; Oman; and West Bank and Gaza. Qatar is missing online World Bank data for GDP in 1995, accordingly it is not included in the ratios for 1995.

The South Asia category includes: Bangladesh; India; Maldives; Nepal; Pakistan; and Sri Lanka. Haiti is missing online World Bank data for GDP in 1995 and 2000, accordingly it is not included in the ratios for 1995 and 2000.

The Sub-Saharan category includes: Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Comoros; Congo, Democratic Republic; Congo, Republic; Cote d'Ivoire; Ethiopia; Gabon; Gambia, The; Ghana; Guinea; Kenya; Liberia; Madagascar;

Malawi; Mali; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; Senegal; Sierra Leone; South Africa; Swaziland; Tanzania; Togo; Uganda; Zambia; and Zimbabwe.

Lange, Glenn-Marie, Quentin Wodon, and Kevin Carey 2018), The Changing Wealth of Nations 2018: Building a Sustainable Future, Washington, DC: The World Bank.

6.5 Human capital, GDP, and physical capital

Human capital estimates are based on the Mincer equation parameter estimates and the population imputation data, with 4.58% as the discount rate using J-F method, as described in preceding chapters. Before 2000, five-education categories were reported by the National Bureau of Statistics of China. They are: no school, elementary school, junior middle school, senior middle school, and college and above. Starting from 2000, college and above was further divided into two categories: three-year college, and four-year university and above.[31] With this more detailed information on educational attainment, we create a separate human capital series starting from 2000.[32]

As shown in Figure 6.5.1 and Figure 6.5.2, China's human capital stock is much larger than its physical capital stock, about 7 to 24 times the amount of physical capital. This is not surprising, given that in most other countries human

[31] When we estimate the Mincer equation to generate annual earnings, we assign 15 years of schooling for the category three-year college; and assign 16 years of schooling for the category four-year university and above. Because we use the lower bound of schooling for this latter education category, the amount of human capital is underestimated.

[32] We report the results based on six education categories from 1985-2015. Please see appendix C.7.

capital accounts for over 60% of national wealth.[33] The nominal ratio of human capital to physical capital, (the latter as measured by Holz), decreases in almost all years, but the rate of decrease slows down after 1996. Whether the more rapid growth of the physical capital stock than of the human capital indicates "overinvestment" in physical capital is beyond the scope of our study.

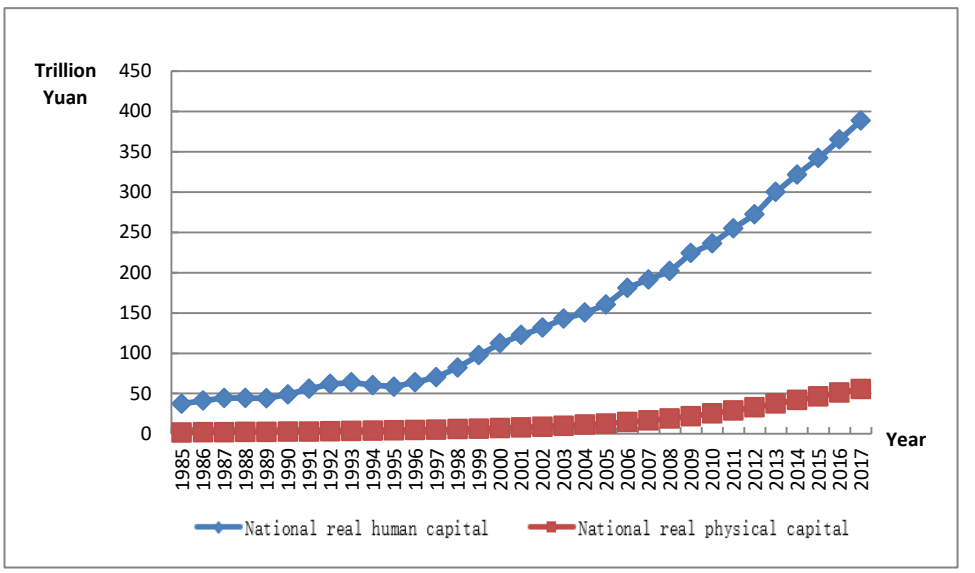


Figure 6.5.1 Human Capital and Physical Capital , 1985-2017

[33] World Bank (1997). The World Bank wealth estimates include physical capital, World Bank (1997). The World Bank wealth estimates include physical capital, natural resources, and other forms of intangible capital besides human capital.

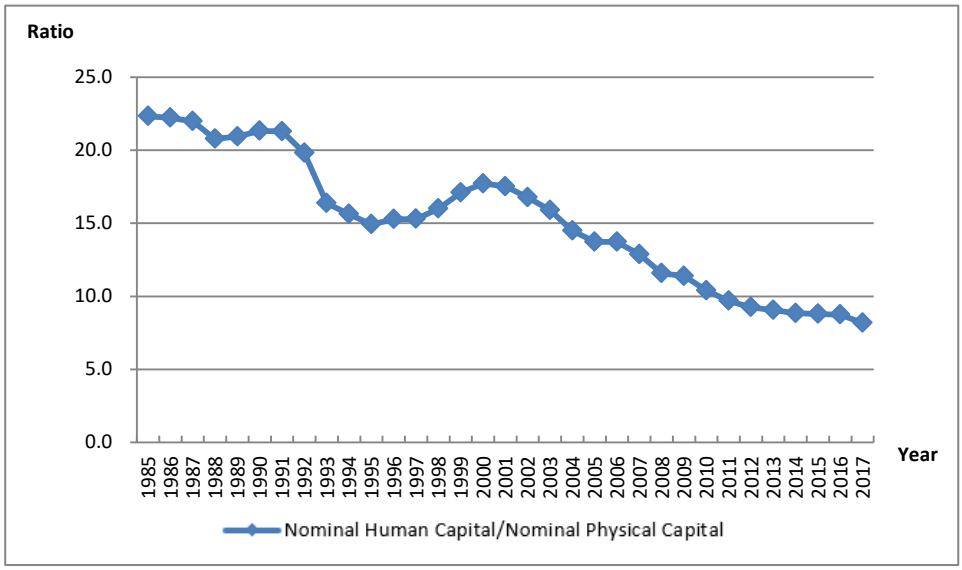


Figure 6.5.2 Human Capital and Physical Capital Ratio, 1985-2017

Chapter 7 Cross-province Comparison

By comparing the stocks of human capital across provinces and over time, we gain some understanding of the cross-section paths of economic progress and hope to gain further understanding of their causes. Our comparison is based on calculation of total provincial human capital and provincial labor force capital constructed using J-F method (see Appendix C results). We also construct two additional indicators: the provincial real human capital per capita and provincial real labor force human capital per capita. The definitions of these real stocks are as follows:

Real human capital per capita=real human capital/ population

Real labor force human capital per capita= real labor force human capital / labor force population

Where the real human capital stocks are the nominal stocks deflated by a cost of living index.

7.1 Cross-province human capital comparison

2017 6-education category nominal provincial human capital stocks are shown in figure 7.1.1. Current year human capital is the nominal human capital adjusted by living cost and expressed in current-year prices for each province. The provinces are shown in descending order of their 2017 total human capital stocks. Shandong is the highest-ranked province in terms of total real human capital, followed by Jiangsu; Tibet ranks the lowest. Notable features of the differences across provinces are: (1) Population plays a dominant role in influencing total human capital, in spite of other provincial differences in educational attainment, age structure, and income level. Provinces with larger populations such as Shandong, Jiangsu, Zhejiang and Henan rank relatively

higher. (2) Provinces at the top rank of human capital per capita (figure 7.1.3), such as Shanghai and Beijing, also rank high in terms of total stock but their total human wealth is magnified by differences in their education levels and age structure.

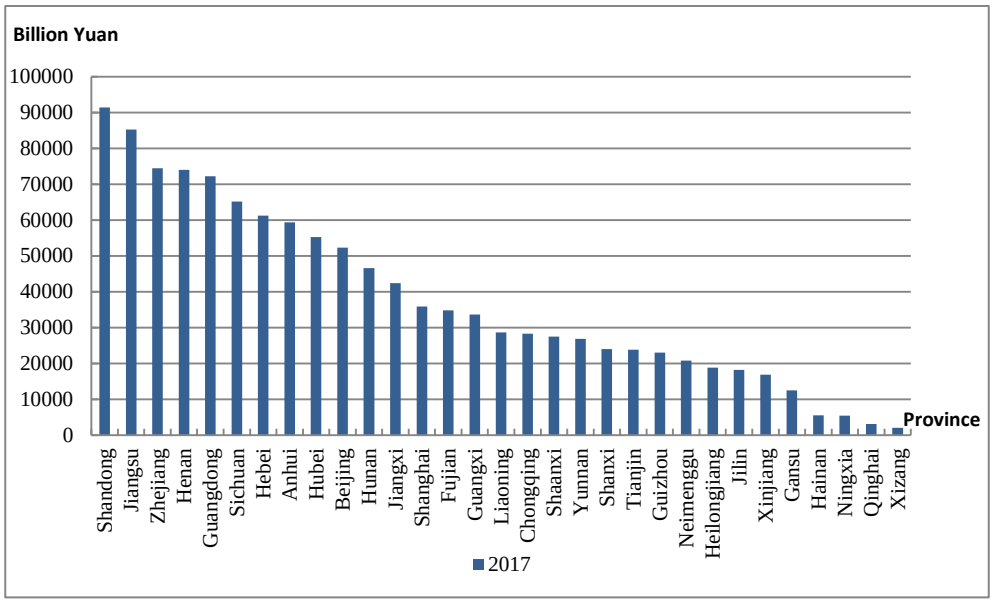


Figure 7.1.1 Provincial Current Year Human Capital in 2017

Figure 7.1.2 presents the provincial comparison of real human capital in 1985 prices. Real human capital is created by deflating nominal human capital by a living cost index based on Brandt and Holz (2006).[34,35]We use their living cost index and update it over time using provincial CPI's to construct a deflator that is comparable across provinces and over time. The ranking of real human capital is similar to the nominal ranking: Shandong has the largest real human capital, followed by Jiangsu; Tibet ranks the lowest.

[34] Brandt Loren, Holz Carsten, 2006. Spatial price differences in China: estimates and implications. Economic Development and Cultural Change 55, 43–86.

[35] Specifically, the living cost index we use here is based on a package of commodities of 1985 in Beijing, other provinces and years are adjusted correspondingly.

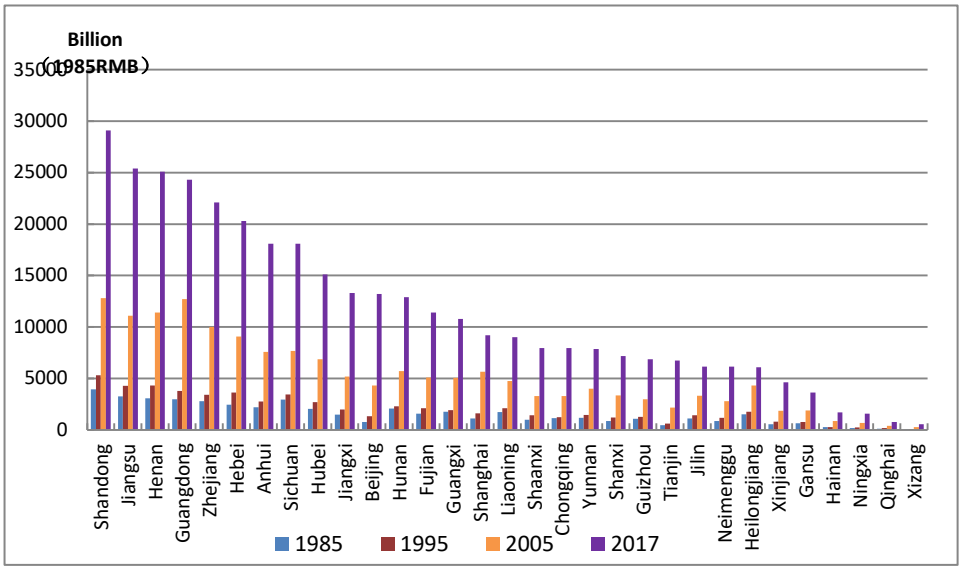


Figure 7.1.2 Provincial Real Human Capital

Figure 7.1.3 shows the provincial comparison of real human capital per capita. The provincial ranking of real human capital per capita is obviously different from that of total provincial real human capital, with Shanghai, Beijing and Tianjin ranking as the top three and Qinghai at the bottom. The per-capita human capital ranking presents a good picture of the inequality of the development stage of the provinces. The ranking is influenced by education level and population structure. More importantly, at this stage of China's economic development, regional inequality in potential earnings has led to clustering of educated workers in the provinces where their earnings potential is highest.

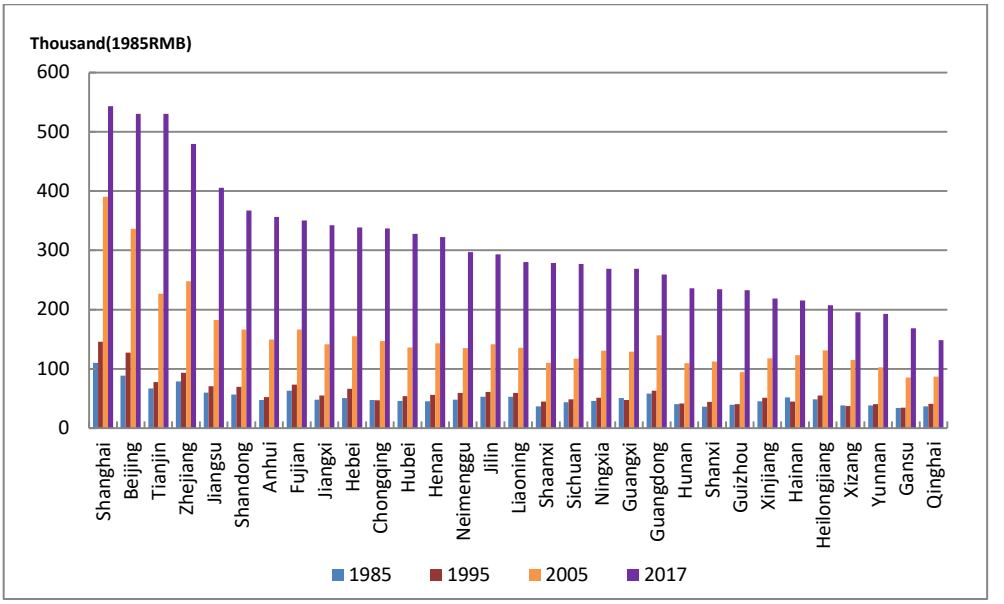


Figure 7.1.3 Provincial Real Human Capital Per Capita

7.2 Cross-province labor force human capital comparison

Provincial real labor force human capital is displayed in figure 7.2.1. Overall, Shandong has the largest real labor force human capital, followed by Guangdong and Jiangsu; Tibet has the least. The provincial rankings by real labor force human capital ranking can differ from their ranking based on total human capital because of the different sizes of the provincial labor forces relative to their populations.

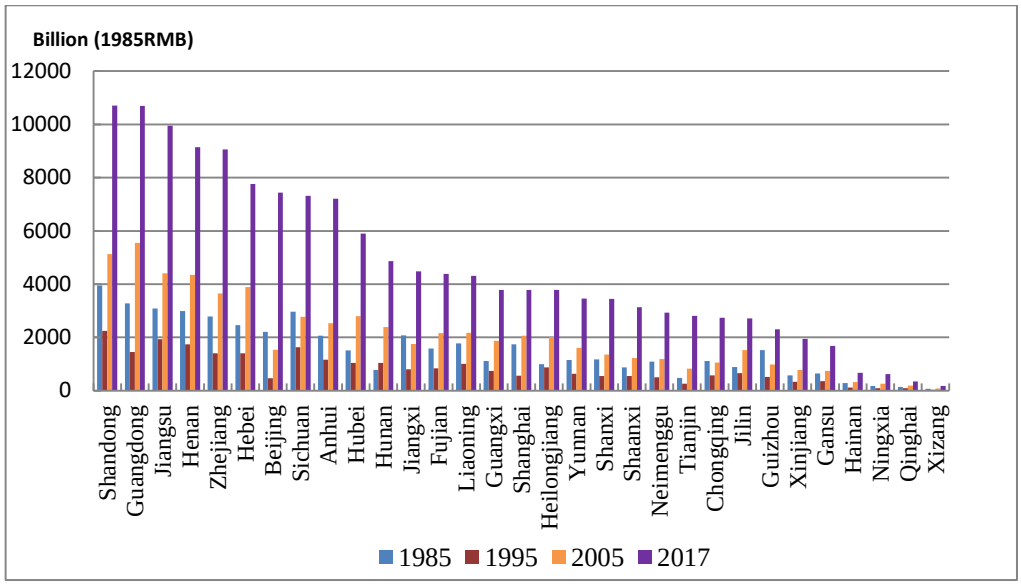


Figure 7.2.1 Provincial Real Labor Force Human Capital

Figure 7.2.2 shows the provincial comparison for real labor force human capital per member of the labor force. Average labor force human capital rankings are almost the same as those for real human capital per capita: Beijing remains at the top, Tianjin and Shanghai follow; Tibet remains to be the last.

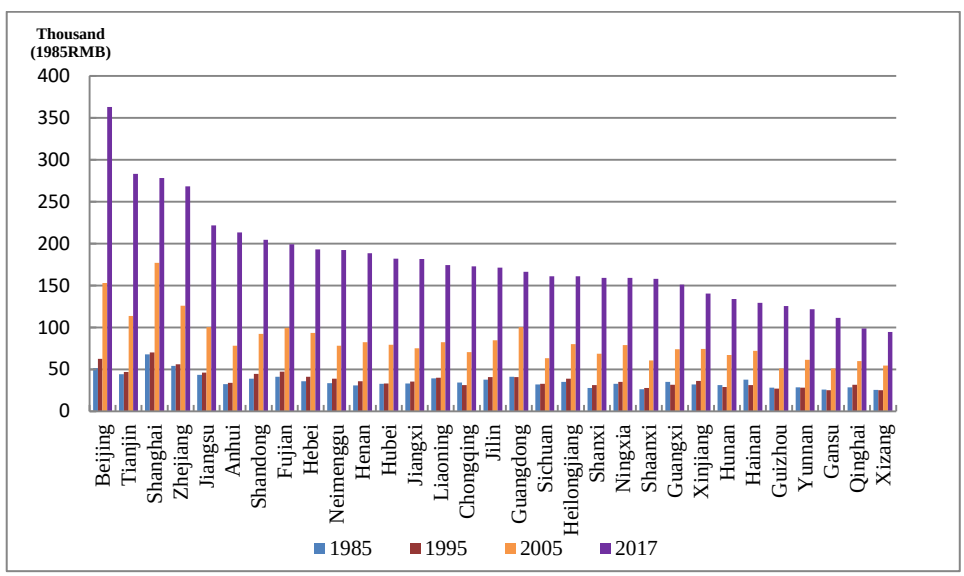


Figure 7.2.2 Provincial Real Average Labor Force Human Capital

7.3 Comparison of the human-capital measures across provinces.

Figure 7.3.1 presents the ratios of nominal labor force human capital to total nominal human capital by province. The ratios reflect age structures, as human capital of the young and more-educated population will be higher than that of the old and less-educated population. In general, for provinces with low ratios and relatively small proportion of young population, future development of the province might require inflows of working-age population from other provinces. The labor forces of more developed provinces tend to be more educated, tending to raise their ratios of labor-force to total human capital. In 2017, Heilongjiang ranks highest, followed by Beijing and Shanxi.

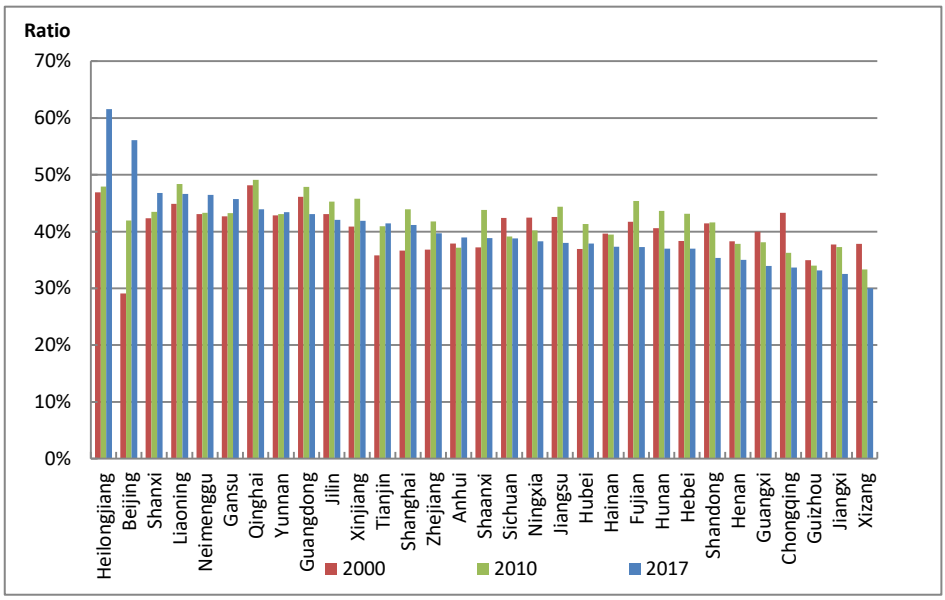


Figure 7.3.1 Ratio of Nominal Labor Force Human Capital to Total Nominal Human Capital

Figure 7.3.2 shows the ratios of provincial nominal GDP to nominal labor force human capital. Jiangsu ranks at the top in 2017, followed by

Chongqing, Shandong and Fujian; Beijing and Shanghai rank the last. These ratios reflect their persistent dispersion, and the continuing geographical disequilibrium in the allocation of labor and human capital in the Chinese economy.

Figure 7.3.3 shows the ratios of provincial nominal total human capital to nominal physical capital. Beijing ranks at the top in 2017, followed by Jiangxi, Anhui and Shanghai; Inner Mongolia and Qinghai rank the last. It is obvious that human capital accounts for more in the total provincial wealth than physical capital in the more developed provinces than the less developed ones.

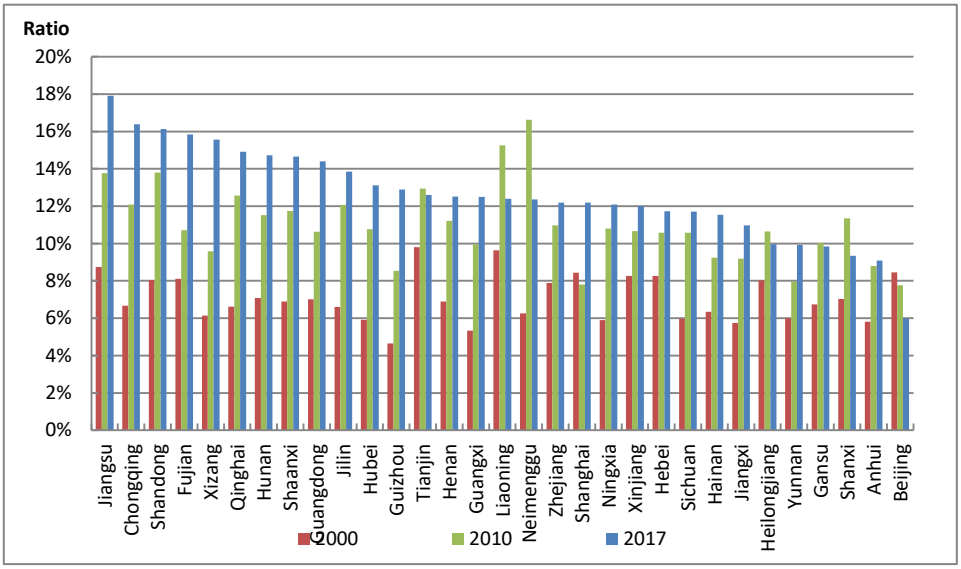


Figure 7.3.2 Ratio of Nominal GDP to Nominal Labor Force Human Capital

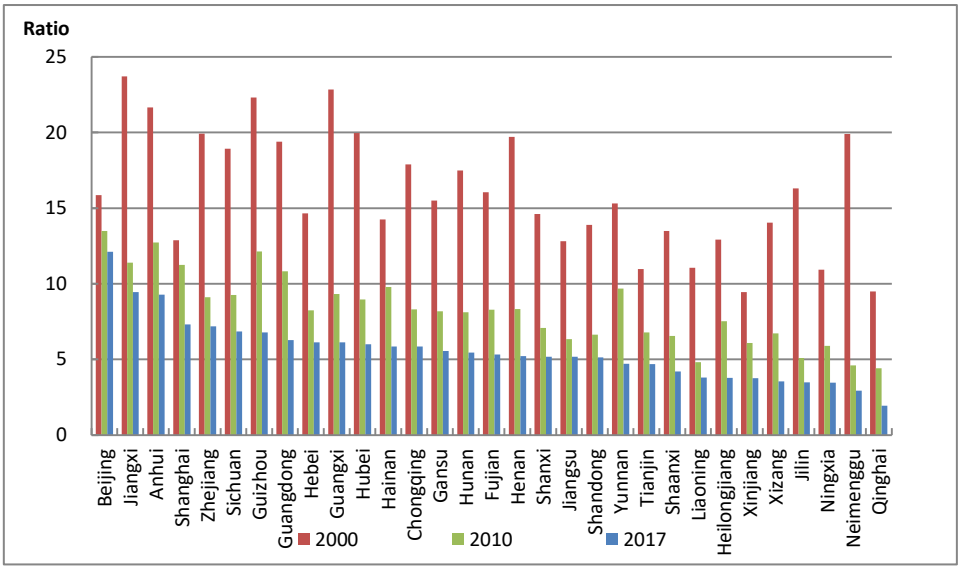


Figure 7.3.3 Ratio of Nominal Human Capital to Nominal Physical Capital

Chapter 8 Human Capital for Beijing

8.1 Total human capital

Table BJ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Beijing. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Beijing.

Table BJ-1.1 Real Physical Capital, Nominal and Real Human Capital for Beijing

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	755	755	42.7
1986	943	883	51.2
1987	1026	885	62.2
1988	1422	1019	75.4
1989	1643	1004	85.2
1990	2365	1371	98.5
1991	2898	1502	111.2
1992	3409	1607	127.5
1993	4105	1626	140.4
1994	4583	1454	159.6
1995	4928	1332	192.3
1996	6130	1485	221.8
1997	7306	1681	251.9
1998	8860	1991	287.4
1999	11188	2498	323.3
2000	13059	2817	363.8

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	14441	3023	410.3
2002	15890	3387	469.3
2003	17249	3669	543.7
2004	18930	3986	627.4
2005	20656	4285	721.2
2006	25484	5242	822.2
2007	30496	6125	934.3
2008	35615	6805	1036.4
2009	40986	7950	1149.1
2010	44317	8397	1295.8
2011	49512	8882	1432.4
2012	55221	9591	1600.1
2013	60653	10197	1767.4
2014	67676	11202	1936.9
2015	72579	11797	2118.9
2016	77633	12442	2351.2
2017	83543	13145	2603.7

8.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table BJ-2.1 presents human capital per capita for Beijing by region. From 1985 to 2017, the nominal human capital per capita increased from 86.2 thousand Yuan to 3.3 million Yuan, an increase of about 39 times; and the real human capital per capita increased from 86.2 thousand Yuan to 527.1 thousand Yuan, an increase of approximately 6 times.

Figure BJ-2.1 illustrates the trends of human capital per capita by gender for Beijing. The real human capital per capita of male is similar to that of female for Beijing. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

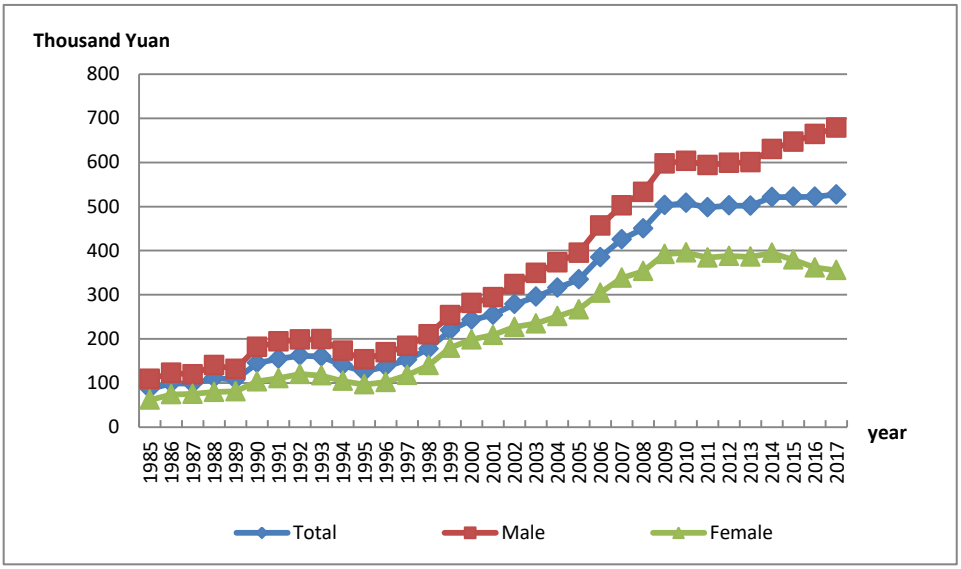


Figure BJ-2.1 Human Capital Per Capita by Gender for Beijing，1985-2017

Table BJ-2.1 Nominal and Real Human Capital Per Capita by Region for Beijing

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	86.22	114.45	36.44	86.22	114.45	36.44
1986	106.05	141.63	42.27	99.29	132.62	39.58
1987	113.75	149.70	48.60	98.08	129.07	41.90
1988	155.00	202.15	56.86	111.01	144.76	40.72
1989	176.38	222.65	65.65	107.78	136.04	40.11
1990	250.19	313.57	75.50	145.05	181.78	43.77
1991	298.59	374.59	85.14	154.70	194.06	44.11

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	342.78	429.18	95.59	161.58	202.31	45.06
1993	403.76	505.48	107.12	159.95	200.23	42.43
1994	441.43	549.78	119.43	140.04	174.36	37.88
1995	465.32	570.93	131.41	125.82	154.37	35.53
1996	566.03	700.19	148.14	137.17	169.64	35.89
1997	662.29	817.37	166.87	152.39	188.06	38.39
1998	788.96	973.39	186.82	177.25	218.71	41.98
1999	980.57	1211.47	208.52	218.97	270.58	46.57
2000	1125.72	1386.72	231.88	242.87	299.24	50.04
2001	1214.92	1473.70	254.61	254.34	308.45	53.29
2002	1306.24	1560.90	277.54	278.41	332.69	59.16
2003	1388.19	1635.84	302.60	295.26	347.97	64.37
2004	1498.39	1744.53	331.20	315.49	367.41	69.76
2005	1612.04	1857.46	355.64	334.39	385.42	73.79
2006	1871.77	2146.11	395.85	384.99	441.34	81.41
2007	2118.81	2415.97	437.58	425.55	485.19	87.88
2008	2354.20	2671.42	481.29	449.79	510.46	91.97
2009	2592.27	2928.98	529.71	502.83	568.20	102.76
2010	2680.62	3013.16	571.90	507.90	570.83	108.34
2011	2776.40	3113.47	615.32	498.05	558.55	110.39
2012	2891.73	3236.12	665.30	502.27	562.01	115.54
2013	2985.36	3333.08	716.20	501.90	560.36	120.41
2014	3149.79	3512.72	769.03	521.35	581.26	127.25
2015	3209.56	3571.90	819.33	521.66	580.60	133.18
2016	3258.73	3618.77	849.94	522.27	580.10	136.25
2017	3349.99	3711.44	902.01	527.11	583.86	141.90

Figure BJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

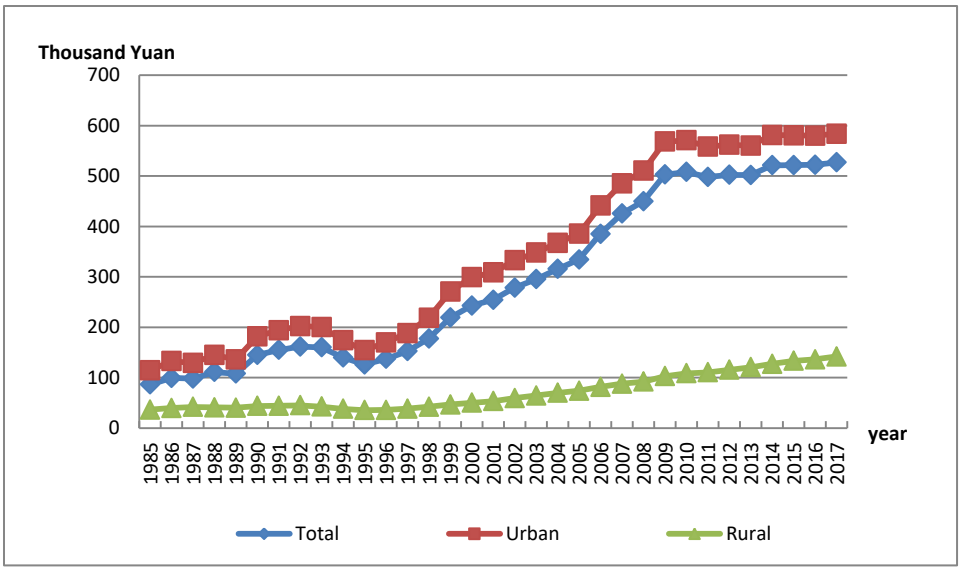


Figure BJ-2.2 Real Human Capital Per Capita by Region for Beijing, 1985-2017

8.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

8.3.1 Total labor force human capital

The total labor force human capital for Beijing is reported in Table

BJ-3.1 From 1985 to 2017, the nominal labor force human capital increased from 292 billion Yuan to 46.9 thousand billion Yuan, an increase of more than 160 times; and the real labor force human capital increased from 292 billion Yuan to 7.4 thousand billion Yuan, an increase of approximately 25 times.

Table BJ-3.1 Nominal and Real Labor Force Human Capital for Beijing

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	292	292
1986	346	324
1987	422	364
1988	536	384
1989	656	401
1990	800	463
1991	936	485
1992	1123	529
1993	1325	525
1994	1509	478
1995	1689	457
1996	1934	469
1997	2330	536
1998	2803	630
1999	3283	733
2000	3800	820
2001	4233	886
2002	4929	1050
2003	5749	1223
2004	6508	1371
2005	7284	1511
2006	9021	1856
2007	11154	2239
2008	13515	2582

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2009	16135	3129
2010	18595	3523
2011	22838	4097
2012	27315	4744
2013	31859	5355
2014	35860	5934
2015	39565	6432
2016	43400	6958
2017	46850	7370

8.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables BJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 49.9 thousand Yuan to 2.3 million Yuan, an increase of more than 47 times; and the real average labor force human capital increased from 49.9 thousand Yuan to 360.4 thousand Yuan, an increase of approximately 7 times.

Table BJ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Beijing

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	49.91	60.46	29.98	49.91	60.46	29.98
1986	58.15	70.12	34.68	54.45	65.66	32.48
1987	68.90	82.96	40.02	59.41	71.53	34.50

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1988	85.70	102.34	46.75	61.37	73.28	33.48
1989	103.14	121.23	53.68	63.03	74.07	32.80
1990	122.52	140.83	61.67	71.02	81.64	35.75
1991	139.25	161.25	68.91	72.14	83.53	35.70
1992	162.28	189.49	76.74	76.50	89.33	36.18
1993	187.04	219.32	85.57	74.08	86.88	33.90
1994	208.53	244.31	94.73	66.11	77.48	30.05
1995	228.37	264.92	102.63	61.74	71.63	27.75
1996	257.64	300.75	117.08	62.42	72.86	28.37
1997	299.86	419.30	136.66	68.97	96.47	31.44
1998	345.25	482.93	157.14	77.58	108.51	35.31
1999	389.62	545.87	177.86	87.02	121.92	39.72
2000	437.62	504.05	197.25	94.43	108.77	42.56
2001	479.81	550.17	217.03	100.42	115.15	45.43
2002	543.26	619.62	237.59	115.78	132.07	50.64
2003	612.19	692.80	260.85	130.20	147.37	55.49
2004	675.21	755.53	283.99	142.19	159.12	59.81
2005	736.89	815.88	306.58	152.90	169.29	63.61
2006	854.39	949.27	348.60	175.74	195.21	71.69
2007	986.93	1097.39	391.09	198.15	220.39	78.54
2008	1119.48	1241.15	435.90	213.85	237.16	83.29
2009	1261.97	1390.44	484.06	244.76	269.73	93.90
2010	1373.92	1506.62	529.52	260.31	285.42	100.32
2011	1559.35	1717.24	571.64	279.73	308.07	102.55
2012	1737.92	1918.14	620.98	301.81	333.12	107.84
2013	1899.95	2096.34	672.30	319.36	352.44	113.03
2014	2029.72	2231.28	724.17	335.87	369.22	119.83
2015	2143.00	2351.04	775.92	348.36	382.15	126.12

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
2016	2225.88	2444.67	808.26	356.86	391.89	129.57
2017	2291.22	2515.83	855.48	360.41	395.77	134.58

Chapter 9 Human Capital for Tianjin

9.1 Total human capital

Table TJ-1.1presents the estimates of nominal and real total human capital and real physical capital for Tianjin. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Tianjin.

Table BJ-1.1 Real Physical Capital, Nominal and Real Human Capital for Tianjin

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	473	473	31.5
1986	524	491	36.7
1987	612	537	41.8
1988	726	544	47.4
1989	848	555	51.6
1990	1052	668	55.5
1991	1208	696	61.9
1992	1367	707	68.4
1993	1558	685	75.3
1994	1789	634	84.5
1995	2010	618	94.9
1996	2320	655	106.9
1997	2684	735	120.2
1998	3064	843	136.0
1999	3694	1027	150.5
2000	4847	1354	166.4

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	5646	1558	185.4
2002	6194	1716	207.9
2003	6645	1822	236.6
2004	7458	1999	271.3
2005	8283	2188	312.6
2006	9882	2571	362.7
2007	11800	2946	425.1
2008	13753	3259	508.2
2009	15916	3809	635.3
2010	17338	4011	787.8
2011	19460	4290	964.5
2012	22195	4764	1152.5
2013	25067	5219	1362.1
2014	28009	5724	1596.9
2015	30314	6090	1794.2
2016	33179	6528	1975.6
2017	35605	6863	2141.5

9.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table TJ-2.1 presents human capital per capita for Tianjin by region. From 1985 to 2017, the nominal human capital per capita increased from 66.74 thousand Yuan to 2.92 million Yuan, an increase of more than 41 times; and the real human capital per capita increased from 66.74 thousand Yuan to 538.24 thousand Yuan, an increase of approximately

8 times.

Figure TJ-2.1 illustrates the trends of human capital per capita by gender for Tianjin. The real human capital per capita of male is similar to that of female for Tianjin. Both of them kept increasing from 1985 to 2017 and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

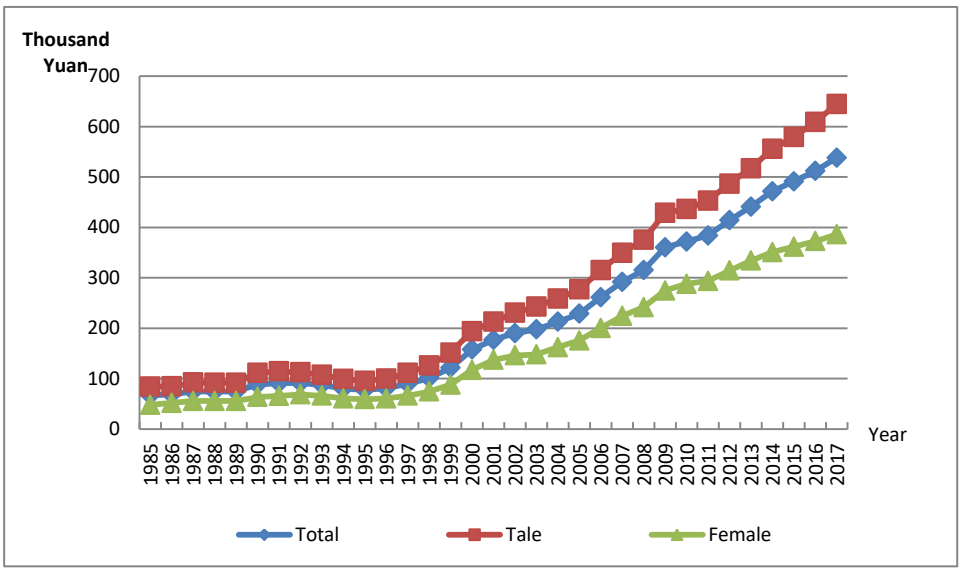


Figure TJ-2.1 Human Capital Per Capita by Gender for Tianjin，1985-2017

Table TJ-2.1 Nominal and Real Human Capital Per Capita by Region for Tianjin

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	66.74	78.64	39.41	66.74	78.64	39.41
1986	73.29	85.25	45.66	68.63	79.82	42.75
1987	84.88	98.90	52.36	74.44	86.71	45.91
1988	98.94	115.20	60.31	74.20	86.39	45.23
1989	113.79	132.30	68.77	74.40	86.50	44.97

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	139.13	163.63	78.25	88.32	103.87	49.67
1991	157.76	184.22	90.48	90.89	106.12	52.12
1992	176.41	203.92	104.78	91.23	105.44	54.18
1993	199.08	228.90	119.77	87.56	100.65	52.66
1994	226.64	259.59	136.62	80.36	92.05	48.45
1995	251.98	287.67	153.35	77.51	88.47	47.16
1996	286.27	326.81	170.69	80.77	92.21	48.16
1997	326.41	372.11	192.75	89.34	101.84	52.75
1998	366.98	418.44	212.91	100.95	115.09	58.56
1999	435.53	500.77	235.29	121.13	139.27	65.44
2000	563.69	660.20	260.21	157.44	184.34	72.66
2001	640.54	751.18	286.58	176.73	207.26	79.07
2002	686.42	800.67	313.81	190.19	221.80	86.93
2003	720.26	834.65	340.32	197.53	228.93	93.34
2004	792.70	916.78	373.73	212.51	245.80	100.20
2005	864.64	998.05	406.77	228.42	263.64	107.45
2006	1003.56	1163.67	437.48	261.12	302.84	113.85
2007	1168.91	1357.08	482.72	291.86	338.94	120.56
2008	1329.00	1543.72	524.33	314.92	365.80	124.25
2009	1505.87	1748.62	571.71	360.41	418.54	136.84
2010	1606.43	1855.69	623.33	371.64	429.15	144.15
2011	1741.40	2000.05	661.93	383.92	440.93	145.93
2012	1929.11	2203.67	723.60	414.04	473.04	155.33
2013	2117.80	2408.05	783.53	440.92	501.37	163.14
2014	2307.78	2612.35	849.19	471.59	533.77	173.51
2015	2444.87	2747.93	930.05	491.13	552.08	186.85
2016	2601.82	2912.25	983.40	511.94	573.06	193.51
2017	2792.35	3121.68	1078.88	538.24	601.64	207.93

Figure TJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

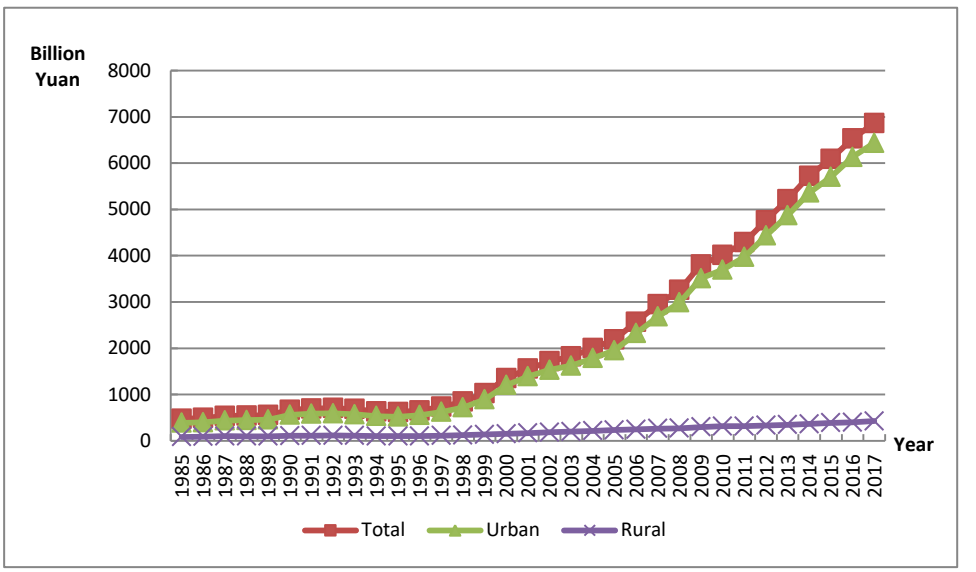


Figure TJ-2.2 Real Human Capital Per Capita by Region for Tianjin，1985-2017

9.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

9.3.1 Total labor force human capital

The total labor force human capital for Tianjin is reported in Table TJ-3.1 From 1985 to 2017, the nominal labor force human capital increased from 212 billion Yuan to 14,756 billion Yuan, an increase of more than 69 times; and the real labor force human capital increased from 212 billion Yuan to 2,845 billion Yuan, an increase of approximately 13 times.

Table TJ-3.1 Nominal and Real Labor Force Human Capital for Tianjin

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	212	212
1986	247	232
1987	288	253
1988	337	252
1989	392	256
1990	445	283
1991	514	296
1992	589	304
1993	667	293
1994	754	268
1995	846	260
1996	962	272
1997	1119	306
1998	1316	362
1999	1520	423
2000	1737	485
2001	1958	540
2002	2217	614
2003	2495	684
2004	2797	750
2005	3116	823

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2006	3706	965
2007	4432	1107
2008	5288	1253
2009	6225	1491
2010	7095	1641
2011	8080	1781
2012	9092	1952
2013	10227	2129
2014	11167	2282
2015	12411	2493
2016	13787	2713
2017	14756	2845

9.3.2 Average labor force human capital

he average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables TJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 44.12 thousand Yuan to 1.49 million Yuan, an increase of more than 33 times; and the Real average labor force human capital from 44.12 thousand Yuan to 288.18 thousand Yuan, an increase of approximately 6 times.

Table TJ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Tianjin

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	44.12	49.33	28.99	44.12	49.33	28.99
1986	50.87	56.86	33.62	47.64	53.24	31.48
1987	58.81	65.84	38.79	51.55	57.72	34.01
1988	67.10	75.01	44.63	50.32	56.25	33.47
1989	76.41	85.35	50.89	49.96	55.81	33.27
1990	85.18	94.56	57.89	54.08	60.03	36.75
1991	96.67	106.94	65.97	55.69	61.60	38.00
1992	109.18	120.37	74.91	56.45	62.24	38.74
1993	122.67	134.91	84.72	53.93	59.32	37.25
1994	137.78	151.14	95.63	48.87	53.59	33.91
1995	152.89	167.28	107.26	47.01	51.45	32.99
1996	171.18	186.93	119.91	48.30	52.74	33.83
1997	194.12	227.00	135.27	53.12	62.12	37.02
1998	220.65	258.12	151.81	60.67	70.99	41.76
1999	247.23	289.70	168.03	68.74	80.57	46.73
2000	275.10	299.94	184.50	76.79	83.75	51.52
2001	301.65	328.35	205.21	83.21	90.60	56.62
2002	330.99	360.50	226.06	91.68	99.87	62.62
2003	361.96	393.85	248.35	99.27	108.02	68.12
2004	396.48	430.86	271.44	106.27	115.52	72.78
2005	431.78	468.35	295.38	114.05	123.71	78.02
2006	495.91	539.41	334.95	129.06	140.38	87.17
2007	571.40	624.47	371.76	142.73	155.97	92.85
2008	654.38	717.46	408.08	155.04	170.01	96.70
2009	745.72	817.61	447.68	178.55	195.70	107.16
2010	823.22	900.34	485.78	190.44	208.21	112.34
2011	918.13	1004.35	528.81	202.40	221.42	116.58

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
2012	1014.32	1106.26	576.52	217.75	237.47	123.76
2013	1111.77	1210.16	623.56	231.49	251.96	129.83
2014	1189.30	1289.33	670.90	243.06	263.44	137.08
2015	1286.57	1387.46	725.66	258.45	278.75	145.79
2016	1392.64	1500.91	771.46	273.99	295.35	151.81
2017	1494.93	1608.43	838.13	288.18	309.99	161.53

Chapter 10 Human Capital for Hebei

10.1 Total human capital

Table HeB-1.1 presents the estimates of nominal and real total human capital and real physical capital for Hebei. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Hebei.

Table HeB-1.1 Real Physical Capital, Nominal and Real Human Capital for Hebei

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1973	1973	76.3
1986	2295	2173	83.5
1987	2730	2400	91.6
1988	3158	2353	101.4
1989	3724	2314	109.9
1990	4315	2673	118.4
1991	4998	2994	129.2
1992	5749	3257	142.4
1993	6575	3284	157.0
1994	7495	3063	175.4
1995	8432	2981	200.1
1996	9636	3172	232.2
1997	10988	3487	270.2
1998	12511	4025	313.2
1999	14034	4597	359.3
2000	15921	5215	402.2
2001	17638	5735	446.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	19132	6253	491.1
2003	20743	6621	548.0
2004	22758	6951	620.8
2005	25520	7649	723.1
2006	28510	8372	840.0
2007	31890	8920	976.4
2008	35930	9426	1154.7
2009	40100	10569	1353.0
2010	44230	11293	1561.5
2011	50090	12068	1824.6
2012	55690	13054	2105.1
2013	60280	13715	2393.3
2014	65600	14659	2679.0
2015	70840	15686	2954.5
2016	76820	16736	3242.5
2017	82970	17750	3491.5

10.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table HeB-2.1 presents human capital per capita for Hebei by region. From 1985 to 2017, the nominal human capital per capita increased from 40.8 thousand Yuan to 1.4 million Yuan, an increase of more than 34 times; and the real human capital per capita increased from 40.8 thousand Yuan to 295.3 thousand Yuan, an increase of approximately 7 times.

Figure HeB-2.1 illustrates the trends of human capital per capita by gender for Hebei. The real human capital per capita of male is similar to that of female for Hebei. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

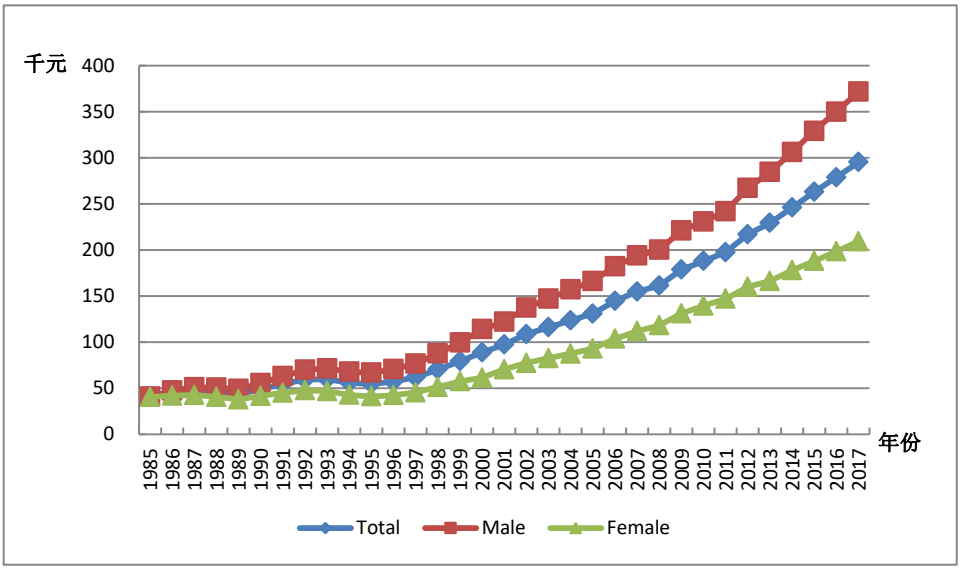


Figure HeB-2.1 Human Capital Per Capita by Gender for Hebei，1985-2017

Table HeB-2.1 Nominal and Real Human Capital Per Capita by Region for Hebei

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	40.80	71.95	34.88	40.80	71.95	34.88
1986	47.38	88.22	39.12	44.87	83.22	37.11
1987	53.64	99.90	43.82	47.17	87.11	38.71
1988	61.72	115.91	49.52	46.00	85.43	37.13
1989	70.49	132.29	55.94	43.81	84.13	34.33
1990	79.12	143.34	63.52	49.01	90.07	39.02

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	91.14	167.82	71.42	54.59	98.92	43.18
1992	104.97	196.28	80.32	59.47	106.64	46.74
1993	120.04	227.52	89.87	59.96	107.02	46.74
1994	137.23	262.17	100.38	56.08	98.74	43.50
1995	154.70	297.43	110.88	54.69	96.48	41.86
1996	174.11	335.20	122.33	57.32	101.05	43.24
1997	195.12	375.56	135.43	61.92	109.18	46.29
1998	218.75	424.15	148.64	70.37	124.93	51.79
1999	242.38	466.09	163.21	79.39	139.09	58.27
2000	271.40	526.62	178.96	88.90	156.37	64.47
2001	299.90	563.10	196.24	97.51	166.54	70.28
2002	332.54	612.30	212.99	108.69	183.66	76.66
2003	364.25	652.06	231.95	116.27	191.19	81.85
2004	404.77	710.36	254.14	123.63	200.85	85.57
2005	437.00	734.96	276.85	130.98	204.94	91.21
2006	492.67	812.28	306.43	144.67	222.71	99.27
2007	553.50	890.71	336.92	154.82	234.06	103.87
2008	614.65	968.93	368.92	161.25	242.03	105.21
2009	678.04	1044.00	406.20	178.71	263.88	115.46
2010	736.82	1098.87	443.67	188.13	270.13	121.71
2011	819.94	1229.14	472.46	197.55	286.94	121.71
2012	925.63	1378.22	517.39	216.97	313.40	130.08
2013	1008.16	1467.17	563.43	229.38	324.85	136.86
2014	1100.84	1572.85	616.68	245.99	342.43	147.15
2015	1187.82	1652.48	683.08	263.02	355.86	162.18
2016	1279.85	1767.43	719.19	278.83	374.98	168.23
2017	1380.29	1864.49	785.70	295.29	388.20	181.26

Figure HeB-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 2010, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

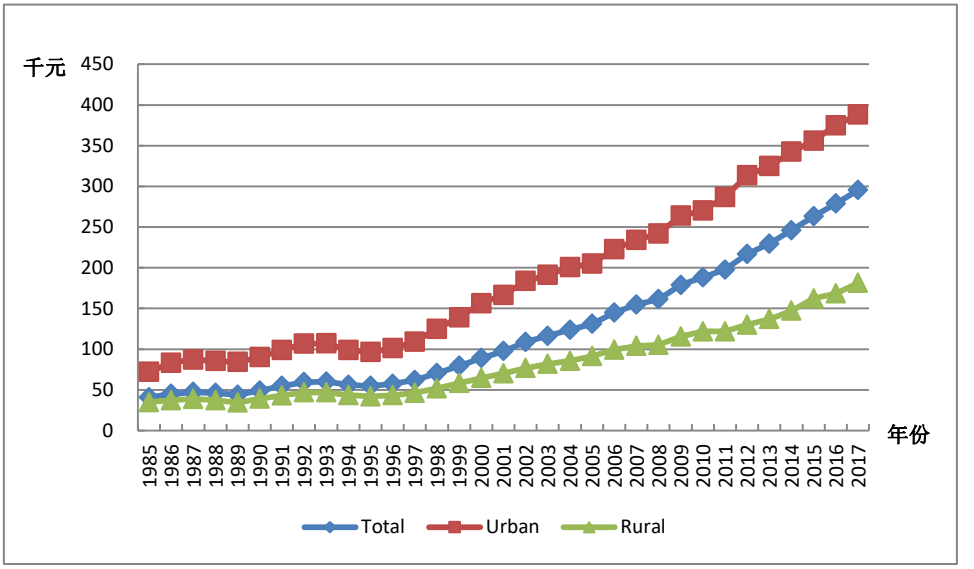


Figure HeB-2.2 Real Human Capital Per Capita by Region for Hebei，1985-2017

10.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

10.3.1 Total labor force human capital

The total labor force human capital for Hebei is reported in Table HeB-3.1 From 1985 to 2017, the nominal labor force human capital increased from 842 billion Yuan to 21.2 thousand billion Yuan, an increase of more than

36 times; and the real labor force human capital increased from 842 billion Yuan to 6.6 thousand billion Yuan, an increase of approximately 9 times.

Table HeB-3.1 Nominal and Real Labor Force Human Capital for Hebei

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	842	842
1986	955	905
1987	1159	1020
1988	1333	994
1989	1567	972
1990	1813	1122
1991	2051	1230
1992	2300	1309
1993	2572	1293
1994	2859	1183
1995	3171	1138
1996	3584	1200
1997	4073	1316
1998	4665	1531
1999	5320	1779
2000	6103	2045
2001	6781	2257
2002	7375	2471
2003	8014	2632
2004	8712	2738
2005	10395	3189
2006	11676	3512
2007	13086	3743
2008	14666	3918
2009	16545	4425

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	19080	4924
2011	21150	5148
2012	22275	5280
2013	23782	5464
2014	25418	5734
2015	27840	6218
2016	29130	6409
2017	30670	6634

10.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables HeB-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 28.5 thousand Yuan to 766.9 thousand Yuan, an increase of more than 27 times; and the real average labor force human capital increased from 28.5 thousand Yuan to 165.9 thousand Yuan, an increase of approximately 6 times.

Table HeB-3.2 Nominal and Real Average Labor Force Human Capital by Region for Hebei

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	28.51	46.58	25.10	28.51	46.58	25.10
1986	32.31	53.75	27.98	30.61	50.71	26.55
1987	36.85	62.46	31.20	32.42	54.46	27.56
1988	41.86	69.74	35.46	31.23	51.40	26.59
1989	47.23	77.75	39.97	29.31	49.44	24.53
1990	52.88	84.70	44.79	32.72	53.22	27.52
1991	59.63	95.52	50.12	35.75	56.31	30.30

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	67.15	108.93	55.96	38.20	59.18	32.57
1993	75.16	123.05	62.39	37.80	57.88	32.44
1994	83.97	137.04	69.49	34.73	51.61	30.11
1995	93.21	152.76	76.76	33.44	49.55	28.98
1996	103.63	169.69	84.65	34.68	51.16	29.92
1997	114.98	199.18	93.88	37.15	57.90	32.09
1998	127.95	220.26	104.33	42.00	64.88	36.36
1999	142.13	243.19	114.73	47.52	72.57	40.96
2000	157.72	250.27	126.39	52.86	74.31	45.53
2001	173.68	267.84	139.09	57.80	79.21	49.81
2002	190.38	288.97	152.53	63.79	86.68	54.90
2003	206.78	304.26	168.21	67.91	89.21	59.36
2004	224.68	319.03	184.65	70.61	90.21	62.17
2005	251.88	352.63	202.61	77.27	98.33	66.75
2006	284.22	393.57	227.66	85.49	107.91	73.75
2007	319.12	437.32	251.52	91.28	114.92	77.54
2008	352.65	478.37	275.75	94.21	119.49	78.64
2009	392.38	528.08	302.74	104.94	133.48	86.05
2010	442.04	590.17	328.20	114.08	145.08	90.03
2011	485.03	649.36	353.63	118.06	151.59	91.10
2012	527.04	699.21	382.58	124.93	159.00	96.19
2013	571.63	745.23	412.89	131.33	165.01	100.30
2014	617.11	791.54	446.83	139.21	172.33	106.62
2015	672.10	845.57	486.40	150.11	182.09	115.49
2016	716.09	892.15	524.79	157.55	189.28	122.76
2017	766.92	939.51	572.12	165.89	195.61	131.98

Chapter 11 Human Capital for Shanxi

11.1 Total human capital

Table SX-1.1 presents the estimates of nominal and real total human capital and real physical capital for Shanxi. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Shanxi.

Table SX-1.1 Real Physical Capital, Nominal and Real Human Capital for Shanxi

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	727	727	43.4
1986	857	812	49.2
1987	973	858	54.6
1988	1160	846	58.5
1989	1358	827	61.3
1990	1558	929	64.3
1991	1819	1037	68.1
1992	2127	1133	72.0
1993	2476	1151	76.6
1994	2873	1066	81.9
1995	3277	1040	86.9
1996	3729	1096	92.3
1997	4234	1207	99.8
1998	4956	1429	110.9
1999	5543	1604	122.6
2000	6203	1723	134.9
2001	7221	2005	148.8

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	8260	2326	165.8
2003	9285	2561	188.1
2004	10397	2749	217.9
2005	11390	2939	256.4
2006	12773	3228	302.8
2007	14129	3408	358.6
2008	15429	3470	418.0
2009	16923	3822	503.8
2010	18418	4037	601.0
2011	20856	4342	715.6
2012	22946	4660	826.0
2013	24805	4890	947.9
2014	27189	5270	1064.6
2015	29473	5674	1172.4
2016	31858	6065	1261.5
2017	34216	6437	1304.0

11.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table SX-2.1 presents human capital per capita for Shanxi by region. From 1985 to 2017,the nominal human capital per capita increased from 30.2 thousand Yuan to 1.1 million Yuan, an increase of more than 37 times; and the real human capital per capita increased from 24.8 thousand Yuan to 114.27 thousand Yuan, an increase of approximately 4.6 times.

Figure SX-2.1 illustrates the trends of human capital per capita by gender for Shanxi. The real human capital per capita of male is similar to that of female for Shanxi. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

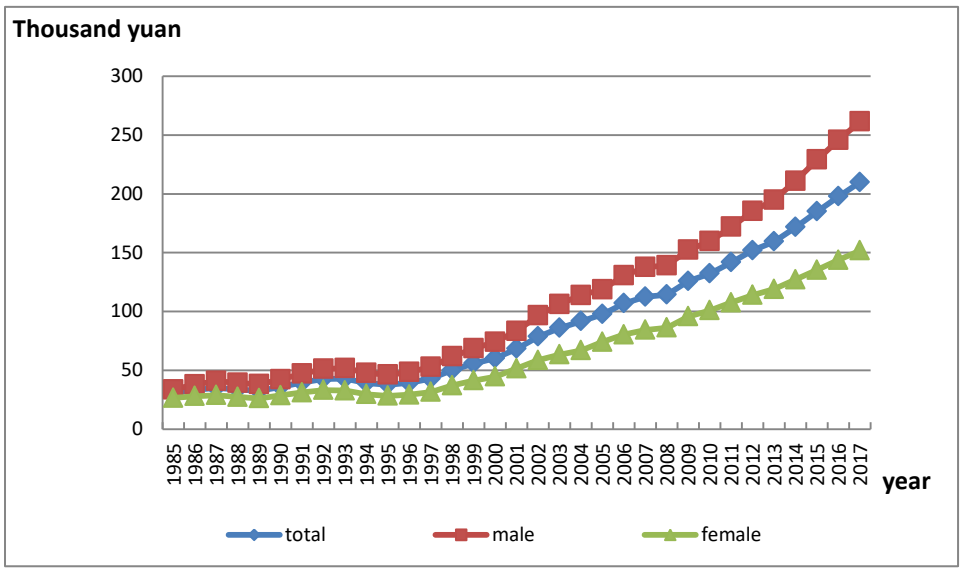


Figure SX-2.1 Human Capital Per Capita by Gender for Shanxi，1985-2017

Table SX-2.1 Nominal and Real Human Capital Per Capita by Region for Shanxi

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	30.25	47.90	17.12	24.81	47.90	17.12
1986	35.11	55.70	20.09	27.80	52.35	19.17
1987	39.84	64.16	23.51	30.34	55.58	21.04
1988	46.14	74.52	27.55	29.63	52.87	20.60
1989	53.24	86.13	32.50	29.28	52.54	19.77
1990	60.26	98.96	37.47	33.15	59.48	22.13

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	69.43	115.35	43.80	37.26	65.28	25.15
1992	80.13	135.60	50.79	40.98	70.34	27.88
1993	92.15	159.91	58.72	42.09	71.44	28.60
1994	105.63	53.38	22.54	30.25	53.38	22.54
1995	119.06	62.47	25.48	33.26	58.71	24.32
1996	133.88	70.30	28.62	35.12	60.90	25.62
1997	150.34	80.61	32.75	33.64	57.19	24.49
1998	174.01	92.26	37.29	32.43	56.28	22.69
1999	192.43	103.19	42.29	35.91	62.02	24.98
2000	216.80	118.85	48.06	39.56	67.26	27.59
2001	246.02	137.69	54.43	42.69	71.42	29.87
2002	279.21	158.68	61.53	42.85	70.89	29.96
2003	311.62	182.32	69.34	39.20	64.70	27.14
2004	346.75	204.86	77.42	37.77	62.30	25.86
2005	378.41	229.87	86.06	39.34	64.54	26.79
2006	422.89	256.98	95.95	42.85	69.99	29.00
2007	466.50	304.18	106.09	50.17	83.93	32.55
2008	508.11	333.21	117.28	55.68	91.57	36.53
2009	557.13	372.16	129.68	60.22	97.69	39.22
2010	603.43	420.18	144.40	68.32	110.84	43.50
2011	680.78	471.71	159.25	78.61	127.24	48.31
2012	748.05	515.16	176.56	85.95	136.77	52.25
2013	808.58	562.13	195.22	91.68	144.05	54.82
2014	885.79	601.94	212.61	97.64	151.68	57.57
2015	961.40	664.56	233.40	106.87	164.50	61.66
2016	1038.85	722.68	254.70	112.52	171.67	63.66
2017	1115.70	775.59	275.69	114.27	172.19	63.98

Figure SX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

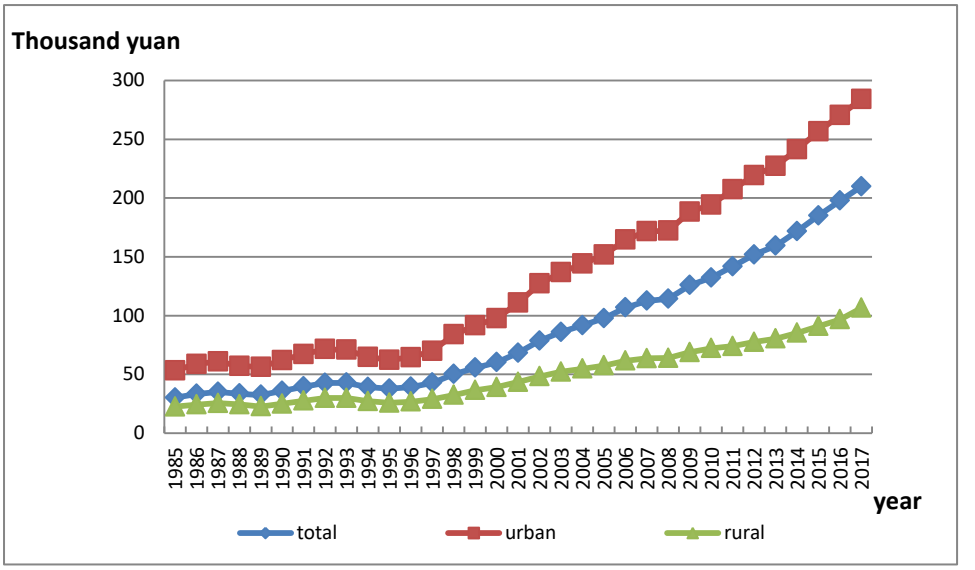


Figure SX-2.2 Real Human Capital Per Capita by Region for Shanxi，1985-2017

11.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

11.3.1 Total labor force human capital

The total labor force human capital for Shanxi is reported in Table SX-3.1 From 1985 to 2017, the nominal labor force human capital increased from 331 billion Yuan to 16 thousand billion Yuan, an increase of more than

48 times; and the real labor force human capital increased from 331 billion Yuan to 3 thousand billion Yuan, an increase of approximately 9.2 times.

Table SX-3.1 Nominal and Real Labor Force Human Capital for Shanxi

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	331	331
1986	392	371
1987	460	405
1988	551	401
1989	643	392
1990	743	443
1991	863	492
1992	989	528
1993	1124	524
1994	1275	475
1995	1444	460
1996	1631	481
1997	1842	527
1998	2089	606
1999	2355	686
2000	2625	735
2001	2913	817
2002	3185	908
2003	3537	987
2004	3923	1048
2005	4414	1148
2006	4997	1272
2007	5560	1349
2008	6251	1413
2009	7119	1612
2010	8008	1760
2011	8791	1836

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	9606	1956
2013	10592	2094
2014	11878	2308
2015	13281	2564
2016	14706	2807
2017	16018	3024

11.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables SX-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 23.1 thousand Yuan to 74.1 thousand Yuan, an increase of more than 31 times; and the real average labor force human capital increased from 23.1 Yuan to 139.9 thousand Yuan, an increase of approximately 6 times.

Table SX-3.2 Nominal and Real Average Labor Force Human Capital by Region for Shanxi

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	23.17	39.40	17.10	23.17	39.40	17.10
1986	26.52	44.53	19.34	25.13	41.85	18.45
1987	30.42	50.68	21.81	26.79	43.90	19.53
1988	34.96	57.43	25.07	25.46	40.74	18.75
1989	40.12	65.40	28.60	24.45	39.89	17.40
1990	45.47	73.23	32.55	27.10	44.01	19.23

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	51.81	83.09	37.04	29.53	47.02	21.27
1992	58.55	93.64	41.93	31.23	48.57	23.02
1993	65.88	105.03	47.19	30.72	46.93	22.98
1994	74.09	117.89	52.88	27.60	41.84	20.70
1995	82.91	131.55	58.75	26.39	40.00	19.62
1996	92.25	145.97	65.01	27.22	40.98	20.24
1997	102.84	168.56	72.03	29.42	45.90	21.77
1998	114.12	185.75	79.86	33.10	51.25	24.50
1999	125.78	203.06	87.92	36.64	55.80	27.39
2000	139.94	213.65	96.89	39.18	56.08	29.30
2001	153.13	231.49	107.80	42.95	61.07	32.47
2002	167.42	250.00	119.34	47.71	67.44	36.20
2003	184.83	271.75	132.47	51.60	72.15	39.21
2004	203.51	294.19	146.46	54.36	75.39	41.13
2005	225.32	323.41	161.13	58.62	81.49	43.63
2006	251.54	357.71	178.75	64.05	88.54	47.22
2007	277.30	389.74	195.23	67.28	92.58	48.79
2008	305.62	424.84	213.32	69.06	94.32	49.50
2009	339.76	467.80	234.67	76.92	104.86	53.97
2010	374.00	506.19	256.40	82.19	110.05	57.36
2011	413.06	557.87	281.72	86.27	115.40	59.80
2012	452.82	606.53	309.93	92.21	122.47	64.10
2013	498.91	663.53	339.08	98.62	130.18	67.94
2014	556.27	736.70	371.43	108.09	141.97	73.39
2015	619.86	815.62	405.59	119.65	156.25	79.59
2016	683.65	892.67	435.16	130.48	169.14	84.46
2017	741.04	958.97	482.48	139.88	179.20	93.18

Chapter 12 Human Capital for Inner Mongolia

12.1 Total human capital

Table NMG-1.1 presents the estimates of nominal and real total human capital and real physical capital for Inner Mongolia. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six- education categories. Column 3 is the real physical capital of Inner Mongolia.

Table NMG-1.1 Real Physical Capital, Nominal and Real Human Capital for Inner Mongolia

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	755	755	25.3
1986	889	847	28.0
1987	1044	926	30.9
1988	1219	930	34.9
1989	1387	910	37.7
1990	1565	1002	40.6
1991	1803	1104	45.1
1992	2040	1170	51.7
1993	2318	1167	59.7
1994	2620	1071	67.8
1995	2934	1020	76.1
1996	3382	1091	83.3
1997	3884	1196	92.0
1998	4412	1367	101.3
1999	4931	1528	111.3
2000	5645	1723	122.6

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	6282	1905	135.9
2002	6918	2050	157.3
2003	7489	2174	196.6
2004	8208	2315	253.8
2005	8931	2460	336.9
2006	10281	2789	434.6
2007	11400	2958	556.4
2008	12816	3147	699.8
2009	14255	3510	898.8
2010	15675	3743	1123.0
2011	17570	3975	1371.0
2012	18920	4149	1659.3
2013	20535	4359	2006.7
2014	22417	4683	2274.0
2015	23905	4939	2531.1
2016	25874	5287	2717.1
2017	27723	5570	2818.1

12.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table NMG-2.1 presents human capital per capita for Inner Mongolia by region. From 1985 to 2017, the nominal human capital per capita increased from 41.1 thousand Yuan to 1.3 million Yuan, an increase of more than 33 times; and the real human capital per capita increased from 41.1 thousand Yuan to 248.3 thousand Yuan, an increase of approximately

6.6times.

Figure NMG-2.1 illustrates the trends of human capital per capita by gender for Inner Mongolia. The real human capital per capita of male is similar to that of female for Inner Mongolia. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

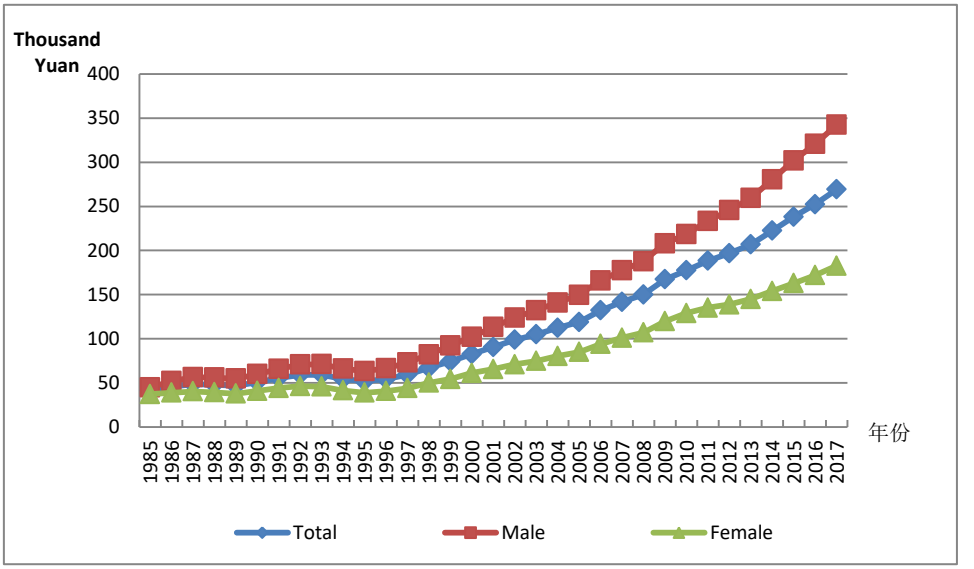


Figure NMG-2.1 Human Capital Per Capita by Gender for Inner Mongolia，1985-2017

Table NMG-2.1 Nominal and Real Human Capital Per Capita by Region for Inner Mongolia

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	41.11	64.80	30.36	41.11	64.80	30.36
1986	47.89	78.31	33.51	45.60	74.23	32.07
1987	54.83	89.73	36.90	48.61	78.39	33.31

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1988	62.76	102.79	41.41	47.90	76.75	32.50
1989	71.05	115.97	46.11	46.62	75.49	30.60
1990	79.27	127.73	51.33	50.77	81.68	32.94
1991	90.53	147.90	57.26	55.44	89.22	35.85
1992	103.11	170.38	63.77	59.14	94.56	38.43
1993	117.21	195.56	71.07	59.03	94.62	38.07
1994	132.71	223.56	78.80	54.25	87.03	34.80
1995	148.50	251.38	86.94	51.64	83.56	32.53
1996	167.70	282.53	95.65	54.11	87.37	33.23
1997	191.99	323.59	105.42	59.15	95.66	35.12
1998	215.95	361.60	115.71	66.90	107.65	38.86
1999	239.35	395.41	127.01	74.15	117.37	43.04
2000	270.46	446.24	138.77	82.57	130.75	46.47
2001	298.47	488.98	151.14	90.51	142.42	50.36
2002	332.74	543.13	164.03	98.62	156.94	51.86
2003	361.12	581.11	178.49	104.83	165.44	54.52
2004	397.74	634.03	194.80	112.17	176.10	57.27
2005	431.31	675.67	212.48	118.82	183.98	60.47
2006	486.46	750.40	231.47	131.96	201.71	64.58
2007	545.79	823.13	255.58	141.60	212.14	67.78
2008	611.11	904.03	280.83	150.08	221.05	70.06
2009	678.97	981.88	311.82	167.19	240.81	77.95
2010	742.55	1048.67	345.82	177.33	249.70	83.53
2011	832.34	1175.23	364.87	188.29	265.25	83.38
2012	897.12	1245.57	396.82	196.74	272.14	88.47
2013	974.33	1334.29	431.09	206.84	281.94	93.49
2014	1064.82	1440.17	469.96	222.43	299.23	100.71
2015	1153.06	1542.40	514.54	238.22	316.98	109.07

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
2016	1235.32	1638.62	560.53	252.40	333.09	117.41
2017	1339.84	1738.21	625.75	269.21	347.43	129.00

Figure NMG-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

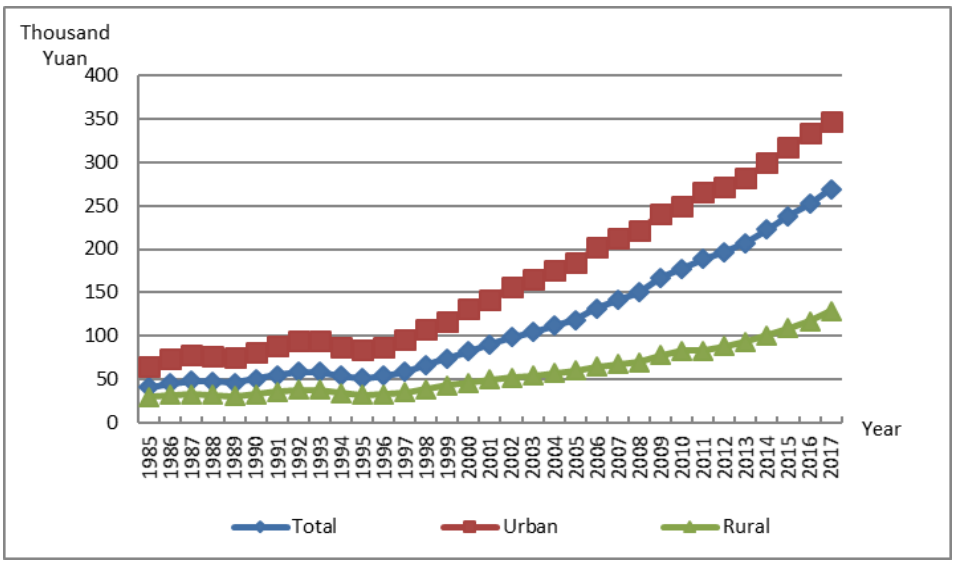


Figure NMG-2.2 Real Human Capital Per Capita by Region for Inner Mongolia，1985-2017

12.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

12.3.1 Total labor force human capital

The total labor force human capital for Inner Mongolia is reported in Table NMG-3.1 From 1985 to 2017, the nominal labor force human capital increased from 295 billion Yuan to 12.9 thousand billion Yuan, an increase of more than 44 times; and the real labor force human capital increased from 295 billion Yuan to 2.6 thousand billion Yuan, an increase of approximately 9 times

Table NMG-3.1 Nominal and Real Labor Force Human Capital for Inner Mongolia

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	295	295
1986	343	326
1987	418	371
1988	497	380
1989	580	381
1990	676	433
1991	781	479
1992	879	506
1993	985	498
1994	1107	456
1995	1248	437
1996	1441	468
1997	1635	508
1998	1864	583
1999	2126	665
2000	2469	761
2001	2732	838
2002	2923	874
2003	3148	921
2004	3375	958

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2005	3735	1034
2006	4354	1186
2007	4844	1261
2008	5407	1331
2009	6092	1503
2010	6906	1652
2011	7587	1719
2012	8209	1804
2013	8879	1891
2014	9847	2064
2015	10691	2216
2016	11766	2411
2017	12934	2606

12.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables NMG-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 28.5 thousand Yuan to 850.9 thousand Yuan, an increase of more than 30 times, and the real average labor force human capital increased from 28.5 thousand Yuan to 171.5 thousand Yuan, an increase of approximately 6 times.

Table NMG-3.2 Nominal and Real Average Labor Force Human Capital by Region for Inner Mongolia

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	28.51	31.47	25.24	28.51	31.47	25.24
1986	32.38	36.71	27.65	30.84	34.94	26.35
1987	37.42	43.42	30.96	33.20	38.47	27.53
1988	42.72	49.99	34.77	32.66	38.14	26.66
1989	48.70	57.35	39.11	31.98	37.64	25.71
1990	54.92	64.94	43.69	35.18	41.59	27.98
1991	61.90	73.95	48.43	37.96	45.32	29.73
1992	69.20	83.53	53.28	39.83	48.05	30.71
1993	77.12	93.96	58.48	39.04	47.55	29.61
1994	86.24	106.09	64.33	35.49	43.67	26.46
1995	95.99	119.13	70.58	33.60	41.73	24.67
1996	107.38	134.39	77.53	34.89	43.70	25.15
1997	120.03	151.44	85.18	37.28	47.09	26.41
1998	133.84	170.18	93.52	41.85	53.28	29.17
1999	149.41	190.62	103.54	46.73	59.72	32.27
2000	167.88	215.30	114.95	51.75	66.48	35.31
2001	182.38	235.31	123.43	55.93	72.29	37.71
2002	196.41	254.68	131.65	58.73	76.24	39.27
2003	210.80	273.94	140.70	61.65	80.19	41.08
2004	226.36	294.83	150.71	64.25	83.74	42.72
2005	247.02	321.39	165.10	68.37	89.00	45.65
2006	278.76	361.74	185.63	75.95	98.59	50.54
2007	312.75	403.42	208.95	81.41	105.03	54.37
2008	347.17	444.17	233.95	85.47	109.36	57.59
2009	390.16	496.43	263.92	96.28	122.51	65.13

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
2010	434.66	547.97	297.72	103.95	131.05	71.20
2011	482.81	611.66	326.50	109.37	138.55	73.98
2012	526.07	666.46	354.24	115.63	146.46	77.90
2013	573.44	726.33	386.70	122.10	154.60	82.41
2014	636.31	807.69	426.85	133.38	169.21	89.59
2015	703.84	894.49	469.98	145.90	185.29	97.58
2016	766.58	973.25	514.08	157.11	199.30	105.56
2017	850.87	1078.89	571.41	171.46	217.19	115.41

Chapter 13 Human Capital for Liaoning

13.1 Total human capital

Table LN-1.1 presents the estimates of nominal and real total human capital and real physical capital for Liaoning. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Liaoning.

Table LN-1.1 Real Physical Capital, Nominal and Real Human Capital for Liaoning

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1542	1542	79
1986	1774	1669	89
1987	2038	1771	100
1988	2408	1769	112
1989	2773	1721	122
1990	3206	1923	132
1991	3602	2050	144
1992	4039	2167	156
1993	4587	2146	174
1994	5188	1953	192
1995	5785	1876	207
1996	6644	1994	221
1997	7259	2109	236
1998	8181	2384	252
1999	9325	2745	268
2000	10789	3165	289
2001	11863	3477	313

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	12536	3714	340
2003	13440	3904	378
2004	14459	4041	434
2005	15565	4272	522
2006	17413	4717	627
2007	19040	4895	742
2008	20772	5098	884
2009	22882	5606	1036
2010	25083	5957	1220
2011	27712	6249	1427
2012	29852	6536	1655
2013	32572	6912	1887
2014	34694	7232	2103
2015	36529	7508	2199
2016	39084	7900	2225
2017	41415	8256	2261

13.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table LN-2.1 presents human capital per capita for Liaoning by region. From 1985 to 2017, the nominal human capital per capita increased from 47 thousand Yuan to1.3 million Yuan, an increase of more than 27 times; and the real human capital per capita increased from 47 thousand Yuan to 255.9 thousand Yuan, an increase of approximately 5 times.

Figure LN-2.1 illustrates the trends of human capital per capita by gender for Liaoning. The real human capital per capita of male is similar to that of female for Liaoning. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

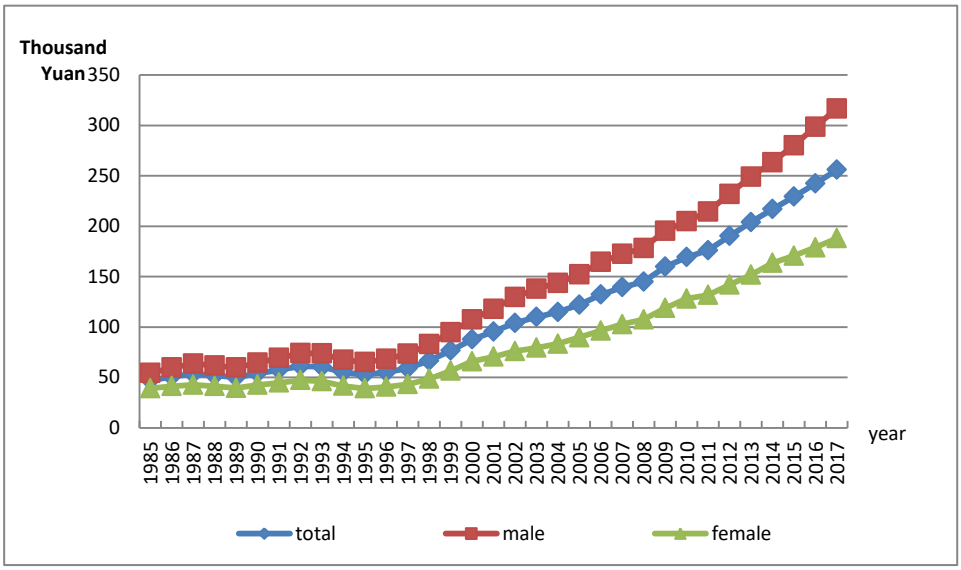


Figure LN-2.1 Real Human Capital Per Capita by Gender for Liaoning，1985-2017

Table LN-2.1 Nominal and Real Human Capital Per Capita by Region for Liaoning

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	47.00	63.78	32.70	47.00	63.78	32.70
1986	53.88	73.19	36.84	50.70	68.40	35.08
1987	61.53	83.24	41.49	53.47	70.85	37.42
1988	70.59	95.08	47.18	51.84	67.67	36.72
1989	80.50	107.96	53.24	49.96	65.56	34.50
1990	90.02	118.66	59.86	54.00	69.89	37.26
1991	101.01	133.83	67.13	57.49	74.36	40.10

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	114.10	151.71	75.18	61.23	77.98	43.90
1993	129.30	172.95	84.03	60.50	76.17	44.24
1994	146.02	196.30	93.75	54.98	68.57	40.83
1995	162.23	217.61	104.11	52.61	65.47	39.08
1996	183.19	246.30	114.93	54.98	68.48	40.40
1997	202.56	270.79	126.77	58.85	72.54	43.64
1998	228.20	305.68	139.47	66.50	82.05	48.65
1999	259.71	350.04	153.06	76.46	95.19	54.31
2000	298.84	407.66	167.54	87.66	110.86	59.63
2001	325.28	437.87	184.33	95.34	119.19	65.48
2002	350.77	465.79	200.85	103.92	128.20	72.28
2003	378.33	495.28	219.66	109.90	134.70	76.23
2004	410.57	532.11	238.96	114.75	140.78	78.02
2005	444.93	571.01	257.62	122.12	149.87	80.87
2006	487.38	622.57	281.06	132.03	161.63	86.84
2007	542.16	693.41	305.42	139.38	172.10	88.19
2008	590.21	752.50	329.67	144.85	178.90	90.23
2009	651.47	830.12	357.20	159.61	197.35	97.47
2010	712.21	909.68	381.51	169.14	210.37	100.11
2011	780.74	996.81	405.22	176.06	219.37	100.77
2012	868.70	1108.09	434.63	190.20	236.99	105.45
2013	961.38	1223.10	466.30	204.01	254.24	108.89
2014	1040.36	1310.45	506.02	216.86	267.57	116.54
2015	1115.46	1387.50	551.72	229.27	279.39	125.31
2016	1198.39	1480.05	581.30	242.23	293.63	129.69
2017	1283.52	1564.79	631.74	255.87	306.15	139.41

Figure LN-2.2 shows the trend of real human capital per capita by

region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

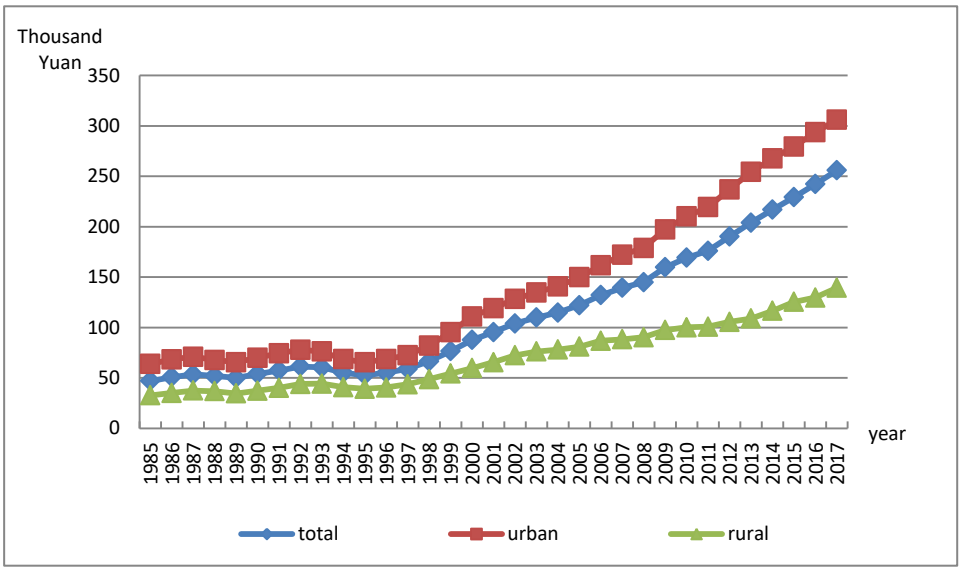


Figure LN-2.2 Real Human Capital Per Capita by Region for Liaoning，1985-2017

13.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

13.3.1 Total labor force human capital

The total labor force human capital for Liaoning is reported in Table LN-3.1 From 1985 to 2017, the nominal labor force human capital increased from 739 billion Yuan to 19.3 thousand billion Yuan, an increase of more than

26times; and the real labor force human capital increased from 739 billion Yuan to 3.9 thousand billion Yuan, an increase of approximately 5 times.

Table LN-3.1 Nominal and Real Labor Force Human Capital for Liaoning

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	739	739
1986	842	792
1987	967	840
1988	1141	838
1989	1309	813
1990	1539	924
1991	1739	991
1992	1932	1040
1993	2159	1016
1994	2407	914
1995	2702	884
1996	3087	937
1997	3442	1011
1998	3898	1149
1999	4339	1294
2000	4842	1441
2001	5321	1581
2002	5640	1696
2003	6086	1791
2004	6464	1829
2005	6978	1935
2006	8011	2191
2007	8670	2251
2008	9590	2374
2009	10777	2662
2010	12140	2903

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	13597	3088
2012	14252	3147
2013	15160	3242
2014	16074	3380
2015	17308	3588
2016	18251	3722
2017	19320	3887

13.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables LN-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from35 thousand Yuan to 788.1 thousand Yuan, an increase of more than 23 times; and the real average labor force human capital increased from 35 thousand Yuan to 158.5 thousand Yuan, an increase of approximately 5 times.

Table LN-3.2 Nominal and Real Average Labor Force Human Capital by Region for Liaoning

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	35.01	44.92	25.22	35.01	44.92	25.22
1986	39.70	50.99	28.33	37.35	47.66	26.99
1987	45.19	58.02	31.73	39.26	49.39	28.61
1988	51.10	65.11	36.17	37.53	46.34	28.15
1989	57.54	72.84	40.94	35.74	44.23	26.53
1990	64.34	80.07	46.18	38.62	47.16	28.74

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	71.82	89.71	51.83	40.93	49.84	30.96
1992	79.74	99.60	57.84	42.92	51.19	33.77
1993	88.15	110.00	64.28	41.48	48.45	33.84
1994	97.67	121.81	71.53	37.08	42.55	31.15
1995	108.22	134.73	79.43	35.41	40.53	29.82
1996	120.47	149.93	87.73	36.56	41.69	30.84
1997	134.28	176.47	96.93	39.44	47.27	33.37
1998	149.99	197.24	106.86	44.20	52.94	37.27
1999	165.70	218.57	116.47	49.42	59.44	41.33
2000	182.47	226.88	126.14	54.31	61.70	44.90
2001	198.12	244.23	137.35	58.88	66.48	48.79
2002	213.16	260.48	149.10	64.08	71.69	53.66
2003	229.93	278.24	162.43	67.68	75.67	56.37
2004	246.05	294.63	175.93	69.61	77.95	57.44
2005	266.16	316.05	189.28	73.79	82.95	59.42
2006	296.37	351.16	210.62	81.06	91.17	65.08
2007	325.18	384.93	230.78	84.41	95.54	66.64
2008	357.37	423.51	251.15	88.45	100.68	68.74
2009	399.40	475.02	274.04	98.64	112.93	74.78
2010	442.84	527.55	296.99	105.89	122.00	77.93
2011	491.13	587.55	321.42	111.54	129.30	79.93
2012	536.17	638.22	350.01	118.39	136.50	84.92
2013	580.59	686.37	379.88	124.16	142.67	88.71
2014	627.69	735.34	413.44	132.00	150.14	95.22
2015	682.20	788.16	453.87	141.42	158.71	103.09
2016	732.78	844.63	486.84	149.43	167.57	108.62
2017	788.08	901.26	533.72	158.54	176.33	117.78

Chapter 14 Human Capital for Jilin

14.1 Total human capital

Table JL-1.1 presents the estimates of the estimates of nominal and real total human capital and real physical capital for Jilin. Column 1 gives the nominal human capital summed across six- education categories. Column 2 shows the totals real human capital for six- education categories. Column 3 displays the real physical capital of Jilin.

Table JL-1.1 Real Physical Capital, Nominal and Real Human Capital for Jilin

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	954	954	32
1986	1118	1059	38
1987	1272	1127	44
1988	1491	1104	54
1989	1707	1072	67
1990	1932	1148	73
1991	2244	1253	88
1992	2544	1326	112
1993	2900	1353	167
1994	3288	1268	200
1995	3692	1232	238
1996	4196	1307	272
1997	4643	1394	305
1998	5162	1561	331
1999	5827	1791	376
2000	6861	2130	421

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	7852	2404	469
2002	8239	2537	526
2003	9000	2736	597
2004	9595	2804	711
2005	10175	2929	854
2006	11217	3181	1089
2007	12170	3288	1448
2008	13381	3433	2003
2009	14384	3687	2463
2010	15708	3884	3086
2011	17492	4137	3853
2012	18705	4315	4492
2013	20138	4512	5120
2014	22330	4902	5770
2015	23300	5033	6277
2016	24867	5282	6739
2017	26256	5490	7557

14.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table JL-2.1 presents human capital per capita for Jilin by region. From 1985 to 2017, the nominal human capital per capita increased from 45.20 thousand Yuan to 1.25 million Yuan, an increase of more than 27 times; and the real human capital per capita increased from 45.20 thousand Yuan to 260.83 thousand Yuan, an increase of approximately

6 times.

Figure JL-2.1 illustrates the trends of human capital per capita by gender for Jilin. The pattern of growth in real human capital per capita for men is similar to for women in Jilin. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated; however since the male's growth rate was significantly higher than female's and men started out higher, the gender gap continues to expand, especially from 1997.

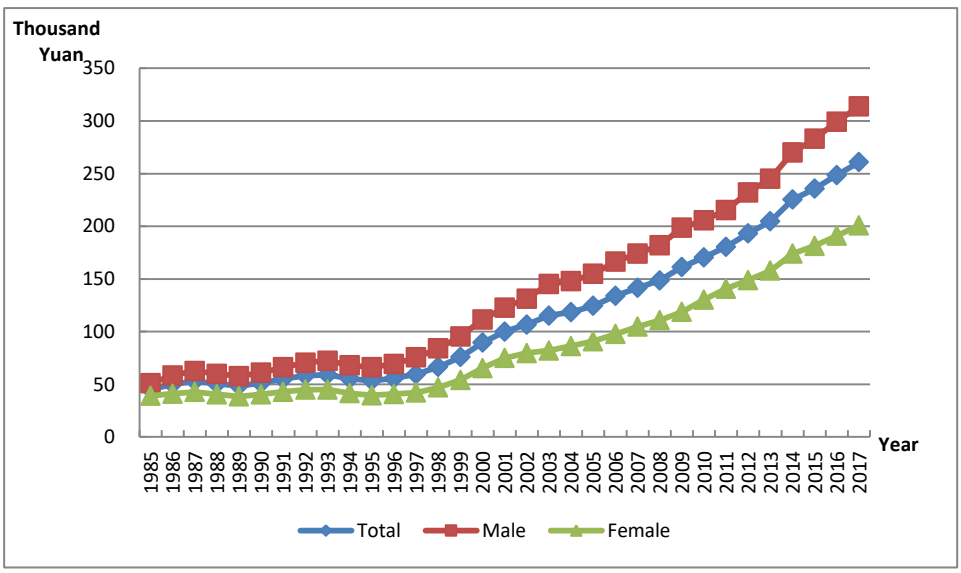


Figure JL-2.1 Human Capital Per Capita by Gender for Jilin，1985-2017

Table JL-2.1 Nominal and Real Human Capital Per Capita by Region for Jilin

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	45.20	60.19	34.91	45.20	60.19	34.91
1986	52.78	72.75	38.92	49.97	68.63	37.03
1987	59.86	83.90	42.96	53.05	73.29	38.81
1988	68.22	96.03	48.49	50.52	68.98	37.42

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1989	77.25	108.79	54.56	48.50	66.85	35.29
1990	85.98	119.82	61.37	51.08	70.87	36.69
1991	98.39	137.43	68.51	54.95	75.89	38.93
1992	111.78	155.75	76.35	58.23	78.69	41.75
1993	126.84	176.61	84.66	59.19	78.82	42.56
1994	143.44	199.10	93.91	55.29	72.13	40.31
1995	159.75	219.07	103.99	53.32	68.95	38.62
1996	178.35	245.97	114.12	55.56	71.88	40.05
1997	198.31	274.07	125.91	59.53	77.24	42.62
1998	219.46	304.42	137.60	66.36	86.39	47.04
1999	246.50	345.27	150.46	75.78	100.09	52.17
2000	288.42	415.52	164.77	89.52	122.54	57.36
2001	326.37	474.21	180.83	99.93	137.78	62.64
2002	346.44	496.38	197.05	106.67	145.39	68.05
2003	378.74	541.37	214.72	115.15	156.84	73.06
2004	405.60	573.09	234.45	118.53	160.26	75.90
2005	432.39	605.59	253.41	124.46	167.01	80.51
2006	472.28	656.80	277.27	133.94	178.98	86.36
2007	523.38	727.03	303.94	141.39	189.77	89.23
2008	579.02	805.55	329.68	148.55	200.06	91.91
2009	628.75	868.36	360.80	161.17	215.88	99.89
2010	689.39	951.99	392.53	170.46	228.89	104.39
2011	763.21	1068.98	411.75	180.51	244.33	107.15
2012	837.97	1173.26	447.62	193.31	261.60	113.73
2013	913.47	1277.58	483.64	204.67	276.83	119.42
2014	1026.38	1440.73	529.62	225.32	305.76	128.84
2015	1090.82	1513.96	578.47	235.63	315.93	138.51
2016	1170.01	1619.32	611.61	248.52	332.92	143.71

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
2017	1247.44	1711.76	656.82	260.83	346.73	151.61

Figure JL-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growth of human capital for rural and urban both accelerated; however, the growth rate is significantly higher in urban area than in rural area. Therefore, the gap between urban and rural expanded rapidly.

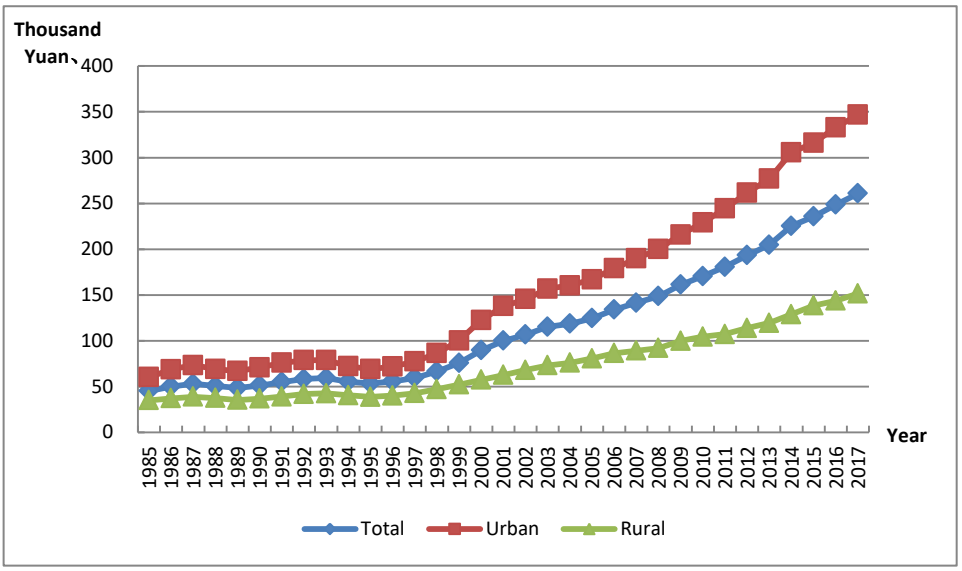


Figure JL-2.2 Real Human Capital Per Capita by Region for Jilin，1985-2017

14.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

14.3.1 Total labor force human capital

The total labor force human capital for Jilin is reported in Table JL-3.1 From 1985 to 2017, the nominal labor force human capital increased from 405 billion Yuan to 11,038 billion Yuan, an increase of more than 27 times; and the real labor force human capital increased from 405 billion Yuan to 2,353 billion Yuan, an increase of approximately 6 times.

Table JL-3.1 Nominal and Real Labor Force Human Capital for Jilin

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	405	405
1986	465	440
1987	547	485
1988	650	482
1989	750	471
1990	861	512
1991	1005	562
1992	1142	597
1993	1295	607
1994	1463	569
1995	1676	563
1996	1900	598
1997	2096	636
1998	2344	717
1999	2623	817
2000	2955	930
2001	3269	1018
2002	3502	1096
2003	3830	1185
2004	4103	1219
2005	4498	1315

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2006	5059	1456
2007	5427	1486
2008	5928	1543
2009	6454	1675
2010	7111	1778
2011	7871	1891
2012	8305	1946
2013	8853	2015
2014	9345	2090
2015	9997	2199
2016	10474	2268
2017	11038	2353

14.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables JL-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 32.27 thousand Yuan to 700.96 thousand Yuan, an increase of more than 21 times; and the real average labor force human capital increased from 32.27 thousand Yuan to 149.42 thousand Yuan, an increase of approximately 5 times.

Table JL-3.2 Nominal and Real Average Labor Force Human Capital by Region for Jilin

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	32.27	41.43	25.54	32.27	41.43	25.54
1986	36.58	47.76	28.49	34.65	45.06	27.11
1987	41.73	55.59	31.72	37.02	48.56	28.66
1988	47.29	62.84	36.15	35.11	45.14	27.90
1989	53.43	70.79	40.86	33.60	43.50	26.43
1990	59.62	77.89	45.95	35.43	46.07	27.47
1991	67.44	87.95	51.21	37.70	48.57	29.10
1992	75.59	98.30	56.84	39.50	49.67	31.08
1993	84.33	109.30	62.94	39.55	48.79	31.64
1994	94.23	121.71	69.71	36.62	44.09	29.93
1995	105.37	135.06	77.13	35.42	42.51	28.64
1996	116.28	149.03	85.24	36.58	43.55	29.92
1997	128.00	174.49	94.14	38.83	49.18	31.86
1998	141.13	192.75	103.84	43.19	54.70	35.50
1999	155.72	213.74	113.51	48.47	61.96	39.36
2000	171.95	221.46	124.28	54.11	65.31	43.26
2001	186.39	238.03	136.14	58.04	69.16	47.16
2002	200.31	253.75	148.53	62.68	74.32	51.29
2003	216.50	271.93	162.89	66.96	78.78	55.42
2004	232.06	287.84	177.82	68.93	80.49	57.57
2005	251.56	309.48	193.49	73.54	85.35	61.47
2006	278.78	341.41	215.42	80.25	93.04	67.10
2007	304.99	371.74	237.14	83.53	97.03	69.62
2008	335.68	410.62	258.96	87.36	101.98	72.19
2009	368.67	449.67	283.48	95.69	111.79	78.48
2010	404.84	493.90	307.07	101.21	118.75	81.66
2011	445.94	548.91	331.17	107.11	125.46	86.18

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
2012	485.99	597.43	359.94	113.90	133.21	91.46
2013	525.55	641.46	390.84	119.63	138.99	96.51
2014	564.48	679.31	426.10	126.24	144.17	103.66
2015	612.96	727.40	467.38	134.81	151.79	111.91
2016	654.25	776.35	504.66	141.69	159.61	118.58
2017	700.96	829.99	547.11	149.42	168.12	126.28

Chapter 15 Human Capital for Heilongjiang

15.1 Total human capital

Table HLJ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Heilongjiang. Column 1 shows nominal human capital aggregated across six- education categories. Column 2 gives the human capital in real terms across the same six- education categories. Column 3 displays the real physical capital of Heilongjiang.

Table HLJ-1.1 Real Physical Capital, Nominal and Real Human Capital for Heilongjiang

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1293	1293	55.9
1986	1506	1413	62.9
1987	1726	1493	69.9
1988	1998	1470	76.7
1989	2290	1470	81.3
1990	2590	1569	85.8
1991	2962	1676	90.9
1992	3367	1759	96.7
1993	3812	1737	103.0
1994	4308	1611	111.2
1995	4807	1548	122.0
1996	5378	1618	134.3
1997	5963	1720	147.5
1998	6567	1885	163.9
1999	7292	2161	179.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	8375	2519	194.6
2001	9723	2898	212.9
2002	10456	3137	233.1
2003	11419	3394	254.2
2004	12490	3567	279.7
2005	13355	3768	309.9
2006	14579	4032	349.1
2007	15806	4144	399.2
2008	17222	4270	460.0
2009	18733	4634	537.3
2010	20341	4837	624.9
2011	20615	4636	720.0
2012	21867	4767	835.9
2013	23297	4962	973.0
2014	23311	4898	1096.5
2015	24314	5053	1226.3
2016	24725	5066	1341.5
2017	26402	5339	1456.7

15.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table HLJ-2.1 presents human capital per capita for Heilongjiang by region. From 1985 to 2017, the nominal human capital per capita increased from 34.66 thousand Yuan to 444.96 thousand Yuan, an increase of more than 12 times; and the real human capital per capita

increased from 34.66 thousand Yuan to 123.06 thousand Yuan, an increase of approximately 3.84 times.

Figure HLJ-2.1 illustrates the trends of human capital per capita by gender for Heilongjiang. The real human capital per capita of male is similar to that of female for Heilongjiang. Both of them kept increasing from 1985 to 2017, and the growth of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result, the gender gap has been expanding, especially from 1997.

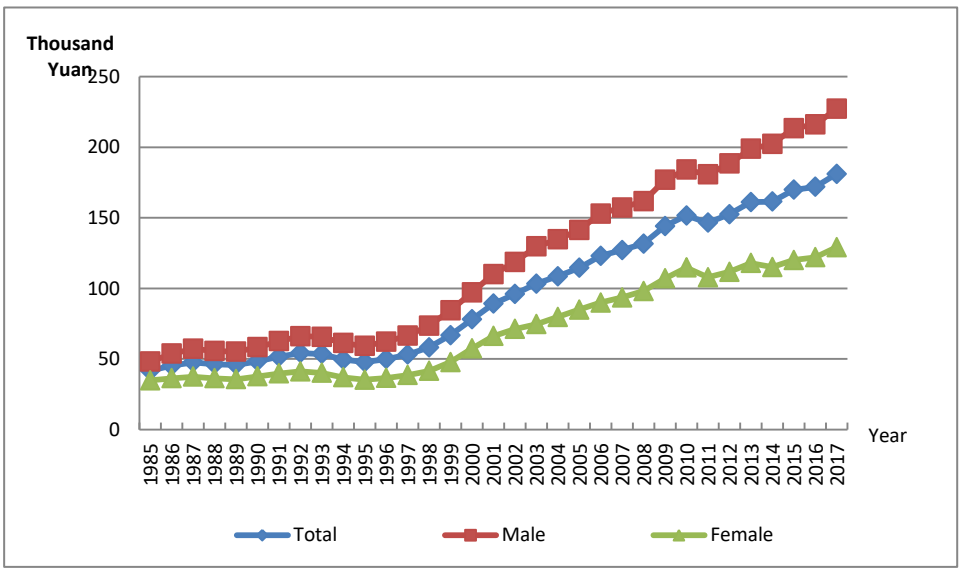


Figure HLJ-2.1 Human Capital Per Capita by Gender for Heilongjiang，1985-2017

Table HLJ-2.1 Nominal and Real Human Capital Per Capita by Region for Heilongjiang

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	34.66	48.12	24.53	34.66	48.12	24.53
1986	40.88	56.55	28.60	38.35	53.35	26.61

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1987	47.98	65.88	33.34	41.49	56.65	29.09
1988	55.87	76.25	38.64	41.07	55.29	29.04
1989	64.87	87.30	45.19	41.60	55.24	29.64
1990	74.58	99.77	51.62	45.17	59.78	31.85
1991	86.23	115.16	59.49	48.75	63.77	34.86
1992	99.80	133.27	68.44	52.09	67.27	37.87
1993	115.59	155.06	78.12	52.59	67.95	38.02
1994	132.52	177.91	88.88	49.50	63.90	35.66
1995	150.41	201.88	100.33	48.41	62.56	34.64
1996	41.63	53.32	32.82	41.63	53.32	32.82
1997	48.23	62.87	36.77	45.23	59.31	34.21
1998	54.96	71.89	41.10	47.54	61.83	35.87
1999	62.87	82.43	46.34	46.26	59.77	34.83
2000	71.27	93.34	51.90	45.73	59.06	34.04
2001	79.76	103.37	58.20	48.32	61.94	35.91
2002	91.17	119.15	65.28	51.58	65.98	38.25
2003	103.57	135.86	73.28	54.12	68.58	40.54
2004	117.28	154.64	81.79	53.43	67.76	39.80
2005	132.58	175.74	91.10	49.56	63.12	36.55
2006	148.08	196.82	100.66	47.70	60.99	34.75
2007	165.76	221.85	110.51	49.88	63.90	36.06
2008	183.94	246.33	121.69	53.05	67.89	38.25
2009	202.77	271.57	133.31	58.19	74.18	42.04
2010	225.41	303.23	145.88	66.78	85.39	47.77
2011	259.26	355.82	159.26	77.99	101.52	53.65
2012	298.91	416.50	175.10	89.09	117.89	58.75
2013	319.63	440.40	190.43	95.89	125.53	64.21

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
2014	347.66	476.42	208.01	103.33	134.72	69.31
2015	379.78	518.83	227.01	108.46	141.75	71.91
2016	405.94	549.71	246.04	114.53	149.00	76.18
2017	444.96	598.47	270.47	123.06	159.35	81.78

Figure HLJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growth of human capital for rural and urban areas both accelerated, and the growth rate is significantly higher in urban areas than in rural areas. Therefore, the gap between urban and rural human capital expanded rapidly.

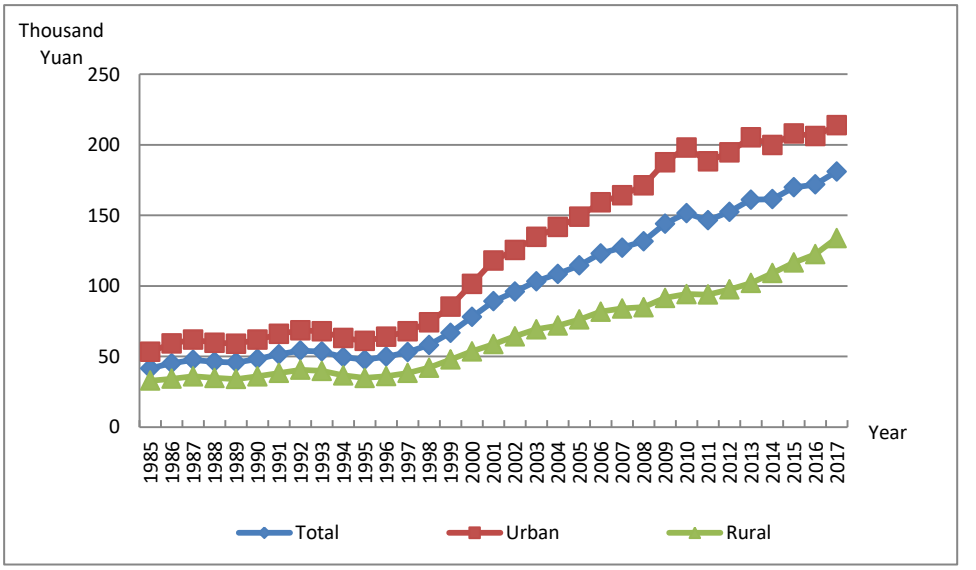


Figure HLJ-2.2 Real Human Capital Per Capita by Region for Heilongjiang, 1985-2017

15.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

15.3.1 Total labor force human capital

The total labor force human capital for Heilongjiang is reported in Table HLJ-3.1 From 1985 to 2017, the nominal labor force human capital increased from 539 billion Yuan to 16,262 billion Yuan, an increase of more than 30.17 times; and the real labor force human capital increased from 539 billion Yuan to 3,291 billion Yuan, an increase of approximately 6.10 times.

Table HLJ-3.1 Nominal and Real Labor Force Human Capital for Heilongjiang

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	539	539
1986	628	589
1987	740	640
1988	880	647
1989	1042	669
1990	1207	731
1991	1405	795
1992	1610	842
1993	1830	834
1994	2068	774
1995	2321	749
1996	2589	782
1997	2889	836

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1998	3227	930
1999	3568	1062
2000	3929	1192
2001	4326	1305
2002	4769	1448
2003	5218	1570
2004	5632	1628
2005	6076	1733
2006	6709	1875
2007	7322	1942
2008	8037	2013
2009	8899	2218
2010	9747	2332
2011	10480	2369
2012	11245	2463
2013	11896	2544
2014	12667	2669
2015	13562	2827
2016	14343	2945
2017	16262	3291

15.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables HLJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 30.05 thousand Yuan to 696.17 thousand Yuan, an increase of more than 23 times; and the real average labor force human capital increased from 30.05 thousand

Yuan to 163.11 thousand Yuan, an increase of approximately 5 times.

Table HLJ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Heilongjiang

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	30.05	37.27	23.96	30.05	37.27	23.96
1986	34.33	42.79	26.87	32.21	40.37	24.99
1987	39.45	49.47	30.10	34.13	42.54	26.27
1988	45.11	56.57	34.27	33.17	41.02	25.75
1989	51.59	64.86	38.75	33.10	41.04	25.41
1990	58.17	72.58	43.61	35.24	43.49	26.91
1991	66.09	82.83	49.15	37.38	45.87	28.80
1992	74.45	93.62	55.06	38.91	47.26	30.46
1993	83.31	105.04	61.35	37.99	46.03	29.86
1994	93.31	118.07	68.30	34.94	42.41	27.40
1995	103.75	131.69	75.48	33.48	40.81	26.06
1996	114.60	145.76	83.20	34.60	41.98	27.15
1997	126.97	168.05	91.53	36.76	46.32	28.78
1998	140.18	185.77	100.84	40.39	50.74	31.80
1999	153.47	203.39	110.31	45.69	57.28	36.12
2000	167.48	211.57	120.58	50.81	60.36	40.62
2001	181.51	227.42	132.38	54.74	64.37	44.42
2002	195.93	243.82	144.33	59.49	69.50	48.67
2003	211.24	260.36	157.70	63.55	73.62	52.55
2004	226.60	276.45	171.50	65.49	75.53	54.32
2005	242.80	293.22	186.15	69.24	79.48	57.64
2006	267.94	322.03	207.00	74.87	85.74	62.59
2007	292.68	350.72	227.28	77.61	88.60	65.20
2008	321.58	386.25	247.49	80.53	92.93	66.23

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
2009	356.71	430.21	269.84	88.92	103.71	71.35
2010	391.11	472.43	291.13	93.59	109.93	73.39
2011	427.52	520.18	313.40	96.64	114.73	74.27
2012	464.67	564.66	339.17	101.79	120.58	78.11
2013	498.92	602.28	365.50	106.71	126.08	81.64
2014	537.76	644.17	394.34	113.32	132.98	86.69
2015	584.58	693.30	428.94	121.84	141.56	93.27
2016	626.49	737.70	465.86	128.65	148.84	99.21
2017	696.17	818.11	518.27	140.89	163.11	108.42

Chapter 16 Human Capital for Shanghai

16.1 Total human capital

Table SH-1.1 presents the estimates of estimate of nominal and real total human capital and real physical capital for Shanghai. Columns 1 shows nominal human capital aggregated across six- education categories. Column 2 shows real human capital in the same six- education categories. Column 3 is the real physical capital of Shanghai.

Table SH-1.1 Real Physical Capital, Nominal and Real Human Capital for Shanghai

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1197	1197	59.2
1986	1493	1404	68.2
1987	1849	1609	78.9
1988	2251	1631	91.1
1989	2669	1669	100.4
1990	3069	1805	109.6
1991	3777	2010	119.1
1992	4350	2105	131.4
1993	4957	1996	147.8
1994	5585	1814	175.0
1995	6320	1730	212.8
1996	7518	1884	255.7
1997	8693	2120	298.1
1998	10038	2447	338.8

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1999	12157	2920	377.7
2000	15417	3613	418.4
2001	16537	3876	461.4
2002	18480	4309	510.3
2003	20764	4837	563.8
2004	23626	5386	627.0
2005	26728	6032	699.3
2006	32612	7273	788.5
2007	37871	8184	891.7
2008	41664	8510	987.5
2009	46736	9584	1100.9
2016	49186	9783	1203.2
2011	51475	9732	1292.0
2012	53341	9810	1382.8
2013	55305	9943	1479.1
2014	58033	10159	1571.6
2015	58275	9962	1692.7
2016	59772	9901	1851.6
2017	60081	9786	2010.6

16.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table SH-2.1 presents human capital per capita for Shanghai by region. From 1985 to 2017, the nominal human capital per capita increased from 117.53 thousand Yuan to 3.55 million Yuan, an increase

of more than 30 times; and the real human capital per capita increased from 117.53 thousand Yuan to 578.36 thousand Yuan, an increase of approximately 5 times.

Figure SH-2.1 illustrates the trends of human capital per capita by gender for Shanghai. The real human capital per capita of male is similar to that of female for Shanghai. Both of them kept increasing from 1985 to 2016, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

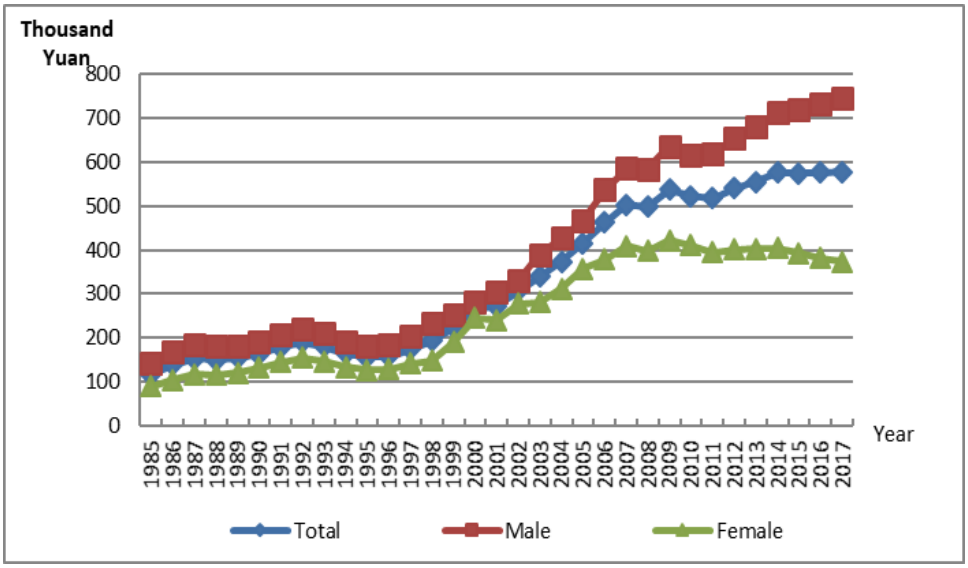


Figure SH-2.1 Human Capital Per Capita by Gender for Shanghai，1985-2017

16.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

16.3.1 Total labor force human capital

The total labor force human capital for Shanghai is reported in Table SH-3.1 From 1985 to 2017 the nominal labor force human capital increased from 528 billion Yuan to 24734 billion Yuan, an increase of more than 47 times; and the real labor force human capital increased from 528 billion Yuan to 4029 billion Yuan, an increase of approximately 7.6 times.

Table SH-3.1 Nominal and Real Labor Force Human Capital for Shanghai

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	528	528
1986	603	567
1987	726	632
1988	881	638
1989	1021	638
1990	1180	694
1991	1377	733
1992	1534	742
1993	1722	693
1994	1937	629
1995	2200	602
1996	2713	680
1997	3207	782
1998	3881	946
1999	4623	1111
2000	5652	1325
2001	6432	1507
2002	7008	1634
2003	7875	1835
2004	8845	2016

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2005	9769	2205
2006	12093	2697
2007	14107	3049
2008	16730	3417
2009	19285	3955
2016	21616	4299
2011	23431	4430
2012	23891	4394
2013	24699	4440
2014	25444	4454
2015	25760	4404
2016	25443	4215
2017	24734	4029

16.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables SH-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 72.45 thousand Yuan to 1.83 million Yuan, an increase of more than 25 times; and the real average labor force human capital increased from 72.45 thousand Yuan to 298.6 thousand Yuan, an increase of approximately 4 times.

Chapter 17 Human Capital for Jiangsu

17.1 Total human capital

Table JS-1.1 presents the estimates of nominal and real total human capital and real physical capital for Jiangsu. Column 1 presents estimates of the nominal human capital aggregated across six- education categories. Column 2 shows the real human capital summed across the same six-education categories. Column 3 gives the real physical capital of Jiangsu

Table JS-1.1 Real Physical Capital, Nominal and Real Human Capital for Jiangsu

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	2697	2697	83.0
1986	3112	2900	101.7
1987	3548	3046	122.5
1988	4257	3000	146.5
1989	4963	2972	165.7
1990	5776	3354	186.5
1991	6755	3772	211.7
1992	7720	4058	253.0
1993	8947	3980	303.3
1994	10261	3697	352.9
1995	11580	3603	408.2
1996	13580	3860	470.1
1997	15322	4254	538.3
1998	17754	4918	618.5
1999	20565	5728	703.8
2000	22585	6277	798.9
2001	26281	7210	899.7

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	28387	7834	1010.4
2003	30947	8434	1172.4
2004	33481	8749	1360.0
2005	36223	9244	1605.8
2006	41410	10386	1876.4
2007	45840	11001	2174.3
2008	51160	11642	2500.8
2009	56820	12971	2925.8
2010	61680	13554	3414.0
2011	69500	14495	3982.6
2012	76020	15427	4562.3
2013	84400	16718	5132.6
2014	92300	17872	5670.7
2015	99230	18899	6234.2
2016	107580	20006	6848.0
2017	115450	21084	7513.9

17.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table JS-2.1 presents human capital per capita for Jiangsu by region. From 1985 to 2017, the nominal human capital per capita increased from 49.26 thousand Yuan to 1.84 million Yuan, an increase of more than 37 times; and the real human capital per capita increased from 49.26 thousand Yuan to 336.16 thousand Yuan, an increase of approximately 7 times.

Figure JS-2.1 illustrates the trends of human capital per capita by gender for Jiangsu. The real human capital per capita of men has followed the same pattern as that of womenfor Jiangsu. Both men and women saw increasing human capital from 1985 to 2017, and both saw accelerated growth as well. However, the grow rate for men remained significantly higher than women's. As a result the gender gap continues to expand, especially from 1997.

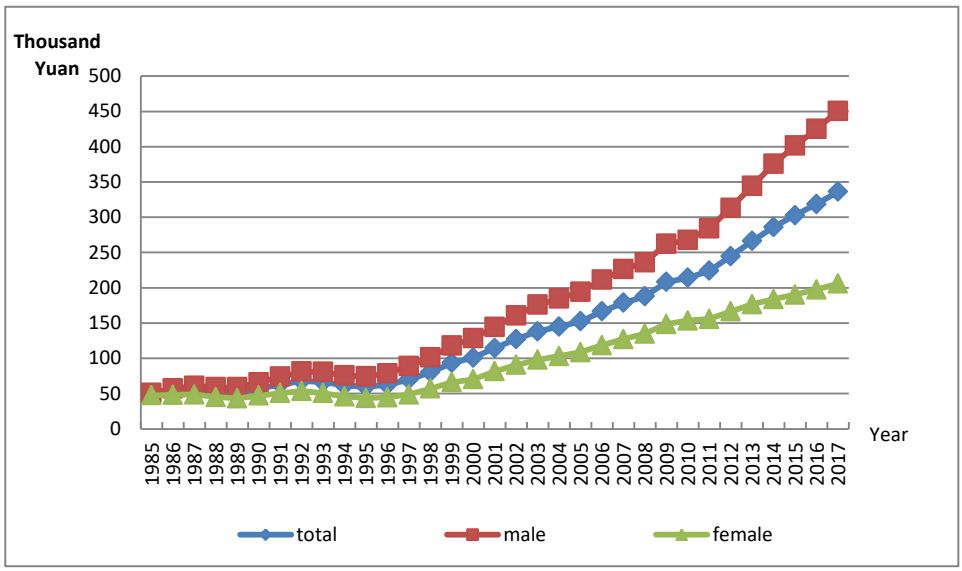


Figure JS-2.1 Real Human Capital Per Capita by Gender for Jiangsu，1985-2017

Table JS-2.1 Nominal and Real Human Capital Per Capita by Region for Jiangsu

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	49.26	74.89	43.61	49.26	74.89	43.61
1986	56.72	90.67	48.88	52.87	85.22	45.38
1987	64.26	103.74	54.58	55.18	88.24	47.06
1988	74.35	120.57	62.59	52.40	83.64	44.45
1989	85.91	139.99	71.47	51.45	83.72	42.83

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	98.18	158.38	81.42	57.01	91.60	47.37
1991	112.65	183.57	91.54	62.90	98.59	52.27
1992	129.51	214.20	102.60	68.08	105.73	56.11
1993	149.23	250.68	114.98	66.38	104.24	53.61
1994	170.39	288.61	128.33	61.39	95.78	49.17
1995	191.20	314.06	144.08	59.49	89.70	47.87
1996	219.25	354.52	159.53	62.32	91.38	49.49
1997	250.99	394.85	176.59	69.68	100.48	53.71
1998	289.45	448.71	196.14	80.18	114.18	60.26
1999	334.84	512.17	216.16	93.26	132.18	67.22
2000	362.77	522.32	241.19	100.83	134.80	74.93
2001	416.86	599.55	263.48	114.36	154.58	80.64
2002	460.89	644.93	287.62	127.19	168.98	87.86
2003	506.97	688.43	316.14	138.16	178.77	95.42
2004	554.54	733.95	344.14	144.91	183.79	99.31
2005	597.40	766.31	372.27	152.45	188.13	104.91
2006	663.56	847.75	407.95	166.43	204.84	113.04
2007	744.40	948.56	446.33	178.65	220.18	118.01
2008	825.37	1046.59	485.94	187.82	230.92	121.67
2009	912.12	1150.51	531.21	208.22	254.87	133.67
2010	973.56	1221.37	563.06	213.94	261.17	135.84
2011	1074.03	1348.28	604.42	224.00	274.38	137.65
2012	1206.01	1502.88	658.53	244.74	298.19	146.18
2013	1344.42	1663.99	718.77	266.30	322.80	155.66
2014	1476.88	1806.24	791.84	285.97	342.80	167.82
2015	1589.59	1918.84	869.34	302.75	358.08	181.52
2016	1712.99	2054.36	921.65	318.56	374.39	189.04
2017	1840.70	2174.62	1008.60	336.16	389.30	203.82

Figure JS-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remained larger than that in rural area. Since 1997, the growth of human capital for rural and urban both accelerated, but the growth rate was significantly higher in urban areas compared to rural areas. Therefore the gap between urban and rural expanded rapidly.

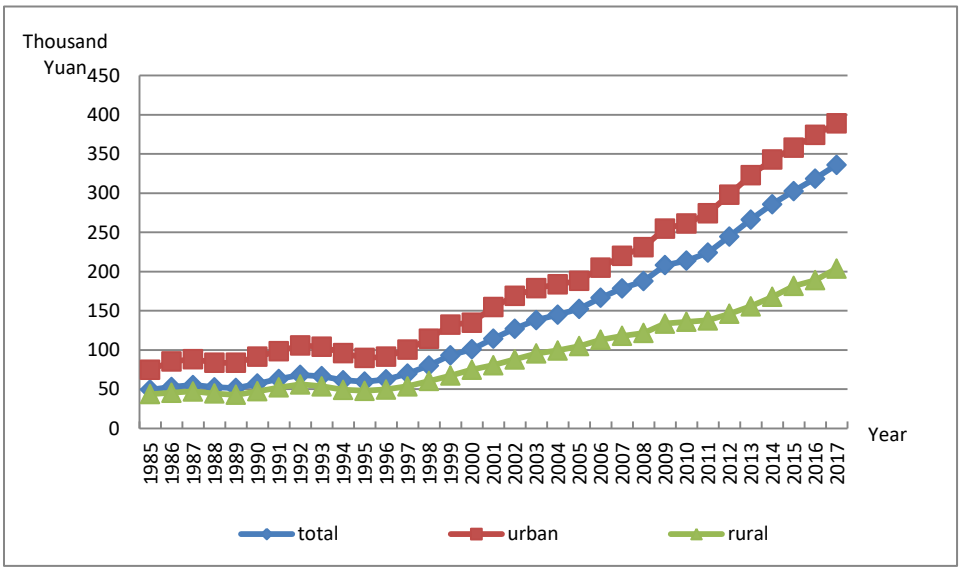


Figure JS-2.2 Real Human Capital Per Capita by Region for Jiangsu，1985-2017

17.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

17.3.1 Total labor force human capital

The total labor force human capital for Jiangsu is reported in Table JS-3.1 From 1985 to 2017, the nominal labor force human capital increased from 1282 billion Yuan to 47,360 billion Yuan, an increase of more than

36.94 times; and the real labor force human capital increased from 1282 billion Yuan to 8,741 billion Yuan, an increase of approximately 6.82 times.

Table JS-3.1 Nominal and Real Labor Force Human Capital for Jiangsu

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	1282	1282
1986	1488	1386
1987	1749	1502
1988	2073	1463
1989	2365	1416
1990	2710	1574
1991	3144	1762
1992	3532	1871
1993	3989	1791
1994	4508	1645
1995	5107	1606
1996	5898	1701
1997	6583	1854
1998	7448	2100
1999	8441	2395
2000	9902	2782
2001	10956	3041
2002	11660	3248
2003	12638	3468
2004	13544	3558
2005	15009	3846
2006	17634	4450
2007	19601	4742
2008	22245	5106
2009	25586	5890
2010	29182	6464

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	32888	6911
2012	34845	7131
2013	37561	7505
2014	40370	7887
2015	43850	8421
2016	45410	8527
2017	47360	8741

17.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables JS-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 35.47 thousand Yuan to 1.06 million Yuan, an increase of more than 30 times; and the real average labor force human capital increased from 35.47 thousand Yuan to 196.44 thousand Yuan, an increase of approximately 5.54 times.

Table JS-3.2 Nominal and Real Average Labor Force Human Capital by Region for Jiangsu

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	35.47	49.82	32.58	35.47	49.82	32.58
1986	40.34	57.50	36.69	37.56	54.04	34.07
1987	46.04	66.89	41.26	39.54	56.89	35.57
1988	52.64	75.87	47.15	37.15	52.63	33.48
1989	59.96	85.93	53.51	35.90	51.39	32.07
1990	67.81	95.15	60.54	39.39	55.03	35.22

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	76.78	108.22	67.83	43.02	58.12	38.73
1992	86.36	122.38	75.65	45.74	60.41	41.37
1993	97.05	139.33	84.03	43.58	57.94	39.18
1994	109.09	158.80	93.06	39.80	52.70	35.65
1995	122.55	178.72	102.45	38.54	51.04	34.04
1996	138.35	199.43	113.48	39.90	51.41	35.21
1997	156.42	220.12	125.99	44.06	56.01	38.32
1998	174.76	239.86	139.84	49.27	61.04	42.96
1999	196.31	264.41	153.78	55.70	68.24	47.82
2000	223.85	297.22	168.99	62.89	76.71	52.50
2001	244.34	317.75	182.69	67.82	81.92	55.92
2002	265.60	338.69	195.82	73.99	88.74	59.81
2003	289.20	362.28	209.61	79.36	94.07	63.27
2004	312.67	386.05	222.57	82.14	96.67	64.23
2005	342.16	416.06	238.20	87.68	102.14	67.13
2006	385.92	461.70	278.41	97.39	111.56	77.14
2007	431.59	511.20	317.29	104.41	118.66	83.89
2008	483.31	569.61	354.78	110.94	125.68	88.83
2009	546.52	643.24	396.17	125.81	142.50	99.69
2010	604.92	708.89	435.98	133.99	151.58	105.18
2011	669.45	785.51	478.29	140.68	159.85	108.93
2012	737.53	854.94	526.96	150.93	169.63	116.97
2013	803.42	919.98	578.45	160.53	178.47	125.28
2014	873.69	986.68	634.65	170.69	187.26	134.51
2015	946.97	1054.39	696.10	181.86	196.76	145.35
2016	1000.96	1109.69	742.04	187.96	202.23	152.20
2017	1064.37	1165.72	811.47	196.44	208.69	163.99

Chapter 18 Human Capital for Zhejiang

18.1 Total human capital

Table ZJ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Zhejiang province. Column 1 shows the nominal human capital across six- education categories. Column 2 gives real human capital estimates aggregated for the same six- education categories. Column 3 shows the real physical capital of Zhejiang.

Table ZJ-1.1 Real Physical Capital, Nominal and Real Human Capital for Zhejiang

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	2256	2256	12.5
1986	2602	2451	15.1
1987	2981	2599	19.3
1988	3521	2533	25.8
1989	4034	2446	30.8
1990	4584	2723	35.6
1991	5329	3065	44.4
1992	6003	3236	57.4
1993	6988	3154	141.5
1994	8018	2893	246.7
1995	9006	2782	380.2
1996	10734	3031	515.8
1997	12553	3402	643.3
1998	15202	4074	766.3
1999	17368	4668	894.0
2000	20106	5320	1061.8
2001	22506	5942	1255.2

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	24524	6519	1498.2
2003	27236	7144	1892.5
2004	30280	7668	2426.7
2005	33189	8280	2880.0
2006	38118	9381	3410.8
2007	42434	10013	4113.7
2008	47513	10665	5100.3
2009	53038	12060	5587.6
2010	57412	12558	6656.5
2011	64002	13251	8079.6
2012	69043	13961	8905.9
2013	74560	14721	9886.1
2014	80961	15650	10935.3
2015	85557	16300	11678.1
2016	94316	17582	12853.3
2017	100898	18414	14892.1

18.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table ZJ-2.1 presents human capital per capita for Zhejiang by region. From 1985 to 2017, the nominal human capital per capita increased from 63.83 thousand Yuan to 2.19 million Yuan, an increase of more than 34 times; and the real human capital per capita increased from 63.83 thousand Yuan to 399.35 thousand Yuan, an increase of approximately 6 times.

Figure ZJ-2.1 illustrates the trends of human capital per capita by gender for Zhejiang. The overall trends in real human capital per capita of males are similar to that of females for Zhejiang. Both of them kept increasing from 1985 to 2017, and the growth of human capital for male and female both accelerated, however, males' growth rate was significantly higher than that of females. As a result the gender gap has been expanding, especially from 1997.

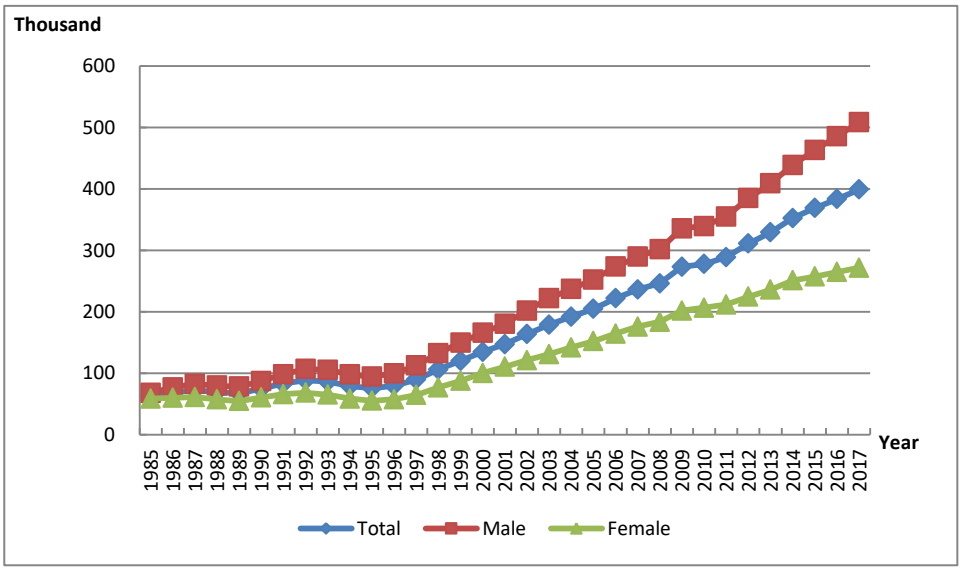


Figure ZJ-2.1 Human Capital Per Capita by Gender for Zhejiang，1985-2017

Table ZJ-2.1 Nominal and Real Human Capital Per Capita by Region for Zhejiang

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	63.83	77.53	58.62	63.83	77.53	58.62
1986	73.35	92.49	65.75	69.08	87.01	61.97
1987	83.35	106.93	73.62	72.66	90.71	65.22
1988	96.62	125.16	84.47	69.50	86.04	62.45
1989	111.23	145.50	96.01	67.44	85.63	59.36

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	126.23	165.61	108.34	74.98	95.46	65.67
1991	144.77	197.77	120.41	83.26	107.95	71.90
1992	164.95	229.00	135.11	88.90	114.47	76.99
1993	191.83	276.79	151.72	86.57	113.97	73.64
1994	220.25	325.72	170.14	79.46	107.56	66.12
1995	245.87	367.28	187.66	75.94	103.66	62.65
1996	283.30	422.82	204.32	79.99	108.68	63.75
1997	332.08	490.30	226.80	89.99	121.06	69.31
1998	396.97	584.78	252.65	106.39	143.67	77.75
1999	448.03	638.21	280.90	120.42	157.58	87.76
2000	510.48	703.85	316.27	135.07	172.24	97.74
2001	558.41	771.23	332.99	147.44	189.49	102.91
2002	616.26	840.84	361.08	163.82	209.10	112.37
2003	682.91	911.34	407.05	179.12	225.51	123.11
2004	758.76	1001.27	447.96	192.15	241.01	129.52
2005	822.16	1061.49	494.88	205.12	251.73	141.39
2006	902.70	1164.13	526.31	222.17	273.07	148.88
2007	1001.98	1279.35	574.31	236.42	288.83	155.61
2008	1098.30	1389.69	623.49	246.53	299.37	160.44
2009	1202.80	1506.38	681.02	273.49	328.78	178.45
2010	1270.41	1567.38	736.50	277.89	328.94	186.10
2011	1396.07	1739.58	766.16	289.05	346.70	183.33
2012	1539.36	1908.09	831.78	311.28	372.10	194.56
2013	1669.19	2058.47	897.70	329.57	392.40	205.06
2014	1824.22	2238.07	975.69	352.64	418.27	218.07
2015	1936.64	2355.33	1043.21	368.96	434.11	229.94
2016	2057.51	2479.90	1085.48	383.56	448.11	235.03
2017	2188.21	2607.43	1171.88	399.35	461.46	248.76

Figure ZJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban areas remained larger than that in rural areas. Since 1997, the growth of human capital for rural and urban areas both accelerated, with the growth rate is significantly higher in urban area than in rural area. Therefore, the gap between urban and rural regions within Zhejiang expanded rapidly.

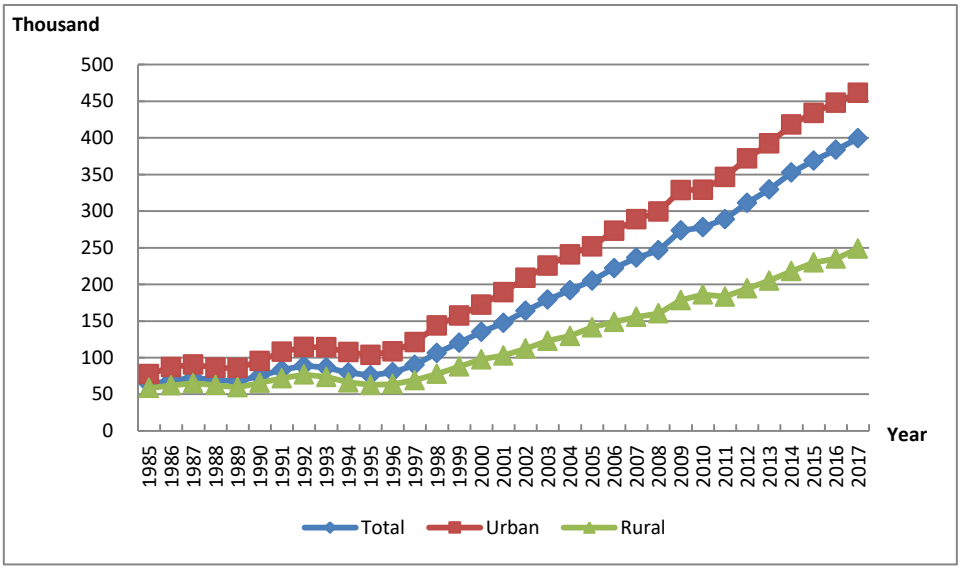


Figure ZJ-2.2 Real Human Capital Per Capita by Region for Zhejiang，1985-2017

18.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

18.3.1 Total labor force human capital

The total labor force human capital for Zhejiang is reported in Table ZJ-3.1 From 1985 to 2017, the nominal labor force human capital increased

from 1,021 billion Yuan to 41,231 billion Yuan, an increase of more than 40 times; and the real labor force human capital increased from 1,021 billion Yuan to 7,653 billion Yuan, an increase of approximately 7 times.

Table ZJ-3.1 Nominal and Real Labor Force Human Capital for Zhejiang

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	1021	1021
1986	1179	1111
1987	1377	1201
1988	1623	1170
1989	1856	1127
1990	2105	1253
1991	2408	1393
1992	2646	1442
1993	2900	1335
1994	3189	1178
1995	3585	1135
1996	4219	1229
1997	4797	1347
1998	5609	1564
1999	6510	1815
2000	7596	2071
2001	8372	2285
2002	8953	2460
2003	9688	2617
2004	10616	2759
2005	11962	3052
2006	14293	3599
2007	16120	3887
2008	18560	4250
2009	21499	4979

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	24578	5459
2011	27313	5750
2012	29092	5982
2013	31198	6264
2014	33251	6538
2015	36238	7013
2016	39121	7414
2017	41231	7653

18.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables ZJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 44.23 thousand Yuan to 1.23 million Yuan, an increase of more than 27 times; and the real average labor force human capital increased from 44.23 thousand Yuan to 228.32 thousand Yuan, an increase of approximately 5 times.

Table ZJ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Zhejiang

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	44.23	51.04	41.41	44.23	51.04	41.41
1986	50.14	58.58	46.57	47.23	55.11	43.89
1987	56.94	67.48	52.38	49.68	57.24	46.40
1988	65.53	77.47	60.29	47.23	53.25	44.58
1989	75.03	88.89	68.75	45.57	52.32	42.50
1990	84.61	98.98	77.90	50.35	57.05	47.22

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	95.04	111.07	87.66	54.97	60.63	52.35
1992	106.13	123.83	98.31	57.84	61.90	56.02
1993	117.72	136.63	109.80	54.21	56.26	53.29
1994	130.28	150.46	121.99	48.13	49.68	47.40
1995	144.10	166.43	134.64	45.63	46.97	44.95
1996	163.76	192.61	149.63	47.69	49.51	46.68
1997	186.36	229.62	166.60	52.33	56.70	50.91
1998	212.52	262.85	185.83	59.25	64.58	57.19
1999	240.29	297.81	204.76	66.99	73.53	63.97
2000	271.88	323.35	224.04	74.14	79.13	69.24
2001	294.33	346.23	243.93	80.33	85.07	75.38
2002	320.18	374.14	264.35	87.98	93.04	82.27
2003	345.50	396.49	289.35	93.34	98.11	87.51
2004	376.72	429.34	313.90	97.91	103.34	90.76
2005	413.99	470.53	339.20	105.61	111.59	96.91
2006	466.36	529.83	379.80	117.45	124.28	107.44
2007	521.30	592.61	418.79	125.72	133.79	113.47
2008	582.57	664.56	459.17	133.40	143.16	118.15
2009	655.42	750.05	502.53	151.77	163.71	131.68
2010	720.45	824.43	539.85	160.01	173.02	136.41
2011	790.74	908.38	584.83	166.46	181.04	139.94
2012	866.24	991.73	636.46	178.11	193.40	148.87
2013	934.57	1063.79	689.51	187.64	202.79	157.50
2014	1008.18	1138.43	747.87	198.22	212.76	167.15
2015	1097.25	1229.70	809.20	212.35	226.65	178.36
2016	1159.62	1296.20	854.20	219.76	234.22	184.95
2017	1230.05	1364.11	924.82	228.32	241.42	196.32

Chapter 19 Human Capital for Anhui

19.1 Total human capital

Table AH-1.1 presents the estimates of nominal and real total human capital and real physical capital for Anhui. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six- education categories. Column 3 is the real physical capital of Anhui.

Table AH-1.1 Real Physical Capital, Nominal and Real Human Capital for Anhui

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1651	1651	38
1986	1910	1797	44
1987	2194	1896	50
1988	2586	1863	56
1989	2995	1834	61
1990	3462	2065	66
1991	4052	2292	71
1992	4560	2381	76
1993	5181	2352	84
1994	5945	2129	94
1995	6732	2103	107
1996	7854	2229	121
1997	9054	2533	136
1998	10169	2837	152
1999	11444	3259	166
2000	13166	3715	182
2001	15127	4238	200
2002	16793	4748	220
2003	18737	5198	243

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2004	20719	5493	277
2005	23207	6067	316
2006	26358	6804	363
2007	28395	6960	420
2008	31370	7238	487
2009	34631	8065	566
2010	37550	8478	664
2011	42610	9106	778
2012	47730	9970	908
2013	53190	10842	1049
2014	58850	11795	1202
2015	64690	12795	1359
2016	71090	13812	1530
2017	77770	14922	1701

19.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table AH-2.1 presents human capital per capita for Anhui by region. From 1985 to 2017, the nominal human capital per capita increased from 35.4 thousand Yuan to 1.51 million Yuan, an increase of more than 43 times; and the real human capital per capita increased from 35.4 thousand Yuan to 293.37 thousand Yuan, an increase of approximately 8 times.

Figure AH-2.1 illustrates the trends of human capital per capita by gender for Anhui. The real human capital per capita of male is similar to that of female for Anhui. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

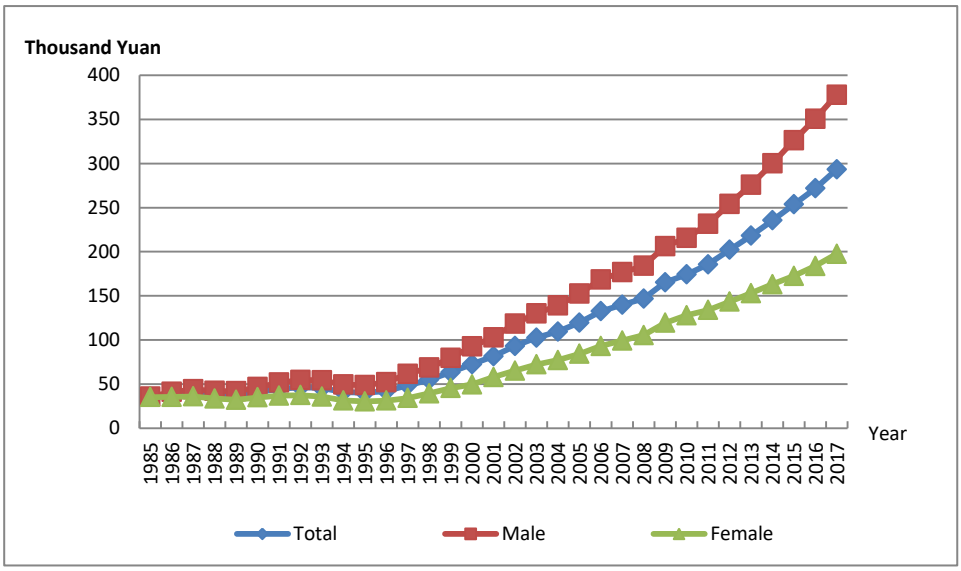


Figure AH-2.1 Human Capital Per Capita by Gender for Anhui，1985-2017

Table AH-2.1 Nominal and Real Human Capital Per Capita by Region for Anhui

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	35.40	77.14	27.69	35.40	77.14	27.69
1986	40.65	91.16	31.02	38.25	86.17	29.12
1987	46.34	105.16	34.62	40.06	90.44	30.02
1988	52.93	119.09	39.41	38.13	84.37	28.69
1989	60.67	136.39	44.63	37.15	83.51	27.35
1990	68.68	152.13	50.48	40.97	90.79	30.09
1991	78.87	177.62	57.04	44.61	98.70	32.66

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	88.97	198.15	64.37	46.46	101.20	34.13
1993	100.10	223.78	72.20	45.44	99.90	33.17
1994	114.15	259.20	80.86	40.88	90.83	29.41
1995	127.97	289.46	90.36	39.98	87.52	28.91
1996	148.20	331.01	100.85	42.07	90.90	29.41
1997	173.52	386.99	112.86	48.55	104.29	32.68
1998	196.29	425.94	124.82	54.76	114.44	36.19
1999	222.39	467.68	138.46	63.33	128.75	40.96
2000	256.39	533.70	153.30	72.34	145.61	45.13
2001	290.84	579.26	170.14	81.48	158.04	49.44
2002	329.23	627.95	187.41	93.08	172.88	55.17
2003	369.40	674.31	207.35	102.48	182.36	60.02
2004	412.24	719.75	228.95	109.29	186.63	63.24
2005	457.27	760.25	251.44	119.54	195.18	68.16
2006	512.96	847.44	278.61	132.41	214.56	74.85
2007	570.20	934.00	305.50	139.76	224.57	78.02
2008	635.62	1036.24	333.14	146.66	235.05	79.96
2009	709.30	1152.43	363.58	165.18	264.36	87.77
2010	771.29	1245.21	393.91	174.14	277.32	91.96
2011	868.30	1387.80	426.18	185.56	293.25	93.95
2012	967.34	1525.29	461.34	202.06	315.36	99.32
2013	1069.36	1663.54	496.87	217.97	335.88	104.36
2014	1174.82	1803.73	535.18	235.46	358.10	110.75
2015	1282.22	1939.25	576.29	253.61	380.06	117.72
2016	1398.89	2084.70	620.78	271.79	401.35	124.82
2017	1529.00	2226.49	690.50	293.37	423.14	137.32

Figure AH-2.2 shows the trend of real human capital per capita by

region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

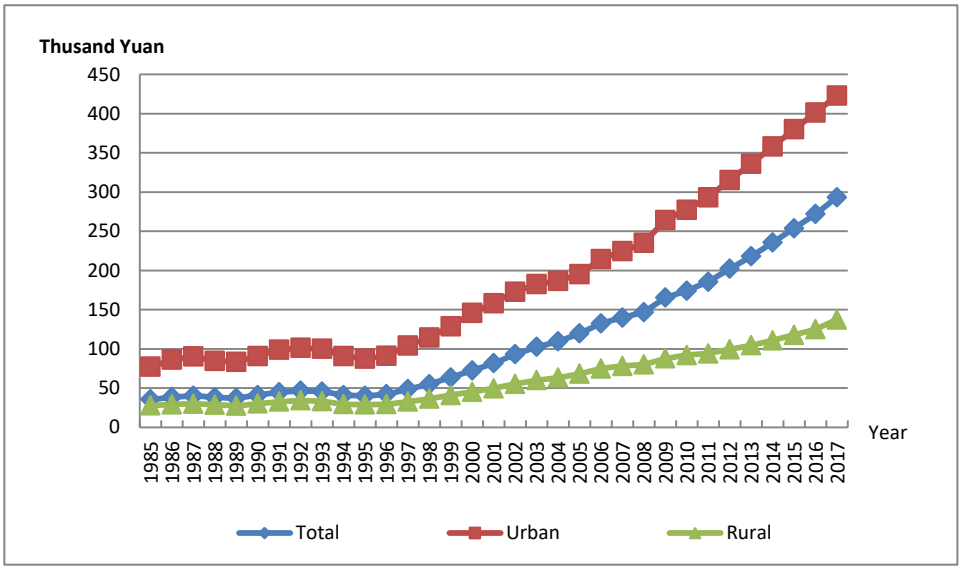


Figure AH-2.2 Real Human Capital Per Capita by Region for Anhui，1985-2017

19.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

19.3.1 Total labor force human capital

The total labor force human capital for Anhui is reported in Table AH-3.1 From 1985 to 2017, the nominal labor force human capital increased from 637 billion Yuan to 30,312 billion Yuan, an increase of more than 48 times; and the real labor force human capital increased from 637 billion Yuan

to 5,834 billion Yuan, an increase of approximately 9 times.

Table AH-3.1 Nominal and Real Labor Force Human Capital for Anhui

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	637	637
1986	743	699
1987	877	758
1988	1058	763
1989	1243	762
1990	1448	863
1991	1670	946
1992	1914	1001
1993	2170	987
1994	2446	878
1995	2771	869
1996	3160	901
1997	3501	985
1998	3937	1105
1999	4410	1263
2000	4987	1416
2001	5504	1550
2002	5866	1667
2003	6309	1760
2004	6769	1804
2005	7634	2002
2006	9002	2333
2007	10029	2470
2008	11158	2589
2009	12421	2908
2010	13945	3162
2011	15584	3345
2012	17362	3643

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2013	19225	3935
2014	22009	4430
2015	24798	4922
2016	27457	5354
2017	30312	5834

19.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables AH-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 24.13 thousand Yuan to 899.26 thousand Yuan, an increase of more than 37 times; and the real average labor force human capital increased from 24.13 thousand Yuan to 173.08 thousand Yuan, an increase of approximately 7 times.

Table AH-3.2 Nominal and Real Average Labor Force Human Capital by Region for Anhui

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	24.13	47.37	19.51	24.13	47.37	19.51
1986	27.47	54.11	22.03	25.85	51.14	20.68
1987	31.50	62.28	24.87	27.24	53.57	21.56
1988	36.01	70.76	28.49	25.97	50.13	20.74
1989	41.12	80.22	32.47	25.19	49.12	19.90
1990	46.45	88.68	36.78	27.70	52.92	21.93
1991	52.29	99.76	41.34	29.62	55.43	23.67
1992	59.08	111.57	46.27	30.90	56.98	24.53

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1993	65.40	123.29	51.67	29.74	55.04	23.74
1994	72.92	136.59	57.71	26.18	47.87	20.99
1995	81.35	151.40	64.30	25.51	45.77	20.57
1996	92.45	169.51	71.61	26.35	46.55	20.88
1997	104.35	197.77	79.75	29.37	53.30	23.10
1998	117.37	218.57	88.34	32.95	58.73	25.61
1999	132.11	241.54	97.02	37.83	66.49	28.70
2000	148.63	254.94	106.68	42.20	69.56	31.40
2001	163.66	272.51	115.86	46.08	74.35	33.66
2002	179.12	289.43	124.71	50.91	79.68	36.71
2003	194.74	305.11	134.35	54.32	82.52	38.89
2004	212.41	323.62	144.10	56.61	83.91	39.80
2005	236.69	349.67	155.33	62.06	89.77	42.11
2006	272.10	399.02	180.83	70.53	101.02	48.58
2007	306.15	443.36	205.85	75.40	106.60	52.57
2008	339.56	487.81	229.84	78.79	110.65	55.16
2009	377.43	539.66	254.68	88.36	123.80	61.48
2010	418.88	598.29	276.68	94.98	133.25	64.59
2011	469.70	673.43	304.65	100.82	142.30	67.16
2012	522.28	746.82	335.92	109.59	154.41	72.32
2013	578.00	824.70	367.44	118.31	166.51	77.18
2014	652.40	929.39	401.17	131.32	184.51	83.02
2015	730.54	1036.35	435.82	145.00	203.11	89.03
2016	808.14	1138.20	469.18	157.58	219.13	94.33
2017	899.26	1246.64	518.80	173.08	236.92	103.18

Chapter 20 Human Capital for Fujian

20.1 Total human capital

Table FJ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Fujian. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Fujian.

Table FJ-1.1 Real Physical Capital, Nominal and Real Human Capital for Fujian

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1372	1372	25
1986	1581	1493	29
1987	1799	1563	33
1988	2098	1443	36
1989	2429	1405	39
1990	2811	1641	41
1991	3318	1874	44
1992	3899	2078	48
1993	4528	2086	55
1994	5243	1920	65
1995	5996	1897	78
1996	6906	2050	92
1997	7855	2280	108
1998	8872	2572	127
1999	9876	2885	146
2000	11120	3166	165
2001	12759	3654	183

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	13977	4012	204
2003	14991	4262	228
2004	16262	4436	261
2005	17644	4699	303
2006	19976	5261	354
2007	22459	5607	419
2008	24658	5878	503
2009	26997	6547	600
2010	29496	6919	701
2011	33096	7354	815
2012	37337	8078	941
2013	40172	8471	1083
2014	43960	9073	1235
2015	47060	9548	1401
2016	50670	10078	1578
2017	54730	10753	1766

20.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table FJ-2.1 presents human capital per capita for Fujian by region. From 1985 to 2017, the nominal human capital per capita increased from 54.95 thousand Yuan to 1.68 million Yuan, an increase of more than 30 times; and the real human capital per capita increased from 54.95 thousand Yuan to 330.14 thousand Yuan, an increase of approximately 6 times.

Figure FJ-2.1 illustrates the trends of human capital per capita by gender for Fujian. The real human capital per capita of male is similar to that of female for Fujian. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

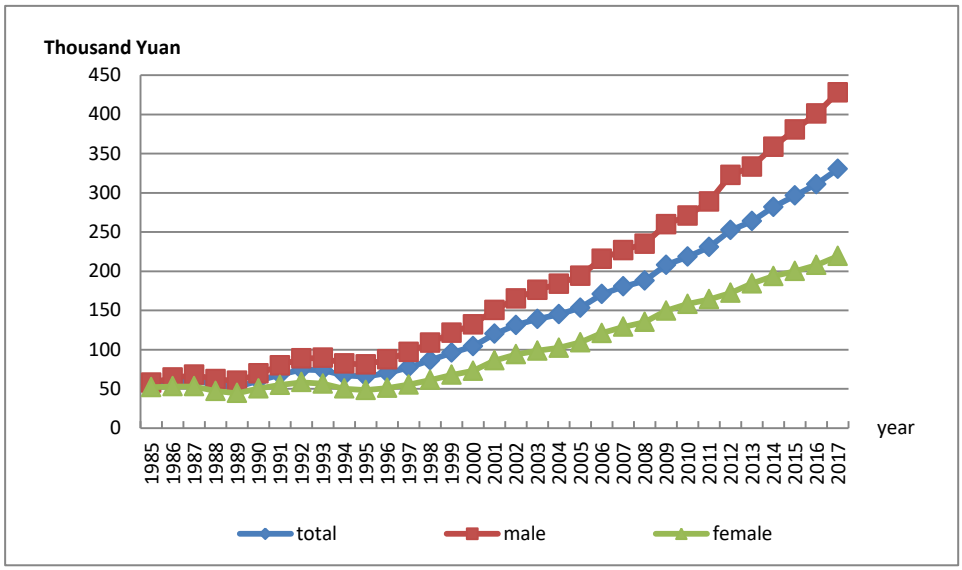


Figure FJ-2.1 Human Capital Per Capita by Gender for Fujian，1985-2017

Table FJ-2.1 Nominal and Real Human Capital Per Capita by Region for Fujian

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	54.95	77.27	48.98	54.95	77.27	48.98
1986	62.32	90.71	54.78	58.88	84.85	51.97
1987	69.89	102.41	61.35	60.74	86.62	53.95
1988	80.00	118.89	69.67	55.03	79.18	48.62
1989	90.94	137.73	78.39	52.60	77.21	46.01

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	103.41	158.11	88.61	60.36	88.55	52.75
1991	120.43	185.27	100.23	68.00	99.19	58.27
1992	139.64	215.44	112.72	74.43	106.80	62.95
1993	160.21	246.91	125.67	73.82	104.80	61.45
1994	183.29	279.58	140.53	67.10	94.86	54.76
1995	207.23	311.20	156.24	65.55	90.71	53.21
1996	236.10	352.87	173.27	70.07	96.22	55.99
1997	265.74	390.86	192.30	77.13	103.97	61.34
1998	297.39	432.12	211.80	86.21	114.95	67.90
1999	328.22	467.96	232.51	95.88	126.12	75.14
2000	365.33	512.75	257.35	104.01	133.91	82.10
2001	418.58	594.07	279.52	119.88	157.83	89.80
2002	456.88	640.25	300.50	131.14	171.47	96.74
2003	489.03	668.34	324.82	139.03	177.75	103.53
2004	530.80	713.89	351.58	144.79	182.91	107.44
2005	575.75	762.96	380.77	153.34	191.84	113.19
2006	647.53	849.80	421.67	170.54	211.35	124.98
2007	722.46	941.79	461.44	180.37	222.86	129.75
2008	787.30	1011.28	503.42	187.68	229.00	135.33
2009	857.46	1087.45	549.29	207.94	250.51	150.83
2010	930.63	1167.00	595.34	218.30	260.75	158.10
2011	1037.44	1304.54	638.58	230.52	277.08	161.05
2012	1166.24	1467.29	693.83	252.32	304.27	170.80
2013	1250.69	1553.05	752.85	263.73	313.89	181.17
2014	1365.18	1680.02	823.40	281.76	332.57	194.45
2015	1460.81	1773.79	898.77	296.38	345.26	208.70
2016	1562.56	1870.19	961.67	310.78	357.25	220.01
2017	1680.33	1976.24	1065.91	330.14	372.66	241.92

Figure FJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

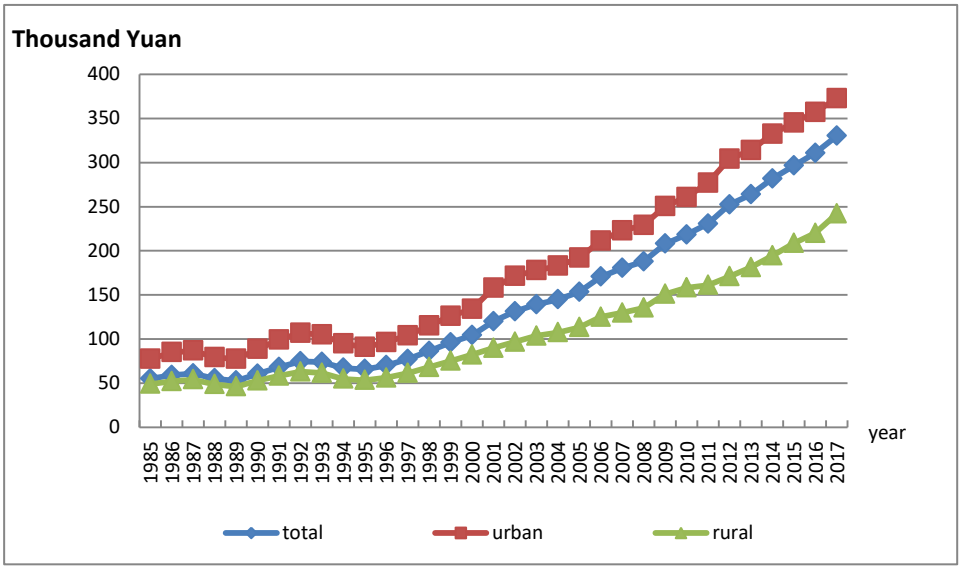


Figure FJ-2.2 Real Human Capital Per Capita by Region for Fujian，1985-2017

20.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

20.3.1 Total labor force human capital

The total labor force human capital for Fujian is reported in Table FJ-3.1 From 1985 to 2017, the nominal labor force human capital increased from 482 billion Yuan to 20398 billion Yuan, an increase of more than 42 times;

and the real labor force human capital increased from 482 billion Yuan to 4067 billion Yuan, an increase of approximately 8 times.

Table FJ-3.1 Nominal and Real Labor Force Human Capital for Fujian

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	482	482
1986	568	536
1987	663	576
1988	794	546
1989	948	549
1990	1104	646
1991	1291	731
1992	1497	803
1993	1756	816
1994	2016	746
1995	2295	735
1996	2609	785
1997	2986	879
1998	3494	1026
1999	4030	1191
2000	4642	1337
2001	5124	1489
2002	5634	1640
2003	6203	1784
2004	6772	1865
2005	7373	1977
2006	8484	2257
2007	9543	2411
2008	10656	2571
2009	11961	2932
2010	13390	3172

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	14520	3263
2012	15580	3413
2013	16427	3508
2014	17604	3679
2015	18943	3890
2016	19591	3950
2017	20398	4067

20.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables FJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 35.69 thousand Yuan to 933.64 thousand Yuan, an increase of more than 26 times; and the real average labor force human capital increased from 35.69 thousand Yuan to 186.15 thousand Yuan, an increase of approximately 5 times.

Table FJ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Fujian

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	35.69	47.11	32.56	35.69	47.11	32.56
1986	40.34	53.86	36.65	38.12	50.39	34.77
1987	45.83	62.23	41.25	39.85	52.63	36.27
1988	52.56	71.84	47.20	36.18	47.84	32.94
1989	59.93	82.21	53.78	34.71	46.09	31.57
1990	67.99	92.50	61.14	39.76	51.80	36.39

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	78.31	107.46	69.22	44.35	57.53	40.24
1992	89.56	123.12	78.22	48.07	61.04	43.68
1993	102.69	142.23	87.95	47.73	60.37	43.01
1994	116.05	159.34	98.75	42.93	54.06	38.48
1995	130.55	178.76	109.67	41.82	52.10	37.35
1996	146.55	200.01	121.01	44.10	54.53	39.10
1997	164.73	233.18	134.01	48.49	62.03	42.75
1998	185.43	258.32	149.07	54.47	68.72	47.79
1999	206.00	281.70	164.55	60.89	75.92	53.18
2000	228.68	293.59	181.62	65.89	76.67	57.94
2001	249.66	318.40	196.31	72.54	84.59	63.07
2002	269.46	342.01	209.61	78.43	91.60	67.48
2003	290.95	366.26	224.02	83.67	97.41	71.40
2004	314.96	395.29	237.28	86.72	101.28	72.51
2005	340.84	426.23	250.78	91.39	107.17	74.55
2006	387.04	476.42	289.11	102.96	118.49	85.69
2007	429.31	521.06	325.26	108.48	123.30	91.46
2008	471.58	565.27	358.88	113.76	128.00	96.48
2009	522.01	619.97	395.00	127.96	142.82	108.47
2010	573.55	674.23	430.61	135.87	150.65	114.36
2011	628.75	742.51	463.59	141.30	157.70	116.92
2012	680.53	799.94	499.85	149.08	165.88	123.05
2013	723.34	840.61	536.36	154.47	169.90	129.07
2014	774.87	887.80	580.39	161.94	175.74	137.06
2015	833.71	938.43	633.86	171.21	182.66	147.19
2016	881.22	978.67	684.14	177.67	186.95	156.52
2017	933.64	1020.94	751.19	186.15	192.52	170.49

Chapter 21 Human Capital for Jiangxi

21.1 Total human capital

Table JX-1.1 presents the estimates of nominal and real total human capital and real physical capital for Jiangxi. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Jiangxi.

Table JX-1.1 Real Physical Capital, Nominal and Real Human Capital for Jiangxi

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1205	1205	34
1986	1404	1313	39
1987	1608	1419	42
1988	1875	1366	44
1989	2133	1308	48
1990	2443	1463	51
1991	2848	1666	54
1992	3259	1815	60
1993	3734	1826	68
1994	4263	1642	76
1995	4911	1614	85
1996	5602	1695	95
1997	6261	1847	108
1998	7097	2069	120
1999	8047	2375	134
2000	9245	2709	148

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	10679	3131	165
2002	11819	3450	190
2003	13144	3796	223
2004	14423	4023	264
2005	15707	4297	312
2006	18081	4879	371
2007	20094	5155	441
2008	22250	5376	523
2009	24534	5963	615
2010	27703	6519	715
2011	31400	6998	822
2012	34850	7536	930
2013	38830	8169	1040
2014	43040	8831	1136
2015	47030	9496	1249
2016	52590	10388	1391
2017	58380	11297	1523

21.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table JX-2.1 presents human capital per capita for Jiangxi by region. From 1985 to 2017, the nominal human capital per capita increased from 38.32 thousand Yuan to 1.5 million Yuan, an increase of more than 39 times; and the real human capital per capita increased from 38.32 thousand Yuan to 291.11 thousand Yuan, an increase of approximately 8

times.

Figure JX-2.1 illustrates the trends of human capital per capita by gender for Jiangxi. The real human capital per capita of male is similar to that of female for Jiangxi. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

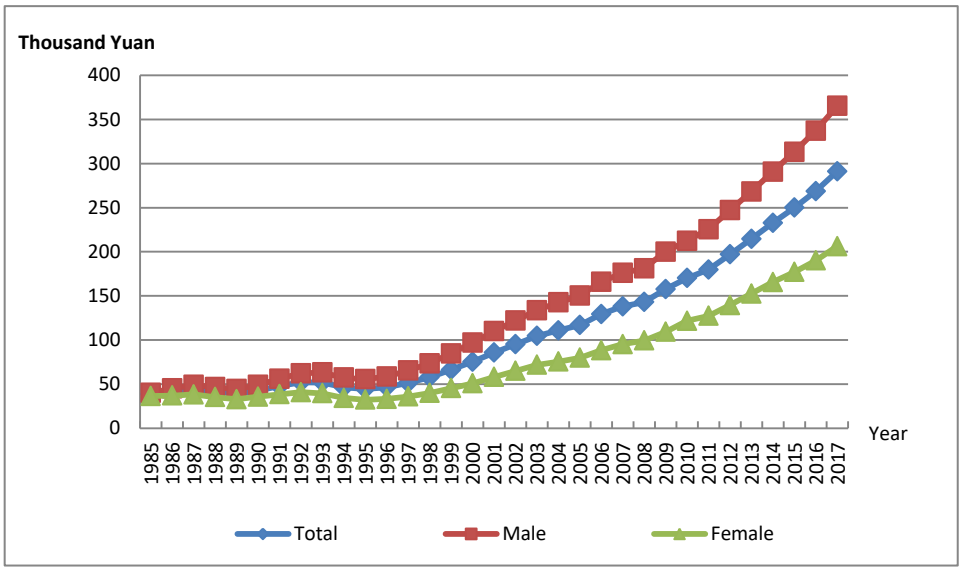


Figure JX-2.1 Human Capital Per Capita by Gender for Jiangxi，1985-2017

Table JX-2.1 Nominal and Real Human Capital Per Capita by Region for Jiangxi

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	38.32	62.58	32.37	38.32	62.58	32.37
1986	44.04	74.77	36.46	41.19	70.54	33.95
1987	49.83	85.88	40.87	43.94	75.09	36.21
1988	56.38	95.91	46.43	41.08	67.79	34.36
1989	63.48	106.80	52.48	38.92	64.41	32.45
1990	71.33	118.93	59.13	42.73	70.67	35.57

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	81.56	137.39	66.58	47.70	78.19	39.53
1992	93.31	160.05	74.59	51.97	84.73	42.79
1993	106.04	184.32	83.08	51.86	84.27	42.36
1994	120.14	212.24	92.05	46.26	76.47	37.05
1995	135.11	239.74	101.71	44.40	73.89	34.99
1996	153.38	272.99	113.47	46.42	77.83	35.94
1997	173.98	307.71	127.47	51.31	85.17	39.55
1998	197.43	352.27	141.60	57.55	96.54	43.49
1999	224.28	404.17	157.28	66.19	111.77	49.25
2000	256.82	467.00	175.59	75.25	126.49	55.48
2001	291.85	524.19	192.44	85.57	142.26	61.29
2002	325.68	568.69	210.68	95.07	154.03	67.17
2003	361.81	612.56	231.15	104.49	164.43	73.26
2004	397.34	644.78	256.58	110.83	167.55	78.57
2005	427.01	662.86	279.21	116.82	169.71	83.65
2006	479.26	735.94	310.61	129.32	186.73	91.60
2007	537.96	817.75	343.67	138.01	198.75	95.79
2008	591.27	883.85	377.85	142.86	202.85	99.08
2009	648.38	950.29	417.74	157.59	219.41	110.42
2010	723.06	1063.4	453.09	170.15	238.57	115.92
2011	807.00	1190.7	485.38	179.85	254.16	117.60
2012	911.35	1342.4	524.87	197.07	279.16	123.50
2013	1020.14	1499.10	563.71	214.62	304.56	128.86
2014	1134.24	1651.56	611.28	232.73	327.67	136.73
2015	1238.38	1773.2	664.63	250.04	346.63	146.46
2016	1360.14	1940.21	700.45	268.67	371.82	151.48
2017	1504.37	2111.8	768.54	291.11	396.78	163.10

Figure JX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

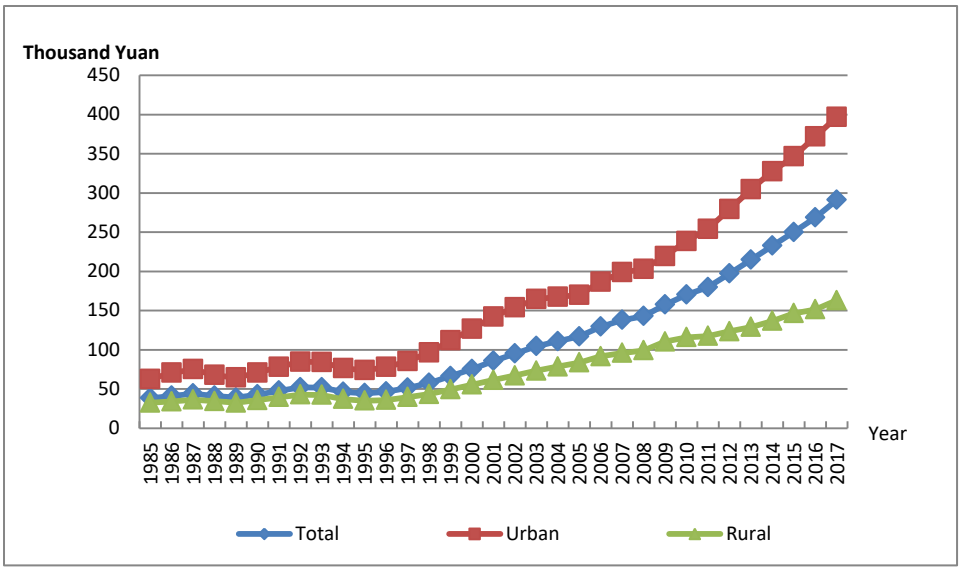


Figure JX-2.2 Real Human Capital Per Capita by Region for Jiangxi，1985-2017

21.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

21.3.1 Total labor force human capital

The total labor force human capital for Jiangxi is reported in Table JX-3.1 From 1985 to 2017, the nominal labor force human capital increased from 438 billion Yuan to 18,983 billion Yuan, an increase of more than 43

times; and the real labor force human capital increased from 438 billion Yuan to 3,735 billion Yuan, an increase of approximately 9 times.

Table JX-3.1 Nominal and Real Labor Force Human Capital for Jiangxi

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	438	438
1986	506	473
1987	585	516
1988	707	515
1989	840	515
1990	996	597
1991	1163	681
1992	1318	736
1993	1496	736
1994	1695	658
1995	1934	641
1996	2187	669
1997	2421	723
1998	2734	808
1999	3074	923
2000	3487	1044
2001	3827	1150
2002	4084	1223
2003	4400	1304
2004	4695	1338
2005	5138	1428
2006	6189	1698
2007	7012	1828
2008	7975	1957
2009	9037	2228
2010	10326	2462

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	11610	2619
2012	12468	2730
2013	13402	2856
2014	14560	3029
2015	16069	3288
2016	17445	3500
2017	18983	3735

21.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables JX-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 26.73 thousand Yuan to 773.99 thousand Yuan, an increase of more than 29 times; and the real average labor force human capital increased from 26.73 thousand Yuan to 152.29 thousand Yuan, an increase of approximately 6 times.

Table JX-3.2 Nominal and Real Average Labor Force Human Capital by Region for Jiangxi

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	26.73	41.32	22.52	26.73	41.32	22.52
1986	30.21	47.08	25.39	28.26	44.42	23.64
1987	34.17	53.94	28.55	30.13	47.16	25.29
1988	38.97	60.79	32.69	28.39	42.96	24.20
1989	44.37	68.48	37.40	27.20	41.30	23.12
1990	50.15	75.27	42.74	30.04	44.72	25.71
1991	56.59	85.19	48.07	33.12	48.49	28.54

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	63.22	95.32	53.72	35.31	50.47	30.82
1993	69.95	105.43	59.72	34.43	48.20	30.45
1994	77.38	116.89	65.96	30.04	42.11	26.55
1995	85.48	129.54	72.47	28.35	39.92	24.93
1996	96.18	144.62	81.47	29.40	41.23	25.80
1997	108.04	167.75	91.66	32.25	46.43	28.44
1998	121.11	186.32	103.04	35.79	51.06	31.65
1999	134.83	206.70	114.69	40.47	57.16	35.91
2000	151.14	218.11	127.68	45.24	59.08	40.34
2001	164.21	233.43	138.01	49.32	63.35	43.96
2002	176.75	246.78	147.39	52.92	66.84	46.99
2003	190.28	260.85	157.51	56.37	70.02	49.92
2004	204.60	276.84	166.46	58.29	71.94	50.97
2005	221.09	296.06	175.66	61.46	75.80	52.63
2006	255.62	336.12	204.86	70.12	85.29	60.41
2007	289.63	374.43	233.70	75.50	91.00	65.14
2008	325.48	416.87	262.31	79.85	95.67	68.78
2009	365.56	465.73	292.33	90.12	107.53	77.27
2010	408.76	522.31	319.67	97.46	117.17	81.79
2011	455.05	589.94	343.11	102.65	125.92	83.13
2012	502.19	651.08	370.85	109.96	135.39	87.26
2013	545.64	700.20	400.74	116.28	142.26	91.61
2014	593.52	752.31	435.03	123.47	149.26	97.30
2015	648.06	808.49	473.66	132.60	158.04	104.38
2016	703.09	880.61	511.93	141.06	168.76	110.71
2017	773.99	963.93	567.44	152.29	181.10	120.42

Chapter 22 Human Capital for Shandong

22.1 Total human capital

Table SD-1.1 presents the estimates of nominal and real total human capital and real physical capital for Shandong. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Shandong.

Table SD-1.1 Real Physical Capital, Nominal and Real Human Capital for Shandong

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of Yuan)	Real Physical Capital (Billions of Yuan)
1985	3260	3260	100.5
1986	3784	3623	114.5
1987	4418	3913	131.7
1988	5167	3860	148.2
1989	6010	3818	161.6
1990	6902	4240	175.5
1991	8064	4715	193.3
1992	9257	5080	214.1
1993	10542	5130	237.2
1994	12045	4735	260.5
1995	13561	4532	287.0
1996	15297	4647	318.8
1997	17144	5055	355.8
1998	19418	5746	399.4
1999	21876	6495	449.7
2000	25004	7369	509.2
2001	28029	8099	573.8

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of Yuan)	Real Physical Capital (Billions of Yuan)
2002	31430	9123	651.9
2003	34510	9896	748.8
2004	37480	10376	874.5
2005	41340	11247	1041.0
2006	46960	12639	1240.1
2007	52790	13617	1455.1
2008	58020	14230	1689.4
2009	64100	15719	1980.3
2010	68930	16432	2301.7
2011	78030	17697	2646.8
2012	85170	18917	3011.9
2013	92850	20190	3396.7
2014	101780	21695	3792.2
2015	109750	23098	4234.1
2016	118830	24496	4650.4
2017	127600	25917	4981.7

22.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table SD-2.1 presents human capital per capita for Shandong by region. From 1985 to 2017, the nominal human capital per capita increased from 46.87 thousand Yuan to 1.61 million Yuan, an increase of more than 34 times; and the real human capital per capita increased from 46.87 thousand Yuan to 326.3 thousand Yuan, an increase of approximately 7 times.

Figure SD-2.1 illustrates the trends of human capital per capita by gender for Shandong. The real human capital per capita of male is similar to that of female for Shandong. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

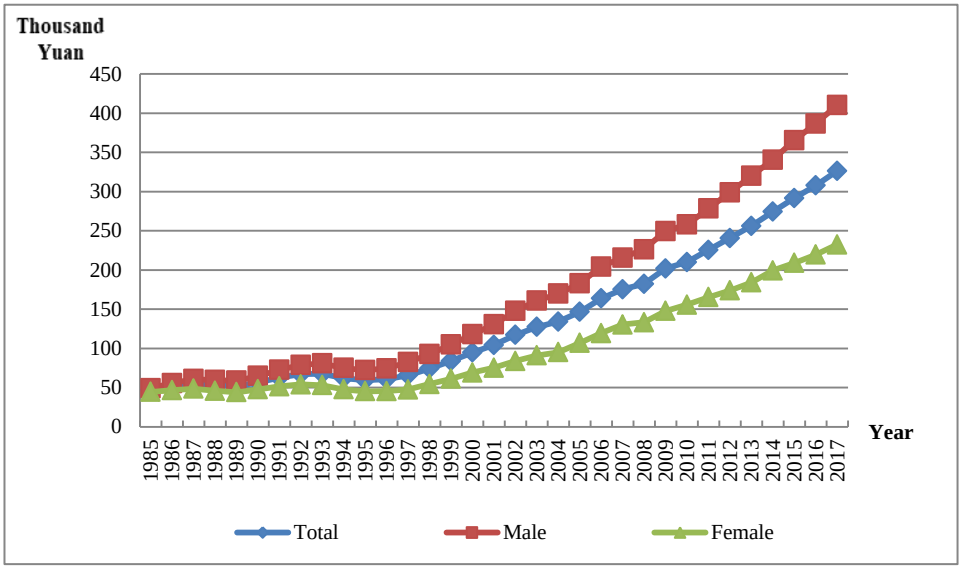


Figure SD-2.1 Human Capital Per Capita by Gender for Shandong，1985-2017

Table SD-2.1 Nominal and Real Human Capital Per Capita by Region for Shandong

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	46.87	76.48	38.20	46.87	76.48	38.20
1986	53.64	89.08	42.66	51.36	84.83	40.98
1987	61.91	103.64	48.30	54.83	90.47	43.20
1988	70.96	117.95	54.74	53.01	85.38	41.85
1989	81.48	135.14	61.77	51.76	84.55	39.72
1990	92.16	150.46	69.94	56.61	91.75	43.24

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	107.14	176.28	78.86	62.64	101.21	46.88
1992	122.30	199.85	88.61	67.12	105.66	50.36
1993	138.78	226.09	98.46	67.53	104.31	50.55
1994	157.64	256.93	109.62	61.97	94.52	46.24
1995	177.43	290.09	120.43	59.29	91.37	43.09
1996	199.37	325.61	132.34	60.57	92.81	43.44
1997	222.80	360.40	145.96	65.69	99.55	46.79
1998	251.10	407.00	160.52	74.30	112.75	51.97
1999	282.68	457.09	175.96	83.93	126.63	57.78
2000	321.02	521.47	193.61	94.61	142.75	64.03
2001	360.61	576.63	212.05	104.20	156.14	68.48
2002	403.68	638.53	229.31	117.18	175.18	74.13
2003	444.23	688.17	248.49	127.39	187.48	79.14
2004	484.23	732.70	270.63	134.06	194.18	82.41
2005	538.63	804.19	293.08	146.54	210.80	87.15
2006	608.10	904.78	326.27	163.67	234.82	96.06
2007	679.68	1005.18	360.32	175.32	251.33	100.74
2008	743.39	1089.67	395.90	182.32	260.23	104.23
2009	822.62	1193.25	437.08	201.73	285.13	114.98
2010	881.30	1259.79	479.04	210.09	292.54	122.47
2011	994.74	1428.63	523.46	225.61	316.85	126.37
2012	1082.97	1544.55	571.60	240.54	335.52	135.29
2013	1177.88	1666.85	620.32	256.13	355.72	142.54
2014	1286.59	1812.41	673.31	274.24	378.79	152.37
2015	1385.68	1927.68	737.33	291.63	397.32	165.37
2016	1493.27	2052.30	806.16	307.83	413.90	177.61
2017	1606.50	2169.24	900.00	326.30	430.60	195.54

Figure SD-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

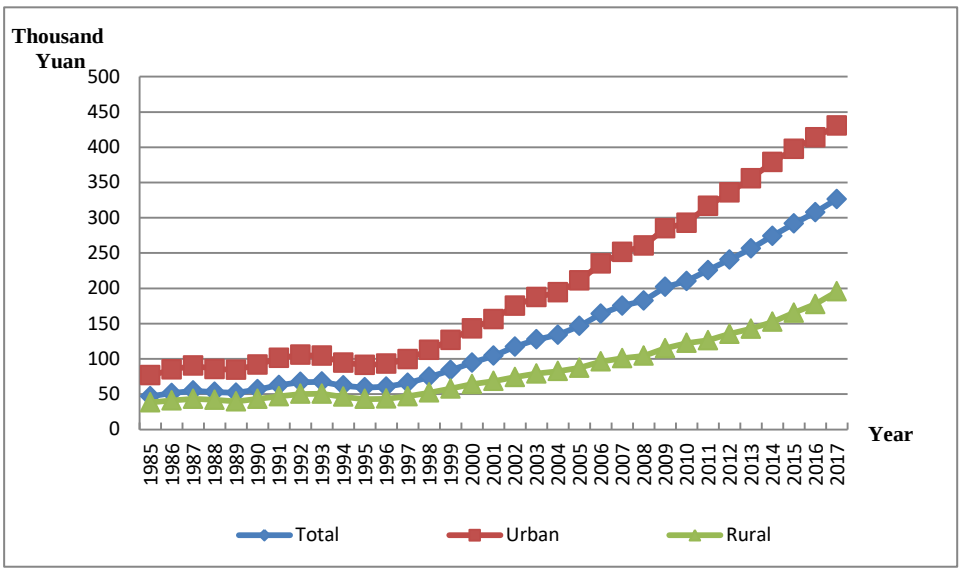


Figure SD-2.2 Real Human Capital Per Capita by Region for Shandong，1985-2017

22.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

22.3.1 Total labor force human capital

The total labor force human capital for Shandong is reported in Table SD-3.1 From 1985 to 2017, the nominal labor force human capital increased from 1374 billion Yuan to 45,080 billion Yuan, an increase of more than 32

times; and the real labor force human capital increased from 1374 billion Yuan to 9,269 billion Yuan, an increase of approximately 7 times.

Table SD-3.1 Nominal and Real Labor Force Human Capital for Shandong

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	1374	1374
1986	1607	1538
1987	1862	1650
1988	2222	1661
1989	2601	1653
1990	2977	1829
1991	3431	2007
1992	3934	2160
1993	4475	2182
1994	5063	1997
1995	5661	1899
1996	6360	1940
1997	7163	2120
1998	8100	2406
1999	9154	2730
2000	10366	3075
2001	11225	3275
2002	12166	3579
2003	13289	3872
2004	14590	4098
2005	16051	4426
2006	18509	5053
2007	20778	5429
2008	23099	5727
2009	25717	6372
2010	28670	6894

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	31090	7106
2012	33260	7453
2013	34920	7661
2014	37680	8113
2015	40160	8548
2016	42690	8902
2017	45080	9269

22.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables SD-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 32.16 thousand Yuan to 861.95 thousand Yuan, an increase of more than 26 times; and the real average labor force human capital increased from 32.16 thousand Yuan to 177.23 thousand Yuan, an increase of approximately 6 times.

Table SD-3.2 Nominal and Real Average Labor Force Human Capital by Region for Shandong

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	32.16	49.13	27.13	32.16	49.13	27.13
1986	36.59	56.30	30.37	35.03	53.62	29.17
1987	41.98	65.18	33.97	37.19	56.90	30.38
1988	48.06	74.15	38.48	35.92	53.67	29.42
1989	55.15	84.66	43.36	35.04	52.97	27.88
1990	62.10	93.77	48.79	38.15	57.18	30.16
1991	70.87	106.76	54.68	41.45	61.30	32.50

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	80.24	120.71	61.07	44.06	63.82	34.71
1993	90.18	135.51	67.80	43.97	62.52	34.81
1994	101.04	152.04	75.14	39.86	55.93	31.70
1995	112.81	169.43	82.81	37.85	53.37	29.63
1996	125.76	188.71	90.78	38.37	53.79	29.80
1997	140.87	219.86	99.63	41.69	60.73	31.94
1998	157.21	244.66	109.51	46.70	67.78	35.46
1999	175.37	271.76	119.89	52.30	75.29	39.37
2000	194.48	285.18	132.12	57.69	78.07	43.69
2001	211.79	307.03	144.85	61.79	83.14	46.78
2002	226.98	323.21	158.07	66.77	88.67	51.10
2003	244.28	338.36	174.09	71.18	92.18	55.45
2004	264.79	359.20	189.61	74.37	95.19	57.74
2005	289.73	385.71	205.89	79.89	101.11	61.22
2006	331.11	441.26	235.23	90.39	114.52	69.25
2007	369.72	491.46	262.46	96.60	122.88	73.38
2008	407.39	538.60	288.90	101.01	128.62	76.06
2009	453.56	593.77	318.01	112.38	141.88	83.66
2010	502.10	654.07	346.84	120.74	151.88	88.67
2011	554.19	727.73	378.11	126.67	161.40	91.28
2012	600.36	786.46	415.00	134.53	170.84	98.22
2013	640.73	829.52	454.94	140.57	177.03	104.54
2014	693.92	890.00	499.06	149.41	186.01	112.94
2015	747.86	948.62	547.03	159.18	195.52	122.69
2016	802.44	1009.59	590.83	167.33	203.61	130.17
2017	861.95	1066.15	654.19	177.23	211.63	142.14

Chapter 23 Human Capital for Henan

23.1 Total human capital

Table HeN-1.1 presents the estimates of nominal and real total human capital and real physical capital for Henan. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Henan.

Table HeN-1.1 Real Physical Capital, Nominal and Real Human Capital for Henan

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	2491	2491	80
1986	2878	2742	93
1987	3304	2971	117
1988	3922	2962	124
1989	4525	2847	141
1990	5211	3253	163
1991	6011	3700	194
1992	6763	3992	253
1993	7650	4088	349
1994	8571	3675	407
1995	9507	3500	484
1996	11115	3682	574
1997	12823	4090	676
1998	14731	4807	759
1999	16738	5621	838
2000	19133	6460	971
2001	22100	7393	1089

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	24060	8021	1204
2003	26740	8764	1413
2004	29270	9095	1780
2005	32050	9741	2125
2006	36920	11057	2597
2007	40720	11552	3327
2008	45640	12065	4404
2009	50830	13492	5201
2010	54560	13616	6545
2011	62410	15099	8400
2012	68290	16098	10009
2013	75580	17291	11668
2014	82050	18420	13440
2015	88270	19582	14866
2016	95430	20746	16589
2017	102640	21998	19638

23.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table HeN-2.1 presents human capital per capita for Henan by region. From 1985 to 2017, the nominal human capital per capita increased from 36.51 thousand Yuan to 1.32 million Yuan, an increase of more than 36 times; and the real human capital per capita increased from 36.51 thousand Yuan to 283.38 thousand Yuan, an increase of approximately 8 times.

Figure HeN-2.1 illustrates the trends of human capital per capita by gender for Henan. The real human capital per capita of male is similar to that of female for Henan. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

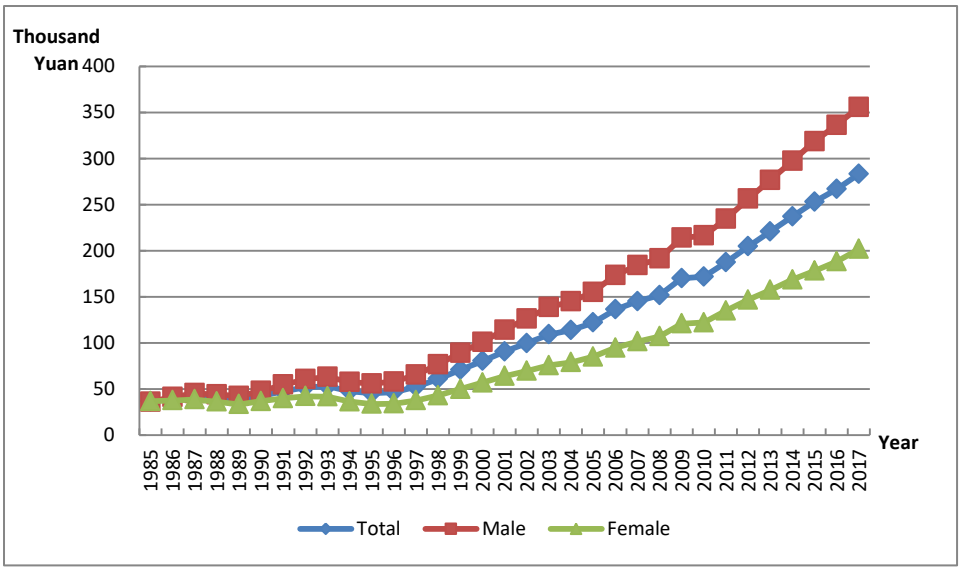


Figure HeN-2.1 Human Capital Per Capita by Gender for Henan，1985-2017

Table HeN-2.1 Nominal and Real Human Capital Per Capita by Region for Henan

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	36.51	59.77	32.45	36.51	59.77	32.45
1986	41.52	72.62	36.01	39.56	68.00	34.52
1987	46.92	86.01	40.01	42.19	74.71	36.43
1988	53.50	98.54	45.39	40.41	70.44	34.99
1989	60.65	112.75	51.21	38.16	70.15	32.36

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	68.13	125.18	57.61	42.53	77.50	36.08
1991	77.57	147.16	64.95	47.75	86.68	40.68
1992	88.03	172.40	72.90	51.96	94.29	44.37
1993	99.35	201.33	81.33	53.09	99.56	44.88
1994	111.25	230.37	90.45	47.70	89.42	40.41
1995	123.48	257.24	100.40	45.46	85.41	38.57
1996	141.13	297.74	110.04	46.75	90.28	38.12
1997	164.24	342.49	123.46	52.39	101.42	41.16
1998	186.79	382.60	136.86	60.95	115.73	47.00
1999	211.15	420.61	151.73	70.91	131.70	53.66
2000	238.19	464.32	167.74	80.42	146.71	59.80
2001	271.16	518.08	187.48	90.71	162.56	66.37
2002	299.10	547.26	207.16	99.71	172.06	72.90
2003	333.26	586.37	230.73	109.23	181.27	80.07
2004	366.53	621.53	255.46	113.89	182.30	84.11
2005	401.53	653.23	281.12	122.04	187.65	90.66
2006	455.27	726.92	316.89	136.35	206.35	100.69
2007	511.52	799.78	353.90	145.12	215.37	106.68
2008	573.89	880.30	394.71	151.71	222.58	110.27
2009	640.96	961.45	442.57	170.13	245.99	123.15
2010	689.05	995.55	490.17	171.96	246.34	123.69
2011	775.42	1121.60	535.92	187.60	263.35	135.23
2012	868.33	1234.31	595.02	204.69	282.45	146.63
2013	965.45	1360.01	651.36	220.87	302.47	155.97
2014	1056.26	1448.15	720.87	237.13	315.74	169.90
2015	1140.99	1504.60	810.35	253.12	323.85	188.72
2016	1227.47	1601.60	861.05	266.85	338.61	196.59
2017	1322.20	1674.04	948.20	283.38	348.69	213.92

Figure HeN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

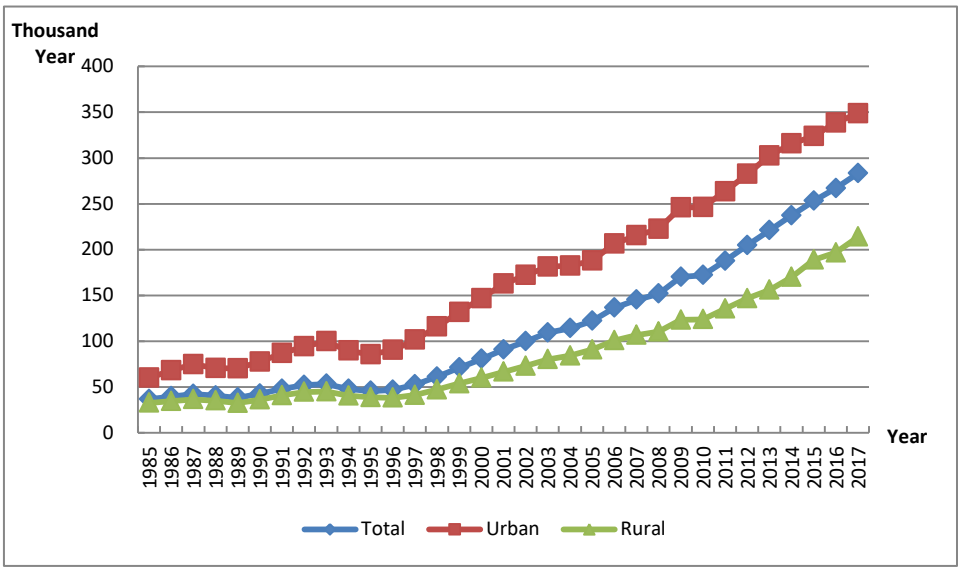


Figure HeN-2.2 Real Human Capital Per Capita by Region for Henan，1985-2017

23.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

23.3.1 Total labor force human capital

The total labor force human capital for Henan is reported in Table HeN-3.1 From 1985 to 2017, the nominal labor force human capital increased from 985 billion Yuan to 359,40 billion Yuan, an increase of more than 36

times; and the real labor force human capital increased from 985 billion Yuan to 7786 billion Yuan, an increase of approximately 8 times.

Table HeN-3.1 Nominal and Real Labor Force Human Capital for Henan

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	985	985
1986	1139	1085
1987	1331	1195
1988	1598	1206
1989	1870	1177
1990	2199	1373
1991	2493	1536
1992	2753	1629
1993	3037	1630
1994	3352	1449
1995	3757	1395
1996	4355	1457
1997	4900	1579
1998	5578	1841
1999	6298	2137
2000	7327	2497
2001	8146	2751
2002	8800	2960
2003	9626	3188
2004	10437	3277
2005	11895	3645
2006	13696	4141
2007	15068	4319
2008	16600	4431
2009	18314	4897
2010	20640	5158

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	22740	5531
2012	23940	5679
2013	25790	5945
2014	28060	6353
2015	31350	7007
2016	33560	7366
2017	35940	7786

23.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables HeN-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 25.29 thousand Yuan to 748.75 thousand Yuan, an increase of more than 29 times; and the real average labor force human capital increased from 25.29 thousand Yuan to 162.21 thousand Yuan, an increase of approximately 7 times.

Table HeN-3.2 Nominal and Real Average Labor Force Human Capital by Region for Henan

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	25.29	42.54	21.92	25.29	42.54	21.92
1986	28.59	49.42	24.43	27.23	46.28	23.42
1987	32.28	57.50	27.30	28.99	49.95	24.86
1988	36.58	64.45	31.11	27.61	46.07	23.98
1989	41.36	72.74	35.29	26.03	45.25	22.30
1990	46.57	80.13	39.89	29.07	49.61	24.99

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	51.91	90.08	44.61	31.98	53.06	27.94
1992	57.53	100.98	49.57	34.05	55.23	30.17
1993	63.37	112.12	54.96	34.01	55.45	30.33
1994	69.87	123.40	60.96	30.19	47.90	27.24
1995	77.53	137.62	67.66	28.78	45.70	25.99
1996	87.58	155.99	75.06	29.31	47.30	26.00
1997	99.33	184.33	83.51	32.01	54.58	27.85
1998	112.05	206.90	92.81	36.97	62.58	31.87
1999	125.29	225.56	102.20	42.52	70.63	36.14
2000	142.01	239.56	112.54	48.39	75.69	40.12
2001	156.08	254.89	123.48	52.71	79.98	43.71
2002	170.43	269.63	135.14	57.33	84.77	47.56
2003	186.30	283.30	149.04	61.70	87.58	51.72
2004	202.08	296.26	163.51	63.45	86.90	53.84
2005	226.62	324.24	180.53	69.44	93.15	58.22
2006	257.17	358.10	207.81	77.76	101.65	66.03
2007	289.19	395.81	233.92	82.89	106.58	70.51
2008	322.77	436.01	260.78	86.16	110.24	72.86
2009	360.52	479.76	290.39	96.40	122.75	80.81
2010	404.18	532.10	320.42	101.00	131.67	80.85
2011	445.22	583.06	352.11	108.29	136.90	88.85
2012	485.85	617.24	389.63	115.25	141.24	96.02
2013	527.58	651.34	431.36	121.62	144.86	103.29
2014	576.91	684.63	482.13	130.62	149.27	113.63
2015	635.90	728.92	543.98	142.13	156.89	126.68
2016	689.12	768.88	607.65	151.25	162.56	138.73
2017	748.75	809.38	681.30	162.21	168.59	153.71

Chapter 24 Human Capital for Hubei

24.1 Total human capital

Table HuB-1.1 presents the estimates of nominal and real total human capital and real physical capital for Hubei. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Hubei.

Table HuB-1.1 Real Physical Capital, Nominal and Real Human Capital for Hubei

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1649	1649	38.8
1986	1959	1870	43.3
1987	2279	2024	48.5
1988	2718	2031	54.1
1989	3166	2035	56.6
1990	3731	2330	58.4
1991	4333	2578	61.3
1992	4974	2702	65.5
1993	5722	2625	70.5
1994	6538	2383	75.9
1995	7456	2261	82.5
1996	8549	2370	91.0
1997	9617	2585	99.6
1998	11311	3084	109.6
1999	12917	3603	120.9
2000	16221	4534	133.5

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	17527	4890	147.8
2002	18124	5077	163.8
2003	20179	5526	182.2
2004	21820	5695	204.7
2005	23252	5898	233.9
2006	25332	6323	270.0
2007	27630	6576	317.7
2008	30068	6747	377.3
2009	32759	7386	447.5
2010	35497	7778	537.2
2011	40206	8329	633.3
2012	45625	9181	741.6
2013	50780	9940	858.5
2014	56910	10918	982.5
2015	62040	11731	1096.2
2016	67750	12540	1210.2
2017	73490	13378	1316.0

24.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table HuB-2.1 presents human capital per capita for Hubei by region. From 1985 to 2017, the nominal human capital per capita increased from 36.66 thousand Yuan to 1.60 million Yuan, an increase of more than 43 times; and the real human capital per capita increased from 36.66 thousand Yuan to 0.29 million Yuan, an increase of approximately 8 times.

Figure HuB-2.1 illustrates the trends of human capital per capita by gender for Hubei. The real human capital per capita of male is similar to that of female for Hubei. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 2000.

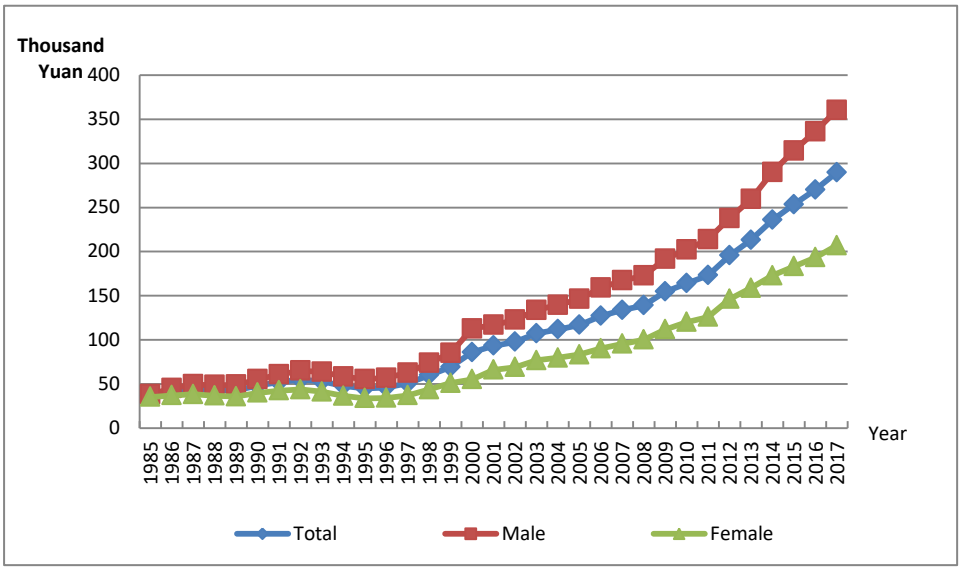


Figure HuB-2.1 Real Human Capital Per Capita by Gender for Hubei，1985-2017

Table HuB-2.1 Nominal and Real Human Capital Per Capita by Region for Hubei

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	36.66	67.03	28.06	36.66	67.03	28.06
1986	43.15	81.17	31.42	41.20	77.01	30.15
1987	49.51	92.07	35.17	43.98	80.36	31.73
1988	57.32	106.21	39.73	42.83	76.93	30.57
1989	66.32	122.06	44.92	42.63	77.49	29.25
1990	76.75	141.18	50.60	47.93	87.61	31.83
1991	87.56	158.92	56.92	52.10	92.86	34.56

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	100.93	181.62	64.10	54.83	96.04	36.00
1993	115.54	206.40	71.74	53.00	91.87	34.27
1994	131.33	232.51	80.27	47.87	81.49	30.90
1995	148.47	257.86	89.39	45.02	75.25	28.70
1996	166.12	285.44	98.30	46.05	75.59	29.25
1997	187.87	316.96	110.18	50.50	81.81	31.64
1998	219.06	373.07	121.54	59.73	98.36	35.26
1999	247.71	419.16	133.83	69.09	113.69	39.49
2000	307.06	537.81	147.18	85.83	145.88	44.23
2001	334.03	570.74	163.85	93.19	154.19	49.34
2002	348.47	572.60	180.17	97.61	155.94	53.82
2003	391.44	637.85	198.80	107.20	169.31	58.62
2004	427.92	683.11	219.44	111.69	173.51	61.16
2005	460.68	722.71	238.99	116.85	178.75	64.48
2006	508.33	787.43	261.43	126.88	192.07	69.22
2007	562.00	860.42	287.17	133.76	200.45	72.35
2008	619.38	939.71	313.85	138.98	207.51	73.62
2009	685.70	1028.79	345.53	154.60	228.78	81.05
2010	748.68	1105.92	378.96	164.05	239.23	86.22
2011	835.76	1231.19	404.76	173.13	252.45	86.63
2012	971.85	1424.13	443.56	195.56	284.05	92.17
2013	1088.74	1575.23	484.43	213.12	305.93	97.73
2014	1229.55	1751.51	538.76	235.88	333.50	106.67
2015	1340.31	1867.30	604.14	253.44	350.63	117.61
2016	1459.58	2023.95	619.19	270.16	372.23	117.95
2017	1591.64	2156.85	692.88	289.74	390.04	130.42

Figure HuB-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

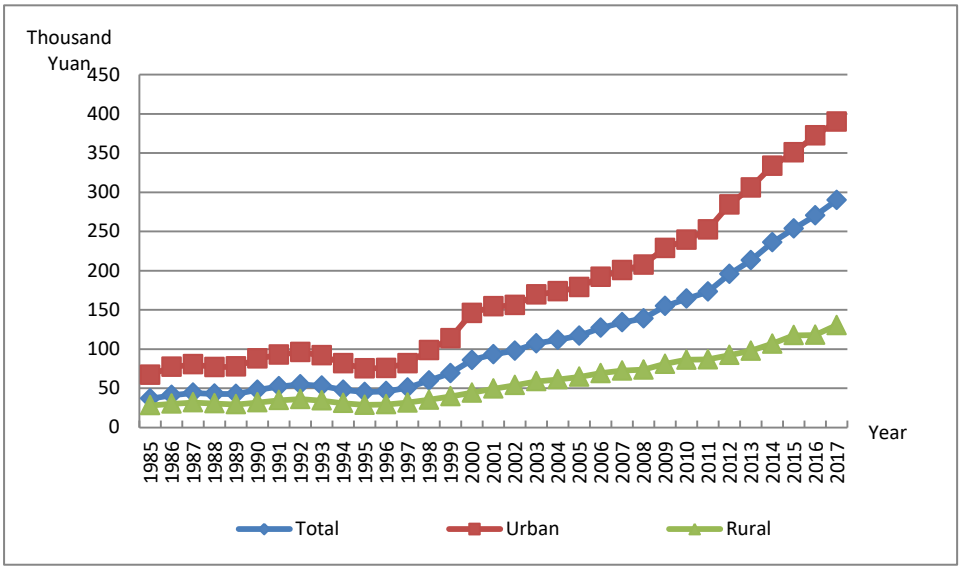


Figure HuB-2.2 Real Human Capital Per Capita by Region for Hubei，1985-2017

24.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

24.3.1 Total labor force human capital

The total labor force human capital for Hubei is reported in Table HUB-3.1 From 1985 to 2017, the nominal labor force human capital increased from 696 billion Yuan to 27,486 billion Yuan, an increase of more

than 39 times; and the real labor force human capital increased from 696 billion Yuan to 5,026 billion Yuan, an increase of approximately 7 times.

Table HuB-3.1 Nominal and Real Labor Force Human Capital for Hubei

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	696	696
1986	815	778
1987	970	863
1988	1163	871
1989	1351	870
1990	1566	979
1991	1809	1078
1992	2026	1104
1993	2253	1038
1994	2504	918
1995	2808	856
1996	3255	909
1997	3733	1011
1998	4359	1198
1999	5082	1427
2000	6031	1704
2001	6482	1830
2002	7018	1985
2003	7623	2114
2004	8263	2183
2005	9028	2315
2006	9901	2499
2007	10737	2582
2008	11741	2655
2009	13073	2967
2010	14458	3186

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	16447	3424
2012	17893	3617
2013	19587	3850
2014	21601	4161
2015	23882	4530
2016	25560	4746
2017	27486	5026

24.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables HUB-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 26.14 thousand Yuan to 0.85 million Yuan, an increase of more than 32 times; and the real average labor force human capital increased from 26.14 thousand Yuan to 0.16 million Yuan, an increase of approximately 6 times.

Table HuB-3.2 Nominal and Real Average Labor Force Human Capital by Region for Hubei

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	26.14	43.07	21.24	26.14	43.07	21.24
1986	29.99	49.43	23.76	28.65	46.90	22.80
1987	34.58	56.92	26.55	30.75	49.68	23.94
1988	39.73	64.67	30.13	29.77	46.85	23.19
1989	45.57	73.55	33.96	29.32	46.69	22.11
1990	51.35	81.35	38.12	32.09	50.48	23.98

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	58.02	91.10	42.55	34.57	53.23	25.84
1992	65.12	101.09	47.25	35.48	53.45	26.54
1993	72.37	111.27	52.27	33.35	49.53	24.97
1994	80.36	122.83	57.57	29.45	43.05	22.16
1995	89.63	135.38	63.13	27.33	39.51	20.27
1996	100.68	150.71	70.66	28.11	39.91	21.02
1997	113.78	168.30	79.58	30.80	43.44	22.85
1998	128.84	188.71	89.33	35.40	49.75	25.91
1999	145.51	212.15	99.19	40.87	57.54	29.27
2000	165.90	242.43	110.33	46.88	65.76	33.15
2001	180.55	260.27	122.48	50.98	70.31	36.88
2002	196.76	280.97	135.35	55.64	76.52	40.43
2003	214.55	302.58	150.59	59.51	80.31	44.41
2004	234.84	326.05	166.61	62.03	82.82	46.44
2005	256.64	352.96	182.70	65.82	87.30	49.29
2006	282.34	384.18	201.39	71.26	93.71	53.32
2007	309.73	416.64	220.74	74.48	97.06	55.61
2008	340.01	452.36	242.52	76.89	99.89	56.89
2009	379.73	500.06	268.43	86.18	111.20	62.96
2010	419.20	544.86	293.71	92.38	117.86	66.82
2011	470.12	615.07	319.66	97.87	126.12	68.42
2012	527.58	685.19	350.93	106.65	136.67	72.92
2013	583.28	749.87	384.48	114.65	145.63	77.57
2014	648.68	822.50	421.65	124.96	156.61	83.48
2015	715.56	893.53	461.71	135.73	167.78	89.88
2016	778.02	965.54	504.14	144.46	177.58	96.03
2017	852.88	1040.64	568.21	155.96	188.19	106.95

Chapter 25 Human Capital for Hunan

25.1 Total human capital

Table HUN-1.1 presents the estimates of nominal and real total human capital and real physical capital for Hunan. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Hunan.

Table HUN-1.1 Real Physical Capital, Nominal and Real Human Capital for Hunan

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1585	1585	38.8
1986	1841	1748	45.5
1987	2112	1830	54.5
1988	2455	1694	69.2
1989	2800	1630	76.6
1990	3225	1870	128.4
1991	3740	2080	145.5
1992	4262	2151	182.4
1993	4856	2094	255.7
1994	5504	1893	317.8
1995	6216	1797	380.6
1996	7087	1898	444.3
1997	7958	2072	497.1
1998	9099	2358	565.0
1999	10574	2723	626.2
2000	12361	3137	706.9
2001	13392	3429	791.3
2002	15006	3857	878.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2003	16365	4106	1006.1
2004	18129	4344	1194.3
2005	19651	4601	1406.8
2006	21656	4997	1667.5
2007	23788	5191	2065.9
2008	26167	5373	2674.1
2009	28537	5880	3141.4
2010	31591	6310	3890.3
2011	36058	6829	4934.2
2012	39468	7329	5863.6
2013	43467	7756	6881.8
2014	49360	8587	8010.7
2015	53590	9194	8995.6
2016	58252	9810	10069.4
2017	63459	10532	11662.7

25.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table HUN-2.1 presents human capital per capita for Hunan by region. From 1985 to 2017, the nominal human capital per capita increased from 31.04 thousand Yuan to 1.16 million Yuan, an increase of more than 37 times; and the real human capital per capita increased from 31.04 thousand Yuan to 0.19 million Yuan, an increase of approximately 6 times.

Figure HUN-2.1 illustrates the trends of human capital per capita by gender for Hunan. The real human capital per capita of male is similar to that of female for Hunan. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

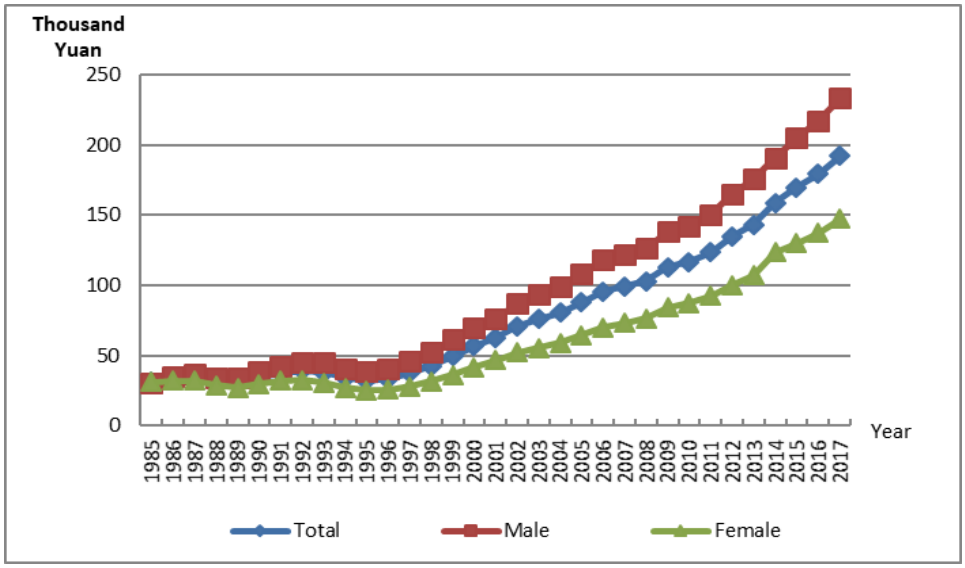


Figure HUN-2.1 Human Capital Per Capita by Gender for Hunan，1985-2017

Table HUN-2.1 Nominal and Real Human Capital Per Capita by Region for Hunan

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	31.04	58.97	25.88	31.04	58.97	25.88
1986	35.58	71.22	28.78	33.78	67.57	27.33
1987	40.24	81.71	32.08	34.85	69.65	28.00
1988	46.11	94.81	36.04	31.80	64.29	25.09
1989	52.51	108.20	40.50	30.57	62.55	23.67
1990	59.31	121.43	45.52	34.41	69.79	26.55

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	67.76	139.84	50.78	37.67	76.46	28.53
1992	77.70	160.90	56.87	39.21	77.52	29.62
1993	88.25	182.91	63.21	38.07	75.06	28.28
1994	99.77	205.71	70.37	34.31	67.64	25.07
1995	111.61	223.97	78.19	32.26	62.36	23.31
1996	125.69	253.35	85.44	33.67	65.80	23.54
1997	143.71	289.49	94.90	37.42	73.00	25.51
1998	164.97	335.48	104.60	42.75	84.17	28.08
1999	192.53	399.38	115.45	49.58	100.61	30.57
2000	224.55	474.38	127.37	56.98	117.97	33.26
2001	245.04	486.33	140.60	62.75	122.28	36.98
2002	276.49	528.38	155.46	71.07	133.39	41.13
2003	302.53	549.85	171.97	75.90	136.89	43.71
2004	336.96	592.29	189.75	80.74	141.65	45.62
2005	375.97	631.57	211.27	88.02	147.94	49.42
2006	414.84	686.15	229.14	95.72	158.19	52.96
2007	456.03	742.20	249.44	99.51	162.66	53.93
2008	502.20	805.86	272.05	103.12	166.93	54.77
2009	549.19	863.09	300.37	113.16	179.32	60.71
2010	583.69	902.42	328.31	116.59	181.86	64.30
2011	652.03	1008.88	350.38	123.49	192.71	64.98
2012	726.48	1105.16	384.51	134.90	206.56	70.19
2013	803.47	1198.38	422.27	143.37	215.12	74.11
2014	913.36	1346.80	470.00	158.90	235.41	80.64
2015	988.31	1413.78	528.43	169.56	243.47	89.68
2016	1064.18	1511.80	548.32	179.22	255.50	91.32
2017	1158.24	1602.98	610.31	192.22	266.64	100.54

Figure HUN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

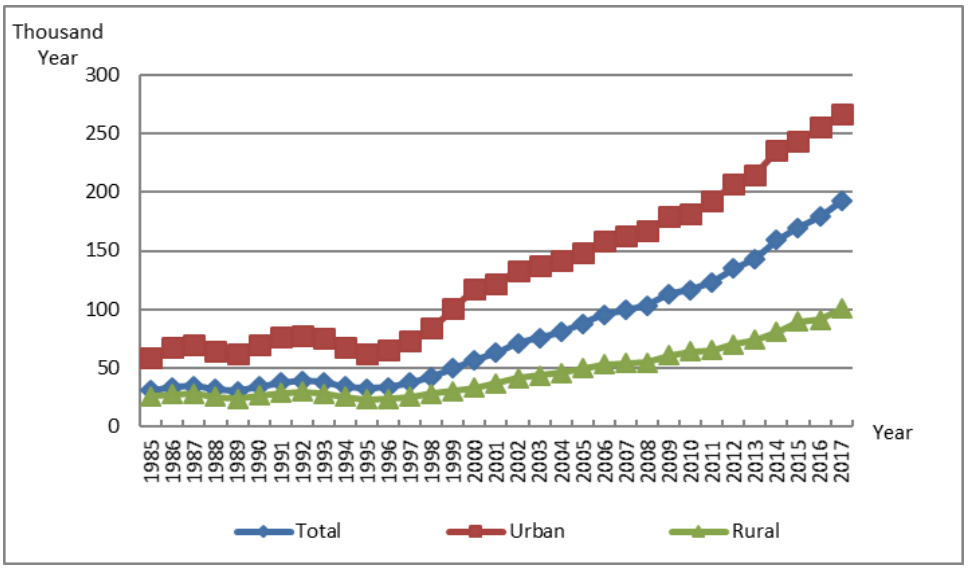


Figure HUN-2.2 Real Human Capital Per Capita by Region for Hunan，1985-2017

25.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

25.3.1 Total labor force human capital

The total labor force human capital for Hunan is reported in Table HUN-3.1 From 1985 to 2017, the nominal labor force human capital increased from 711 billion Yuan to 23,481 billion Yuan, an increase of more

than 33 times; and the real labor force human capital increased from 711 billion Yuan to 3,892 billion Yuan, an increase of approximately 5 times.

Table HUN-3.1 Nominal and Real Labor Force Human Capital for Hunan

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	711	711
1986	823	781
1987	966	838
1988	1130	780
1989	1298	756
1990	1510	876
1991	1742	970
1992	1954	991
1993	2195	953
1994	2435	842
1995	2753	799
1996	3117	839
1997	3454	905
1998	3885	1016
1999	4405	1143
2000	5019	1283
2001	5477	1412
2002	6046	1565
2003	6735	1695
2004	7460	1789
2005	8026	1879
2006	9136	2109
2007	10042	2187
2008	11041	2259
2009	12143	2494
2010	13794	2747

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	15492	2925
2012	16439	3045
2013	17697	3150
2014	19144	3324
2015	21058	3608
2016	22187	3730
2017	23481	3892

25.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables HUN-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 23.73 thousand Yuan to 0.65 million Yuan, an increase of more than 27 times; and the real average labor force human capital increased from 23.73 thousand Yuan to 10.77 thousand Yuan, an increase of approximately 5 times.

Table HUN-3.2 Nominal and Real Average Labor Force Human Capital by Region for Hunan

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	23.73	41.40	20.20	23.73	41.40	20.20
1986	26.73	47.16	22.64	25.38	44.75	21.50
1987	30.27	54.15	25.33	26.24	46.16	22.11
1988	34.47	61.48	28.71	23.80	41.69	19.98
1989	39.17	70.01	32.35	22.81	40.47	18.91
1990	44.13	77.79	36.39	25.62	44.71	21.23

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	49.69	87.22	40.64	27.66	47.69	22.83
1992	55.60	97.08	45.12	28.20	46.77	23.50
1993	61.96	108.01	49.86	26.89	44.32	22.31
1994	68.73	118.58	54.91	23.78	38.99	19.56
1995	76.66	130.92	60.23	22.25	36.45	17.95
1996	85.37	144.94	66.92	22.98	37.64	18.44
1997	95.55	170.54	74.61	25.04	43.00	20.05
1998	106.34	188.78	83.36	27.80	47.36	22.38
1999	119.15	212.00	92.16	30.91	53.41	24.40
2000	133.47	222.59	101.57	34.13	55.35	26.52
2001	147.68	240.70	111.58	38.07	60.52	29.34
2002	164.38	262.98	122.94	42.55	66.39	32.53
2003	183.01	286.06	136.48	46.05	71.22	34.69
2004	202.95	310.31	150.54	48.67	74.21	36.20
2005	226.90	335.93	166.48	53.11	78.69	38.94
2006	251.83	368.09	184.48	58.13	84.86	42.64
2007	275.96	396.34	201.34	60.11	86.86	43.53
2008	301.80	425.33	219.32	61.74	88.10	44.15
2009	331.96	458.74	239.77	68.18	95.31	48.46
2010	359.68	490.95	259.65	71.63	98.94	50.85
2011	397.72	542.52	281.29	75.09	103.63	52.17
2012	435.98	585.01	307.28	80.75	109.34	56.09
2013	475.23	624.27	335.28	84.60	112.06	58.85
2014	516.68	662.52	367.48	89.70	115.80	63.05
2015	563.74	705.29	405.28	96.58	121.46	68.78
2016	602.02	741.90	443.65	101.21	125.38	73.89
2017	650.24	780.63	500.01	107.77	129.85	82.37

Chapter 26 Human Capital for Guangdong

26.1 Total human capital

Table GD-1.1 presents the estimates of nominal and real total human capital and real physical capital for Guangdong. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six- education categories. Column 3 is the real physical capital of Guangdong.

Table GD-1.1 Real Physical Capital, Nominal and Real Human Capital for Guangdong

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	3129	3129	3129
1986	3638	3461	3638
1987	4199	3603	4199
1988	5087	3369	5087
1989	5994	3246	5994
1990	6965	3868	6965
1991	8101	4444	8101
1992	9381	4797	9381
1993	10911	4591	10911
1994	12386	4283	12386
1995	13968	4234	13968
1996	16913	4784	16913
1997	20475	5673	20475
1998	24357	6859	24357
1999	28916	8275	28916
2000	33386	9390	33386

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	37524	10618	37524
2002	42240	12107	42240
2003	47010	13382	47010
2004	51420	14221	51420
2005	55680	15064	55680
2006	63290	16822	63290
2007	70970	18188	70970
2008	78160	18965	78160
2009	86320	21450	86320
2010	91540	22059	91540
2011	100130	22887	100130
2012	108810	24180	108810
2013	116660	25298	116660
2014	125630	26627	125630
2015	131330	27411	131330
2016	138110	28156	138110
2017	144950	29120	144950

26.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table GD-2.1 presents human capital per capita for Guangdong by region. From 1985 to 2017, the nominal human capital per capita increased from 61.04 thousand Yuan to 1.53 million Yuan, an increase of more than 25 times; and the real human capital per capita increased from 61.04 thousand Yuan to 0.31 million Yuan, an increase more than 5 times.

Figure GD-2.1 illustrates the trends of human capital per capita by gender for Guangdong. The real human capital per capita of male is similar to that of female for Guangdong. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

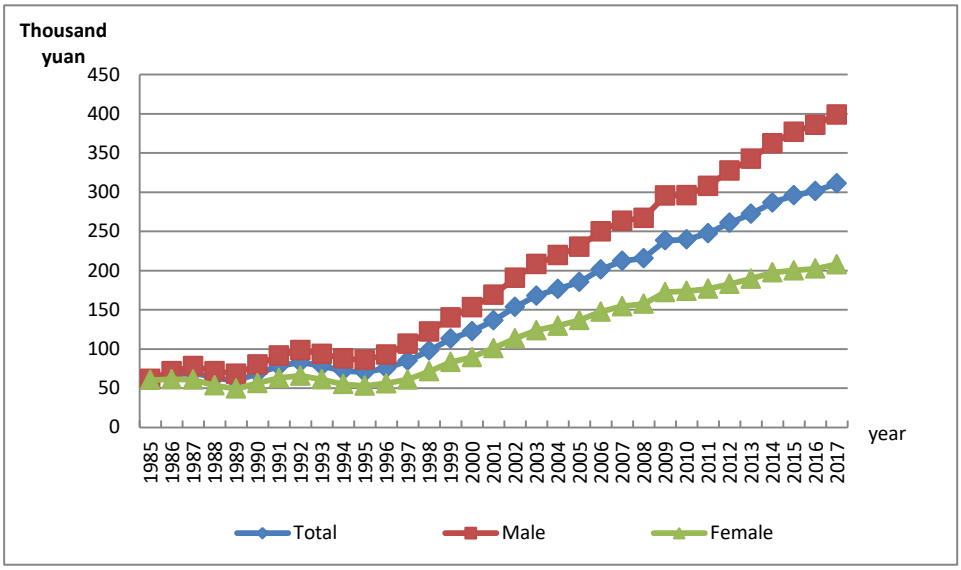


Figure GD-2.1 Human Capital Per Capita by Gender for Guangdong，1985-2017

Table GD-2.1 Nominal and Real Human Capital Per Capita by Region for Guangdong

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	61.04	92.06	52.52	61.04	92.06	52.52
1986	70.24	110.81	58.59	66.82	105.83	55.64
1987	81.30	125.33	65.50	69.76	106.12	56.70
1988	95.17	143.64	73.93	63.03	93.92	49.50
1989	109.55	162.19	82.46	59.33	87.00	45.11

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	124.23	177.98	92.62	68.99	98.01	51.91
1991	142.28	206.04	103.86	78.05	110.92	58.27
1992	162.42	237.35	116.10	83.06	117.87	61.50
1993	186.15	276.16	129.75	78.33	112.41	56.99
1994	208.88	309.05	144.56	72.23	103.97	51.84
1995	232.19	343.09	159.83	70.38	102.05	49.71
1996	266.31	382.45	176.59	75.33	106.12	51.57
1997	306.40	430.15	195.08	84.89	116.90	56.12
1998	347.60	477.71	213.38	97.89	132.07	62.58
1999	394.72	532.97	233.18	112.96	149.74	70.00
2000	435.72	573.95	254.23	122.55	157.78	76.31
2001	482.02	629.91	277.87	136.40	174.56	83.75
2002	535.40	697.07	299.03	153.46	195.91	91.40
2003	589.62	760.33	323.66	167.84	212.21	98.54
2004	638.00	813.60	350.54	176.45	221.32	102.91
2005	685.24	863.98	377.50	185.39	230.42	107.91
2006	757.69	949.93	411.92	201.39	248.86	115.90
2007	827.86	1031.14	444.98	212.16	260.50	120.97
2008	888.86	1101.40	475.67	215.68	263.74	122.22
2009	959.58	1182.51	512.14	238.45	290.13	134.55
2010	994.60	1211.54	547.45	239.68	288.31	139.37
2011	1082.86	1323.24	571.75	247.51	299.05	137.84
2012	1173.40	1430.51	612.53	260.76	314.49	143.50
2013	1255.48	1525.00	657.34	272.25	327.34	149.90
2014	1352.58	1637.32	708.18	286.68	343.53	158.16
2015	1418.30	1704.95	757.48	296.02	352.09	167.00
2016	1479.08	1771.62	790.39	301.54	357.28	170.84
2017	1548.43	1840.70	838.80	311.07	365.01	179.86

Figure GD-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

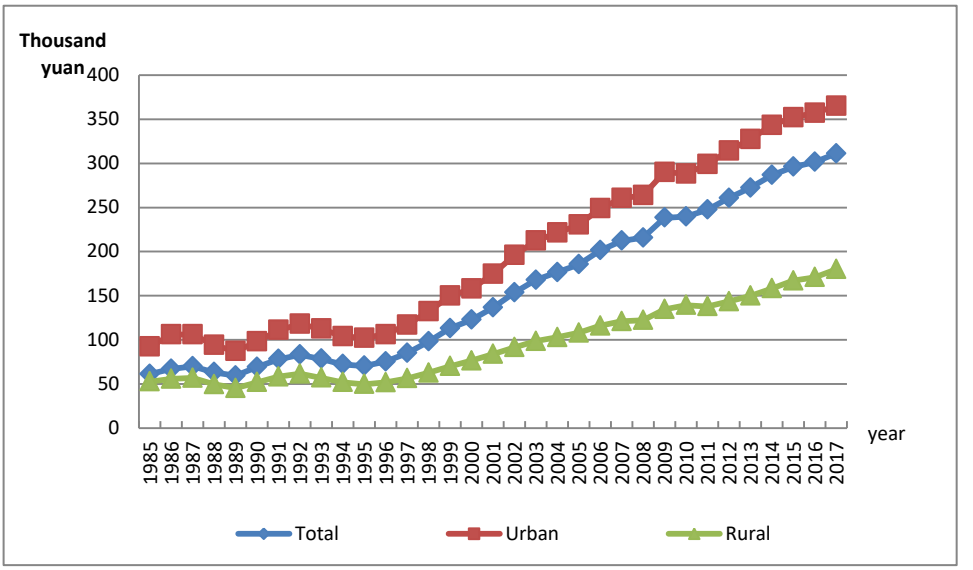


Figure GD-2.2 Real Human Capital Per Capita by Region for Guangdong, 1985-2017

26.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

26.3.1 Total labor force human capital

The total labor force human capital for Guangdong is reported in Table GD-3.1 From 1985 to 2017, the nominal labor force human capital increased

from 1242 billion Yuan to 62,440 billion Yuan, an increase of more than 50 times; and the real labor force human capital increased from 1242 billion Yuan to 12,602 billion Yuan, an increase of approximately 10 times.

Table GD-3.1 Nominal and Real Labor Force Human Capital for Guangdong

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	1242	1242
1986	1425	1356
1987	1671	1433
1988	2077	1375
1989	2515	1361
1990	3002	1666
1991	3419	1873
1992	3829	1955
1993	4250	1787
1994	4725	1632
1995	5358	1623
1996	6669	1885
1997	8379	2319
1998	10521	2958
1999	12827	3665
2000	15401	4321
2001	16684	4714
2002	18243	5225
2003	20189	5742
2004	22190	6135
2005	24374	6592
2006	27492	7306
2007	30557	7837
2008	34463	8371
2009	39145	9735

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	43804	10563
2011	46283	10596
2012	49118	10939
2013	52340	11376
2014	56010	11909
2015	59910	12543
2016	61300	12550
2017	62440	12602

26.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables GD-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 43.3 thousand Yuan to 0.97 million Yuan, an increase of more than 22 times; and the real average labor force human capital increased from 43.3 thousand Yuan to 0.2 million Yuan, an increase of approximately 5 times.

Table GD-3.2 Nominal and Real Average Labor Force Human Capital by Region for Guangdong

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	43.30	62.13	37.42	43.30	62.13	37.42
1986	49.03	70.83	41.89	46.66	67.65	39.79
1987	57.15	81.37	46.82	49.01	68.89	40.53
1988	66.84	93.78	52.87	44.25	61.32	35.40
1989	77.82	107.97	59.23	42.12	57.91	32.40
1990	89.16	120.98	66.36	49.48	66.62	37.19
1991	99.66	135.61	73.60	54.60	73.00	41.29

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	110.46	150.63	80.98	56.40	74.80	42.90
1993	121.91	167.22	88.64	51.26	68.07	38.94
1994	135.53	185.92	97.14	46.82	62.55	34.83
1995	150.82	205.77	108.30	45.69	61.20	33.68
1996	175.46	235.80	120.53	49.60	65.42	35.20
1997	204.51	279.77	134.34	56.61	76.03	38.65
1998	237.34	317.43	149.06	66.72	87.75	43.71
1999	268.71	351.33	164.32	76.77	98.71	49.33
2000	300.11	371.26	180.64	84.20	102.06	54.22
2001	321.49	395.60	195.01	90.84	109.63	58.77
2002	346.35	424.76	208.84	99.20	119.38	63.84
2003	376.27	458.23	225.08	107.02	127.89	68.52
2004	406.92	493.21	241.80	112.50	134.17	70.99
2005	440.93	529.36	260.05	119.25	141.18	74.34
2006	481.97	573.97	291.35	128.08	150.37	81.97
2007	522.70	619.03	320.34	134.06	156.39	87.08
2008	569.74	672.95	348.22	138.39	161.14	89.47
2009	624.33	734.48	380.76	155.26	180.20	100.04
2010	669.52	780.84	410.86	161.45	185.82	104.60
2011	714.84	834.22	443.46	163.65	188.53	106.91
2012	760.24	883.74	480.87	169.31	194.29	112.66
2013	806.92	933.74	520.14	175.38	200.42	118.61
2014	860.24	987.54	563.53	182.91	207.20	125.85
2015	916.32	1040.29	610.09	191.84	214.83	134.51
2016	945.79	1068.43	649.20	193.63	215.47	140.32
2017	977.33	1095.40	691.41	197.25	217.21	148.26

Chapter 27 Human Capital for Guangxi

27.1 Total human capital

Table GX-1.1 presents the estimates of nominal and real total human capital and real physical capital for Guangxi. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Guangxi.

Table GX-1.1 Real Physical Capital, Nominal and Real Human Capital for Guangxi

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1410	1410	34.8
1986	1602	1508	37.6
1987	1795	1581	40.5
1988	2129	1563	42.1
1989	2461	1477	43.5
1990	2809	1645	44.3
1991	3227	1837	46.4
1992	3687	1980	49.8
1993	4207	1873	55.5
1994	4731	1670	62.9
1995	5223	1557	70.6
1996	5920	1655	79.0
1997	6766	1876	86.9
1998	7839	2242	96.5
1999	8653	2533	107.7
2000	9753	2862	119.0
2001	10587	3090	131.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	11752	3461	145.0
2003	13177	3839	161.7
2004	14565	4063	184.0
2005	15749	4288	215.3
2006	17606	4730	254.5
2007	19647	4974	305.6
2008	21594	5066	371.0
2009	23500	5639	475.5
2010	25067	5835	618.8
2011	28760	6324	782.9
2012	32160	6852	951.5
2013	35130	7318	1087.6
2014	38000	7752	1223.6
2015	40460	8131	1368.4
2016	44430	8786	1520.8
2017	48040	9347	1587.0

27.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table GX-2.1 presents human capital per capita for Guangxi by region. From 1985 to 2017, the nominal human capital per capita increased from 40.22 thousand Yuan to 1.19 million Yuan, an increase of more than 29 times; and the real human capital per capita increased from 40.22 thousand Yuan to 0.23 million Yuan, an increase of approximately 6 times.

Figure GX-2.1 illustrates the trends of human capital per capita by gender for Guangxi. The real human capital per capita of male is similar to that of female for Guangxi. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

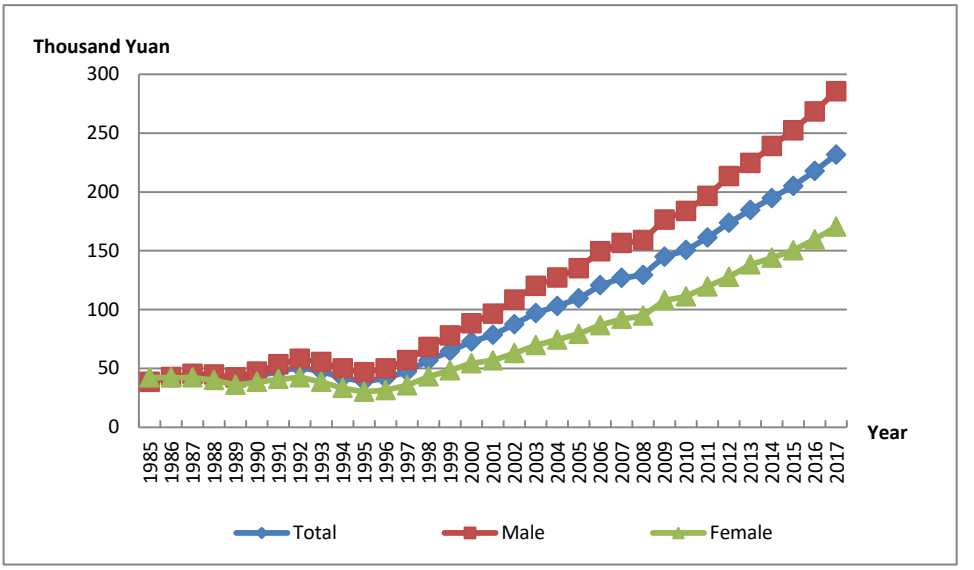


Figure GX-2.1 Human Capital Per Capita by Gender for Guangxi，1985-2017

Table GX-2.1 Nominal and Real Human Capital Per Capita by Region for Guangxi

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	40.22	74.30	35.27	40.22	74.30	35.27
1986	44.96	89.54	38.32	42.32	84.32	36.08
1987	49.67	101.10	41.84	43.75	86.38	37.24
1988	57.75	122.10	47.45	42.41	84.61	35.66
1989	65.55	141.38	52.78	39.34	81.85	32.17
1990	73.52	156.68	58.88	43.05	92.28	34.38

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	83.52	179.77	65.52	47.54	103.09	37.15
1992	94.48	204.47	72.68	50.75	109.58	39.10
1993	106.81	231.58	80.81	47.55	100.66	36.50
1994	119.16	256.50	89.13	42.07	88.91	31.82
1995	130.39	272.89	97.69	38.88	80.16	29.41
1996	148.12	306.50	107.19	41.40	85.34	30.04
1997	170.19	348.44	118.26	47.19	96.35	32.88
1998	198.20	408.56	129.74	56.69	116.34	37.27
1999	220.15	435.15	142.46	64.44	127.48	41.67
2000	248.18	476.10	156.70	72.83	139.48	46.07
2001	268.29	493.98	171.89	78.30	142.86	50.74
2002	297.03	541.82	186.19	87.48	158.44	55.35
2003	332.80	603.65	203.20	96.96	174.95	59.63
2004	369.03	661.86	221.95	102.94	184.26	62.08
2005	401.48	704.86	242.21	109.31	190.52	66.69
2006	448.63	771.07	267.94	120.53	205.11	73.10
2007	500.90	845.36	294.82	126.81	212.94	75.31
2008	551.76	913.76	322.70	129.44	213.92	75.98
2009	603.72	978.23	354.61	144.87	233.92	85.63
2010	646.54	1019.47	387.23	150.50	236.91	90.43
2011	732.57	1151.87	418.45	161.08	253.25	92.00
2012	814.56	1262.51	457.92	173.55	268.96	97.55
2013	886.34	1342.12	502.75	184.64	280.07	104.32
2014	954.63	1407.57	553.87	194.75	287.40	112.78
2015	1020.21	1467.16	613.64	205.03	295.15	123.11
2016	1100.72	1555.00	657.16	217.67	307.89	129.63
2017	1191.27	1634.36	735.48	231.78	317.57	143.50

Figure GX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

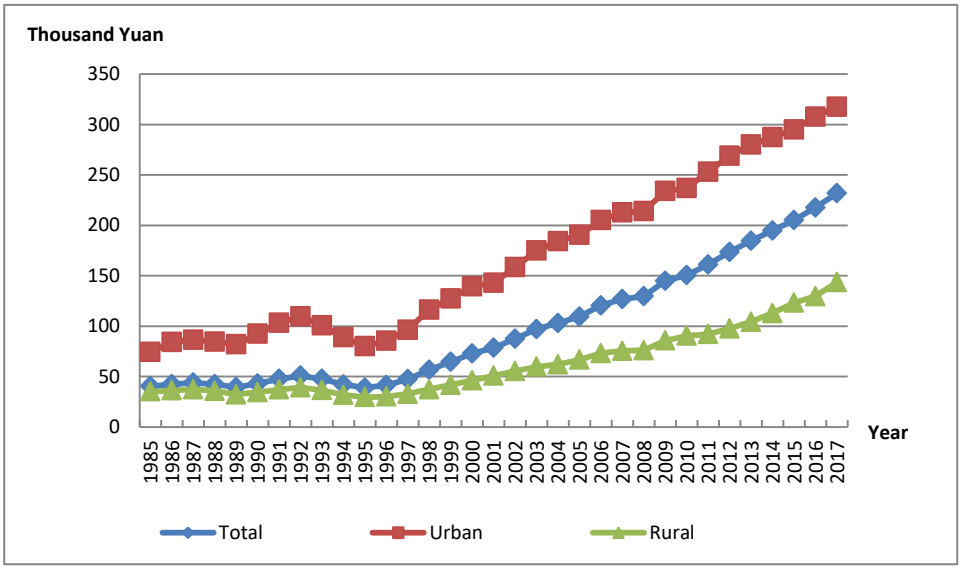


Figure GX-2.2 Real Human Capital Per Capita by Region for Guangxi1985-2017

27.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

27.3.1 Total labor force human capital

The total labor force human capital for Guangxi is reported in Table GX-3.1 From 1985 to 2017, the nominal labor force human capital increased from 525 billion Yuan to 16318 billion Yuan, an increase of more than 31

times; and the real labor force human capital increased from 525 billion Yuan to 3,177 billion Yuan, an increase of approximately 6 times.

Table GX-3.1 Nominal and Real Labor Force Human Capital for Guangxi

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	525	525
1986	605	570
1987	712	627
1988	837	615
1989	965	580
1990	1111	650
1991	1279	728
1992	1445	776
1993	1620	722
1994	1813	641
1995	2026	604
1996	2322	649
1997	2640	733
1998	2996	857
1999	3395	994
2000	3902	1145
2001	4193	1225
2002	4500	1327
2003	4800	1400
2004	5208	1453
2005	5706	1556
2006	6374	1717
2007	7046	1787
2008	7770	1824
2009	8624	2072
2010	9559	2227

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	10428	2292
2012	11336	2415
2013	12304	2562
2014	13402	2733
2015	14422	2898
2016	15385	3041
2017	16318	3177

27.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables GX-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 27.92 thousand Yuan to 0.66 million Yuan, an increase of more than 23 times; and the real average labor force human capital increased from 27.92 thousand Yuan to 0.13 thousand Yuan, an increase of approximately 5 times.

Table GX-3.2 Nominal and Real Average Labor Force Human Capital by Region for Guangxi

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	27.92	48.92	24.48	27.92	48.92	24.48
1986	31.04	55.82	26.91	29.23	52.56	25.34
1987	34.82	64.83	29.62	30.66	55.40	26.36
1988	39.73	75.09	33.34	29.19	52.04	25.06
1989	44.93	85.33	37.26	26.97	49.40	22.71
1990	50.80	95.35	41.77	29.74	56.16	24.39

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	56.77	106.80	46.22	32.30	61.25	26.20
1992	63.06	118.23	50.96	33.88	63.37	27.41
1993	70.17	131.68	56.12	31.28	57.24	25.35
1994	77.85	144.83	61.81	27.51	50.20	22.07
1995	85.91	156.66	67.76	25.63	46.02	20.40
1996	96.85	174.03	75.16	27.07	48.46	21.07
1997	109.23	200.99	83.29	30.31	55.58	23.16
1998	123.22	223.02	91.93	35.26	63.51	26.41
1999	139.06	247.57	100.84	40.72	72.53	29.50
2000	157.58	261.57	111.21	46.24	76.63	32.70
2001	168.87	276.40	121.58	49.34	79.94	35.89
2002	180.06	292.06	131.42	53.09	85.40	39.06
2003	191.69	304.62	142.26	55.91	88.28	41.75
2004	207.48	324.73	152.46	57.90	90.40	42.65
2005	226.59	348.72	163.63	61.79	94.26	45.05
2006	253.47	383.09	185.67	68.27	101.90	50.66
2007	281.04	419.13	206.90	71.28	105.58	52.85
2008	310.45	455.85	228.56	72.87	106.72	53.81
2009	344.43	497.22	251.49	82.74	118.90	60.73
2010	378.77	534.47	273.44	88.23	124.20	63.86
2011	415.42	585.43	297.65	91.32	128.71	65.44
2012	452.39	625.11	325.73	96.38	133.17	69.39
2013	489.70	659.25	356.05	101.97	137.57	73.88
2014	529.20	691.08	390.45	107.92	141.11	79.51
2015	568.91	716.87	429.94	114.32	144.21	86.25
2016	609.29	752.56	474.35	120.43	149.01	93.57
2017	658.06	786.50	536.66	128.12	152.82	104.71

Chapter 28 Human Capital for Hainan

28.1 Total human capital

Table HaN-1.1 presents the estimates of nominal and real total human capital and real physical capital for Hainan. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Hainan.

Table HaN-1.1 Real Physical Capital, Nominal and Real Human Capital for Hainan

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	237	237	6.4
1986	275	263	7.6
1987	310	270	9.0
1988	370	253	10.3
1989	432	232	11.8
1990	502	259	14.2
1991	592	296	16.9
1992	694	327	21.5
1993	804	314	24.9
1994	920	284	30.0
1995	1041	283	34.6
1996	1196	311	37.7
1997	1379	355	40.6
1998	1610	427	43.5
1999	1863	501	46.8
2000	2097	558	50.1
2001	2270	613	53.5

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	2568	698	57.4
2003	2951	803	62.1
2004	3288	861	67.3
2005	3568	921	74.1
2006	4048	1031	82.3
2007	4412	1070	91.9
2008	4863	1106	104.3
2009	5320	1218	118.4
2010	5629	1230	138.2
2011	6266	1294	160.2
2012	6911	1384	191.2
2013	7660	1499	226.9
2014	8409	1608	265.6
2015	8975	1698	297.0
2016	9693	1784	330.9
2017	10352	1851	366.3

28.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table HaN-2.1 presents human capital per capita for Hainan by region. From 1985 to 2017, the nominal human capital per capita increased from 44.14 thousand Yuan to 1.23 million Yuan, an increase of more than 29 times; and the real human capital per capita increased from 44.14 thousand Yuan to 0.23 million Yuan, an increase of approximately 5 times.

Figure HaN-2.1 illustrates the trends of human capital per capita by gender for Hainan. The real human capital per capita of male is similar to that of female for Hainan. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

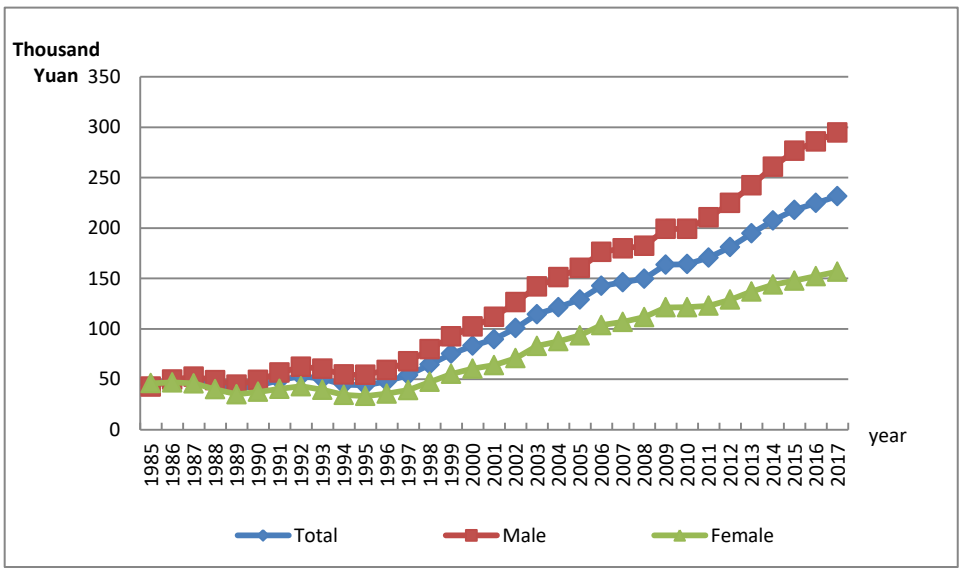


Figure HaN-2.1 Human Capital Per Capita by Gender for Hainan，1985-2017

Table HaN-2.1 Nominal and Real Human Capital Per Capita by Region for Hainan

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	44.14	83.06	37.77	44.14	83.06	37.77
1986	50.52	101.24	41.16	48.27	97.63	39.17
1987	56.71	113.21	45.21	49.37	99.43	39.17
1988	65.45	126.93	50.42	44.72	86.21	34.56
1989	74.67	141.57	55.65	40.16	76.13	29.92
1990	84.85	156.41	61.62	43.82	84.45	30.65

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	98.17	180.97	68.25	49.02	93.96	32.77
1992	112.98	206.98	75.55	53.16	98.59	35.08
1993	128.52	231.52	83.69	50.27	89.15	33.36
1994	144.84	256.87	91.92	44.68	78.75	28.58
1995	161.67	282.41	100.12	43.86	78.28	26.29
1996	183.53	318.29	110.02	47.74	84.19	27.86
1997	209.73	361.74	121.10	54.02	94.26	30.57
1998	242.96	420.78	132.73	64.41	112.35	34.69
1999	279.18	481.39	145.93	75.15	129.70	39.20
2000	312.18	528.39	159.80	83.11	140.26	42.84
2001	332.39	547.03	173.46	89.70	146.97	47.30
2002	370.62	608.60	185.74	100.67	165.16	50.55
2003	420.65	691.35	200.40	114.49	188.75	54.05
2004	463.97	755.87	216.12	121.46	199.96	54.79
2005	499.90	802.24	232.95	129.10	209.51	58.07
2006	559.56	892.35	255.47	142.49	230.28	62.25
2007	602.77	945.29	278.97	146.22	233.21	64.01
2008	658.20	1024.77	301.82	149.75	238.28	63.65
2009	714.95	1103.60	327.38	163.70	257.90	69.73
2010	751.27	1140.34	354.46	164.12	255.02	71.36
2011	825.94	1250.15	371.71	170.61	265.00	69.42
2012	903.40	1351.55	403.15	180.89	277.56	72.98
2013	994.48	1471.12	442.56	194.60	295.35	77.88
2014	1084.81	1581.21	490.52	207.48	310.61	83.97
2015	1152.65	1648.38	540.17	218.01	319.97	92.02
2016	1221.75	1744.74	564.28	224.81	329.13	93.78
2017	1295.02	1821.53	607.39	231.59	332.96	99.06

Figure HaN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

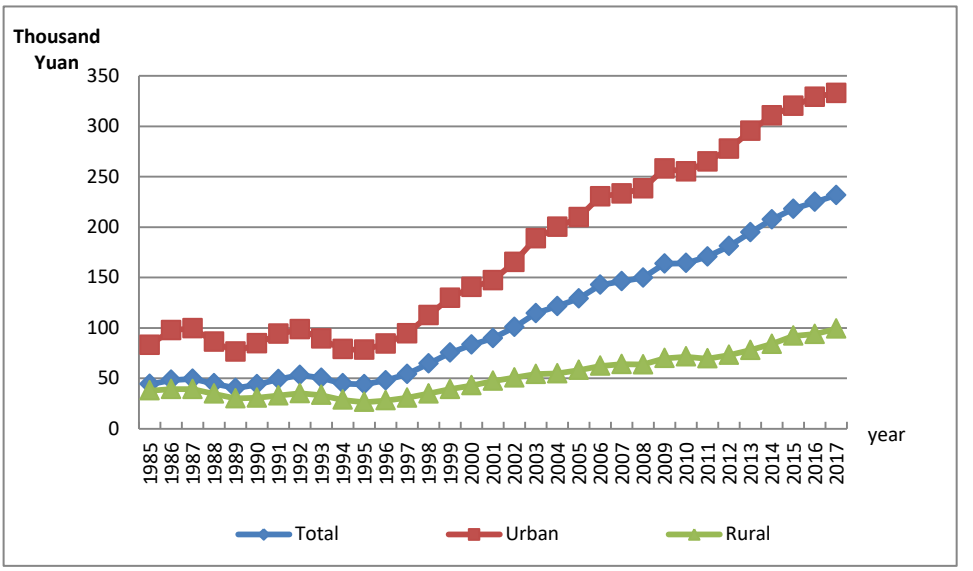


Figure HaN-2.2 Real Human Capital Per Capita by Region for Hainan，1985-2017

28.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

28.3.1 Total labor force human capital

The total labor force human capital for Hainan is reported in Table HaN-3.1 From 1985 to 2017, the nominal labor force human capital increased from 92 billion Yuan to 3,867 billion Yuan, an increase of more than 42 times;

and the real labor force human capital increased from 92 billion Yuan to 680 billion Yuan, an increase of approximately 7 times.

Table HaN-3.1 Nominal and Real Labor Force Human Capital for Hainan

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	92	92
1986	104	99
1987	119	104
1988	145	99
1989	172	93
1990	203	105
1991	237	118
1992	272	128
1993	314	123
1994	364	112
1995	422	114
1996	479	125
1997	551	142
1998	636	168
1999	728	196
2000	831	221
2001	897	242
2002	968	263
2003	1049	285
2004	1153	301
2005	1285	331
2006	1422	360
2007	1566	377
2008	1744	393
2009	1978	449
2010	2222	481

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	2417	493
2012	2653	524
2013	2906	559
2014	3204	603
2015	3555	662
2016	3701	670
2017	3867	680

28.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables HaN-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 31.51 thousand Yuan to 0.75 million Yuan, an increase of more than 23 times; and the real average labor force human capital increased from 31.51 thousand Yuan to 0.13 million Yuan, an increase of approximately 4 times.

Table HaN-3.2 Nominal and Real Average Labor Force Human Capital by Region for Hainan

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	31.51	50.36	28.37	31.51	50.36	28.37
1987	35.48	58.66	31.01	33.88	56.57	29.50
1988	40.35	68.44	33.99	35.11	60.11	29.45
1989	46.48	77.21	38.01	31.76	52.45	26.06
1990	53.39	87.69	42.22	28.71	47.16	22.70
1991	60.88	97.50	46.92	31.42	52.65	23.34

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1992	68.90	109.92	51.77	34.34	57.07	24.85
1993	77.57	123.02	56.89	36.48	58.60	26.42
1994	87.82	138.40	62.56	34.38	53.29	24.93
1995	99.34	155.06	68.90	30.65	47.54	21.42
1996	111.86	172.42	75.62	30.32	47.79	19.86
1997	125.41	191.95	82.70	32.60	50.77	20.94
1998	141.40	221.68	91.25	36.41	57.77	23.04
1999	159.66	248.48	100.69	42.30	66.34	26.32
2000	178.93	275.43	110.89	48.17	74.21	29.78
2001	199.70	291.79	122.45	53.17	77.45	32.82
2002	213.21	312.06	131.49	57.57	83.84	35.86
2003	226.16	332.87	140.07	61.43	90.33	38.12
2004	241.41	354.86	149.80	65.64	96.88	40.41
2005	260.51	381.04	159.58	67.95	100.80	40.45
2006	284.66	411.62	170.58	73.27	107.50	42.52
2007	310.73	444.15	191.07	78.74	114.62	46.55
2008	337.07	475.99	211.68	81.21	117.43	48.57
2009	366.87	511.91	233.15	82.64	119.03	49.17
2010	406.15	562.42	256.91	92.13	131.43	54.72
2011	443.32	604.33	280.31	95.94	135.15	56.43
2012	481.86	658.39	307.49	98.17	139.56	57.43
2013	524.19	708.16	339.79	103.44	145.43	61.51
2014	569.51	755.56	374.92	109.64	151.69	65.98
2015	620.12	805.10	414.89	116.63	158.15	71.03
2016	675.83	854.98	460.91	125.89	165.96	78.51
2017	707.93	889.27	497.88	128.12	167.75	82.74

Chapter 29 Human Capital for Chongqing

29.1 Total human capital

Table CQ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Chongqing. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Chongqing.

Table CQ-1.1 Real Physical Capital, Nominal and Real Human Capital for Chongqing

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	826	826	36.6
1986	959	921	39.1
1987	1114	974	43.9
1988	1282	913	47.5
1989	1462	889	47.1
1990	1675	1005	47.5
1991	1968	1103	49.9
1992	2256	1138	53.9
1993	2584	1098	59.9
1994	2953	967	68.5
1995	3389	929	77.8
1996	3797	949	86.8
1997	4372	1058	98.3
1998	5045	1267	114.6
1999	5804	1468	131.5
2000	6199	1621	149.4
2001	6918	1778	171.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	7537	1946	197.9
2003	8622	2212	234.0
2004	10188	2521	277.5
2005	10592	2600	329.6
2006	11581	2776	386.9
2007	12951	2966	451.0
2008	14675	3183	519.7
2009	16536	3644	603.0
2010	18006	3844	700.4
2011	20515	4159	816.9
2012	22600	4466	940.7
2013	25213	4851	1071.5
2014	28037	5301	1215.8
2015	30200	5635	1374.4
2016	32613	5979	1554.6
2017	35339	6413	1738.4

29.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table CQ-2.1 presents human capital per capita for Chongqing by region. From 1985 to 2016, the nominal human capital per capita increased from 34.3 thousand Yuan to 1.5 million Yuan, an increase of more than 43 times; and the real human capital per capita increased from

34.3 thousand Yuan to 0.27 million Yuan, an increase of approximately 8 times.

Figure CQ-2.1 illustrates the trends of human capital per capita by gender for Chongqing. The real human capital per capita of male is similar to that of female for Chongqing. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result, the gender gap has been expanding, especially from 1997.

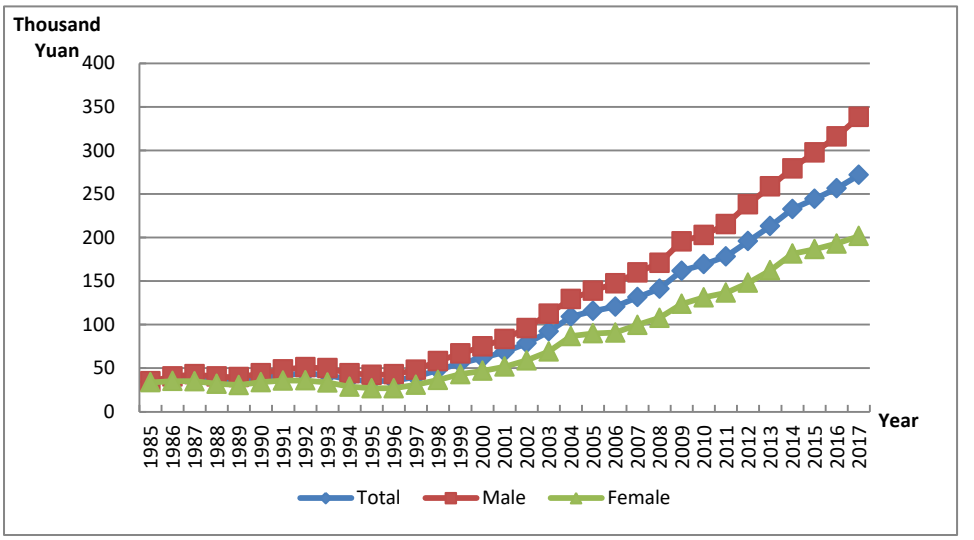


Figure CQ-2.1 Human Capital Per Capita by Gender for Chongqing，1985-2017

Table CQ-2.1 Nominal and Real Human Capital Per Capita by Region for Chongqing

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	34.30	66.91	26.33	34.30	66.91	26.33
1986	39.63	80.31	29.25	38.03	77.08	28.07
1987	44.89	92.25	32.37	39.23	80.63	28.29
1988	51.31	103.64	36.50	36.55	73.82	26.00
1989	58.25	116.58	41.06	35.44	70.91	24.98

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	65.87	129.39	46.25	39.51	77.62	27.75
1991	76.03	149.71	51.53	42.62	83.94	28.89
1992	87.46	171.90	57.33	44.10	86.67	28.91
1993	99.48	192.35	64.09	42.26	81.70	27.22
1994	112.95	214.69	71.83	36.99	70.31	23.52
1995	127.93	236.19	80.39	35.08	64.78	22.05
1996	141.55	261.96	87.19	35.39	65.50	21.80
1997	165.98	313.56	97.46	40.17	75.90	23.59
1998	191.63	362.80	109.60	48.12	91.09	27.52
1999	220.84	425.88	119.48	55.84	107.69	30.21
2000	236.59	444.66	132.18	61.87	116.27	34.56
2001	267.09	489.16	143.25	68.66	125.77	36.83
2002	304.57	540.99	157.28	78.64	139.65	40.60
2003	359.19	623.21	174.82	92.16	159.92	44.86
2004	441.63	756.99	193.99	109.29	187.32	48.00
2005	471.23	756.94	214.43	115.68	185.82	52.64
2006	503.28	780.20	237.55	120.63	187.04	56.95
2007	574.42	873.82	263.29	131.53	200.08	60.29
2008	650.82	974.52	290.28	141.17	211.31	62.94
2009	734.49	1080.52	321.91	161.83	238.10	70.94
2010	792.97	1144.91	351.11	169.29	244.46	74.97
2011	879.56	1266.91	365.58	178.32	256.90	74.13
2012	990.96	1397.56	402.31	195.83	276.21	79.51
2013	1107.10	1532.44	442.47	213.01	294.91	85.15
2014	1230.58	1674.25	489.72	232.65	316.50	92.58
2015	1309.53	1739.20	539.79	244.36	324.56	100.73
2016	1398.26	1825.92	573.22	256.32	334.71	105.08
2017	1497.75	1914.51	626.95	271.81	347.48	113.79

Figure CQ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore, the gap between urban and rural expanded rapidly.

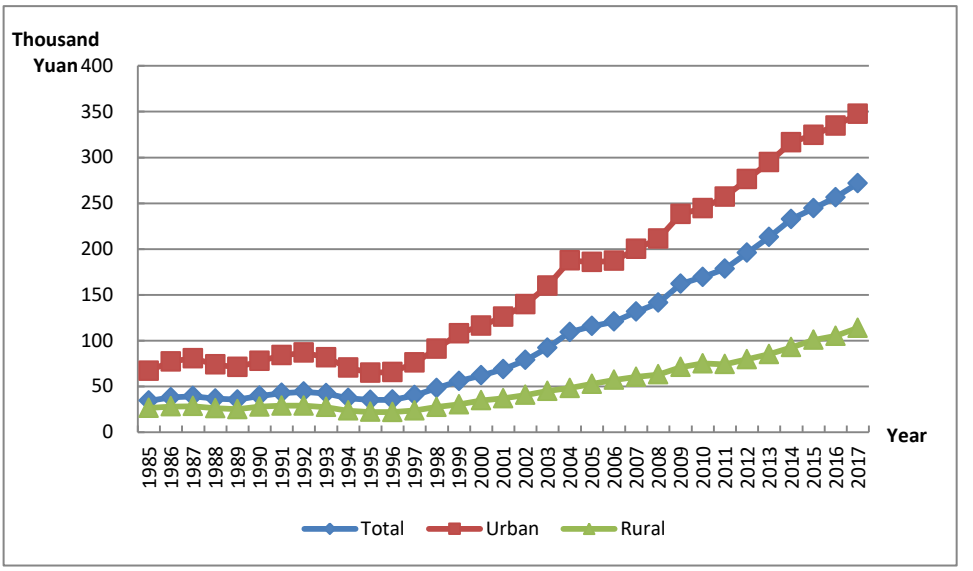


Figure CQ-2.2 Real Human Capital Per Capita by Region for Chongqing，1985-2017

29.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

29.3.1 Total labor force human capital

The total labor force human capital for Chongqing is reported in Table CQ-3.1 From 1985 to 2016, the nominal labor force human capital increased from 348 billion Yuan to 11,898 billion Yuan, an increase of more than 34

times; and the real labor force human capital increased from 348 billion Yuan to 2,159 billion Yuan, an increase of approximately 6 times.

Table CQ-3.1 Nominal and Real Labor Force Human Capital for Chongqing

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	348	348
1986	404	388
1987	489	427
1988	592	422
1989	702	427
1990	827	496
1991	976	547
1992	1103	556
1993	1238	526
1994	1368	448
1995	1538	422
1996	1725	431
1997	1910	462
1998	2123	533
1999	2331	589
2000	2684	702
2001	2816	724
2002	2871	741
2003	3002	770
2004	3102	768
2005	3327	817
2006	3907	937
2007	4374	1002
2008	4864	1055
2009	5591	1232
2010	6530	1394

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	7470	1515
2012	7980	1577
2013	8601	1655
2014	9297	1758
2015	10331	1928
2016	11009	2018
2017	11898	2159

29.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables CQ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 24.71 thousand Yuan to 0.76 million Yuan, an increase of more than 30 times; and the real average labor force human capital increased from 24.17 thousand Yuan to 0.14 million Yuan, an increase of approximately 6 times.

Table CQ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Chongqing

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	24.71	45.22	19.22	24.71	45.22	19.22
1986	27.98	51.69	21.60	26.86	49.61	20.73
1987	31.90	59.93	24.30	27.88	52.38	21.24
1988	37.06	68.24	27.84	26.40	48.61	19.83
1989	42.48	77.13	31.71	25.84	46.92	19.29
1990	48.06	84.35	36.11	28.83	50.61	21.66
1991	54.60	94.95	40.56	30.62	53.24	22.74

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	61.35	105.62	45.16	30.93	53.25	22.77
1993	68.54	117.33	49.89	29.11	49.84	21.19
1994	75.94	128.44	54.68	24.87	42.07	17.91
1995	84.98	141.25	59.59	23.31	38.74	16.35
1996	94.09	155.63	65.62	23.53	38.91	16.41
1997	105.04	180.17	72.72	25.43	43.61	17.60
1998	117.99	202.81	80.59	29.62	50.92	20.24
1999	131.82	228.72	88.31	33.33	57.83	22.33
2000	145.16	238.77	96.47	37.95	62.44	25.22
2001	156.89	252.38	104.13	40.34	64.89	26.77
2002	169.41	264.93	112.39	43.73	68.39	29.01
2003	185.09	281.17	120.99	47.49	72.15	31.05
2004	201.79	296.66	127.13	49.94	73.41	31.46
2005	223.32	318.64	131.82	54.83	78.22	32.36
2006	255.12	357.90	151.23	61.16	85.80	36.25
2007	291.65	403.87	173.38	66.78	92.47	39.70
2008	326.62	445.49	196.54	70.83	96.60	42.62
2009	374.97	505.16	220.75	82.61	111.31	48.64
2010	423.76	564.61	243.93	90.48	120.56	52.08
2011	469.26	619.13	271.79	95.14	125.54	55.11
2012	515.69	664.70	303.14	101.94	131.37	59.91
2013	558.82	705.13	334.91	107.55	135.70	64.45
2014	602.45	743.81	369.60	113.91	140.61	69.87
2015	653.06	787.62	407.20	121.88	146.98	75.99
2016	698.57	828.56	448.39	128.04	151.88	82.20
2017	755.80	884.34	497.55	137.14	160.51	90.30

Chapter 30 Human Capital for Sichuan

30.1 Total human capital

Table SC-1.1 presents the estimates of nominal and real total human capital and real physical capital for Sichuan. Column 1 contains nominal human capital estimates based on six-education categories. Column 2 presents real human capital estimates based on six-education categories. Column 3 reports the real physical capital of Sichuan.

Table SC-1.1 Real Physical Capital, Nominal and Real Human Capital for Sichuan

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	2091	2091	60.2
1986	2415	2306	66.7
1987	2790	2484	73.5
1988	3211	2379	79.4
1989	3648	2250	83.5
1990	4164	2479	88.2
1991	4830	2790	93.8
1992	5509	2974	100.5
1993	6301	2907	106.3
1994	7188	2650	115.5
1995	8143	2525	128.8
1996	9269	2621	144.5
1997	10942	2930	162.1
1998	12262	3290	185.0
1999	14280	3877	207.3
2000	15531	4217	232.7

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	17052	4525	260.6
2002	18425	4897	292.7
2003	20031	5239	330.4
2004	21629	5393	374.8
2005	23448	5752	428.2
2006	26945	6438	495.1
2007	30448	6846	577.0
2008	34280	7325	668.5
2009	38330	8116	777.6
2010	41560	8518	901.3
2011	47860	9293	1036.4
2012	52970	10010	1182.8
2013	58410	10724	1337.1
2014	64040	11567	1490.7
2015	69200	12324	1649.2
2016	75350	13152	1825.5
2017	81340	13994	1998.2

30.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table SC-2.1 presents human capital per capita for Sichuan by region. From 1985 to 2017, the nominal human capital per capita increased from 31.04 thousand Yuan to 1.24 million yuan, an increase of approximately 40 times; and the real human capital per capita increased from 31.04 thousand Yuan to 0.21 million Yuan, an increase of approximately 7

times.

Figure SC-2.1 illustrates the trends of human capital per capita by gender for Sichuan. The real human capital per capita of males is similar to that of females for Sichuan. Both of them kept increasing from 1985 to 2017, and the growth of human capital for males and females both accelerated, with males' growth rate significantly higher than females'. As a result, the gender gap has expanded, especially from 1997.

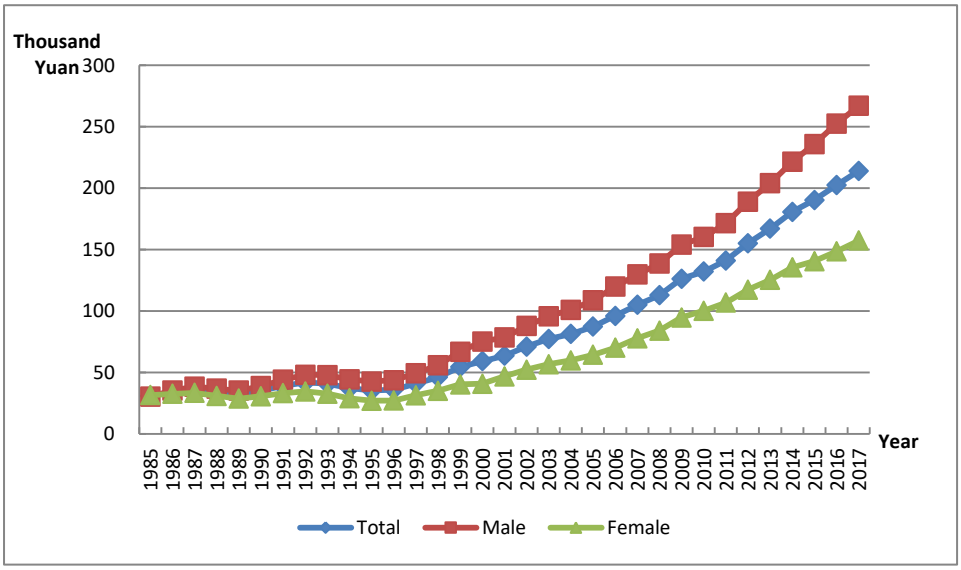


Figure SC-2.1 Human Capital Per Capita by Gender for Sichuan，1985-2017

Table SC-2.1 Nominal and Real Human Capital Per Capita by Region for Sichuan

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	31.04	64.31	24.94	31.04	64.31	24.94
1986	35.74	78.10	27.67	34.13	74.53	26.43
1987	40.67	90.25	30.72	36.20	78.22	27.78
1988	46.21	101.84	34.43	34.24	71.82	26.28
1989	52.38	114.68	38.58	32.31	68.65	24.27

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	59.15	127.46	43.28	35.21	75.17	25.94
1991	67.70	146.74	47.95	39.11	82.97	28.14
1992	77.78	169.26	53.18	41.99	87.17	29.84
1993	88.66	191.18	59.20	40.90	84.22	28.46
1994	100.99	213.88	66.51	37.23	73.67	26.11
1995	114.20	234.89	73.86	35.41	67.99	24.51
1996	127.41	264.39	80.75	36.03	69.70	24.56
1997	153.20	332.04	90.52	41.02	83.28	26.22
1998	172.24	371.64	100.12	46.21	93.40	29.14
1999	200.92	442.15	111.42	54.55	113.28	32.76
2000	218.17	466.66	124.29	59.24	119.91	36.33
2001	239.98	506.17	134.75	63.68	127.77	38.35
2002	267.46	555.89	147.67	71.09	141.02	42.03
2003	295.67	604.55	161.73	77.33	150.51	45.62
2004	326.38	654.42	178.19	81.38	155.76	47.78
2005	356.40	690.84	198.30	87.43	161.68	52.33
2006	402.27	763.01	216.18	96.12	174.38	55.77
2007	467.60	866.88	240.63	105.14	187.08	58.56
2008	528.43	953.72	266.14	112.92	196.59	61.33
2009	596.76	1045.04	295.80	126.36	213.98	67.52
2010	644.95	1093.03	324.82	132.19	216.57	71.94
2011	727.28	1224.24	347.67	141.22	230.80	72.78
2012	821.78	1355.39	383.91	155.30	248.56	78.79
2013	909.72	1462.54	422.25	167.02	260.91	84.29
2014	1000.47	1567.00	466.72	180.71	274.87	91.98
2015	1068.93	1627.59	516.65	190.37	281.55	100.21
2016	1160.28	1735.42	555.62	202.52	294.32	105.97
2017	1244.52	1815.75	611.57	214.11	302.80	115.72

Figure SC-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growth of human capital for rural and urban both accelerated, and the growth rate is significantly higher in the urban area than in the rural area. Therefore, the gap between urban and rural expanded rapidly.

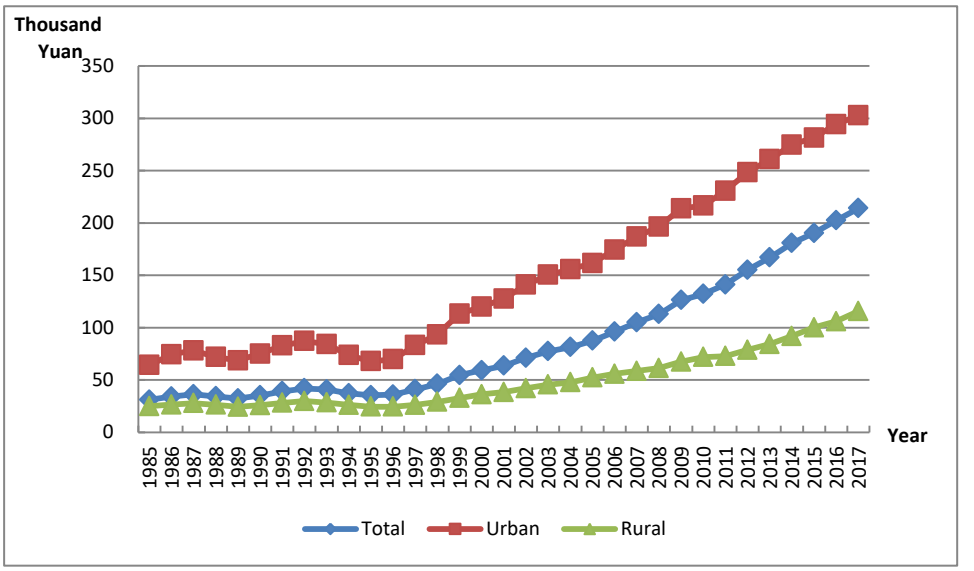


Figure SC-2.2 Real Human Capital Per Capita by Region for Sichuan，1985-2017

30.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population over 16 years of age, non-retired and out of school.

30.3.1 Total labor force human capital

The total labor force human capital for Sichuan is reported in Table SC-3.1 From 1985 to 2016, the nominal labor force human capital increased from 885 billion Yuan to 31,570 billion Yuan, an increase of more than 39

times; and the real labor force human capital increased from 885 billion Yuan to 5,510 billion Yuan, an increase of approximately 6 times.

Table SC-3.1 Nominal and Real Labor Force Human Capital for Sichuan

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	885	885
1986	1018	972
1987	1211	1080
1988	1474	1095
1989	1746	1080
1990	2062	1229
1991	2422	1403
1992	2720	1479
1993	3036	1412
1994	3344	1248
1995	3744	1174
1996	4244	1215
1997	4688	1277
1998	5316	1450
1999	5983	1650
2000	6587	1810
2001	6916	1858
2002	7077	1906
2003	7380	1960
2004	7667	1939
2005	8186	2032
2006	9760	2366
2007	10737	2456
2008	12211	2652
2009	14013	3013
2010	16260	3376

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	18591	3658
2012	20073	3848
2013	22036	4103
2014	24291	4452
2015	27380	4937
2016	29310	5185
2017	31570	5510

30.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital to the labor force population. Tables SC-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 22.46 thousand Yuan to 0.7 million Yuan, an increase of more than 34 times; and the real average labor force human capital increased from 22.46 thousand Yuan to 0.12 million Yuan, an increase of approximately 6 times.

Table SC-3.2 Nominal and Real Average Labor Force Human Capital by Region for Sichuan

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	22.46	42.53	18.55	22.46	42.53	18.55
1986	25.35	48.65	20.80	24.20	46.42	19.87
1987	28.95	56.62	23.38	25.82	49.07	21.15
1988	33.41	64.49	26.74	24.84	45.48	20.41
1989	38.22	73.11	30.34	23.64	43.76	19.09
1990	43.25	80.21	34.37	25.77	47.31	20.59

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	48.99	90.33	38.54	28.37	51.08	22.62
1992	54.84	100.36	42.86	29.81	51.69	24.05
1993	61.01	111.66	47.31	28.38	49.19	22.75
1994	67.51	122.28	51.82	25.19	42.12	20.34
1995	75.46	134.81	56.44	23.66	39.02	18.73
1996	83.87	150.35	62.31	24.01	39.63	18.95
1997	93.81	174.91	69.24	25.55	43.87	20.06
1998	105.92	197.16	76.92	28.89	49.55	22.39
1999	119.40	223.87	84.53	32.93	57.35	24.85
2000	132.67	237.58	92.64	36.46	61.05	27.08
2001	142.26	250.83	99.46	38.22	63.31	28.31
2002	151.92	264.10	106.70	40.91	67.00	30.37
2003	161.85	277.25	114.68	42.98	69.02	32.35
2004	173.35	292.68	122.16	43.84	69.66	32.75
2005	187.49	310.05	129.94	46.54	72.56	34.29
2006	216.99	351.42	151.27	52.60	80.32	39.02
2007	245.99	388.12	172.99	56.27	83.76	42.10
2008	280.13	436.75	195.00	60.84	90.03	44.94
2009	322.23	494.05	219.49	69.28	101.16	50.10
2010	364.67	547.80	243.30	75.72	108.54	53.88
2011	408.15	607.57	267.50	80.31	114.54	56.00
2012	451.76	660.10	295.63	86.60	121.05	60.67
2013	497.09	709.78	324.91	92.56	126.62	64.86
2014	545.21	756.85	357.40	99.92	132.76	70.43
2015	599.12	812.53	393.61	108.03	140.56	76.35
2016	649.89	867.78	431.27	114.97	147.17	82.25
2017	700.00	919.89	475.75	122.17	153.40	90.02

Chapter 31 Human Capital for Guizhou

31.1 Total human capital

Table GZ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Guizhou. Column 1 contains nominal human capital based on six-education categories. Column 2 presents real human capital based on six-education categories. Column 3 reports the real physical capital of Guizhou.

Table GZ-1.1 Real Physical Capital, Nominal and Real Human Capital for Guizhou

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	901	901	23
1986	1028	976	25
1987	1157	1021	27
1988	1316	975	29
1989	1490	931	30
1990	1670	1023	32
1991	1970	1152	34
1992	2257	1223	35
1993	2603	1214	37
1994	2989	1135	39
1995	3429	1069	42
1996	3875	1103	45
1997	4432	1220	49
1998	4981	1368	55
1999	5488	1520	62

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	6327	1758	70
2001	6985	1904	80
2002	7536	2075	92
2003	8188	2225	105
2004	9040	2359	120
2005	9841	2540	136
2006	11064	2807	155
2007	12101	2886	178
2008	13379	2968	204
2009	14892	3348	234
2010	15870	3466	274
2011	18313	3806	316
2012	20405	4129	371
2013	22501	4442	433
2014	24974	4816	498
2015	27024	5115	571
2016	29041	5420	662
2017	31670	5856	755

31.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table GZ-2.1 presents human capital per capita for Guizhou by region. From 1985 to 2017, the nominal human capital per capita increased from 32.83 thousand Yuan to 1.07 million Yuan, an increase of more than 32 times; and the real human capital per capita increased from

32.83 thousand Yuan to 0.2 million Yuan, an increase of approximately 6 times.

Figure GZ-2.1 illustrates the trends of human capital per capita by gender for Guizhou. The real human capital per capita of males is similar to that of females for Guizhou. Both of them kept increasing from 1985 to 2017, and the growth of human capital for males and females both accelerated, with males' growth rate significantly higher than females'. As a result, the gender gap has expanded, especially from 1997 onward.

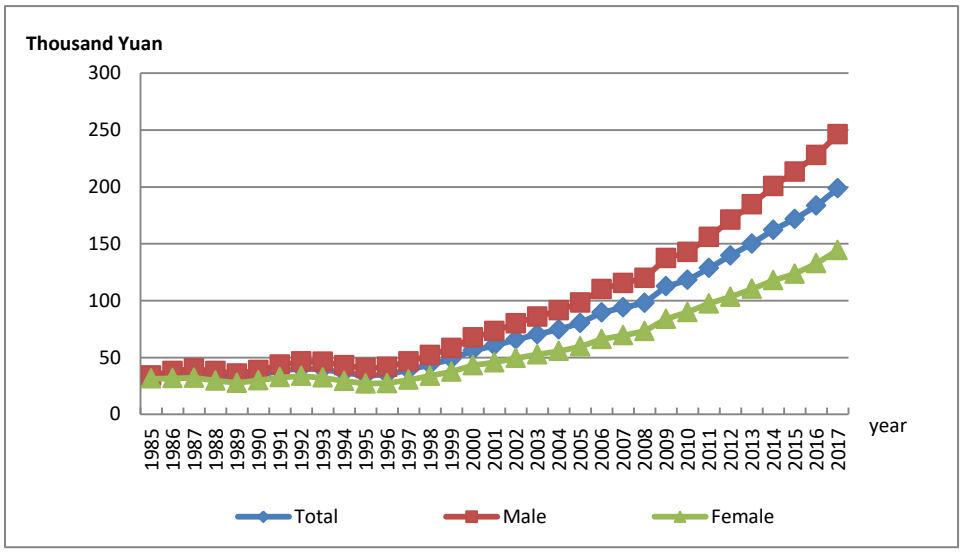


Figure GZ-2.1 Human Capital Per Capita by Gender for Guizhou，1985-2017

Table GZ-2.1 Nominal and Real Human Capital Per Capita by Region for Guizhou

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	32.83	70.43	23.98	32.83	70.43	23.98
1986	36.96	83.91	25.82	35.07	78.86	24.69
1987	41.17	96.53	27.98	36.33	82.70	25.29
1988	45.87	108.12	30.91	33.99	76.24	23.83
1989	51.15	123.71	33.85	31.98	73.99	21.97

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	56.44	137.98	37.06	34.58	81.62	23.40
1991	65.67	163.96	40.67	38.40	93.36	24.43
1992	74.50	186.48	44.70	40.37	97.68	25.12
1993	85.02	212.98	49.17	39.65	96.34	23.78
1994	96.66	241.63	54.01	36.69	89.59	21.13
1995	109.37	269.92	59.20	34.09	83.75	18.57
1996	122.96	305.68	65.06	35.01	85.75	18.93
1997	141.11	363.02	71.55	38.83	98.49	20.14
1998	158.78	413.51	78.57	43.62	111.63	22.20
1999	175.48	456.41	86.30	48.59	124.58	24.46
2000	202.19	540.10	94.71	56.18	148.61	26.79
2001	221.58	576.29	104.28	60.41	154.85	29.18
2002	239.04	611.64	113.59	65.81	166.18	32.01
2003	259.14	647.69	124.39	70.42	174.40	34.36
2004	286.14	707.47	135.96	74.66	184.06	35.67
2005	310.79	749.00	148.76	80.20	193.70	38.22
2006	352.98	817.20	164.77	89.55	208.01	41.51
2007	393.69	883.31	182.52	93.91	212.31	42.81
2008	441.95	961.55	200.61	98.04	216.00	43.25
2009	500.09	1054.91	223.09	112.43	240.34	48.58
2010	540.70	1091.96	247.03	118.09	241.30	52.43
2011	618.41	1211.81	274.00	128.52	254.30	55.49
2012	690.02	1318.25	303.01	139.63	269.37	59.70
2013	759.91	1404.19	337.67	150.02	279.93	64.90
2014	840.76	1504.75	378.79	162.13	292.94	71.10
2015	907.16	1559.43	424.78	171.70	297.64	78.55
2016	982.49	1674.79	463.10	183.36	315.23	84.46
2017	1074.19	1770.53	517.16	198.63	329.62	93.76

Figure GZ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in the urban area remained larger than that in the rural area. Since 1997, the growth has accelerated for both rural and urban human capital, and the growth rate is significantly higher in the urban area than in the rural area. Therefore, the gap between urban and rural human capital expanded rapidly.

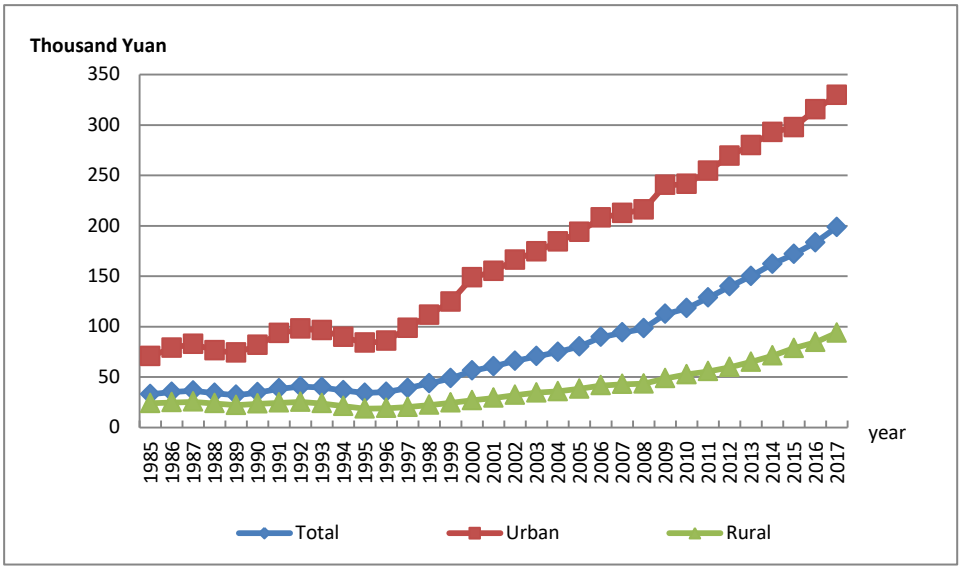


Figure GZ-2.2 Real Human Capital Per Capita by Region for Guizhou，1985-2017

31.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population over 16 years of age, non-retired and out of school.

31.3.1 Total labor force human capital

The total labor force human capital for Guizhou is reported in Table GZ-3.1. From 1985 to 2017, the nominal labor force human capital increased from 317 billion Yuan to 10,50 billion Yuan, an increase of more than 33

times; and the real labor force human capital increased from 317 billion Yuan to 1,931 billion Yuan, an increase of approximately 6 times.

Table GZ-3.1 Nominal and Real Labor Force Human Capital for Guizhou

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	317	317
1986	366	348
1987	430	379
1988	505	374
1989	584	365
1990	670	411
1991	797	467
1992	921	500
1993	1055	494
1994	1200	457
1995	1371	428
1996	1524	435
1997	1665	459
1998	1838	507
1999	2003	556
2000	2213	616
2001	2402	657
2002	2575	711
2003	2724	742
2004	2914	761
2005	3198	825
2006	3645	924
2007	3958	941
2008	4347	960
2009	4770	1066
2010	5394	1173

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	6171	1278
2012	6750	1360
2013	7463	1467
2014	8238	1580
2015	9361	1764
2016	9797	1819
2017	10503	1931

31.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital to the labor force population. Tables GZ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 23.4 thousand Yuan to 0.58 million Yuan, an increase of more than 24 times; and the real average labor force human capital increased from 23.4 thousand Yuan to 0.11 million Yuan, an increase of approximately 4.5 times.

Table GZ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Guizhou

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	23.40	45.15	17.10	23.40	45.15	17.10
1986	26.14	52.01	18.63	24.80	48.89	17.81
1987	29.46	60.69	20.36	25.98	52.00	18.40
1988	33.18	69.02	22.67	24.56	48.67	17.48
1989	36.90	78.07	25.13	23.07	46.69	16.31
1990	40.60	85.94	27.85	24.88	50.84	17.58

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	46.10	97.79	30.85	27.00	55.68	18.53
1992	51.62	109.77	34.04	28.04	57.50	19.13
1993	57.75	122.32	37.46	27.02	55.33	18.11
1994	64.58	136.24	41.10	24.58	50.51	16.08
1995	72.55	151.49	44.88	22.62	47.00	14.08
1996	80.48	168.82	49.08	22.96	47.36	14.28
1997	88.34	194.73	53.87	24.37	52.83	15.16
1998	97.66	215.61	59.19	26.91	58.21	16.73
1999	107.20	237.48	64.48	29.76	64.82	18.28
2000	118.50	251.55	70.39	33.00	69.22	19.91
2001	128.19	270.61	76.23	35.07	72.71	21.33
2002	136.54	288.30	82.10	37.71	78.33	23.13
2003	143.97	302.40	88.72	39.24	81.43	24.51
2004	153.52	319.19	95.67	40.10	83.04	25.10
2005	167.37	342.69	103.04	43.15	88.62	26.48
2006	191.73	383.12	116.58	48.59	97.52	29.37
2007	211.98	414.33	130.17	50.40	99.59	30.53
2008	236.19	451.53	144.66	52.13	101.43	31.19
2009	264.28	489.39	161.12	59.08	111.50	35.09
2010	300.57	534.94	178.20	65.38	118.21	37.82
2011	339.77	590.69	199.55	70.34	123.96	40.41
2012	373.67	631.78	225.28	75.28	129.10	44.38
2013	411.26	666.57	254.45	80.84	132.88	48.91
2014	449.14	697.67	290.23	86.16	135.82	54.48
2015	499.45	732.69	333.16	94.10	139.84	61.61
2016	533.59	767.86	379.98	99.05	144.52	69.30
2017	579.16	802.27	434.89	106.48	149.36	78.84

Chapter 32 Human Capital for Yunnan

32.1 Total human capital

Table YN-1.1 presents the estimates of nominal and real total human capital and real physical capital for Yunnan. Column 1 contains nominal human capital estimated based on six-education categories. Column 2 contains real human capital estimated based on six-education categories. Column 3 contains the real physical capital of Yunnan.

Table YN-1.1 Real Physical Capital, Nominal and Real Human Capital for Yunnan

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	986	986	56.8
1986	1140	1077	58.5
1987	1306	1155	60.5
1988	1503	1111	63.2
1989	1697	1057	65.5
1990	1922	1166	68.8
1991	2237	1316	75.7
1992	2626	1411	84.1
1993	3068	1362	92.2
1994	3577	1340	100.1
1995	4077	1264	109.3
1996	4668	1334	120.0
1997	5329	1462	131.9
1998	6169	1663	147.6
1999	6942	1881	163.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	7839	2171	177.1
2001	8921	2499	191.6
2002	10165	2861	208.1
2003	11351	3160	229.8
2004	12536	3293	256.0
2005	13768	3565	284.4
2006	15237	3877	316.7
2007	16794	4036	351.6
2008	18354	4179	387.0
2009	19790	4488	451.4
2010	21078	4605	550.1
2011	23974	5003	671.0
2012	26014	5285	811.4
2013	28317	5576	969.2
2014	30707	5906	1151.0
2015	33062	6237	1348.4
2016	35850	6663	1558.3
2017	38330	7055	1768.0

32.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table YN-2.1 presents human capital per capita for Yunnan by region. From 1985 to 2017, the nominal human capital per capita increased from 32.03 thousand Yuan to 0.94 million Yuan, an increase of more than 29 times; and the real human capital per capita increased from 32.03

thousand Yuan to 0.17 million Yuan, an increase of approximately 5 times.

Figure YN-2.1 illustrates the trends of human capital per capita by gender for Yunnan. The real human capital per capita of males is similar to that of females for Yunnan. Both of them kept increasing from 1985 to 2017, and the growth of human capital for both males and females accelerated, with males' growth rate significantly higher than females'. As a result, the gender gap has expanded, especially from 1997 onward.

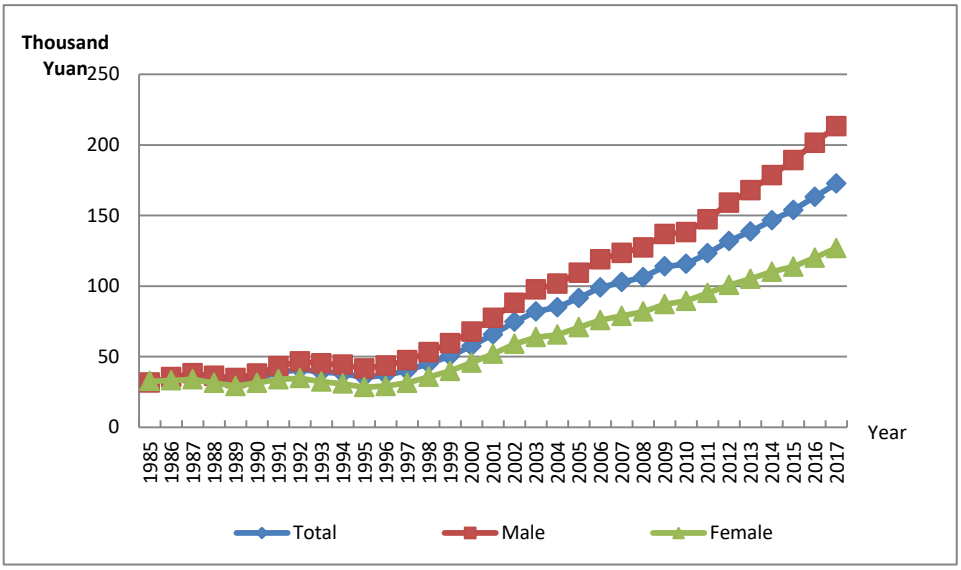


Figure YN-2.1 Real Human Capital Per Capita by Gender for Yunnan，1985-2017

Table YN-2.1 Nominal and Real Human Capital Per Capita by Region for Yunnan

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	32.03	75.48	24.94	32.03	75.48	24.94
1986	36.29	91.07	27.20	34.29	86.90	25.57
1987	40.78	105.75	29.81	36.06	93.96	26.28
1988	45.84	121.17	33.00	33.87	88.90	24.49
1989	51.41	138.87	36.35	32.03	86.41	22.67
1990	57.33	155.92	40.07	34.79	95.49	24.17

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	65.87	179.18	44.42	38.77	105.72	26.09
1992	76.31	210.41	48.98	41.00	112.45	26.44
1993	88.03	244.08	53.98	39.07	109.81	23.63
1994	101.30	281.41	59.54	37.96	107.93	21.74
1995	114.05	312.98	65.25	35.36	99.78	19.56
1996	129.06	352.23	71.41	36.89	103.50	19.68
1997	145.73	392.67	78.73	39.97	110.31	20.88
1998	166.92	450.46	86.44	44.99	123.57	22.67
1999	185.92	493.55	94.68	50.37	137.04	24.66
2000	207.47	543.86	104.03	57.44	154.72	27.54
2001	234.23	595.15	114.85	65.61	172.59	30.22
2002	264.89	658.36	125.84	74.55	192.27	32.95
2003	294.35	706.43	138.28	81.94	203.66	35.85
2004	323.24	748.91	152.33	84.91	203.50	37.29
2005	353.32	796.29	166.27	91.49	212.75	40.30
2006	388.91	854.46	181.98	98.96	224.04	43.33
2007	427.39	914.51	199.54	102.71	226.42	44.86
2008	466.46	972.28	217.76	106.21	228.39	46.18
2009	501.69	1016.65	239.35	113.77	237.59	50.65
2010	529.11	1030.41	261.91	115.60	231.99	53.50
2011	589.85	1125.23	283.29	123.09	241.73	55.16
2012	649.24	1190.11	312.72	131.90	248.22	59.53
2013	703.93	1242.61	343.14	138.61	250.65	63.60
2014	761.43	1296.90	378.16	146.45	254.97	68.78
2015	815.36	1330.76	422.57	153.81	256.00	75.87
2016	878.01	1382.00	465.18	163.18	262.19	82.13
2017	937.67	1407.81	525.35	172.59	264.96	91.56

Figure YN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in the urban area remained larger than that in the rural area. Since 1995, the growth of human capital for rural and urban both accelerated, and the growth rate is significantly higher in the urban area than in the rural area. Therefore, the gap between urban and rural human capital expanded rapidly.

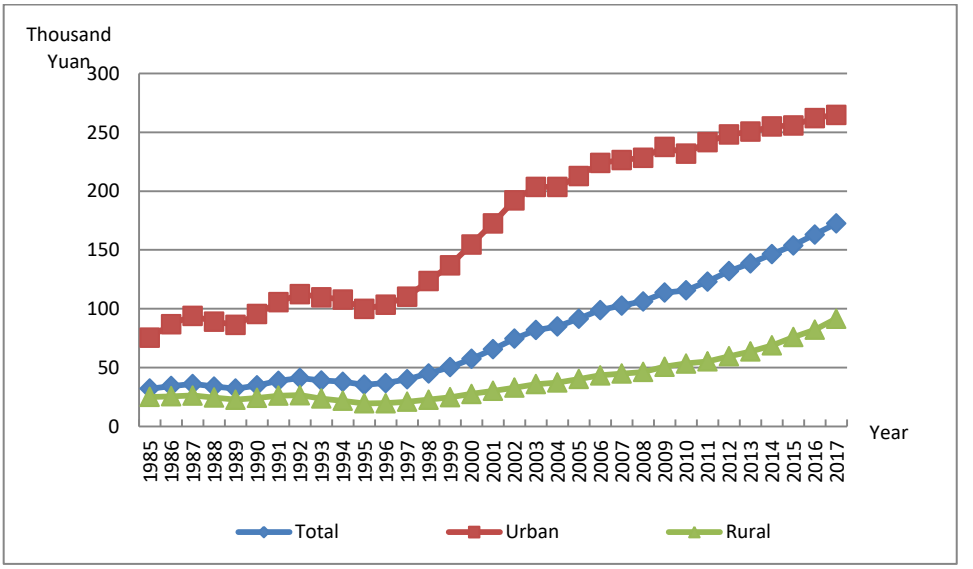


Figure YN-2.2 Real Human Capital Per Capita by Region for Yunnan，1985-2017

32.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population over 16 years of age, non-retired and out of school.

32.3.1 Total labor force human capital

The total labor force human capital for Yunnan is reported in Table YN-3.1 From 1985 to 2017, the nominal labor force human capital increased from 402 billion Yuan to 16,179 billion Yuan, an increase of more than 40

times. The real labor force human capital increased from 402 billion Yuan to 2,952 billion Yuan, an increase of approximately 7 times.

Table YN-3.1 Nominal and Real Labor Force Human Capital for Yunnan

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	402	402
1986	465	439
1987	550	486
1988	636	470
1989	716	446
1990	820	497
1991	966	569
1992	1128	606
1993	1318	584
1994	1523	569
1995	1751	540
1996	2005	570
1997	2278	622
1998	2598	698
1999	2936	791
2000	3329	917
2001	3640	1011
2002	4002	1113
2003	4424	1216
2004	4824	1250
2005	5339	1365
2006	5914	1485
2007	6473	1536
2008	7112	1598
2009	7878	1765
2010	8754	1892

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	9815	2026
2012	10537	2120
2013	11434	2230
2014	12362	2357
2015	13858	2596
2016	14921	2751
2017	16179	2952

32.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital to the labor force population. Tables YN-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 23.93 thousand Yuan to 0.57 million Yuan, an increase of more than 24 times. The real average labor force human capital increased from 23.93 thousand Yuan to 0.1 million Yuan, an increase of approximately 4 times.

Table YN-3.2 Nominal and Real Average Labor Force Human Capital by Region for Yunnan

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	23.93	53.03	18.32	23.93	53.03	18.32
1986	27.10	62.01	20.13	25.62	59.17	18.92
1987	30.95	72.80	22.23	27.37	64.68	19.60
1988	34.34	80.50	24.88	25.37	59.06	18.46
1989	38.02	89.13	27.67	23.69	55.47	17.26
1990	42.06	97.42	30.76	25.52	59.67	18.56

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	47.89	111.51	34.22	28.18	65.79	20.10
1992	54.28	128.33	37.98	29.18	68.59	20.50
1993	61.43	146.59	42.19	27.22	65.95	18.47
1994	69.01	164.48	46.73	25.77	63.09	17.06
1995	77.44	183.96	51.32	23.91	58.65	15.38
1996	86.62	204.20	56.29	24.64	60.00	15.51
1997	97.03	225.37	61.83	26.50	63.31	16.40
1998	108.55	246.22	68.16	29.14	67.54	17.88
1999	120.20	266.08	74.66	32.40	73.88	19.45
2000	133.65	289.49	81.91	36.81	82.36	21.68
2001	146.29	310.98	90.10	40.62	90.19	23.71
2002	159.14	334.89	98.68	44.25	97.80	25.84
2003	174.05	357.93	108.81	47.83	103.19	28.21
2004	188.05	376.59	119.51	48.73	102.33	29.26
2005	205.37	404.84	130.66	52.50	108.17	31.67
2006	224.98	434.62	143.45	56.49	113.96	34.15
2007	245.52	462.77	156.59	58.26	114.58	35.20
2008	268.19	490.78	171.04	60.26	115.29	36.28
2009	293.60	522.77	188.01	65.77	122.17	39.79
2010	319.32	544.27	205.67	69.00	122.54	42.01
2011	349.83	583.22	223.39	72.22	125.29	43.50
2012	382.66	617.66	244.34	76.99	128.83	46.51
2013	413.38	646.26	267.70	80.64	130.36	49.62
2014	444.52	667.30	295.53	84.75	131.19	53.75
2015	489.88	706.31	329.50	91.75	135.87	59.16
2016	527.84	739.27	366.89	97.32	140.25	64.77
2017	571.04	763.71	416.97	104.19	143.74	72.67

Chapter 33 Human Capital for Tibet

33.1 Total human capital

Table XZ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Tibet. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Tibet.

Table XZ-1.1 Real Physical Capital, Nominal and Real Human Capital for Tibet

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	59	59	6.4
1986	69	65	6.8
1987	79	70	7.2
1988	91	69	7.6
1989	104	68	7.8
1990	119	73	8.1
1991	136	77	8.5
1992	159	83	9.0
1993	182	83	9.6
1994	206	74	10.6
1995	233	70	12.2
1996	282	78	13.3
1997	338	89	13.7
1998	400	104	14.2
1999	480	125	15.0
2000	507	132	15.8
2001	656	170	16.7

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	785	202	18.6
2003	810	207	21.5
2004	891	222	26.9
2005	994	245	33.2
2006	1120	270	40.0
2007	1178	275	47.2
2008	1302	288	55.5
2009	1420	309	65.6
2010	1589	338	80.6
2011	1990	402	93.1
2012	1946	381	109.4
2013	2020	382	130.1
2014	2203	404	153.7
2015	2388	430	175.9
2016	2618	460	200.9
2017	2804	485	228.6

33.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table XZ-2.1 presents human capital per capita for Tibet by region. From 1985 to 2017, the nominal human capital per capita increased from 32.99 thousand Yuan to 961.52 thousand Yuan, an increase of more than 29 times; and the real human capital per capita increased from 32.99 thousand Yuan to 166.23 thousand Yuan, an increase of approximately 5 times.

Figure XZ-2.1 illustrates the trends of human capital per capita by gender for Tibet. The real human capital per capita of male is similar to that of female for Tibet. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

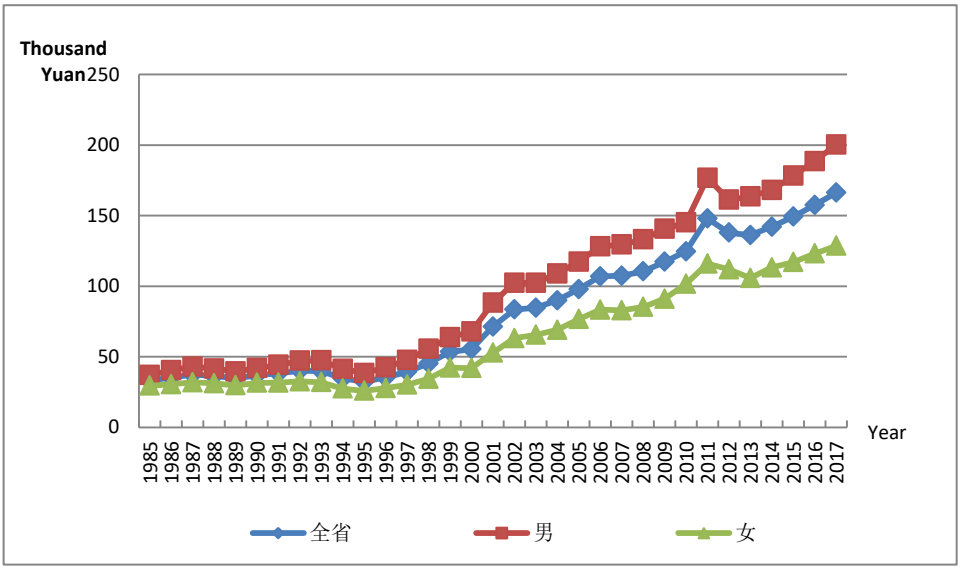


Figure XZ-2.1 Human Capital Per Capita by Gender for Tibet，1985-2017

Table XZ-2.1 Nominal and Real Human Capital Per Capita by Region for Tibet

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	32.99	140.63	20.30	32.99	140.63	20.30
1986	37.59	164.72	22.11	35.27	153.94	20.81
1987	42.39	187.99	24.10	37.32	162.15	21.63
1988	47.84	211.18	26.69	36.35	154.63	21.03
1989	53.50	233.35	29.54	34.71	147.42	19.71

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	59.59	247.43	32.75	36.83	148.59	20.87
1991	67.36	285.54	36.60	38.14	156.74	21.41
1992	77.01	331.57	40.67	40.05	166.98	21.93
1993	86.88	375.28	45.24	39.80	164.06	21.86
1994	96.65	417.32	49.85	34.60	145.37	18.44
1995	107.68	454.57	55.34	32.25	130.54	17.42
1996	127.51	512.05	61.68	35.25	134.29	18.30
1997	149.53	573.42	68.60	39.20	143.50	19.28
1998	173.94	639.89	75.80	45.24	160.45	20.98
1999	205.59	737.26	83.69	53.44	185.98	23.06
2000	212.95	693.64	92.91	55.34	174.28	25.65
2001	274.85	962.57	101.89	71.26	243.80	27.87
2002	324.66	1154.24	110.98	83.45	289.45	30.39
2003	331.54	1126.68	121.76	84.66	280.30	33.04
2004	360.63	1204.64	133.25	89.89	293.82	34.97
2005	397.77	1317.98	145.20	97.86	316.71	37.77
2006	443.61	1463.42	158.56	106.89	345.10	40.28
2007	459.73	1472.02	172.94	107.34	337.35	42.16
2008	499.99	1582.39	188.76	110.45	343.09	43.54
2009	537.96	1681.24	204.93	117.20	359.21	46.68
2010	584.82	1803.06	219.51	124.57	376.94	48.93
2011	731.90	2376.03	234.74	148.00	472.17	49.97
2012	704.48	2168.48	251.32	137.84	415.95	51.74
2013	720.16	2157.32	266.31	136.19	399.82	52.92
2014	774.54	2295.96	284.91	142.11	411.92	55.24
2015	829.15	2397.48	314.47	149.20	421.29	59.89
2016	897.47	2542.61	346.83	157.51	435.47	64.44
2017	961.52	2670.18	390.36	166.23	450.11	71.32

Figure XZ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2016, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

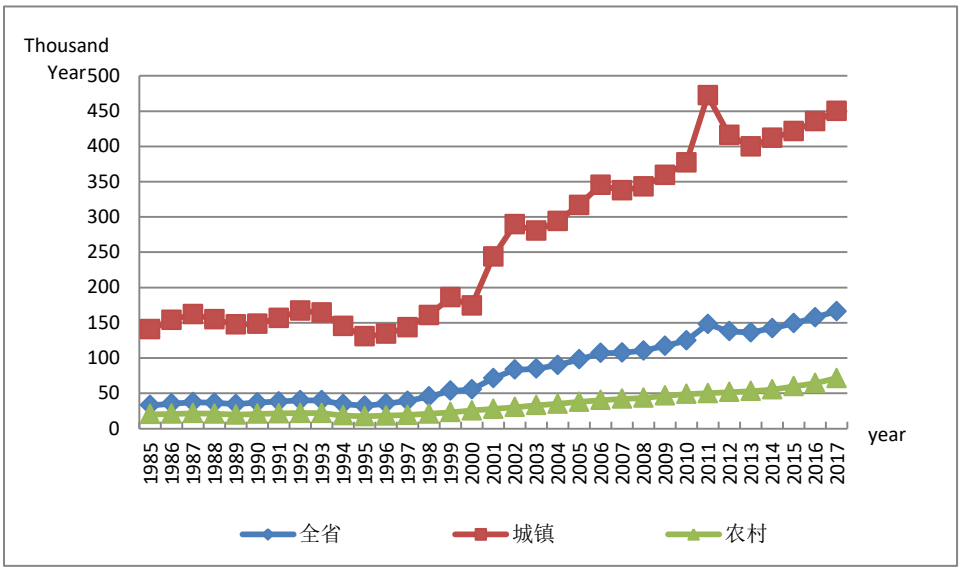


Figure XZ-2.2 Real Human Capital Per Capita by Region for Tibet，1985-2017

33.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

33.3.1 Total labor force human capital

The total labor force human capital for Tibet is reported in Table XZ-3.1 From 1985 to 2017, the nominal labor force human capital increased from 22 billion Yuan to 842 billion Yuan, an increase of more than 38 times; and the

real labor force human capital increased from 22 billion Yuan to 148 billion Yuan, an increase of approximately 7 times.

Table XZ-3.1 Nominal and Real Labor Force Human Capital for Tibet

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	22	22
1986	25	23
1987	28	25
1988	33	25
1989	39	25
1990	47	29
1991	51	29
1992	57	30
1993	65	30
1994	74	27
1995	85	25
1996	99	28
1997	117	31
1998	138	36
1999	163	43
2000	192	50
2001	194	51
2002	209	55
2003	225	58
2004	246	62
2005	272	68
2006	309	76
2007	344	81
2008	391	87
2009	450	99
2010	530	114

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	558	115
2012	598	119
2013	635	122
2014	661	124
2015	727	133
2016	789	141
2017	842	148

33.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables XZ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 22.12 thousand Yuan to 468.69 thousand Yuan, an increase of more than 21 times; and the real average labor force human capital increased from 22.12 thousand Yuan to 84.54 thousand Yuan, an increase of approximately 4 times.

Table XZ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Tibet

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	22.12	77.37	16.51	22.12	77.37	16.51
1986	24.30	86.83	17.85	22.82	81.15	16.80
1987	27.11	99.25	19.31	24.00	85.61	17.34
1988	31.14	114.30	21.37	23.87	83.69	16.84
1989	35.74	130.19	23.53	23.31	82.25	15.69
1990	41.43	143.23	25.98	25.71	86.02	16.55

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	45.52	160.74	28.70	25.89	88.24	16.79
1992	50.88	180.51	31.69	26.60	90.91	17.09
1993	57.05	203.30	34.97	26.34	88.88	16.89
1994	63.98	227.91	38.46	23.01	79.39	14.23
1995	71.98	251.58	42.11	21.67	72.25	13.26
1996	82.27	271.20	47.01	22.94	71.12	13.95
1997	94.21	304.47	52.76	24.92	76.19	14.83
1998	107.84	330.08	59.18	28.30	82.77	16.38
1999	122.68	356.70	66.01	32.17	89.98	18.19
2000	139.39	370.59	73.58	36.44	93.11	20.31
2001	143.80	395.56	80.71	37.73	100.19	22.08
2002	152.95	429.33	88.41	40.02	107.67	24.21
2003	162.36	457.74	97.06	42.19	113.88	26.34
2004	174.59	498.53	106.10	44.23	121.59	27.85
2005	189.14	541.17	115.46	47.37	130.04	30.03
2006	209.64	595.76	127.49	51.37	140.49	32.39
2007	227.08	629.56	139.50	53.74	144.28	34.01
2008	249.71	672.85	152.94	55.90	145.89	35.27
2009	275.96	717.02	168.26	60.91	153.19	38.33
2010	304.46	747.18	184.62	65.72	156.20	41.15
2011	320.70	800.16	195.89	65.98	159.01	41.70
2012	338.89	848.90	208.33	67.38	162.83	42.89
2013	355.59	890.17	221.12	68.30	164.98	43.94
2014	368.76	916.31	235.95	68.95	164.40	45.75
2015	400.51	1002.67	252.61	73.42	176.19	48.11
2016	434.62	1073.31	275.54	77.70	183.82	51.20
2017	468.69	1111.20	307.12	82.54	187.32	56.11

Chapter 34 Human Capital for Shaanxi

34.1 Total human capital

Table SaX-1.1 presents the estimates of nominal and real total human capital and real physical capital for Shaanxi. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Shaanxi.

Table SaX-1.1 Real Physical Capital, Nominal and Real Human Capital for Shaanxi

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	830	830	32.8
1986	979	925	39.0
1987	1128	991	44.1
1988	1335	991	49.4
1989	1550	962	53.7
1990	1763	1070	57.4
1991	2102	1198	61.2
1992	2515	1309	64.7
1993	2976	1361	69.0
1994	3484	1253	73.8
1995	4001	1209	79.3
1996	4579	1255	84.9
1997	5212	1361	91.0
1998	5679	1509	99.0
1999	6472	1758	108.3
2000	7025	1912	119.7
2001	8479	2273	132.0

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	8228	2235	146.0
2003	9684	2581	163.2
2004	10503	2716	183.5
2005	11177	2855	210.7
2006	12866	3234	245.0
2007	14564	3479	291.8
2008	16214	3641	349.2
2009	18103	4044	419.6
2010	19680	4227	506.7
2011	22648	4603	600.4
2012	25029	4952	706.8
2013	28397	5455	818.5
2014	31490	5952	938.7
2015	32395	6066	1048.5
2016	35454	6555	1168.3
2017	38466	6995	1288.4

34.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table SaX-2.1 presents human capital per capita for Shaanxi by region. From 1985 to 2017, the nominal human capital per capita increased from 30.54 thousand Yuan to 1.35 million Yuan, an increase of more than 44 times; and the real human capital per capita increased from 30.54 thousand Yuan to 244.62 thousand Yuan, an increase of approximately 8 times.

Figure SaX-2.1 illustrates the trends of human capital per capita by gender for Shaanxi. The real human capital per capita of male is similar to that of female for Shaanxi. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

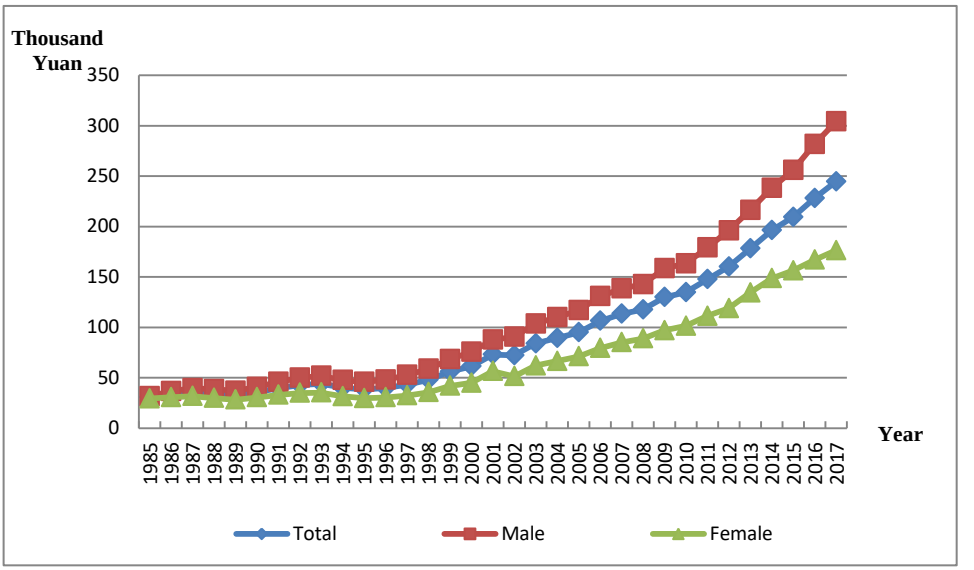


Figure SaX-2.1 Human Capital Per Capita by Gender for Shaanxi，1985-2017

Table SaX-2.1 Nominal and Real Human Capital Per Capita by Region for Shaanxi

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	30.54	61.89	22.71	30.54	61.89	22.71
1986	35.70	76.45	25.35	33.72	71.72	24.08
1987	40.76	89.42	28.28	35.79	76.82	25.26
1988	46.33	101.05	31.85	34.39	72.28	24.36
1989	52.84	115.31	35.89	32.81	70.14	22.69
1990	59.15	126.95	40.31	35.89	75.26	24.96
1991	69.62	150.79	45.21	39.69	83.31	26.58

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	82.31	179.64	50.77	42.85	89.25	27.82
1993	96.30	209.93	56.83	44.03	91.49	27.56
1994	111.49	241.26	63.49	40.09	82.02	24.59
1995	126.73	270.21	70.55	38.29	77.85	22.79
1996	145.10	308.49	78.23	39.76	80.58	23.06
1997	165.35	349.60	86.76	43.19	86.80	24.59
1998	180.45	370.62	96.21	47.94	94.19	27.46
1999	206.17	424.03	106.28	55.99	110.86	30.83
2000	224.82	450.45	117.73	61.19	117.42	34.49
2001	272.36	552.54	130.51	73.02	143.89	37.16
2002	265.73	492.93	143.09	72.18	130.72	40.58
2003	315.04	589.75	157.59	83.95	155.15	43.18
2004	345.43	629.89	172.88	89.31	160.88	45.90
2005	371.66	658.22	187.54	94.95	166.62	48.91
2006	423.13	733.65	209.65	106.36	181.89	54.46
2007	474.25	804.66	230.90	113.29	189.64	57.07
2008	523.64	869.87	252.44	117.59	193.04	58.48
2009	581.29	947.46	277.90	129.85	210.26	63.23
2010	627.37	995.95	304.36	134.75	213.13	66.15
2011	726.56	1139.17	330.53	147.67	230.65	68.02
2012	809.73	1241.71	358.50	160.21	245.01	71.56
2013	927.22	1402.83	390.93	178.12	269.26	75.32
2014	1038.38	1535.00	436.75	196.27	290.02	82.69
2015	1118.02	1634.58	485.54	209.35	306.08	90.93
2016	1233.71	1774.39	528.17	228.10	328.00	97.74
2017	1345.21	1888.62	591.56	244.62	342.94	108.28

Figure SaX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

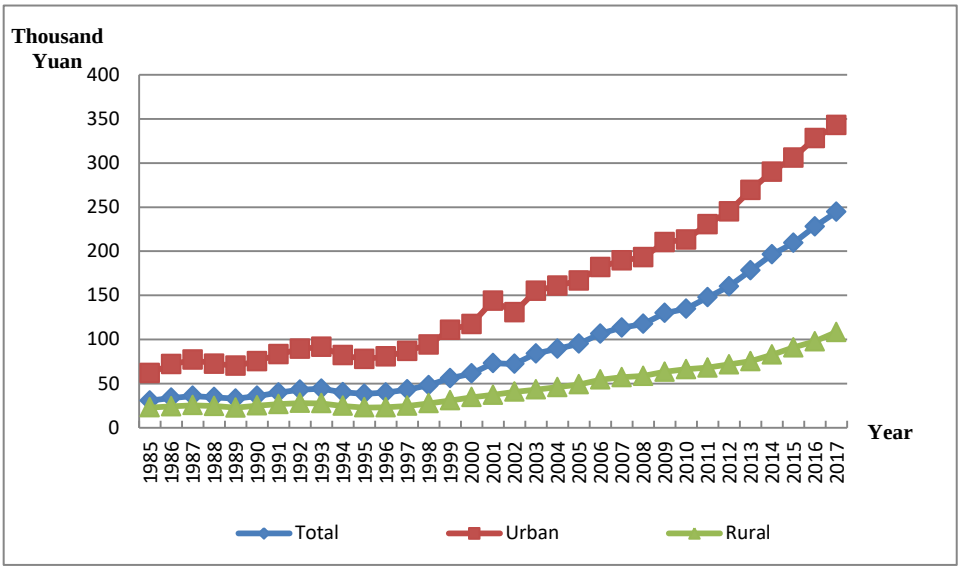


Figure SaX-2.2 Real Human Capital Per Capita by Region for Shaanxi，1985-2017

34.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

34.3.1 Total labor force human capital

The total labor force human capital for Shaanxi is reported in Table SaX-3.1 From 1985 to 2017, the nominal labor force human capital increased from 348 billion Yuan to 149,390 billion Yuan, an increase of more than 42 times; and the real labor force human capital increased from 348 billion Yuan

to 27,190 billion Yuan, an increase of approximately 7.8 times.

Table SaX-3.1 Nominal and Real Labor Force Human Capital for Shaanxi

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	348	348
1986	390	368
1987	445	392
1988	552	411
1989	659	410
1990	774	470
1991	897	513
1992	1031	541
1993	1180	545
1994	1336	487
1995	1505	460
1996	1664	462
1997	1853	491
1998	2073	557
1999	2332	640
2000	2615	720
2001	2844	772
2002	3073	840
2003	3347	896
2004	3650	948
2005	4093	1048
2006	4866	1228
2007	5617	1348
2008	6426	1449
2009	7364	1649
2010	8620	1854

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	9439	1921
2012	10393	2059
2013	11575	2224
2014	12800	2420
2015	13498	2528
2016	14076	2603
2017	14939	2719

34.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables SaX-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 21.87 thousand Yuan to 761.45 thousand Yuan, an increase of more than 34 times; and the real average labor force human capital increased from 21.87 thousand Yuan to138.6 thousand Yuan, an increase of approximately 6 times.

Table SaX-3.2 Nominal and Real Average Labor Force Human Capital by Region for Shaanxi

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	21.87	41.51	16.84	21.87	41.51	16.84
1986	24.35	46.88	18.77	23.01	43.98	17.82
1987	27.37	53.51	20.95	24.08	45.97	18.71
1988	31.65	61.89	23.82	23.59	44.27	18.22
1989	36.37	70.99	26.89	22.63	43.18	17.00
1990	41.37	79.24	30.28	25.14	46.98	18.75
1991	47.17	90.29	33.97	26.99	49.88	19.97

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1992	53.70	103.30	37.98	28.15	51.32	20.81
1993	60.76	117.07	42.29	28.05	51.02	20.51
1994	68.32	131.36	47.00	24.89	44.66	18.20
1995	76.51	146.60	51.82	23.39	42.24	16.74
1996	85.20	162.51	56.93	23.66	42.45	16.78
1997	95.07	196.01	62.84	25.21	48.67	17.81
1998	105.90	215.55	69.53	28.48	54.78	19.84
1999	117.99	236.97	76.71	32.39	61.96	22.25
2000	131.01	233.84	84.84	36.07	60.96	24.85
2001	143.84	250.75	93.02	39.02	65.30	26.48
2002	155.51	264.84	100.99	42.50	70.23	28.64
2003	168.32	277.27	109.73	45.08	72.94	30.06
2004	183.19	292.81	118.91	47.55	74.79	31.57
2005	203.08	318.63	128.67	52.01	80.66	33.56
2006	237.45	369.56	148.38	59.92	91.62	38.54
2007	269.04	415.23	168.19	64.57	97.86	41.57
2008	301.15	457.60	187.69	67.89	101.55	43.48
2009	339.07	505.55	210.35	75.92	112.19	47.86
2010	386.73	566.27	233.50	83.20	121.18	50.75
2011	433.35	635.61	256.13	88.21	128.69	52.71
2012	482.26	698.01	283.33	95.53	137.73	56.55
2013	537.13	759.28	314.03	103.20	145.74	60.50
2014	596.89	817.81	347.85	112.85	154.52	65.86
2015	655.24	876.96	387.17	122.69	164.21	72.50
2016	703.07	929.91	424.72	130.00	171.89	78.59
2017	761.45	989.11	476.61	138.60	179.61	87.24

Chapter 35 Human Capital for Gansu

35.1 Total human capital

Table GS-1.1 presents the estimates of nominal and real total human capital and real physical capital for Gansu. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Gansu.

Table GS-1.1 Real Physical Capital, Nominal and Real Human Capital for Gansu

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	519	519	26.8
1986	606	569	29.6
1987	693	606	34.0
1988	808	598	39.8
1989	938	588	46.0
1990	1053	639	54.2
1991	1213	700	65.3
1992	1376	743	80.9
1993	1569	733	105.4
1994	1771	667	123.0
1995	2000	629	139.4
1996	2280	652	156.1
1997	2593	720	172.3
1998	2947	827	186.0
1999	3302	948	204.2
2000	3664	1057	236.4

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	4162	1153	272.2
2002	4564	1265	308.3
2003	5117	1403	355.4
2004	5637	1510	426.2
2005	6108	1607	493.0
2006	6878	1787	580.6
2007	7436	1831	681.4
2008	8174	1861	846.6
2009	8914	2003	973.4
2010	9506	2051	1161.3
2011	10782	2203	1406.1
2012	11682	2316	1649.6
2013	12696	2448	1909.0
2014	13800	2604	2193.4
2015	14887	2766	2440.0
2016	15856	2910	2738.4
2017	17052	3087	3074.5

35.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table GS-2.1 presents human capital per capita for Gansu by region. From 1985 to 2017, the nominal human capital per capita increased from 27.6 thousand Yuan to 789.25 thousand Yuan, an increase of more than 28 times; and the real human capital per capita increased from 27.6 thousand Yuan to 142.87 thousand Yuan, an increase of approximately 5

times.

Figure GS-2.1 illustrates the trends of human capital per capita by gender for Gansu. The real human capital per capita of male is similar to that of female for Gansu. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

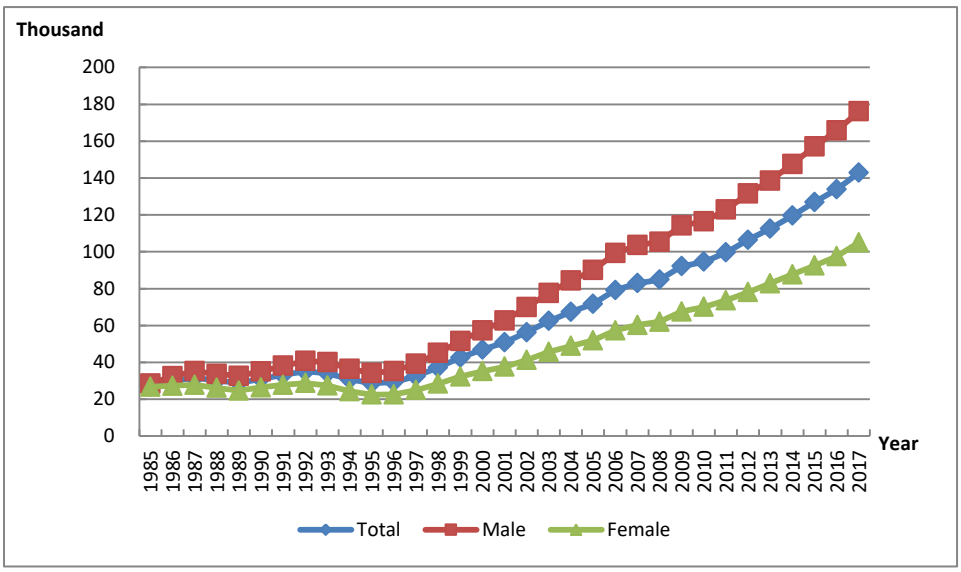


Figure GS-2.1 Human Capital Per Capita by Gender for Gansu，1985-2017

Table GS-2.1 Nominal and Real Human Capital Per Capita by Region for Gansu

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	27.60	62.83	19.77	27.60	62.83	19.77
1986	31.92	75.32	21.74	29.98	70.39	20.51
1987	36.13	85.47	23.91	31.60	73.69	21.18
1988	40.69	95.18	26.49	30.11	68.04	20.23
1989	46.06	106.17	29.33	28.88	64.21	19.05

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	51.07	116.37	32.52	30.99	69.07	20.17
1991	57.55	132.47	36.01	33.21	74.39	21.37
1992	64.98	150.92	40.00	35.07	78.98	22.31
1993	73.14	171.61	44.33	34.17	77.96	21.35
1994	81.61	192.00	49.14	30.72	70.00	19.17
1995	91.11	213.96	54.54	28.68	65.61	17.68
1996	102.48	243.28	60.14	29.30	67.63	17.77
1997	116.90	281.47	66.91	32.48	76.12	19.22
1998	132.64	323.20	74.00	37.21	88.29	21.49
1999	148.14	361.61	81.63	42.55	101.62	24.14
2000	162.72	394.22	90.27	46.93	111.68	26.67
2001	183.36	430.47	99.60	50.80	118.40	27.89
2002	203.06	460.57	108.72	56.29	127.57	30.17
2003	227.68	502.50	119.41	62.43	137.94	32.68
2004	251.49	537.23	131.07	67.36	145.58	34.40
2005	272.63	560.28	143.25	71.72	150.03	36.50
2006	304.61	612.66	159.41	79.15	162.11	40.05
2007	336.74	658.78	176.06	82.92	165.70	41.62
2008	372.57	713.27	193.57	84.81	166.11	42.09
2009	409.94	765.05	213.91	92.13	176.58	45.52
2010	438.12	789.23	235.62	94.51	174.49	48.39
2011	487.61	866.24	256.67	99.62	181.19	49.87
2012	536.98	926.29	282.90	106.47	187.92	53.32
2013	583.57	982.80	308.23	112.50	194.16	56.18
2014	633.71	1036.19	340.94	119.58	200.30	60.86
2015	683.03	1075.29	382.68	126.90	204.99	67.11
2016	729.02	1134.10	405.48	133.81	213.64	70.05
2017	789.25	1182.06	455.99	142.87	219.60	77.77

Figure GS-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

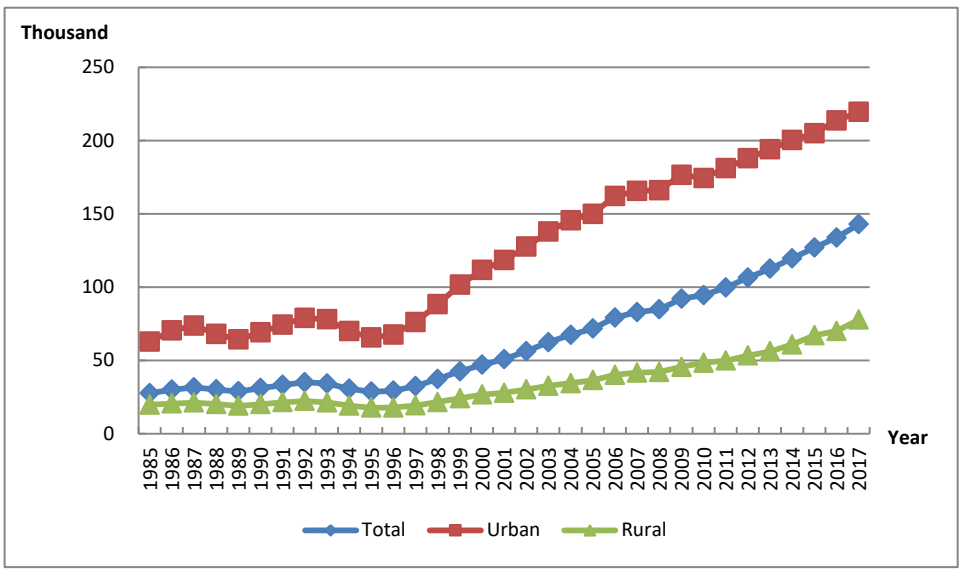


Figure GS-2.2 Real Human Capital Per Capita by Region for Gansu，1985-2017

35.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

35.3.1 Total labor force human capital

The total labor force human capital for Gansu is reported in Table GS-3.1 From 1985 to 2017, the nominal labor force human capital increased from 220 billion Yuan to 7,800 billion Yuan, an increase of more than 35 times; and the real labor force human capital increased from 220 billion Yuan

to 1,397 billion Yuan, an increase of approximately 6 times.

Table GS-3.1 Nominal and Real Labor Force Human Capital for Gansu

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	220	220
1986	256	240
1987	305	267
1988	368	273
1989	441	276
1990	507	307
1991	586	338
1992	659	356
1993	739	345
1994	827	312
1995	932	293
1996	1036	297
1997	1144	318
1998	1251	352
1999	1390	400
2000	1563	452
2001	1707	473
2002	1828	507
2003	1948	534
2004	2091	558
2005	2343	614
2006	2663	689
2007	2909	712
2008	3213	726
2009	3605	803
2010	4110	881

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	4671	948
2012	5052	994
2013	5538	1058
2014	6066	1135
2015	6821	1257
2016	7237	1315
2017	7800	1397

35.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables GS-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 20.98 thousand Yuan to 520.96 thousand Yuan, an increase of more than 24 times; and the real average labor force human capital increased from 20.98 thousand Yuan to 93.31 thousand Yuan, an increase of approximately 4 times.

Table GS-3.2 Nominal and Real Average Labor Force Human Capital by Region for Gansu

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	20.98	45.92	14.89	20.98	45.92	14.89
1986	23.79	52.30	16.47	22.35	48.88	15.54
1987	27.20	60.15	18.25	23.79	51.86	16.17
1988	30.85	67.24	20.48	22.83	48.07	15.64
1989	35.07	75.14	22.85	21.99	45.44	14.84
1990	38.98	82.08	25.46	23.66	48.72	15.79

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	43.67	92.24	28.14	25.20	51.80	16.70
1992	48.53	102.70	30.99	26.20	53.75	17.29
1993	53.75	114.53	34.09	25.12	52.03	16.42
1994	59.45	126.57	37.52	22.40	46.15	14.63
1995	66.09	140.45	41.21	20.81	43.07	13.36
1996	72.71	154.43	45.48	20.81	42.93	13.44
1997	80.46	180.30	50.41	22.39	48.76	14.48
1998	88.50	197.51	55.84	24.90	53.95	16.22
1999	97.85	218.63	61.49	28.18	61.44	18.18
2000	108.28	226.40	68.27	31.30	64.14	20.17
2001	118.12	241.54	74.14	32.76	66.43	20.76
2002	127.59	256.31	80.16	35.37	70.99	22.25
2003	136.66	268.63	86.96	37.46	73.74	23.80
2004	147.60	282.40	94.01	39.42	76.53	24.67
2005	163.19	303.42	102.11	42.77	81.25	26.01
2006	182.71	331.83	116.44	47.26	87.80	29.26
2007	202.13	356.84	130.81	49.47	89.75	30.92
2008	223.36	386.53	145.95	50.47	90.02	31.74
2009	249.99	422.86	163.23	55.71	97.60	34.73
2010	280.15	458.17	181.50	60.06	101.30	37.28
2011	310.01	500.12	201.37	62.89	104.61	39.13
2012	339.18	533.23	223.52	66.74	108.18	42.13
2013	368.49	562.28	247.06	70.42	111.08	45.03
2014	400.23	589.92	274.22	74.86	114.03	48.95
2015	442.82	628.92	306.27	81.61	119.90	53.71
2016	476.68	662.33	340.73	86.61	124.77	58.87
2017	520.96	699.36	387.30	93.31	129.92	66.05

Chapter 36 Human Capital for Qinghai

36.1 Total human capital

Table QH-1.1 presents the estimates of nominal and real total human capital and real physical capital for Qinghai. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Qinghai.

Table QH-1.1 Real Physical Capital, Nominal and Real Human Capital for Qinghai

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	110	110	11.1
1986	130	123	11.8
1987	150	133	12.9
1988	171	129	13.9
1989	194	124	14.6
1990	216	130	15.6
1991	251	142	16.5
1992	293	153	17.5
1993	338	157	18.6
1994	392	149	19.9
1995	445	144	21.4
1996	504	147	23.7
1997	567	158	26.7
1998	651	180	30.3
1999	736	204	34.4
2000	828	230	39.2

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	930	252	45.7
2002	1029	272	53.3
2003	1130	293	61.7
2004	1229	308	70.9
2005	1338	332	81.1
2006	1498	365	91.9
2007	1657	378	104.1
2008	1826	378	117.5
2009	2024	408	137.1
2010	2189	419	162.6
2011	2490	448	194.7
2012	2733	477	239.3
2013	2954	495	298.5
2014	3198	521	366.6
2015	3406	541	441.8
2016	3697	576	519.4
2017	4038	620	596.9

36.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table QH-2.1 presents human capital per capita for Qinghai by region. From 1985 to 2017, the nominal human capital per capita increased from 28.43 thousand Yuan to 778 thousand Yuan, an increase of more than 27 times; and the real human capital per capita increased from 28.43 thousand Yuan to 119.4 thousand Yuan, an increase of approximately 5

times.

Figure QH-2.1 illustrates the trends of human capital per capita by gender for Qinghai. The real human capital per capita of male is similar to that of female for Qinghai. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

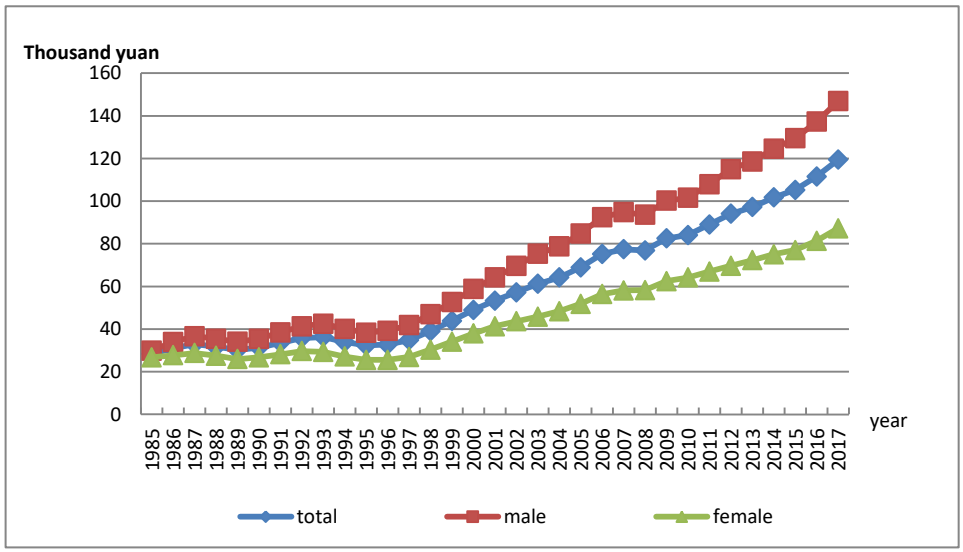


Figure QH-2.1 Human Capital Per Capita by Gender for Qinghai，1985-2017

Table QH-2.1 Nominal and Real Human Capital Per Capita by Region for Qinghai

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	28.43	54.15	20.45	28.43	54.15	20.45
1986	32.85	64.35	22.60	30.98	60.48	21.39
1987	37.23	73.40	24.93	32.97	64.00	22.42
1988	41.99	82.56	27.93	31.68	60.69	21.62
1989	47.15	92.42	31.16	30.22	57.92	20.43

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	51.89	100.26	34.52	31.33	60.01	21.04
1991	59.58	115.22	38.60	33.61	63.45	22.37
1992	68.38	132.41	43.11	35.81	67.14	23.43
1993	77.92	150.03	48.17	36.27	66.73	23.70
1994	89.31	171.99	53.75	33.98	62.09	21.91
1995	100.19	191.24	59.54	32.30	57.68	20.97
1996	112.11	211.67	66.06	32.75	57.31	21.39
1997	124.83	232.06	73.56	34.80	59.78	22.85
1998	141.68	263.87	81.42	39.08	67.57	25.05
1999	158.48	293.20	90.04	43.87	75.46	27.81
2000	176.36	323.12	99.55	48.98	83.49	30.93
2001	196.68	357.94	109.63	53.35	89.79	33.66
2002	216.44	390.32	119.62	57.23	95.90	35.69
2003	236.45	419.73	131.45	61.22	101.30	38.27
2004	256.26	447.17	143.97	64.18	105.71	39.73
2005	277.96	478.02	157.10	68.89	113.34	42.05
2006	308.54	518.78	173.04	75.22	120.83	45.81
2007	338.99	556.89	189.58	77.39	122.02	46.77
2008	371.14	598.11	206.56	76.89	120.34	45.38
2009	409.24	648.91	226.15	82.50	126.51	48.85
2010	439.72	680.54	245.78	84.09	126.24	50.18
2011	495.18	767.76	263.62	89.06	134.36	50.59
2012	539.46	827.57	282.97	94.07	140.57	52.66
2013	580.04	878.54	303.43	97.24	143.39	54.46
2014	624.32	934.00	326.11	101.74	148.15	57.05
2015	662.82	973.45	352.48	105.24	150.20	60.33
2016	715.24	1042.51	378.69	111.51	158.01	63.67
2017	778.00	1110.00	418.30	119.40	165.43	69.57

Figure QH-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

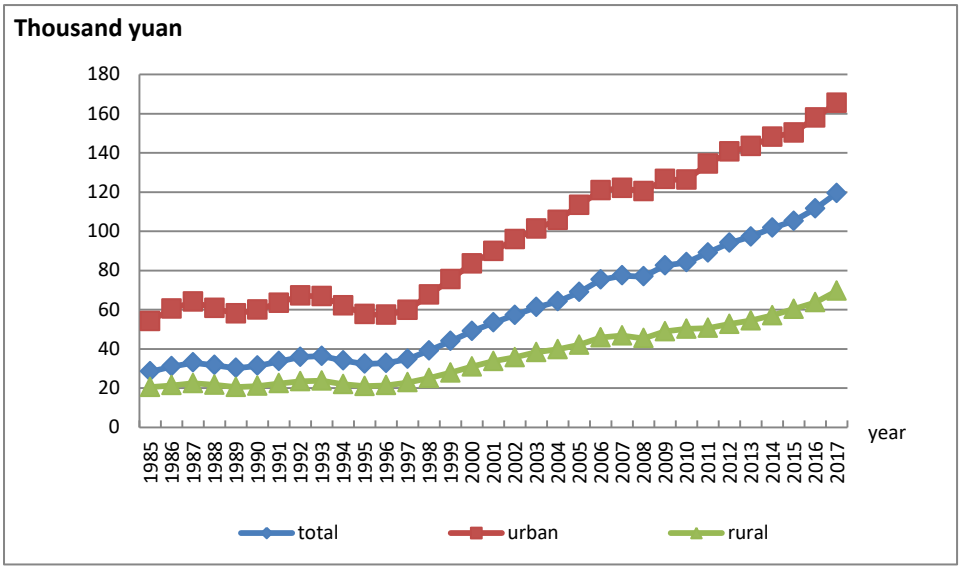


Figure QH-2.2 Real Human Capital Per Capita by Region for Qinghai，1985-2017

36.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

36.3.1 Total labor force human capital

The total labor force human capital for Qinghai is reported in Table QH-3.1 From 1985 to 2017, the nominal labor force human capital increased from 460 billion Yuan to 17730 billion Yuan, an increase of more than 38

times; and the real labor force human capital increased from 460 billion Yuan to 2750 billion Yuan, an increase of approximately 6 times.

Table QH-3.1 Nominal and Real Labor Force Human Capital for Qinghai

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	46	46
1986	54	51
1987	64	57
1988	76	57
1989	90	57
1990	104	63
1991	123	69
1992	142	75
1993	165	77
1994	190	73
1995	217	70
1996	247	73
1997	281	79
1998	317	88
1999	356	99
2000	399	111
2001	435	119
2002	473	126
2003	514	135
2004	560	141
2005	609	152
2006	680	167
2007	766	176
2008	855	178
2009	963	195
2010	1075	206

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	1165	211
2012	1261	221
2013	1371	231
2014	1487	244
2015	1612	258
2016	1682	264
2017	1773	275

36.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables QH-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 22.4 thousand Yuan to 509.32 thousand Yuan, an increase of more than 23 times; and the real average labor force human capital increased from 22.4 thousand Yuan to 78.92 thousand Yuan, an increase of approximately 4 times.

Table QH-3.2 Nominal and Real Average Labor Force Human Capital by Region for Qinghai

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	22.40	41.30	16.02	22.40	41.30	16.02
1986	25.38	47.01	17.85	23.93	44.18	16.89
1987	28.91	53.92	19.86	25.61	47.01	17.86
1988	32.92	61.20	22.46	24.83	44.99	17.38
1989	37.43	69.50	25.25	23.99	43.55	16.56
1990	41.74	76.25	28.26	25.21	45.64	17.22

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	47.56	86.69	31.72	26.84	47.74	18.38
1992	53.78	97.80	35.53	28.19	49.59	19.31
1993	60.99	110.76	39.71	28.44	49.27	19.53
1994	68.81	124.46	44.28	26.27	44.93	18.05
1995	77.06	138.63	49.03	24.95	41.81	17.27
1996	86.05	153.07	54.35	25.25	41.44	17.60
1997	96.09	176.19	60.44	26.90	45.39	18.78
1998	106.58	192.59	67.04	29.58	49.32	20.62
1999	117.25	208.58	73.82	32.65	53.68	22.80
2000	129.29	215.48	81.17	36.14	55.68	25.22
2001	140.67	233.48	88.36	38.47	58.57	27.13
2002	152.09	251.09	95.78	40.59	61.69	28.58
2003	163.84	267.33	104.30	42.86	64.52	30.36
2004	176.70	284.02	113.24	44.61	67.14	31.25
2005	190.33	301.81	122.44	47.48	71.56	32.77
2006	211.03	329.04	136.19	51.82	76.64	36.05
2007	235.04	361.58	150.16	54.00	79.22	37.05
2008	259.26	392.01	164.93	53.96	78.87	36.23
2009	288.32	428.52	181.65	58.42	83.55	39.24
2010	316.50	460.12	198.52	60.79	85.35	40.53
2011	343.86	503.27	212.59	62.18	88.07	40.79
2012	370.03	537.89	228.04	64.88	91.36	42.44
2013	396.66	567.64	243.91	66.88	92.65	43.78
2014	424.27	596.57	261.67	69.55	94.62	45.78
2015	453.13	621.35	280.90	72.37	95.87	48.08
2016	478.41	650.89	306.50	75.15	98.65	51.54
2017	509.32	678.64	340.59	78.92	101.14	56.64

Chapter 37 Human Capital for Ningxia

37.1 Total human capital

Table NX-1.1 presents the estimates of nominal and real total human capital and real physical capital for Ningxia. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Ningxia.

Table NX-1.1 Real Physical Capital, Nominal and Real Human Capital for Ningxia

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	144	144	10.7
1986	172	163	11.8
1987	195	172	12.9
1988	229	173	13.8
1989	265	171	14.3
1990	301	181	14.9
1991	350	198	15.7
1992	403	211	16.5
1993	466	213	17.4
1994	536	198	18.3
1995	610	193	19.3
1996	704	208	20.2
1997	826	236	21.3
1998	944	269	22.8
1999	1081	312	24.9
2000	1177	341	27.4

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	1419	403	30.6
2002	1597	455	34.4
2003	1782	499	39.7
2004	1960	529	46.2
2005	2160	574	54.4
2006	2504	651	64.2
2007	2827	697	75.0
2008	3143	714	90.1
2009	3505	790	109.7
2010	3780	819	132.9
2011	4336	884	154.8
2012	4834	965	181.1
2013	5315	1026	210.8
2014	5824	1103	252.3
2015	6215	1163	302.1
2016	6875	1268	355.8
2017	7467	1356	401.2

37.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table NX-2.1 presents human capital per capita for Ningxia by region. From 1985 to 2017, the nominal human capital per capita increased from 36.72 thousand Yuan to 1.26 million Yuan, an increase of more than 34 times; and the real human capital per capita increased from 36.72 thousand Yuan to 228.4 thousand Yuan, an increase of approximately 6

times.

Figure NX-2.1 illustrates the trends of human capital per capita by gender for Ningxia. The real human capital per capita of male is similar to that of female for Ningxia. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

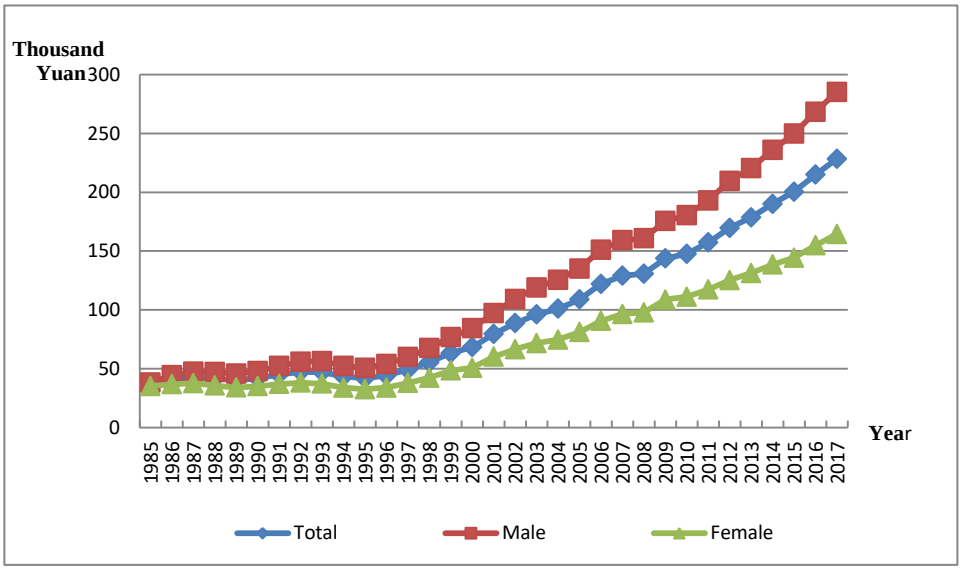


Figure NX-2.1 Human Capital Per Capita by Gender for Ningxia，1985-2017

Table NX-2.1 Nominal and Real Human Capital Per Capita by Region for Ningxia

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	36.72	66.62	27.54	36.72	66.62	27.54
1986	42.86	82.30	30.50	40.62	77.65	29.02
1987	48.29	96.14	33.60	42.62	82.53	30.36
1988	54.82	106.19	37.86	41.45	77.45	29.57
1989	62.28	120.28	42.47	40.07	75.50	27.99
1990	69.48	131.76	47.61	41.68	78.39	28.79

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	79.52	151.56	53.42	44.94	84.35	30.67
1992	90.27	172.18	59.75	47.26	87.67	32.22
1993	103.07	197.39	66.93	47.09	87.25	31.71
1994	116.95	224.17	74.86	43.33	79.39	29.17
1995	131.69	251.95	83.37	41.72	76.07	27.90
1996	149.19	286.12	91.99	44.19	81.04	28.80
1997	172.45	334.14	102.35	49.14	91.09	30.96
1998	194.25	374.24	113.34	55.35	102.02	34.36
1999	219.27	420.29	125.65	63.22	115.61	38.83
2000	235.50	434.42	139.27	68.23	119.86	43.25
2001	279.95	520.02	154.34	79.45	141.63	46.90
2002	311.45	562.38	169.93	88.74	153.94	51.95
2003	343.47	601.50	187.40	96.10	162.22	56.16
2004	374.50	635.96	206.09	100.97	166.03	59.11
2005	409.77	679.32	225.54	108.86	174.56	63.92
2006	468.88	768.79	249.31	121.96	194.25	69.05
2007	523.01	842.61	272.63	128.97	202.57	71.30
2008	575.53	911.63	296.13	130.71	203.13	70.48
2009	637.53	994.92	323.86	143.70	220.93	75.93
2010	681.16	1035.33	352.49	147.64	221.60	78.98
2011	771.44	1161.65	382.85	157.26	235.00	79.80
2012	850.16	1254.95	418.90	169.72	248.42	85.85
2013	925.61	1339.43	457.74	178.64	256.67	90.38
2014	1004.18	1424.46	501.24	190.13	267.61	97.41
2015	1071.09	1486.45	552.56	200.48	275.94	106.32
2016	1164.92	1587.48	600.98	214.92	290.34	114.26
2017	1257.65	1674.96	667.44	228.40	301.22	125.27

Figure NX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

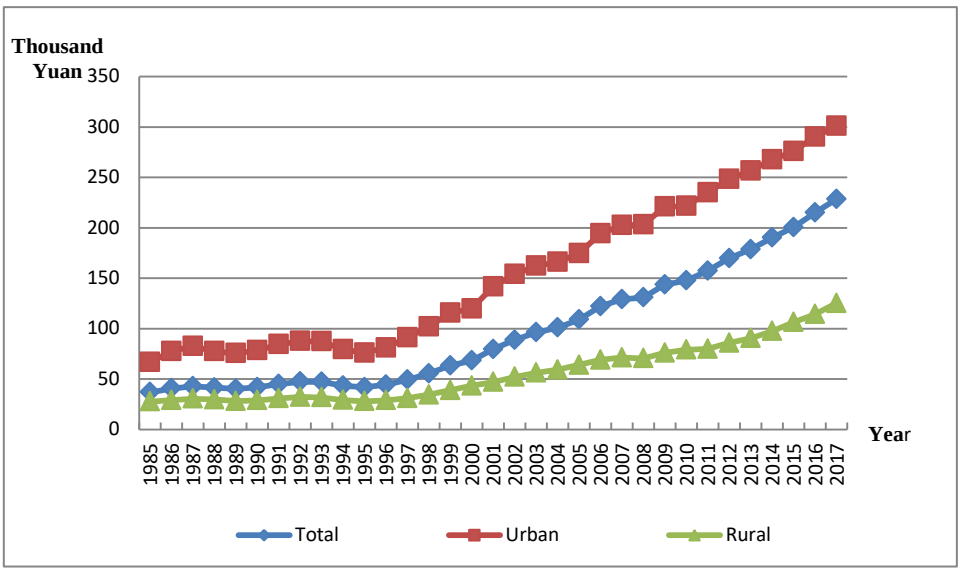


Figure NX-2.2 Real Human Capital Per Capita by Region for Ningxia，1985-2017

37.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

37.3.1 Total labor force human capital

The total labor force human capital for Ningxia is reported in Table NX-3.1 From 1985 to 2017, the nominal labor force human capital increased from 53 billion Yuan to 28,58 billion Yuan, an increase of more than 53 times;

and the real labor force human capital increased from 53 billion Yuan to 521 billion Yuan, an increase of approximately 9 times.

Table NX-3.1 Nominal and Real Labor Force Human Capital for Ningxia

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	53	53
1986	62	59
1987	71	63
1988	86	65
1989	101	65
1990	118	71
1991	138	78
1992	161	85
1993	188	86
1994	218	81
1995	253	80
1996	291	86
1997	334	96
1998	385	110
1999	440	128
2000	500	145
2001	550	157
2002	597	171
2003	661	186
2004	731	198
2005	814	218
2006	923	242
2007	1041	259
2008	1173	268
2009	1336	303
2010	1521	331

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	1675	342
2012	1845	370
2013	2026	392
2014	2247	427
2015	2501	470
2016	2685	497
2017	2858	521

37.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables NX-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 26.40 thousand Yuan to 734.51 thousand Yuan, an increase of more than 27 times; and the real average labor force human capital increased from 26.40 thousand Yuan to 133.97 thousand Yuan, an increase of approximately 5 times.

Table NX-3.2 Nominal and Real Average Labor Force Human Capital by Region for Ningxia

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	26.42	44.42	20.02	26.42	44.42	20.02
1986	29.64	50.30	22.42	28.10	47.46	21.33
1987	32.96	57.26	25.02	29.15	49.15	22.61
1988	37.82	65.47	27.90	28.65	47.75	21.79
1989	43.15	74.97	30.98	27.79	47.05	20.42
1990	49.12	84.60	34.40	29.46	50.33	20.80

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1991	55.76	96.11	38.73	31.51	53.49	22.24
1992	62.78	108.25	43.50	32.88	55.12	23.45
1993	70.88	121.94	48.68	32.41	53.90	23.06
1994	80.24	137.48	54.43	29.74	48.69	21.21
1995	90.38	153.79	60.64	28.65	46.43	20.30
1996	101.01	171.99	67.56	29.98	48.71	21.16
1997	113.41	203.89	75.54	32.44	55.58	22.85
1998	127.39	227.61	84.45	36.45	62.05	25.60
1999	142.27	252.62	93.41	41.24	69.49	28.87
2000	158.45	260.66	103.20	46.04	71.92	32.05
2001	174.31	282.79	112.80	49.76	77.02	34.28
2002	188.78	300.41	122.65	54.15	82.23	37.49
2003	205.18	317.97	133.97	57.81	85.75	40.15
2004	223.37	338.16	146.22	60.58	88.28	41.94
2005	244.77	361.61	159.81	65.38	92.92	45.29
2006	275.09	403.87	179.59	72.06	102.05	49.74
2007	305.07	444.36	199.90	75.79	106.83	52.28
2008	336.06	482.23	220.77	76.76	107.45	52.55
2009	373.85	527.23	244.06	84.70	117.07	57.22
2010	414.48	572.71	267.60	90.14	122.58	59.96
2011	457.20	631.45	292.35	93.45	127.74	60.93
2012	500.20	680.79	320.54	100.17	134.76	65.69
2013	541.08	718.40	351.22	104.69	137.66	69.35
2014	586.66	758.30	388.39	111.47	142.46	75.48
2015	641.81	806.11	430.31	120.48	149.65	82.80
2016	687.60	850.48	470.24	127.35	155.55	89.41
2017	734.51	890.64	526.16	133.97	160.17	98.75

Chapter 38 Human Capital for Xinjiang

38.1 Total human capital

Table XJ-1.1 presents the estimates of nominal and real total human capital and real physical capital for Xinjiang. Columns 1 is nominal human capital in six- education categories. Columns 2 is real human capital in six-education categories. Column 3 is the real physical capital of Xinjiang.

Table XJ-1.1 Real Physical Capital, Nominal and Real Human Capital for Xinjiang

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	460	460	26.0
1986	552	515	29.0
1987	645	562	31.6
1988	764	580	35.0
1989	883	576	38.2
1990	1011	628	42.6
1991	1194	682	48.1
1992	1407	739	55.2
1993	1640	764	63.9
1994	1898	697	75.3
1995	2112	647	86.2
1996	2448	678	95.6
1997	2832	757	105.3
1998	3218	858	116.8
1999	3622	991	128.1
2000	4039	1113	141.2

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	4506	1194	155.2
2002	4866	1295	172.7
2003	5247	1391	195.2
2004	5639	1454	219.8
2005	5994	1533	245.5
2006	6932	1749	275.0
2007	7908	1892	309.7
2008	8978	1989	347.5
2009	10108	2224	387.3
2010	11054	2333	441.0
2011	12497	2493	503.1
2012	13865	2667	596.8
2013	15335	2839	716.4
2014	16805	3077	855.3
2015	18444	3357	999.9
2016	20070	3602	1119.5
2017	21713	3811	1258.4

38.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. Table XJ-2.1 presents human capital per capita for Xinjiang by region. From 1985 to 2017, the nominal human capital per capita increased from 36.47 thousand Yuan to 1.02 million Yuan, an increase of about 28 times; and the real human capital per capita increased from 36.47 thousand Yuan to 179.39 thousand Yuan, an increase of approximately 5

times.

Figure XJ-2.1 illustrates the trends of human capital per capita by gender for Xinjiang. The real human capital per capita of male is similar to that of female for Xinjiang. Both of them kept increasing from 1985 to 201, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result the gender gap has been expanding, especially from 1997.

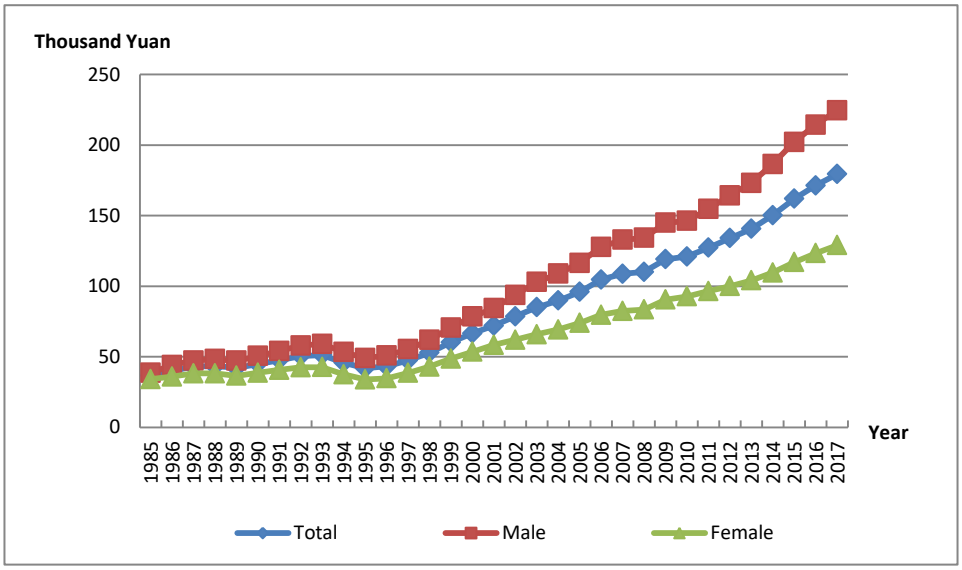


Figure XJ-2.1 Human Capital Per Capita by Gender for Xinjiang，1985-2017

Table XJ-2.1 Nominal and Real Human Capital Per Capita by Region for Xinjiang

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	36.47	65.15	24.10	36.47	65.15	24.10
1986	43.03	80.35	26.60	40.12	74.67	24.91
1987	49.24	93.03	29.91	42.90	79.39	26.80
1988	57.25	108.65	33.55	43.45	79.25	26.93
1989	64.40	122.44	36.95	42.06	78.00	25.08

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1990	72.11	136.34	40.93	44.82	83.12	26.23
1991	83.34	159.97	45.96	47.60	89.22	27.30
1992	96.18	187.11	51.61	50.52	95.48	28.49
1993	109.83	215.93	57.53	51.21	96.99	28.66
1994	124.72	246.67	64.41	45.80	86.77	25.55
1995	136.57	268.01	71.26	41.86	79.62	23.08
1996	155.59	310.29	78.50	43.11	83.50	22.98
1997	177.12	357.62	86.90	47.32	92.98	24.49
1998	198.27	402.62	95.87	52.85	104.79	26.80
1999	220.07	447.40	105.67	60.19	119.18	30.51
2000	241.55	490.57	116.21	66.57	130.55	34.38
2001	271.58	547.57	128.47	71.96	140.12	36.62
2002	295.19	584.22	141.21	78.57	151.16	39.89
2003	320.84	623.28	155.70	85.06	160.46	43.90
2004	348.24	664.54	171.93	89.77	167.57	46.39
2005	374.87	699.69	189.33	95.86	175.38	50.47
2006	414.77	755.41	207.54	104.63	187.47	54.24
2007	454.29	807.81	226.88	108.69	191.66	55.32
2008	496.78	866.42	247.24	110.05	191.58	55.05
2009	541.24	925.92	270.47	119.09	204.41	59.04
2010	573.20	952.54	295.64	120.99	202.98	61.00
2011	637.34	1058.30	315.14	127.16	213.76	60.89
2012	696.62	1138.79	343.64	134.01	222.51	63.42
2013	759.13	1222.84	373.94	140.55	229.96	66.29
2014	820.65	1294.74	412.33	150.24	242.68	70.52
2015	889.85	1371.33	459.17	161.97	255.76	78.06
2016	954.60	1446.05	499.82	171.34	265.97	83.88
2017	1022.09	1508.28	558.66	179.39	270.91	92.10

Figure XJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2017, the real human capital per capita in urban area remains larger than that in rural area. Since 1997, the growths of human capital for rural and urban both accelerated, and the growth rate is significantly higher in urban area than in rural area. Therefore the gap between urban and rural expanded rapidly.

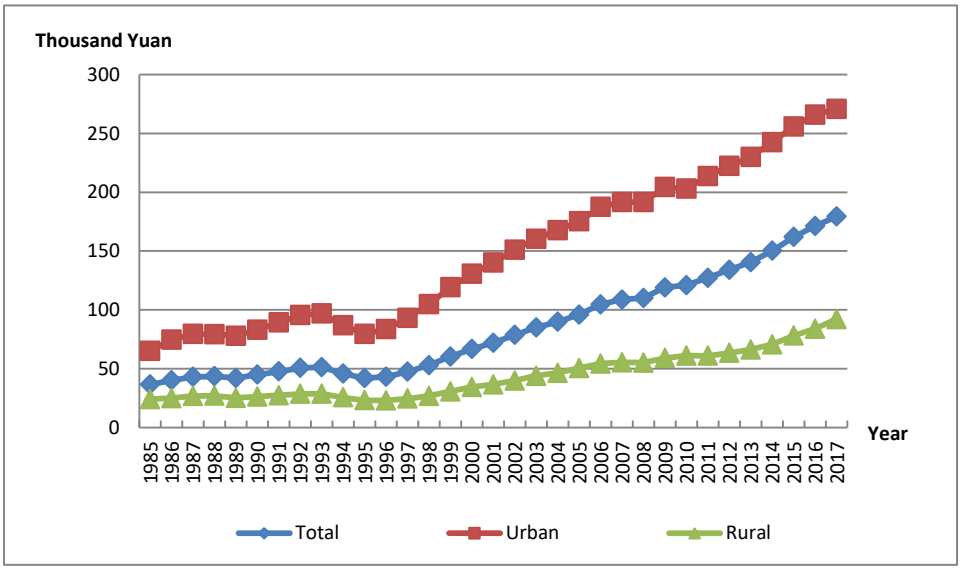


Figure XJ-2.2 Real Human Capital Per Capita by Region for Xinjiang1985-2017

38.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

38.3.1 Total labor force human capital

The total labor force human capital for Xinjiang is reported in Table XJ-3.1 From 1985 to 2017, the nominal labor force human capital increased from 169 billion Yuan to 9,096 billion Yuan, an increase of more than 54 times; and the real labor force human capital increased from 169 billion Yuan

to 1,586 billion Yuan, an increase of approximately 9 times.

Table XJ-3.1 Nominal and Real Labor Force Human Capital for Xinjiang

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1985	169	169
1986	195	182
1987	229	200
1988	287	218
1989	352	230
1990	430	267
1991	511	292
1992	600	315
1993	696	325
1994	800	295
1995	885	272
1996	1005	280
1997	1137	305
1998	1297	347
1999	1467	403
2000	1651	458
2001	1771	474
2002	1905	511
2003	2060	551
2004	2221	576
2005	2422	623
2006	2857	725
2007	3302	792
2008	3808	844
2009	4407	969
2010	5061	1066

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	5488	1091
2012	5934	1135
2013	6405	1179
2014	7064	1281
2015	7701	1390
2016	8324	1483
2017	9096	1586

38.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. Tables XJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2017, the nominal average labor force human capital increased from 25.79 thousand Yuan to 657.44 thousand Yuan, an increase of more than 25 times; and the real average labor force human capital increased from 25.79 thousand Yuan to 114.63 thousand Yuan, an increase of approximately 4 times.

Table XJ-3.2 Nominal and Real Average Labor Force Human Capital by Region for Xinjiang

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	25.79	41.56	18.42	25.79	41.56	18.42
1986	29.19	48.09	20.38	27.22	44.69	19.08
1987	33.79	57.15	22.88	29.50	48.78	20.50
1988	40.08	67.92	25.79	30.48	49.54	20.70
1989	46.62	78.84	28.74	30.47	50.22	19.51
1990	54.23	89.91	32.31	33.68	54.81	20.71

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)			Real Average Labor Force Human Capital (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	61.69	103.65	36.33	35.22	57.81	21.58
1992	69.90	119.22	40.78	36.75	60.84	22.51
1993	78.59	135.70	45.66	36.73	60.96	22.74
1994	88.12	153.09	51.05	32.46	53.85	20.25
1995	95.78	165.54	56.51	29.43	49.18	18.30
1996	105.89	184.33	62.52	29.45	49.61	18.30
1997	117.39	217.83	69.50	31.49	56.64	19.58
1998	130.35	241.88	77.20	34.88	62.95	21.58
1999	143.66	266.75	85.30	39.49	71.06	24.63
2000	156.84	269.63	93.81	43.53	71.75	27.76
2001	169.73	289.25	103.51	45.39	74.02	29.51
2002	183.68	311.27	113.23	49.25	80.54	31.99
2003	198.89	332.08	124.76	53.18	85.49	35.18
2004	214.73	350.54	137.80	55.71	88.39	37.18
2005	234.58	373.27	152.43	60.37	93.56	40.64
2006	260.60	410.53	169.70	66.08	101.88	44.35
2007	286.20	445.73	187.13	68.65	105.75	45.63
2008	314.03	482.71	204.84	69.63	106.73	45.61
2009	346.51	523.79	224.59	76.17	115.63	49.03
2010	379.39	559.69	244.30	79.89	119.26	50.41
2011	411.41	607.36	264.70	81.76	122.68	51.14
2012	441.00	645.06	287.57	84.37	126.04	53.07
2013	473.87	687.27	312.07	87.20	129.24	55.32
2014	515.90	739.25	339.77	93.57	138.56	58.11
2015	561.00	794.38	370.22	101.25	148.15	62.94
2016	605.04	846.09	400.37	107.78	155.62	67.19
2017	657.44	901.09	440.87	114.63	161.85	72.68

Chapter 39 Human Capital for Hong Kong

39.1 Total human capital

Table HK-1.1 presents the estimates of nominal and real total human capital and real physical capital for Hongkong. Columns 1 is nominal human capital in five-education category. Columns 2 is real human capital in five-education category.

Table HK-1.1 Real Physical Capital, Nominal and Real Human Capital for Hong Kong

Year	Nominal Human Capital (Billions of HKD)	Real Human Capital (Billions of 1985 HKD)
1985	3841	3841
1986	4231	4088
1987	4648	4255
1988	4894	4148
1989	5259	4045
1990	5680	3965
1991	6113	3832
1992	6762	3869
1993	7306	3845
1994	8004	3871
1995	8650	3836
1996	9575	3994
1997	10590	4174
1998	11070	4241
1999	11800	4713
2000	13050	5410
2001	14270	6014
2002	15340	6668

Year	Nominal Human Capital (Billions of HKD)	Real Human Capital (Billions of 1985 HKD)
2003	15880	7083
2004	17310	7752
2005	18690	8295
2006	20370	8858
2007	22340	9525
2008	23470	9601
2009	24580	9991
2010	26270	10440
2011	28870	10890
2012	31700	11500
2013	33560	11660
2014	35620	11850
2015	38450	12430
2016	42070	13280
2017	45120	14030

39.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. The data of Hong Kong presents human capital per capita for Hongkong by region. From 1985 to 2017, the nominal human capital per capita increased from 790.82 thousand HKD to 7.6 million HKD, an increase of more than 9 times; and the real human capital per capita increased from 790.820 thousand HKD to 2.36 thousand HKD, an increase of approximately 3 times.

Figure HK-2.1 illustrates the trends of human capital per capita by gender for Hongkong. The real human capital per capita of male is similar to

that of female for Hongkong. Both of them kept increasing from 1985 to 2017, and the growths of human capital for male and female both accelerated, with male's growth rate significantly higher than female's. As a result, the gender gap has been expanding, especially from 1997.

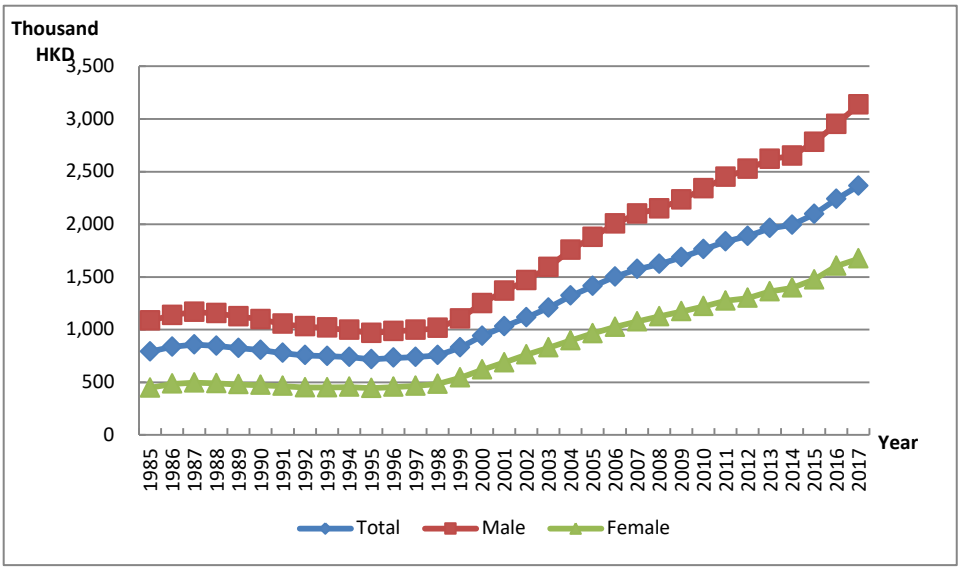


Figure HK-2.1 Human Capital Per Capita by Gender for Hong Kong, 1985-2017

39.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

39.3.1 Total labor force human capital

The total labor force human capital for Hongkong is reported in Table HK-3.1 From 1985 to 2017, the nominal labor force human capital increased from 2,748 billion HKD to 39,320 billion HKD, an increase of more than 14 times; and the real labor force human capital increased from 2,748 billion HKD to 12,23 billion HKD, an increase of approximately 4.5 times.

Table HK-3.1 Nominal and Real Labor Force Human Capital for Hong Kong

Year	Nominal Labor Force Human Capital (Billions of HKD)	Real Labor Force Human Capital (Billions of 1985 HKD)
1985	2748	2748
1986	2998	2897
1987	3367	3082
1988	3645	3089
1989	3950	3038
1990	4280	2988
1991	4616	2894
1992	5237	2997
1993	5656	2977
1994	6206	3002
1995	6745	2991
1996	7502	3129
1997	8449	3330
1998	8868	3398
1999	9517	3799
2000	10440	4329
2001	11430	4817
2002	12400	5389
2003	12970	5785
2004	14240	6380
2005	15450	6861
2006	16880	7341
2007	18800	8015
2008	19920	8147
2009	21050	8557
2010	22570	8965
2011	25100	9473
2012	27670	10030
2013	29230	10160

Year	Nominal Labor Force Human Capital (Billions of HKD)	Real Labor Force Human Capital (Billions of 1985 HKD)
2014	30990	10310
2015	33380	10790
2016	36710	11590
2017	39320	12230

39.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. From 1985 to 2017, the nominal average labor force human capital increased from 890.98 thousand HKD to 8.4 million HKD, an increase of more than 9 times; and the real average labor force human capital increased from 890.98 thousand HKD to 2.61 million HKD, an increase of approximately 3 times.

Chapter 40 Human Capital for Taiwan

40.1 Total human capital

Table TW-1.1 presents the estimates of nominal and real total human capital and real physical capital for Taiwan. Columns 1 is nominal human capital in five-education categories. Columns 2 is real human capital in five-education categories.

Table TW-1.1 Real Physical Capital, Nominal and Real Human Capital for Taiwan

Year	Nominal Human Capital (Billions of NTD)	Real Human Capital (Billions of 1985 NTD)
1985	56250	56250
1986	55150	54770
1987	60580	59850
1988	68890	67200
1989	83660	78160
1990	91010	81650
1991	102100	88390
1992	114600	94960
1993	124600	100400
1994	132900	102800
1995	143000	106700
1996	144700	104700
1997	158800	113900
1998	160500	113200
1999	166600	117300
2000	167700	116600
2001	161700	112400
2002	156700	109200

Year	Nominal Human Capital (Billions of NTD)	Real Human Capital (Billions of 1985 NTD)
2003	162900	113800
2004	162900	112000
2005	166300	111800
2006	164200	109700
2007	166000	109000
2008	167200	106000
2009	164000	104900
2010	164000	103900
2011	163600	102200
2012	163100	99990
2013	163600	99450
2014	165600	99510
2015	165000	99470
2016	163300	97090
2017	158700	93780

40.2 Human capital per capita

To obtain further information on the dynamics of human capital, we calculate human capital per capita, defined as the ratio of human capital to non-retired population. The data of Taiwan presents human capital per capita for Taiwan by region. From 1985 to 2017, the nominal human capital per capita increased from 3.09 million NTD to 8.36 million NTD, an increase of more than 2.7 times; and the real human capital per capita increased from 3.09 million NTD to 4.94 million NTD, an increase of approximately1.6 times.

Figure TW-2.1 illustrates the trends of human capital per capita by gender for Taiwan. The trend of real human capital per capita for male is similar to that for female in Taiwan. Both of them kept increasing from 1985 to 2000, and the growths of human capital for male and female both accelerated. But from 2000 to 2017, the real human capital per capita of male and female tend to be flat or even declining.

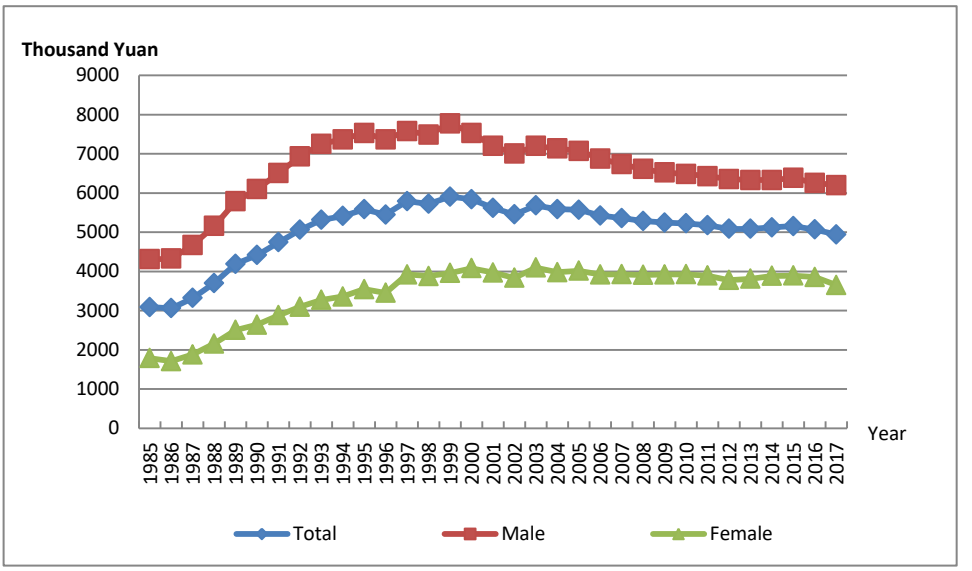


Figure TW-2.1 Human Capital Per Capita by Gender for Taiwan, 1985-2017

40.3 Labor force human capital

We also use the J-F method to estimate the labor force human capital. The labor force refers to the population that is over 16 years old, non-retired and out of school.

40.3.1 Total labor force human capital

The total labor force human capital for Taiwan is reported in Table TW-3.1 From 1985 to 2017, the nominal labor force human capital increased from 31,820 billion NTD to 121,500 billion NTD, an increase of more than 4

times; and the real labor force human capital increased from 31,820 billion NTD to 71,780 billion NTD, an increase of approximately 2.26 times.

Table TW-3.1 Nominal and Real Labor Force Human Capital for Taiwan

Year	Nominal Labor Force Human Capital (Billions of NTD)	Real Labor Force Human Capital (Billions of 1985 NTD)
1985	31820	31820
1986	32220	32000
1987	35580	35150
1988	41600	40580
1989	48970	45750
1990	54820	49180
1991	61970	53650
1992	70230	58210
1993	77240	62180
1994	83430	64530
1995	91020	67910
1996	93900	67970
1997	98590	70720
1998	100700	71000
1999	105900	74570
2000	108600	75520
2001	105200	73140
2002	104300	72660
2003	110500	77240
2004	112100	77090
2005	115700	77800
2006	115200	76980
2007	117800	77300
2008	118900	75380
2009	117200	74980
2010	117900	74710

Year	Nominal Labor Force Human Capital (Billions of NTD)	Real Labor Force Human Capital (Billions of 1985 NTD)
2011	119500	74650
2012	120000	73520
2013	121100	73620
2014	123600	74280
2015	123100	74200
2016	123600	73490
2017	121500	71780

40.3.2 Average labor force human capital

The average labor force human capital is the ratio of the labor force human capital and the labor force population. From 1985 to 2017, the nominal average labor force human capital increased from 3.07 million NTD to 8.89 million NTD, an increase of more than 2.92 times; and the real average labor force human capital increased from 3.07 million NTD to 5.25 million NTD, an increase of approximately 1.71 times.

Appendix A Population Imputation

1. Data collection

When estimating population by age, gender and education in urban and rural areas, we use the following data sources:

Table1. 1 Data Sources of Normal Provinces

Data	Sources	Notes
National, urban and rural population aged 6 years and over, by age, sex and education level: 1982,1987, 1990,1995, 2000,2005, 2010,2015	• 1982, *China Demographic Statistics Yearbook* 1988 edited by Department of Demographic Statistics of National Bureau of Statistics • 1987, *China 1987 1% Demographic Sampling* Survey edited by Department of Demographic Statistics of National Bureau of Statistics • 1990, *China 1990 Census* edited by Census Office of State Council, and Department of Demographic Statistics of National Bureau of Statistics • 1995, *China Demographic Statistics Yearbook.* 1998 edited by Department of Demographic and Employment Statistics of National Bureau of Statistics • 2000, http://www.stats.gov.cn/tjsj/ndsj/renkoupucha /2000pucha/pucha.htm • 2005, http://www.stats.gov.cn/tjsj/ndsj/renkou/2005 /renkou.htm	

Data	Sources	Notes
	• 2010, *China 2010 Census* • 2015, *China 2015 1% Demographic Sampling* Survey edited by Department of Demographic Statistics of National Bureau of Statistics	
National, urban and rural population aged 0-5 years, by age and sex: 1982,1987, 1990,1995, 2000,2005, 2010,2015	• 1982, *China 1982 Census* edited by State Department Census Office, Department of Demographic Statistics of National Bureau of Statistics • 1987, *China Demographic Statistics Yearbook. 1989* edited by Department of Demographic Statistics of National Bureau of Statistics • 1990, *China 1990 Census* edited by State Department Census Office, Department of Demographic Statistics of National Bureau of Statistics • 1995, *China Demographic Statistics Yearbook. 1996* edited by Department of Demographic and Employment Statistics of National Bureau of Statistics • 2000, http://www.stats.gov.cn/tjsj/ndsj/renkoupucha /2000pucha /pucha.htm • 2005, http://www.stats.gov.cn/tjsj/ndsj/renkou/2005 /renkou.htm • 2010, *China 2010 Census and China Demographic Statistics Yearbook* 2012 • 2015, *China 2015 1% Demographic Sampling* Survey edited by Department of	We assume that the population aged 0-4years receive no schooling

Data	Sources	Notes
	Demographic Statistics of National Bureau of Statistics	
National, urban and rural population by age and sex: 1982-2015	• *China Demographic Statistics Yearbook. 1988-1993* edited by Department of Demographic Statistics of National Bureau of Statistics • *China Demographic Statistics Yearbook. 1994-1998*, 2006 edited by Department of Demographic and Employment Statistics of National Bureau of Statistics • *China Demographic Statistics Yearbook. 1999-2005* edited by Department of Demographic and Social Science Statistics of National Bureau of Statistics • *China Demographic and Employment Statistics Yearbook 2007-2010*, edited by Department of Demographic and Employment Statistics of National Bureau of Statistics	
Mortality rate by age and sex: 1986, 1989-1990, 1994-2017	• *China Demographic Statistics Yearbook：1988-2018*	In the yearbooks of 1988 and 1989, only the mortality rate for 1986 is available. In the yearbooks of 1992 and 1993, the mortality rate is not separated by age and sex.
Enrollment by education level: 1980-2017	• *Educational Statistics yearbook of China.1987* edited by the Plan and Finance Bureau of National Educational Committee	*Part of Educational Statistics Yearbook of China.* are downloaded

Data	Sources	Notes
	• *Educational Statistics yearbook of China. 1989-1992*, edited by the Plan and Development Department of National Educational Committee • *Educational Statistics yearbook of China 1993-1996*, edited by the Plan and Development Department of National Educational Committee • *Educational Statistics yearbook of China 1997*, edited by the Plan and Development Department of National Educational Ministry • *Educational Statistics yearbook of China. 1998-2017*edited by the Plan and Development Department of National Educational Ministry	fromhttp://www.cnki.net/.
National, urban and rural population and birth rate for each year	• *China Statistics Yearbook 2018.* • *Statistics Summary for 56 years in China.* China Statistics Press	
Students by age, grade of primary and junior school: 2003-2017	• *Educational Statistics yearbook of China.2003-2017*, edited by the Plan and Development Department of National Educational Ministry	

Table HK.A.2.1 Data Sources of Hong Kong

Data	Sources	Notes
Population by age, sex and education level	• 1981, Hong Kong 1981 Population Census Main Tables • 1986, Hong Kong 1986 Population By-Census Main Tables • 1991, Hong Kong 1991 Population Census Main Tables • 1996, Hong Kong 1996 Population By-Census Main Tables • 2001, Hong Kong 2001 Population Census Thematic Report • 2006, Hong Kong 2006 Population By-Census Thematic Report • 2011, Hong Kong 2011 Population Census Thematic Report • 1985-2017 Census and Statistics Department of Hong Kong	
Total population	• 1980-2017, Hong Kong *Statistics Yearbook*	It is the resident population.
Enrollment by education level	• 1985-2017, Hong Kong Education Bureau	
Mortality rate by age and sex	• Hong Kong Mortality Table	
Birth by sex	• 1985-2017, Hong Kong *Statistics Yearbook*	
Employment rate by age, sex and education level	• 1985-2017, Hong Kong Census and Statistics Department	
Consumer Price Index (CPI)	• 1981-2017, Hong Kong *Statistics Yearbook*	
Enrollment rate	• Hong Kong Education Bureau	

Data	Sources	Notes
Nominal GDP by industry	• Hong Kong *Statistics Yearbook*	
Real GDP Index by Industry	• Hong Kong *Statistics Yearbook*	
Employed population by Industry	• Hong Kong *Statistics Yearbook*	
Average discount rate （based on the basic loan interest of Central Bank）	• Monetary Policy Bureau of PBC • http://www.pbc.gov.cn/publish/zhengcehuobisi/631/2012/20120706181352694274852/20120706181352694274852_.html	The data is not available for some years.
10-year treasury bond rate	• *China Financial Statistics Yearbook* • *China Financial Statistics Yearbook(English Version)*	The data is not available for 2009, 2005 and 1994.

Table TW.A.2.1 Data Sources of Taiwan

Data	Sources	Notes
Population age, sex and education level	• Department of Household Registration, M.O.I • Taiwan Population *Statistics Yearbook*	
Population aged 6 years and over, by age and sex gender	• Department of Household Registration, M.O.I	
Total Population	• Directorate-General of Budget, Accounting and Statistics, Executive Yuan	

Data	Sources	Notes
Enrollment by education level	• Not available.	
Mortality rate by age and sex	• Department of Household Registration, M.O.I	Data is based on date of occurrence
Birth by sex	• Department of Household Registration, M.O.I	Data is based on the date of occurrence, which is before the end of May in the following year.
Employment rate by age, sex and education level	• Directorate-General of Budget, Accounting and Statistics, Executive Yuan: Human Capital Survey	Before 1999 (included), "College" includes graduates
Consumer Price Index (CPI)	• Directorate-General of Budget, Accounting and Statistics, Executive Yuan	
Enrollment rate	• Taiwan Education Bureau	From 1988, Taiwan started to record enrollment rate of graduates from middle level professional school, so the table includes data from 1988.
Nominal GDP by industry	• Directorate-General of Budget, Accounting and Statistics, Executive Yuan	
Real GDP by industry	• Directorate-General of Budget, Accounting and Statistics, Executive Yuan	
Employed population by industry	• Directorate-General of Budget, Accounting and Statistics, Executive Yuan: Human Capital Survey	Before 1998, based on "Standard industrial Classification (the sixth edition)";

Data	Sources	Notes
		In 1999-2000, based on "standard industrial classification (the seventh edition)"; In 2001-2011, based on "Standard industrial Classification (the eighth edition)"; In 2012-2017, based on "Standard industrial Classification (the ninth edition)".

2. Data processing

2.1 Basic population data

2.1.1 Census data

Due to direct registration and computer aggregation, the census data do not take into account the left-out population.[36] The total populations from the 1982, 1990, 2000 and 2010 census data published at that time are slightly different from the population released in *China Statistics Yearbook 2011*. Thus, some adjustments need to be made to the population data by age, sex and educational attainment. The adjustment is implemented by the following

[36] See Zhang, Weimin and Hongyan Cui (2003),"The estimation accuracy of China Census 2000", *Population Research*, Vol.27, No.4 (July), pp.25-35.

method. The adjusted urban population by age, sex and educational attainment equals the urban population by age, sex and educational attainment from the census data times the ratio of total urban population released in *China Statistics Yearbook 2010* to the total urban population in the census data. A similar formula is applied to the rural population.

2.1.2 1%-Sample data

We adjust the sample data to match the total rural and urban data. Urban population by age, sex and educational attainment is divided by urban sampling ratio, which is the ratio of urban sample population to urban total population released in *China Statistics Yearbook 2008*. The same method is applied to the rural data.

2.2 New enrollment

2.2.1 Educational category in China

There are six education levels in China: no schooling, primary school, junior middle school (including regular junior middle school and vocational junior middle school), senior middle school (including regular senior middle school, regular specialized middle school and vocational high school), college, and university and above. “College” and “university and above” were combined as “college and above” before 2000.

2.2.2 National enrollment data

The new enrollments by gender of primary school from 1985 to 1990 are not available, so it is assumed that the share of females in the new enrollments equals that in Grade 1.

From 1980 to 1983, we have no information about the share of females in the new enrollments, so we use female share in new enrollment of the closest

year.

From 1983 to 2003, we only have the total new enrollment of college and university and the total females in college and university. To get the female enrollments in college and university, we assume that the proportion of female is the same as in college and university enrollments.

From 2004 to 2017, the female enrollment data for university and college is available in the statistic yearbooks. The enrollment of 2017 is obtained by using method of line fitting from 2011 to 2016.

2.2.3 New enrollment data of urban and rural areas

The new enrollments by gender in urban and rural areas in each educational level are not available. We assume that the proportions of female enrollment in urban and rural areas equal the corresponding proportions at the national level.

The new enrollments of specialized middle school are not separated by urban and rural. So we assume that the ratio of urban to rural new enrollments in specialized middle school is the same as that of regular senior middle school.

From 2003 to 2017, the new enrollments of vocational high school are not separated by urban and rural, thus the same processing method is applied as above.

3. Imputation method

We use the perpetual inventory method to impute the population data.

3.1 Perpetual inventory method

The perpetual inventory formula is:

$$L(y,e,a,s) = L(y-1,e,a,s)\cdot(1-\delta(y,a,s)) + IF(y,e,a,s) \\ -OF(y,e,a,s) + EX(e,a,s)$$

where $L(y,e,a,s)$ is the population in year y with education level e, age a and sex s. $\delta(y,a,s)$ is the mortality rate. $IF(y,e,a,s)$ is the inflow of population of age a, sex s and education level e in year y. $OF(y,e,a,s)$ represents the outflow of population of age a and sex s and education level e in year y. $EX(e,a,s)$ is a residual term.

$$IF(y,e,a,s) = \lambda(y,e,a,s)\cdot ERS(y,e,s)$$

$$OF(y,e,a,s) = \lambda(y,e+1,a,s)\cdot ERS(y,e+1,s)$$

ERS is the new enrollment of different education levels, λ is the age distribution of new enrollment of different education levels and

$$\sum_a \lambda(y,e,a,s) = 1$$

3.2 Estimate the age distribution λ

We use the data from the *China Educational Statistical Yearbook: 2003-2017* to estimate the age distribution (1982-2017) of new enrollments.

We have the data of new enrollment of primary school by age, region and sex, and the data of new enrollment of junior middle school by age, region, sex and grade from 2003 to 2017.

3.2.1 Estimate the age distribution λ: 2003-2017

For primary school, we assume that the sex ratio of enrollment equals to the sex ratio of entrants. We use rural_2003 as an example; Table A.1 is the raw data. First, we use total enrollments (second column) and total female

enrollments (third column) to obtain the sex ratio. Next, we use this ratio to separate total entrants (first column). Finally, we calculate the age distribution in rural area in 2003 (Table A.2).

For junior middle school, we assume that the sex ratio of enrollment equals to the sex ratio in each grade, and we assume that the age distribution of Grade 1 students is the same as that of new enrollments. We use rural_2003 as an example; Table A.3 is the raw data. First, we use total enrollments (first column) and total female enrollments (second column) to obtain the sex ratio. Next, we use this ratio to separate Grade 1 (third column). Finally, we calculate the age distribution in rural area in 2003 (Table A.4).

For senior middle school, first, for year 2003, we assume that students in Grade 3 and Grade 4 in junior middle school in the last year have the same age distribution as those of new entrants to senior middle school in this year. For example, in 2003, the age distribution of new entrants to senior middle school is the same as that of Grade 3 and 4 students in junior middle school in 2003 (Table A.5). Second, for 2004 and later, we assume that students in Grade 3 and Grade 4 in junior middle school have the same age distribution as those of new entrants to senior middle school in the same year. For example, in 2004, the age distribution of new entrants to senior middle school is the same as that of Grades 3 and 4 students in junior middle school in 2003 (Table A.6).

For university, we assume that the age distribution of new entrants to university is the same as that of Grade 1 students in senior middle school three years ago. For example, in 2006, the age distribution of new entrants to university is the same as that of Grade 1 students of senior middle school in 2003.

Using the method above, we can get the age distribution of enrollment of each educational level. Table A.7 is the age distribution in rural areas in 2003, Table A.8 is the age distribution in urban areas in 2003 (keep three decimal fraction because of the space limitation).

3.2.1 Estimate the age distribution λ: before 2003

We use the data from China Educational Statistical Yearbook: 2003 and 2004 instead.

3.2.2.1 for primary school

1995: use the age distribution of Grade 3 and Grade 4 in junior school instead. (Table A.3 Grade 3)

1996: use the age distribution of Grade 2 in junior school instead. (Table A.3 Grade 2)

1997: use the age distribution of Grade 1 in junior school instead. (Table A.3 Grade 1)

1998: use the age distribution of Grade 6 in primary school instead. (Table A.1 Grade 6)

1999: use the age distribution of Grade 5 in primary school instead. (Table A.1 Grade 5)

2000: use the age distribution of Grade 4 in primary school instead. (Table A.1 Grade 4)

2001: use the age distribution of Grade 3 in primary school instead. (Table A.1 Grade 3)

2002: use the age distribution of Grade 2 in primary school instead. (Table A.1 Grade 2)

Before 1995: use the age distribution in 1995 instead.

3.2.2.2 for junior middle school

2002: use the age distribution of Grade 2 in junior middle school in 2004 instead.

2001: use the age distribution of Grade 3 in junior middle school in 2004 instead.

Before 2001: use the age distribution in 2001 instead.

3.2.2.3 for senior middle school

The age distribution of new entrants to senior is the same as that of junior middle school three years ago.

3.2.2.4 for university

The age distribution of new entrants to university is the same as that of senior middle school three years ago.

3.3 Method of imputing population data: 1985-2017

When adopting the perpetual inventory method to estimate the urban and rural population, we ignore migrants between urban and rural China. To take these migrants into account, we make the following adjustments. For example, from 1982 to 1990, we get the estimated 1990 population data by gender, education and age using the perpetual inventory method. The actual 1990 population by gender, education and age subtracting the estimated 1990 population by gender, education and age gives the net migrants between urban and rural China in these eight years. We assume that the number of immigrants in each year is the same, and then we add the average difference to the estimated population data.

4. Some specific problems

4.1 National, rural and urban population at age zero: 1985-2017

4.1.1 National population at age zero

The total population at the end of the year and the birth rates for each year

are obtained from Table 3-1 ‘Population and Its Composition’ and Table 3-2 ‘Birth Rate, Death Rate and Natural Growth Rate of Population’ in *China Statistic Yearbook 2011*. We assume that the population at the beginning of a given year equals that at the end of the previous year. Thus, the average of the population at the end of the given year and the previous year is the average population of the given year. The product of the average population and the corresponding birth rate gives the new-born population. Multiplying the new-born population by the survival rate of those aged zero at the corresponding year gives the population at age zero at the end of the year.

(Definition: birth rate, also called gross birth rate, refers to the ratio of the new-born population in a given region during a given period, usually one year, and the average population of the same period. The birth rate here is yearly birth rate, which is calculated from the following equation: Birth rate = (new-born population / average population)* 1000‰, where new-born population is the number of the new-born babies who are alive when they are detached from the mothers no matter how long they have been in their mother’s body. Average population is the average of the populations at the beginning and at the end of the year, or the population at the middle of the year.)

4.1.2 Rural and urban population at age zero

The data used include total national population for each year from 1983 to 2017, birth rate for each year from 1983 to 2017, national, rural and urban population by age and gender from the population sampling surveys for 1987 and each year from 1989 to 2017.

The share of urban population at age zero in the national population at age zero can be calculated from these sampling data, and this share is assumed to be the true share. In other words, multiplying it with the national population at age zero produces the urban population at age zero. Further, the gender ratio

from the sampling data is also assumed to be true, thus we can divide the urban population at age zero into the two genders. Similar steps are used for the rural population at age zero.

Since there is no population sampling data for 1983-1986 and 1988, we assume the numbers of those aged 1, 3, 4, 5, 6 in 1989 equals the new-born population for 1988, 1986, 1985, 1984 and 1983 with the sampling weights adjusted, respectively. Migration between urban and rural regions is neglected here.

4.2 The death rate of those aged 65 and over

When imputing the population by age, gender and education level with perpetual inventory method, the number of those aged 65 and over should be multiplied by the death rate. The death rate is calculated in the following way. With the population and the death rate, both by age and gender, from the population sampling data for each year, the number of deaths of those aged 65 and over for each year can be calculated. Dividing it by the corresponding total population gives the death rate of those aged 65 and over. Since there is no population sampling data for 1983-1986, 1988 and 1991-1993, the death rate of the closest year is used.

4.3 Application of the age distributions of every education level for each year

The age distributions are obtained from the macro- and micro-level data, and the enrollment numbers for each year are used with adjustments. They change over time, but do not vary between urban and rural regions.

Tables and figures of appendix A

Table A.1 Number on School-age Population in Primary School, Rural, 2003, China Education Statistical Yearbook

	Enrollment								
	Total	**Of which: new entrant**	**Of which: female**	**Grade 1**	**Grade 2**	**Grade 3**	**Grade 4**	**Grade 5**	**Grade 6**
Age	76891519	11924477	36322339	12159626	12862008	12985923	13295122	13951495	11637345
5	308950	297013	144660	302758	6052	125	8	6	1
6	5046575	4754352	2372386	4782290	257461	6647	165	10	2
7	11010378	6350637	5180829	6444175	4321918	237121	6945	204	15
8	11864959	410669	5605866	492215	7338813	3813008	213075	7553	295
9	12221282	74134	5796024	91262	711394	7682374	3514009	213151	9092
10	12995292	22398	6170350	27731	155006	927169	8067444	3604354	213588
11	13084959	8630	6211805	10868	43937	221535	1082185	8423636	3302798
12	8410789	4293	3979851	5476	17127	65676	295215	1234989	6792306
13	1468214	1616	654151	1948	7153	22371	84281	351020	1001441
14	368378	534	159283	630	2292	7181	23368	89514	245393
15	111743	201	47134	273	855	2716	8427	27058	72414

Table A.2 Age Distribution in Primary School, Rural, 2003

Age	Male	Female
5	0.025	0.025
6	0.399	0.398
7	0.532	0.533
8	0.034	0.035
9	0.006	0.006
10	0.003	0.003
11	0.000	0.000
12	0.000	0.000
13	0.000	0.000
14	0.000	0.000
15	0.000	0.000
Sum	1	1

Table A.3 Number of School – age Population and Enrollment in Junior Middle School, Rural, 2003, China Education Statistical Yearbook

Rural	Enrollment					
	Total	Of which: female	Grade 1	Grade 2	Grade 3	Grade 4
10	31217107	15243521	10846398	9888047	10008568	474094
11	14636	6715	14222	407	7	0
12	388359	182837	365232	22427	700	0
13	4523447	2172333	4000135	490469	32745	98
14	9974932	4777600	5128966	4317657	524854	3455
15	10015544	4776361	1063487	4758148	4119319	74590
16	5810306	2731587	225263	994786	4272665	317592
17	1169589	507334	38929	182266	883709	64685
18	198706	77478	7742	26440	152300	12224

Table A.4 Age Distribution of New Entrants in Junior Middle School, Rural, 2003

Age	Male	Female
10	0.000	0.000
11	0.036	0.034
12	0.368	0.370
13	0.472	0.473

Age	Male	Female
14	0.098	0.098
15	0.021	0.020
16	0.005	0.004
17	0.000	0.000
18	0.000	0.000
Sum	1	1

Table A.5 Age Distribution of New Entrants in Senior Middle School, Rural, 2003

Age	Male	Female
11	0.000	0.000
12	0.000	0.000
13	0.000	0.000
14	0.053	0.055
15	0.394	0.407
16	0.437	0.439
17	0.096	0.084
18	0.018	0.013
19	0.003	0.002
Sum	1	1

Table A.6 Age Distribution of New Entrants in Senior Middle School, Rural, 2004

Age	Male	Female
11	0.000	0.000
12	0.000	0.000
13	0.003	0.003
14	0.050	0.051
15	0.394	0.407
16	0.437	0.439
17	0.096	0.084
18	0.018	0.013
19	0.003	0.002
Sum	1	1

Table A.7 Age Distribution of New Enrollments by Educational Level, Rural,2003

Age	Illiterate to primary school		Primary school to junior middle school		Junior middle school to senior middle school		Senior middle school to college		Senior middle school to university	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
5	0.025	0.025								
6	0.399	0.398								
7	0.532	0.533								
8	0.034	0.035								
9	0.006	0.006								
10	0.003	0.003								
11			0.036	0.034						
12			0.368	0.370						
13			0.472	0.473						
14			0.098	0.098	0.053	0.055				
15			0.021	0.020	0.394	0.407				
16			0.005	0.004	0.437	0.439				
17					0.096	0.084	0.000	0.000	0.000	0.000
18					0.018	0.013	0.000	0.000	0.000	0.000
19					0.003	0.002	0.000	0.000	0.000	0.000
20							0.000	0.000	0.000	0.000
21							0.000	0.000	0.000	0.000
22							0.000	0.000	0.000	0.000

Table A.8 Age Distribution of New Enrollments by Educational Level, Urban, 2003

Age	Illiterate to primary school		Primary school to junior middle school		Junior middle school to senior middle school		Senior middle school to college		Senior middle school to university	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
5	0.025	0.029								
6	0.561	0.564								
7	0.388	0.382								
8	0.021	0.021								
9	0.003	0.003								
10	0.001	0.001								
11			0.048	0.050						
12			0.370	0.373						
13			0.477	0.475						
14			0.087	0.086	0.066	0.069				
15			0.015	0.014	0.392	0.406				
16			0.003	0.002	0.440	0.441				
17					0.087	0.074	0.063	0.060	0.063	0.060
18					0.013	0.009	0.406	0.393	0.406	0.393
19					0.002	0.001	0.440	0.438	0.440	0.438
20							0.079	0.091	0.079	0.091
21							0.011	0.015	0.011	0.015
22							0.001	0.002	0.001	0.002

Appendix B Mincer Parameters

Main Equation:

$$\ln(inc) = \alpha + \beta \cdot Sch + \gamma \cdot Exp + \delta \cdot Exp^2 + u$$

where *inc* is income; *Sch* is years of schooling; *exp* is years of work experience; α, β, γ, δ are corresponding parameters; u is an error term.

1. Samples and methods

1.1 Surveys

(1) The annual Urban Household Survey (UHS);

(2) Chinese Health and Nutrition Survey (CHNS);

(3) Chinese Household Income Project (CHIP);

(4) China Household Finance Survey (CHFS);

(5) China Family Panel Studies (CFPS)

(6) China Labor-force Dynamics Survey (CLDS)

1.2 Components of income

(1) Main job and Secondary job salaries;

(2) Other cash income from work;

(3) Pension;

(4) The estimated market value of received items;

(5) Various subsidies;

(6) Individual's share of household income according to working-hour share.

1.3 Work experience

Exp = Age–16, if Sch <10

Exp = Age–Sch–6, if Sch >9

Exp = 0, if Exp <0

1.4 Selection of sample

(1) 16-60 years old for males, and 16-55 years old for females;

(2) Must have information on income and educational attainment;

(3) Students, retirees, people who are unemployed but looking for a job, the disabled, people who are waiting to enter school and housekeepers are excluded.

1.5 Imputation method

(1) To make all parameters comparable, we first use UHS, CHIP, CHNS, CHFS, CFPS, and CLDS to obtain all urban and rural parameters by gender and then compute the annual results by weighting the sample sizes of the available data sets for that year. When both UHS and CHNS are available for a given year, we drop CHNS estimates due to the relatively low quality of income measures.

(2) We use UHS to obtain urban parameters for 1986-1997.

(3) We use CHIP to obtain urban and rural parameters for 1988, 1995, 2002 and 2007, and urban parameters for 1999.

(4) [37]We use CHNS to obtain urban parameters for 2000, 2004, 2006, and rural parameters for 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009,

[37] We have urban datasets of UHS for 1989, 1991, 1993 and 1997, so we do not use the CHNS datasets of those years for urban parameter estimation.

2011,2015.

(5) We use CHFS to obtain urban and rural parameters for 2010,2012.

(6) We use CFPS to obtain urban and rural parameters for 2010, 2012 2014 and 2016.

(7) We use CLDS to obtain urban and rural parameters for 2014.

As an example, for the intercept term, we can obtain the urban intercept $\alpha^u 88$ (UHS), assuming the sample size is $n^u 88$ (UHS).

We estimate the urban intercept $\alpha^u 88$ (UHS) using UHS 1988, with the sample size of $n^u 88$ (UHS). We also could obtain the urban and rural intercepts $\alpha^u 88$ (CHIP), $\alpha^r 88$ (CHIP), with the sample size of $n^u 88$(CHIP), $n^r 88$(CHIP) respectively. The annual urban and rural intercepts are:

$$\alpha^u 88 = \frac{\alpha^u 88(UHS) \times n^u 88(UHS)}{n^u 88(UHS) + n^u 88(CHIP)} + \frac{\alpha^u 88(CHIP) \times n^u 88(CHIP)}{n^u 88(UHS) + n^u 88(CHIP)}$$

$$\alpha^r 88 = \alpha^r 88(CHIP)$$

The same principle is applied to estimate other parameters for urban and rural areas.

1.6 Parameter α

$$\ln(inc) = \alpha + \beta \cdot Sch + \gamma \cdot Exp + \delta \cdot Exp^2$$

$\hat{y} = \alpha \times e^{\hat{\ln y}}$, where α is an adjustment factor. We estimate it as follows:

(1) Obtain $\hat{\ln y}$ from the regression of $\ln(y_i)$ on all right-hand-side variables.

(2) Obtain $\hat{m}_i = e^{\hat{\ln y}}$.

(3) Regress y_i on $\hat{m}_i$ without the intercept: $\hat{y} = \alpha \times \hat{m}_i$ and keep α.

(4) For the given values *Sch*, *Exp*, *Exp*^2, obtain $\hat{\ln y}$.

(5) $\hat{y} = \alpha \times e^{\hat{\ln y}}$.

2. Data

We use six well-known household surveys in China. UHS, CFPS, CHNS, CHIP, CHFS, CLDS.

Table B.1 shows the distribution of the six datasets across years.

3. Key variables

3.1. UHS

3.1.1 Definition of income

1) Salaries from working in the state-owned, collective or other institutions;

2) Other income from working units;

3) Private employment income;

4) Income from re-employment after retirement;

5) Other employment income;

6) Other working income;

7) Pension;

8) Price subsidies;

9) Household avocation production income.

3.1.2 Years of schooling

(1)1986-1991

LEVEL	Sch
College	16
Professional school	11
Senior middle school	12
Junior middle school	9
Primary school	6
Others	0

(2)1992-1997

LEVEL	Sch
College	16
Community college	15
Professional school	11
Senior middle school	12
Junior middle school	9
Primary school	6
Others	0

3.1.3 Selection of samples

(1) Include male individuals from 16 to 60 years old and female individuals from 16 to 55 years old;

(2) Discard individuals whose value of regular wage is missing, and individuals who did not to report education information;

(3) Discard individuals who are self-employed, short term contract workers, the retired, job seekers, the disabled, homemakers, students in school, workers waiting for a job assignment, students waiting to enter school, etc.

3.2 CHIP

3.2.1 Definition of income

Urban income definitions:

In 1988 it includes: employment salary and subsidies, other income from work units, pension;

In 1995 it includes: employment salary and subsidies, other income from work units, other goods from work units, pension;

The same principle is applied in CHIP 2002, CHIP 2007 and 2013.

Rural income definitions:

Sum of individual income and household income;

In 1988, individual income includes: regular income, pension, other cash income, and other goods from work units; household income is net household income from agriculture.

In 1995, individual income includes: regular income (such as salary, bonus, and subsidies), pension, other cash income, and received goods from work units; household income is net household income from agriculture.

In 1999, the data set does not include rural information.

In 2002, individual income includes: wages, pensions, subsidies, received goods from work units; household income is net household income from agriculture.

In 2007, it only has the total household income, including both non-rural income and rural income.

In 2013, it only shows individual's total employment income and household's total disposable income. The employment income includes total wage income or net business income.

3.2.2 Years of schooling

(1)1988

LEVEL	Sch
College and above	16
Professional school	15
Middle level professional, technical or vocational school	11
Upper middle school	12
Lower middle school	9
Junior middle school	6
4 or more years of elementary school	4
1-3 years of elementary school	2
Illiterate or semi-illiterate	0

(2)1995&1999&2002

LEVEL	Sch
College and above	16
Professional school	15
Middle level professional school	11
Upper middle school	12
Lower middle school	9
Elementary school	6
Illiterate or semi-illiterate	0

(3)2007&2013

LEVEL	Sch
Graduate school	18
College and above	16
Professional school	15
Middle level professional, technical or vocational school	11
Upper middle school	12
Lower middle school	9
Elementary school	6
Illiterate or semi-illiterate	0

3.2.3 Selection of samples

(1) Include male individuals from 16 to 60 years old and female individuals from 16 to 55 years old;

(2) Discard individuals whose value of years of schooling is missing, individuals who failed to report education level information;

(3) Keep individuals whose current status is working or employed, or re-employed after retirement;

(4) Discard individuals who are self-employed, private enterprise owners or managers;

(5) Discard individuals whose reported income is 0 or below.

3.3 CHNS

3.3.1 Income variables

Income includes wages, subsidies, other job-related income and household agricultural income. For CHNS, we use the sum of INDINC (Total net individual income, nominal), INDSUB (Individual subsidies) and individual share of HHSUB (Household subsidies) to generate the variable of final individual income.

3.3.1.1 Total net individual income, nominal (INDINC)

Variable: INDINC - Total net individual income, nominal

Data files: INDBUSN - business income

INDFARM - farming income

INDFISH - fishing income

INDGARD - gardening income

INDLVST - livestock income

INDRETIRE - retirement income

INDWAGE - non-retirement wages

a) Non-Retirement Wages

Variable: INDWAGE - Total individual income from all non-retirement wages earned by individuals. Annual wage is calculated for each job recorded in the wage file.

Generally, annual wage income is the months of work times Average Monthly non-Retirement Wage, plus Bonuses and Other Cash or In-Kind Income. For 1989, annualized income from piece work is calculated.

Source:

C3, months worked last year (job level), 1991 - 2011

C8, average monthly wages (job level), 1991 - 2011

C6, wages per piece of completed work, 1989

C7, the average number of pieces completed/work, 1989

I19, the value of bonuses received last year (job level), 1989-2011

I101, other cash income (job level), 2006-2011

I103, the value of other non-cash income (job level), 2006-2011

B2, B3B, B4, B5, B9, B10, filter questions (person level)

b) Retirement Income

Variable: INDRET - Total Individual Retirement Income

Source:

J5, retirement pensions/salaries (individual), 1989 - 2000

B2D, retirement wage from this job (job level), 2004 – 2011

c) Business Income

Variable: INDBUS - Total individual net income from all businesses operated by the household that the individual participates in.

Source:

The individual proportion of net income from household businesses:

H6, Months worked in household business last year

H7, Days per week worked in household business last year

H8, Hours per day worked in household business last year

Total household net income from all household businesses:

H2, Business type

H3, Revenue from this business

H4, Expenses

d) Farming Income

Variable: INDFARM - Total individual net income from farming.

Source:

The individual proportion of net income from household farming:

E4A, months worked on farm last year

E4B, days worked on farm per week last year

E4C, hours worked on farm per day last year

E2A, worked on HH farm/orchard last year (from 2004 on)

E4, 12-month average hours worked on farm per week (1989 only)

Total household net income from farming:

E7, cash for collective farming (individual level), 1989 - 2011

E9, in-kind for collective farming (individual level), 1989 - 2011

E13B, expenses to raise crop (crop level), 1989

E15B, receipts from the sale of the crop (crop level), 1989

E17B, receipts if crop kept had been sold (crop level), 1989

E19B, receipts if crop given away had been sold (crop level), 1989

E13, kg of crop grown (crop level), 1991-1997

E14, kg of crop sold to the government (crop level), 1991-1997

E15, government price for the crop (crop level), 1991-1997

E16, kg of crop sold to the free market (crop level), 1991-1997

E17, the free-market price for the crop (crop level), 1991-1997

E12, expenses to raise all crops (household level), 1991-2011

E14A, receipts from the sale of all crops (household level), 1991-2011

E16A, the value of all crops consumed (household level), 1991-2011

e) Fishing Income

Variable: INDFISH - Individual income from fishing.

Source:

The individual proportion of net income from household farming:

G4A, months worked on fishing last year

G4B, days worked on fishing per week last year

G4C, hours worked on fishing per day last year

G2, filter: worked on fishing last year (from 2004 on)

G4, 12-month average hours worked on fishing per week (1989 only)

Total household net income from farming:

G7, wages received from collective fishing (individual)

G9, the market value of fish received in-kind from the collective (individual)

G11, revenue from fish sales (household)

G13, the value of fish consumed at home (household)

G15, the value of fish given as a gift (household)

G16, expenses of fishing business (household)

f) Gardening Income

Variable: INDGARD - Total individual net income from gardening

Source:

The individual proportion of net income from household gardening:

D3A, months worked on gardening last year

D3B, days worked on gardening per week last year

D3C, hours worked on gardening per day last year

D2A, worked in HH garden last year (from 2004 on)

D3, 12-month average hours worked on gardening per week (1989 only)

Total household net income from household garden or orchard

D5, revenue from the sale of home garden produce, 1989 - 2011

D6, the market value of consumed produce, 1989 - 2011

D7, expenses to grow produce, 1991-2011

g) Livestock Income

Variable: INDLVST - Total individual net income from raising livestock.

Source:

The individual proportion of net HH income (HHLVST) from household livestock business:

F4A, months worked on raising livestock last year

F4B, days worked on raising livestock per week last year

F4C, hours worked on raising livestock per day last year

F2A, raising livestock last year (from 2004 on)

F4, 12-month average hours worked on raising livestock per week (1989 only)

Total household net income from all livestock activities:

F7, wages received from collective animal husbandry (individual)

F9, market value of livestock received in-kind from the collective (individual)

F14, expenses to raise livestock (livestock level)

F15, expenses from using home-grown feed (livestock level)

F17, revenue from the sale of livestock products (livestock level)

F19, the value of livestock products consumed at home (livestock level)

F21, the value of livestock products given as gifts (livestock level)

3.3.1.2 Subsidies

The subsidies include INDSUB (Individual subsidies) and individual share of HHSUB (Household subsidies). We allocate household subsidies equally among household individuals; the household subsidies are divided by the number of members in a household.

INDSUB=(I9+I11+I12+I13+I13A+I14+I14A+I14B)*12

HHSUB=I10A+I15A+I16A+I17A+I21+K47

Source:

ANNUAL subsidies for the following items, at the Household level:

I10A, one-child subsidy, 1991 - 2011

I15A, gas subsidy, 1993 - 2011

I16A, coal subsidy, 1993 - 2011

I17A, electricity subsidy, 1993 - 2011

I21, food/gift/discounts from work unit, 1989 - 2011

K47, childcare subsidy, 1989 - 2011

MONTHLY subsidies for the following items, at the Individual level:

I9, food subsidy, 1989 - 1997

I11, health subsidy, 1989 - 1997

I12, bath/haircut subsidy, 1989 - 1997

I13, book/newspaper subsidy, 1989 - 1997

I13A, housing subsidy, 1989 - 1997

I14, other subsidies, 1989 - 1997

I14A, the average monthly subsidy from job 1, 2000 - 2011

I14B, the average monthly subsidy from job 2, 2004 – 2011

3.3.2 Imputing individual share of household income

Agricultural income includes incomes from five sources: gardening, farming, livestock raising, fishing, and small handicraft and commercial household businesses. These incomes come from either collective or household businesses or both.

We assume each individual's contribution to the household income is proportional to his or her share of time allocated to five activities: gardening, farming, raising livestock, fishing and small handicraft and commercial household business. First, we add up all working hours of all family members in each of these activities. Second, we calculate the working hour share of each member in the family's total hours. Third, we multiply the household income by the share to approximate individual income for each

category. Finally, we add up individual income from the four categories for each family member.

3.3.3 Years of schooling

Level	Sch
None	0
Completed primary school	6
Junior middle school degree	9
Senior middle school degree	12
Middle technical, professional , or vocational degree	11
3- or 4- year college degree	16
Master's degree or above	18

3.3.4 Selection of sample

(1) Males from 16 to 60 years of age and females from 16 to 55 years of age;

(2) Exclude individuals who fail to provide information on wage and educational attainment, and who are self-employed or business owners;

3.4 CHFS

3.4.1 Definition of income

(1) The income divides into urban income and rural incomes. Urban income mainly includes wage income and social security income; rural income mainly includes wage income, household income from agriculture and social security income.

(2) Wage income mainly includes three components: wages, bonuses，and allowances. Social Security income mainly includes three components: social endowment insurance, retirement and pensions.

3.4.2 Personal income distribution of agricultural production

In rural income, wage income and social security income are personal income, but the income of agricultural production is household income. Therefore, it is necessary to determine how the household income is allocated to individuals and thus calculate the total personal income.

(1) Allocation method

Step 1: Statistics for each family on farming and agricultural production should be recorded as working as family labor.

Step 2: Calculation of family practitioners produced income, and apportioned to individual farming, sharing: Family net income of agricultural production / Labor force engaged in agricultural household production.

3.4.3 Years of schooling

2010 and 2012

Level	Sch
No school	0
Primary school	6
Junior middle school	9
Senior middle school	12
Middle professional degree	11
Post-secondary professional degree	15
College	16
Master’s degree	18
PhD degree	22

3.4.4 Selection of samples

(1) Include male individuals from 16 to 60 years old and female individuals from 16 to 55 years old.

(2) Discard individuals whose value of year of schooling is missing, individuals who did not report education level information.

(3) Keep individuals whose current status is working or employed, or re-employed after retirement.

(4) First Occupation:

In urban samples of 2010, we discard individuals, who work for businesses or private companies; self-employed individuals farmers at home, and other samples, and we delete samples without income data sample. In the rural sample of 2010, we delete the samples without income data. In the urban sample of 2012, we discard individuals, who work for businesses or private companies; self-employed individuals farmers at home and other samples; and seasonal jobs, and we delete samples without income data sample. In the rural sample of 2012, we delete the samples without income data.

(5) Second Occupation: Urban and rural samples without income data are deleted from the sample.

(6) Family agricultural production and management: Rural sample households engaged in agricultural production but we delete samples without income data.

Attention: Some units of income are ten thousand Yuan.

(7) Social Security Income: Rural and urban samples were deleted with the relevant guaranteed income but without income data.

3.5 CFPS

3.5.1 Definition of income

(1) The income divides into urban income and rural incomes. Urban income mainly includes wage income and social security income; rural income mainly includes wage income, household income from agriculture and social security income.

(2) Wage income mainly includes three components: wages, bonuses and allowances. Social Security income mainly includes three components: social endowment insurance, retirement and pensions.

(3) Agriculture income refers to the net income from farming, gardening, livestock, fishing and side-line occupation.

3.5.2 Personal income distribution of agricultural production

In rural income, wage income and social security income are personal income, but the income of agricultural production is household income. Therefore, it is necessary to determine how the household income is allocated to individuals, and thus calculate the total personal income.

(1) Allocation method

Step 1: statistics for each family on farming and agricultural production should be recorded as working as family labor.

Step 2: Calculation of family practitioners produced income, and apportioned to individual farming, sharing: Family net income of agricultural production / Labor force engaged in agricultural household production.

3.5.3 Years of schooling

Level	Sch
No school	0
Primary school	6
Junior middle school	9
Senior middle school/ Middle professional degree	12
College /Post-secondary professional degree	15
university	16
Master's degree	18
PhD degree	22

3.5.4 Selection of samples

(1) Include male individuals from 16 to 60 years old and female individuals from 16 to 55 years old.

(2) Discard individuals whose value of year of schooling is missing, individuals who did not report education level information.

(3) Keep individuals whose current status is working or employed, or re-employed after retirement.

(4) First Occupation:

In the urban sample, we discard individuals, who work for businesses or private companies; self-employed individuals farmers at home, and other samples, and we delete samples without income data. In the rural sample, we delete the samples without income data.

(5) Second Occupation: Urban and rural samples without income data were deleted from the sample.

(6) Family agricultural production and management: Rural sample households engaged in agricultural production but we delete samples

without income data.

(7) Social Security Income: Rural and urban samples were deleted with the relevant guaranteed income but without income data.

3.6 CLDS

3.6.1 Definition of income

(1) The income divides into urban income and rural incomes. Urban income mainly includes wage income; rural income mainly includes agriculture income and agricultural government subsidies.

(2) Wage income mainly includes three components: wages, bonuses and allowances.

(3) Agriculture income refers to the net income from farming, gardening, livestock, fishing and side-line occupation.

3.6.2 Personal income distribution of agricultural production

In rural income, agriculture income and agricultural government subsidies are household income. Therefore, it is necessary to determine how the household income is allocated to individuals, and thus calculate the total personal income.

(1) Allocation method

Step 1: Calculation of the whole hours for farm work of each family members according to the days of agricultural production in this year for the individual, the average number of hours a day to do farm work in the busy season, and the number of hours a day to do farm work in slack season.

Step 2: Calculation of the ratio of each family practitioner farm work hours to the whole farm work hours for the family. We could obtain personal rural income by calculating family rural income times each person's ratio of farm work.

3.6.3 Years of schooling

Level	Sch
No school	0
Primary school	6
Junior middle school	9
Senior middle school/ Middle professional degree	12
College /Post-secondary professional degree	15
university	16
Master’s degree	18
PhD degree	22

3.6.4 Selection of samples

(1) Include male individuals from 16 to 60 years old and female individuals from 16 to 55 years old.

(2) Discard individuals whose value of year of schooling is missing, individuals who did not report education level information.

(3) Drop individuals whose current status is farming, employers, or self-employed in the urban area.

(4) Drop students.

(5) Drop individual whose wage is zero.

4. Imputing parameters

4.1. Imputation method of urban parameters

4.1.1 Parameter estimates based on UHS, CHIP, CHNS, CHFS

We use UHS, CHIP, CHNS, CHFS, CFPS data to estimate the earnings equation by gender and year. Table B.1.1-B.1.4 contain means and standard deviations of each variable for UHS, CHIP, CHNS, CHFS, CFPS.

4.1.2 General idea about imputation

We use UHS, CHIP, CHNS, CHFS, CFPS and CLDS to estimate parameters of the basic Mincer equation, and obtain the fitted values for the intercept, return to education, and experience related terms. They are weighted by respective sample size if more than one sample is available. Then we use the parameter estimates to fit a time trend model, and then obtain the fitted values of each parameter by gender for the years 1985-2017. These fitted values are the final urban imputed parameters.

4.1.3 Specifications

We treat α , β , γ , δ separately and use the parameters for each group as the dependent variable and use time (i.e., year) as the independent variable.

For α , β , γ and δ , we use the linear time trend model. The regression equation is: $Y = a0 + a1 * time + u$.

For α, β, γ and δ, we assume that they increase or decrease at a constant rate each year. Taking the α_male as an example, we assume that the intercept increases at the growth rate of a1 per year.

Figure B.1- Figure B.8 show the parameter estimates for each group and the sample regression lines of the time trend models. The fitted values of the time trend models are the values of our imputed parameters for the period 1985 to 2016.

Tables and figures of appendix B

Table B.1 Micro Datasets

Year	UHS	CHIP	CHNS	CHFS	CFPS	CLDS
1985						
1986	U					
1987	U					
1988	U	U/R				
1989	U		U/R			
1990	U					
1991	U		U/R			
1992	U					
1993	U		U/R			
1994	U					
1995	U	U/R				
1996	U					
1997	U		U/R			
1998						
1999		U				
2000			U/R			

2001						
2002	U/R					
2003						
2004		U/R				
2005						
2006		U/R				
2007	U/R					
2008						
2009		U/R				
2010			U/R	U/R		
2011		U/R				
2012			U/R	U/R		
2013	U/R					
2014				U/R	U/R	
2015		U/R				
2016				U/R		

Note: CHIP: Chinese Household Income Project

UHS: Urban Household Survey

CHNS: China Health and Nutrition Survey

CHFS: China Household Finance Survey

CFPS: China Family Panel Studies

CLDS: China Labor-force Dynamic Survey

Table B.1.1 Summary Statistics: UHS Samples

Year	Variables	Male		Female	
		Mean	S.D.	Mean	S.D.
1986	inc	1412.75	520.03	1221.24	484.64
	Sch	9.95	2.77	9.57	2.73
	Exp	19.45	10.5	17.44	9.31
1987	inc	1467.5	580.3	1269.51	483.63
	Sch	10.07	2.76	9.64	2.65
	Exp	19.98	10.34	18.06	9.27
1988	inc	1888.71	800.42	1622.98	688.3
	Sch	10.24	2.78	9.75	2.70
	Exp	19.69	10.32	17.69	9.13
1989	inc	2160.52	954.64	1867.8	842.22
	Sch	10.38	2.82	9.90	2.63
	Exp	19.86	10.36	18.00	9.11
1990	inc	2375.74	1027.18	2062.86	900.48
	Sch	10.54	2.78	10.08	2.64
	Exp	20.19	10.23	18.21	9.08
1991	inc	2606.83	1103.42	2289.72	982.51
	Sch	10.70	2.80	10.29	2.59
	Exp	19.70	9.97	17.91	8.82
1992	inc	3227	1682.20	2715.65	1298.94
	Sch	11.41	2.76	10.72	2.56
	Exp	21.05	10.55	18.69	9.00
1993	inc	4293.68	2777.62	3623.46	2299.25
	Sch	11.39	2.72	10.75	2.55
	Exp	21.41	10.55	19.12	9.07
1994	inc	5934.77	4036.38	4935.77	3391.77
	Sch	11.51	2.77	10.93	2.49
	Exp	21.25	10.54	18.96	9.07

	inc	7187.35	4701.14	6033.56	4018.84
1995	Sch	11.61	2.72	10.97	2.48
	Exp	21.49	10.26	19.23	8.94
	inc	7969.58	5466.77	6683.32	4888.78
1996	Sch	11.64	2.69	11.07	2.43
	Exp	21.80	10.28	19.58	8.96
	inc	8554.39	6037.77	7107.18	5311.87
1997	Sch	11.64	2.69	11.12	2.42
	Exp	22.03	10.10	19.75	8.96

Table B.1.2 Summary Statistics: CHNS samples

Year	Variables	Urban				Rural			
		Male		Female		Male		Female	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	inc	1616.175	1070.05	1479.52	1494.19	1397.97	1259.56	1208.33	1084.54
1989	Sch	9.15	3.94	8.78	3.82	6.30	4.04	4.58	4.34
	Exp	18.68	11.45	15.76	9.54	17.88	11.47	16.45	10.34
	inc	2010.275	980.09	1692.80	851.69	1468.11	1306.13	1261.13	1138.94
1991	Sch	9.59	3.69	9.31	3.52	6.72	3.92	4.86	4.32
	Exp	19.14	11.29	16.01	9.16	18.41	11.51	17.08	10.45
	inc	3046.21	2102.93	2671.68	2335.47	2103.69	1911.10	1752.09	1491.08
1993	Sch	10.08	3.34	9.67	3.19	7.11	3.71	5.26	4.29
	Exp	20.29	10.75	17.14	9.00	19.27	11.55	17.99	10.32
	inc	6479.53	3622.15	5503.19	3652.81	4517.69	3818.30	3588.66	2958.12
1997	Sch	10.70	3.03	10.43	2.85	7.37	3.51	5.51	4.20
	Exp	20.43	10.23	17.25	9.06	20.60	11.57	19.33	10.58
	inc	10112.61	10832.57	8216.76	8367.89	5332.65	4511.72	4166.85	3346.32
2000	Sch	11.41	2.98	11.23	2.95	7.99	3.24	6.42	4.11
	Exp	21.06	10.28	18.49	9.26	21.32	11.60	20.46	10.49
	inc	14440.98	11543.27	13080.04	10584.54	7254.25	6479.61	5722.63	4963.01
2004	Sch	11.48	2.81	11.52	2.57	8.29	3.17	6.67	4.09

	Exp	23.21	9.97	20.48	8.84	25.08	10.90	23.20	9.70
	inc	19009.48	21177.45	15916.35	16025.81	10173.17	8371.42	7480.72	6806.45
2006	Sch	11.92	2.82	12.07	2.85	8.43	3.57	6.82	4.36
	Exp	24.82	9.50	20.92	8.72	25.71	10.81	23.66	9.50
	inc	26775.71	27500.44	21608.55	20930.16	14634.10	11684.12	12023.1	9507.12
2009	Sch	11.69	2.88	12.00	2.76	8.32	3.33	7.31	4.11
	Exp	26.64	9.96	21.36	9.43	26.31	10.93	23.91	9.71
	inc	39813.88	38432.36	36982.66	36946.27	21927.65	17409.49	16949.41	13000.58
2011	Sch	12.75	3.15	13.27	3.09	8.74	3.50	7.65	4.15
	Exp	24.01	11.11	18.80	9.76	27.05	10.73	24.55	9.42
	inc	60266.71	77971.86	56864.46	92045.41	34861.94	34861.94	29325.26	21387.12
2015	Sch	13.42	2.95	13.78	2.92	10.13	2.77	10.12	3.13
	Exp	24.24	10.82	19.90	9.33	25.06	11.70	21.57	10.59

Table B.1.3 Summary Statistics: CHIP samples

		Urban				**Rural**			
Year	**Variables**	**Male**		**Female**		**Male**		**Female**	
		Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
	inc	1944.15	940.23	1645.54	827.08	969.92	880.64	869.50	760.95
1988	Sch	10.71	2.92	10.01	2.74	7.17	3.28	5.024	3.88
	Exp	21.02	10.94	18.30	9.39	18.37	12.39	15.43	10.86
	inc	6701.29	3751.52	5529.63	3016.56	4561.45	3528.27	4309.77	3111.00
1995	Sch	11.60	2.86	10.87	2.72	7.95	2.82	6.27	3.41
	Exp	22.54	10.77	20.67	9.59	21.32	11.91	20.08	11.16
	inc	9431.35	5666.40	7757.61	5112.18				
1999	Sch	12.05	2.74	11.74	2.57				
	Exp	22.72	10.08	20.74	9.18				
	inc	12428.98	7905.79	10016.43	7252.22	5250.14	5049.25	3694.44	3794.98
2002	Sch	12.19	2.81	11.98	2.59	8.52	2.76	6.88	3.68
	Exp	23.80	10.06	21.25	9.22	21.82	12.07	19.84	11.05

Year	Variables	Urban				Rural			
		Male		Female		Male		Female	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
2007	inc	31521.57	29229.78	23371.48	17987.89	13677.31	9934.98	10136.26	7731.67
	Sch	12.77	3.03	12.86	2.86	8.20	2.38	7.54	2.51
	Exp	21.49	11.06	17.62	9.73	22.37	12.81	19.38	11.35
2013	inc	44487.78	32237.46	34850.66	24773.89	21290.12	16574.77	19974.63	15289.29
	Sch	12.65	3.06	12.83	3.05	9.36	2.43	8.98	2.78
	Exp	21.96	10.89	18.75	9.60	22.94	12.16	21.68	11.37

Table B.1.4 Summary Statistics: CFPS samples

Year	Variables	Urban				Rural			
		Male		Female		Male		Female	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
2010	inc	31478.54	32080.28	23329.77	20280.96	11807.6	12406.6	7294.23	7956.00
	Sch	11.16	3.76	11.39	3.95	6.80	4.14	5.01	4.43
	Exp	21.52	11.36	17.75	10.00	25.58	11.14	23.56	9.59
2012	Inc	32218.61	32512.06	23076.81	23047.57	18987.82	16528.45	11354.48	11942.87
	Sch	10.47	3.72	10.69	3.97	8.17	3.68	6.46	4.45
	Exp	22.28	11.67	19.32	10.37	23.63	12.05	22.23	10.47
2014	Inc	39021.1	30071.84	29781.15	32905.47	22899.72	21970.64	13408.08	14837.86
	Sch	10.47	4.01	10.69	4.30	7.08	4.18	5.60	4.63
	Exp	21.47	11.92	18.84	10.46	24.64	11.95	23.53	10.36
2016	Inc	44879.84	42012.90	34124.17	34752.51	26985.75	23361.22	18660.04	17993.55
	Sch	10.08	3.87	10.23	4.32	7.44	3.96	6.66	4.49
	Exp	18.34	11.68	16.44	10.61	22.32	12.18	20.07	11.29

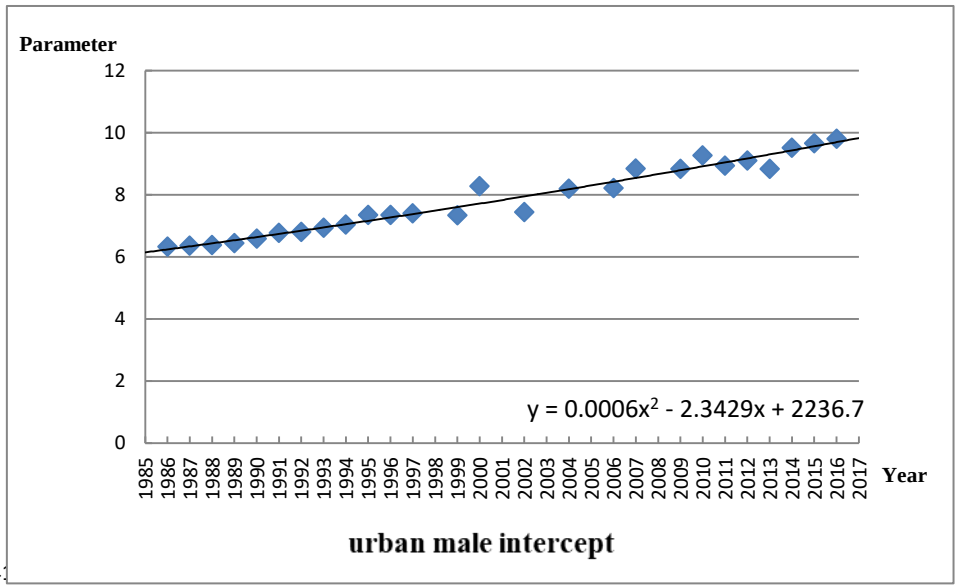
Table B.1.5 Summary Statistics: CHFS samples

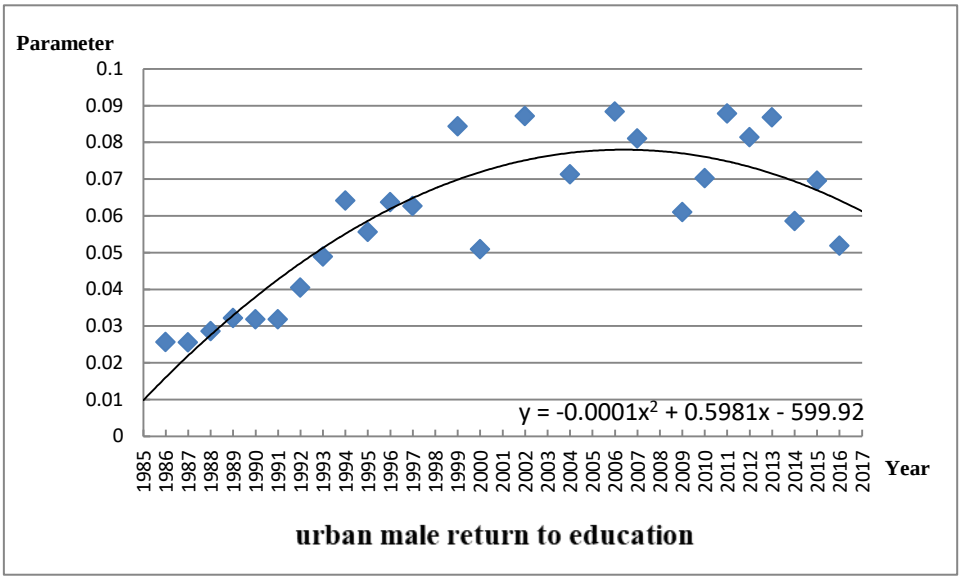
Year	Variables	Urban				Rural			
		Male		Female		Male		Female	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
2010	inc	38243.56	50501.83	30393.70	31788.25	9897.42	12063.79	6567.49	9487.33
	Sch	11.86	3.51	11.97	3.57	8.03	3.03	6.69	3.56
	Exp	21.65	10.26	18.49	8.91	28.03	10.31	25.04	9.47
2012	inc	44669.12	49302.04	35952.4	37685.9	17501.2	16639.32	12178.25	12480.3
	Sch	12.17	3.45	12.51	3.54	8.59	3.09	7.57	3.71
	Exp	19.29	11.31	15.92	10.01	22.72	12.39	20.85	11.27

Table B.1.6 Summary Statistics: CLDS samples

Year	Variables	Urban				Rural			
		Male		Female		Male		Female	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
2014	inc	49140.28	46818.38	39476.19	41543.86	26174.77	33250.29	18752.97	31854.3
	Sch	13.04	2.93	13.35	2.94	8.98	2.46	8.56	2.58
	Exp	21.87	11.30	17.72	9.87	24.78	11.85	21.701	10.48

Figures B.1-B.4 Parameter Estimates Against Time: Urban sample

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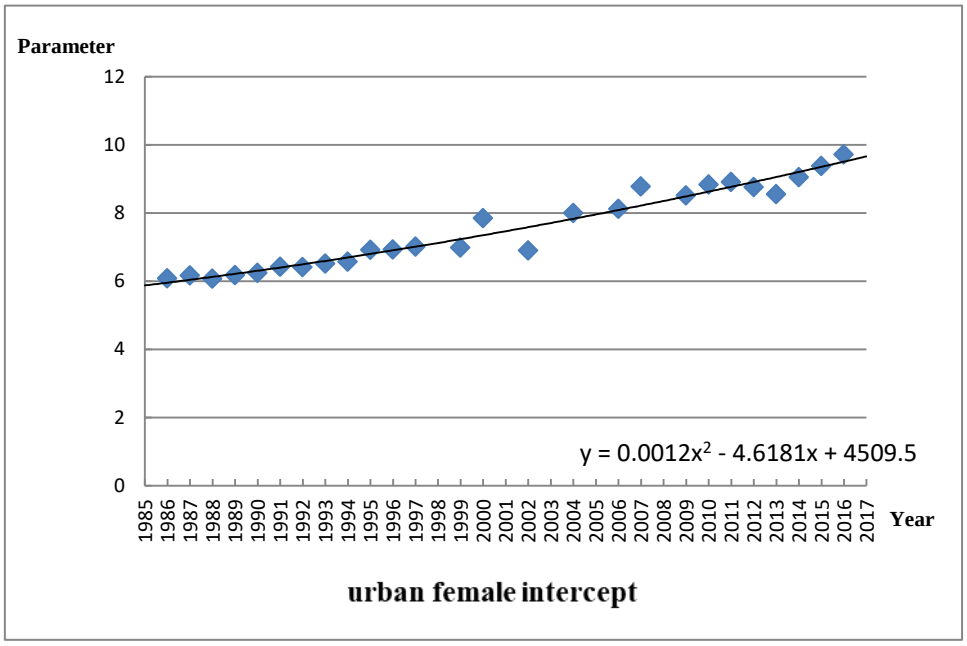
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
y = -0.0001x² + 0.5981x - 599.92
1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Year
urban male return to education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10
8
6
4
2
0
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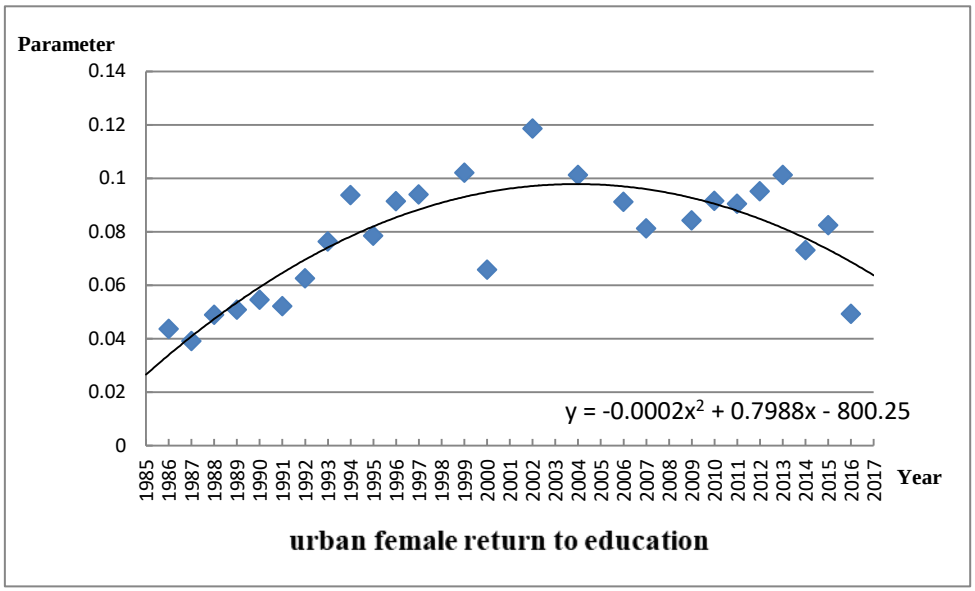
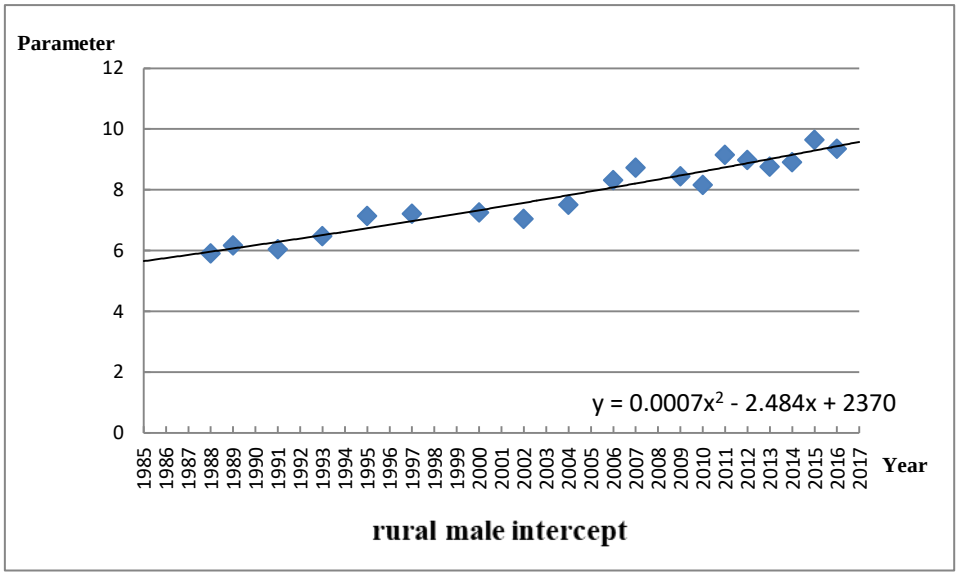
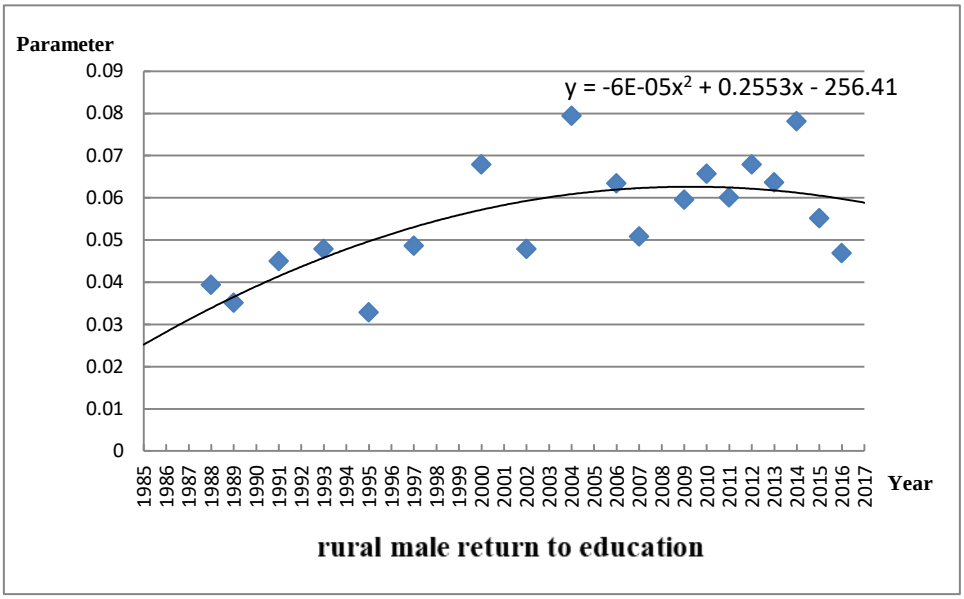
Year
urban female intercept



Figures B.5-B.8 Parameter Estimates Against Time: Rural Samples

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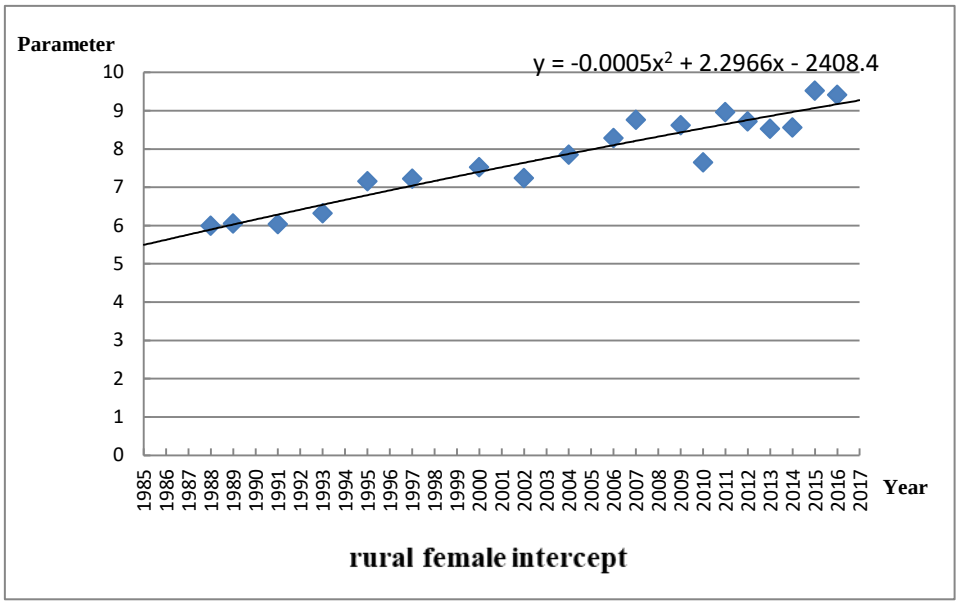
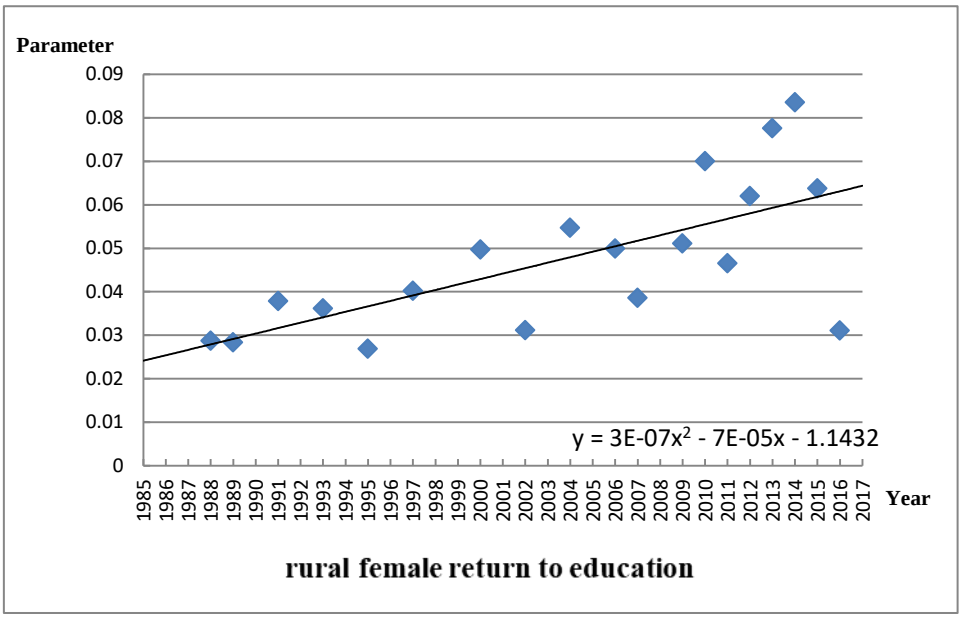
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Year
rural male return to education


Parameter
y = -0.0005x² + 2.2966x - 2408.4
10
9
8
7
6
5
4
3
2
1
0
1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Year
rural female intercept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0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
y = 3E-07x² - 7E-05x - 1.1432
1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
Year
rural female return to education

Appendix C Human Capital Stock Calculation

This section summarizes the basic methods and procedures for estimating China's human capital stock from 1985 to 2017 based on the J-F approach. In particular, it explains estimations for necessary data of the J-F approach based on China's data. We use the following notations:

y indicates calendar years from 1980 to 2017. s indicates sex equaling to one and two for males and females, respectively. a indicates age ranging from 0 to 60 years. e indicates the levels of education classified into five categories for years 1985-2000 including no schooling(ns), primary school(pri), junior middle school(jm), senior middle school(sm), and college(col). For years 2000-2017, the levels of education (e) are classified into six categories including no schooling(ns), primary school(pri), junior middle school(jm), senior middle school(sm), college(col) and university(uni).

Variables used for measuring the human capital stock:

whrs(y,s,a,e): annual market hours worked per employed person in year y with sex s, age a , and education level e;

empr(y,s,a,e): employment rate in year y for persons with sex s, age a, and education level e;

mhrs(y,s,a,e): market labor time per capita in year y for persons with sex s, age a, and education level e;

com(y,s,a,e): hourly compensation net of taxes on labor income for persons with sex s, age a, and education level e;

yinc(y,s,a,e): annual income of the employed in year y with sex s, age a, and education level e;

ymi(y,s,a,e): annual market income per capita net of tax on labor compensation in year y for persons with sex s, age a , and education level e;

sr(y,s,a): survival rate in year y for persons with sex s and age a;

employed(y,s,a,e): population employed in year y with sex s, age a, and education level e;

pop(y,s,a,e): population in year y with sex s, age a, and education level e;

newEnroll(y,s,a,e): population enrolled in education level e in year y, with sex s and age a;

pop_inschool(y,s,a,e-n): number of people in school in year y with sex s, age a, education level e, and grade n+1;

where e-n represents students in grade n+1 of education level e

senr(y,s,a,e+1,e-n): share of people enrolled in the next education level e+1 and in school in year y with sex s, age a , education level e, and grade n+1;

mi(y,s,a,e): human capital of the population not in school in year y with sex s, age a , and education level e;

R = (1+real growth rate of income)/(1+discount rate);

pop_inschool(y,s,a,e): number of people in school in year y with sex s, age a, and education level e;

pop_nischool(y,s,a,e): number of people not in school in year y with sex s, age a, and education level e;

Le(y): total population with education level e in year y;

Ls(y): total population with sex s;

Mi(s): human capital for both sexes (nominal income);

v_e : share of the present value of human capital for the population with education level e;

$\overline{v}_e$: average share of the present value of human capital for the population with education level e;

$\overline{v}_s$: average share of the present value of human capital for the population with sex s;

ΔlnK: growth rate of the aggregate human capital stock;

Poplog(y,s): logarithmic growth rate of the population for sex s in year y;

Mitg (y): cumulative growth rate of the aggregate human capital stock;

MiQ(y): total human capital in year y measured in the base year's prices.

1. Schooling and work status by age for calculating human capital using the J-F approach

no school or work	0-4
school only	5-16
work and school	16-a
work only	a-59
Retirement	male：60+；female：55+

(1) When calculate human capital using the J-F approach, the retirement age is 60 for males and 55 for females. The legal retirement ages were set by the second meeting of the fifth NPC Standing Committee on May 24, 1978. Detailed regulations are described in "The Temporary Method of Settling the Old, Weak, Ill, and Disabled Cadre by the State Council" and "The Temporary Method of Settling the Retired Workers by the State Council "(1978, No.104). In general, the legal retirement age is 60 for males, 50 for female workers and 55 for female cadres. However, for

workers who work in high temperature, high elevation, highly exhausting conditions, and harmful conditions, the legal retirement age is 55 for males and 45 for females. For people who become disabled due to illness and other reasons, the legal retirement age is 50 for males and 45 for females.

(2) *a* in the table is the upper bound of "work and school", and the lower bound of "work only". This age is determined according to the calculation of the lower bound of people in school in each year. The method of calculating people in school is discussed in section 3.2.

2. Estimation of annual market income ymi(y,s,a,e)

2.1 Estimation of annual income of the employed

2.1.1 Estimation of annual income of the employed using Mincer equation

Using data from CHIP (Chinese Household Income Project), CHNS (China Health and Nutrition Survey), UHS (Urban Household Survey), CHFS(China Household Finance Survey) and CFPS(Chinese Family Panel Studies), we regress the logarithm of annual income *ln yinc* on years of schooling *sch*, work experience *exp* and work experience squared exp^2 by OLS.

$$\ln(inc) = \alpha + \beta \cdot Sch + \gamma \cdot Exp + \delta \cdot Exp^2 + u$$

We use the fitted value of ln yinc from the equation above to obtain $\mathrm{m}_i = e^{\ln \mathrm{yinc}}$. We regress the annual income observed in the survey data on m_i

by OLS (without the intercept) to obtain the coefficient on m_i, α[38]. Finally, we estimate the annual income of the employed as yinc= $\alpha \times e^{\ln yinc}$.

Note that the annual income used for estimating the Mincer equation is in real terms with 1985 as the based year.

2.1.2 Coding of schooling and work experience in the Mincer equation

(1) Coding of years of schooling:

	No schooling	Primary school	Junior middle school	Senior middle school	College	University
1985-1999	0	6	9	12	15	
2000-2017	0	6	9	12	15	16

(2) Coding of work experience:

For people younger than age 16, working experience is: *exp*=0;

For people older than age 16, if s<10, working experience is: *exp=age*-6;

For people older than age 16, if s≥10, working experience is: *exp=age-sch*-6.

2.2 Estimation of annual market income

When estimate the annual income of the employed using the Mincer equation, we obtain $\text{yinc}_{y,s,a,e} = \text{whrs}_{y,s,a,e} \times \text{com}_{y,s,a,e}$.

According to

[38] Jeffrey M. Wooldridge (2005), Introductory Econometrics: A Modern Approach, 3rd edition.

$$mhrs_{y,s,a,e}=whrs_{y,s,a,e}\times empr_{y,s,a,e}\ ,\quad ymi_{y,s,a,e}=whrs_{y,s,a,e}\times empr_{y,s,a,e}\times com_{y,s,a,e}$$

The annual market income is given by:

$$ymi_{y,s,a,e}=yinc_{y,s,a,e}\times empr_{y,s,a,e}.$$

2.2.1 Calculation of employment rate empr(y,s,a,e)

To calculate employment rate, empr(y,s,a,e) by age, sex and educational for individuals older than 16, we use the data from census years of 1987, 1995, 2000, 2005 and 2010 and replace middle years' employment rates by the average of these years.

We assume that the employment rate of college graduates is the same as that of university graduates.

The formula used to calculate the employment rate is:

empr(y,s,a,e)=[employed(y,s, a, e)]/pop(y,s, a, e)

The data sources of employment rates are listed in the table below:

Data	Sources
The employed by age, sex and education Level in 1987	"China Population Census 1987"
Population by age, sex and education level in 1987	"China Population Census 1987"
The employed by age, sex and education level in 1995	"China Population Census 1995"
Population by age, sex and education level in 1995	"China Population Census 1995"
The employed by age, sex and education level in 2000	"China Population Census 2000"
Population by age, sex and education level in 2000	"China Population Census 2000"
The employed by age group, sex and education in 2005	"China Population and Employment Statistics Yearbook 2006"
The employed by age group, sex and education in 2010	"China Population and Employment Statistics Yearbook 2011"
Population by age, sex and education in 2010	"China Population Census 2011"

Note: The 1% sample population in 1995 is converted to the total population by the actual sampling percentage of 1.04%.

The employed in "China Population Census 2000" for each province, autonomous region and municipality is aggregated to get the total population employed by the actual sampling percentage of 9.5%. To divide the age group data in 2005 and 2010 we assume that the employment rate in each age in the same age group has the same increasing rate. For example , the employment rate of a 25-year-old individual in 2005 equals to the employment rate of a 25-year-old individual in 2000 times the growth rate of the employment rate of the individual's corresponding age group (25-29) between 2000 and 2005.

3. Calculation of enrollment rate

Enrollment rate is the share of people with education level *e* enrolled in a higher level of education *e*+1.

3.1 Calculation of enrollment by sex, age and education level

Based on the age distribution of the enrollment number for a certain education level and sex, the enrollment number of each year by sex, age and education level is given by:

$$\text{NewEnroll}(y,s,a,e) = \text{NewEnroll}(y,s,e) * \lambda(y,s,a,e)$$

$$\sum_{a} \lambda(y,s,a,e) = 1$$

Note that $\lambda(y,s,a,e)$ refers to the age distribution of the enrollment number for each education level and sex.

There is no college or university in rural areas, so the enrollment number of college and university in rural areas is assumed to be 0.

3.2 In-school population of each education level and each grade

The in-school population of age *a*, sex *s*, education level *e*, and grade *n*+1 in year *y* is the enrolled population of age a-n, sex s , and education level e in year y-n:

pop_inschool(y,s,a,e-n)= NewEnroll (y-n,s,a-n,e)

3.3 Enrollment rate of each education level and each grade

The probability of advancing to the next higher level of education is estimated by the average ratio of the sum of all students of any age in a year initially enrolled to the sum of all students of any age initially enrolled in the next higher level of education *X* years later, where *X* is the number of years it takes to complete an education level.

3.3.1 Enrollment rate from no schooling to primary school

The formula from no schooling to primary school is:

senr(y,s,a,pri-ns) = Newenroll(y+1,s, pri)/ pop(y,s,ns)

The upper(lower) bound of people out of school in year y and enrolled into primary school in year y+1 is determined by the upper(lower) bound of the age distribution for enrollment of primary school in year y+1. For example, the age distribution for enrollment of primary school in year 2008 is from 5 to 10. The upper(lower) bound of people who have no schooling in year 2007 and enrolled into primary school in year 2008 is 9(4). .

3.3.2 Enrollment rate from primary school to junior middle school

The steps of calculating this enrollment rate by sex and age in year y are as follows:

(1) The enrollment rate of the first grade of primary school in year y by age and sex is the average enrollment rate that the group in this grade can be

enrolled in the first grade of junior middle school six years later, and the formula is:

senr(y,s,a,jm-pri) = newEnroll (y+6, s, jm)/ newEnroll (y, s, pri)

(2) The population of the second grade of primary school in year y by age and sex is the enrolled population of primary school in year y-1 by age and sex. The probability that the group in this grade can be enrolled in junior middle school 5 years later is the average enrollment rate that the group in this grade can be enrolled in the first grade of junior middle school five years later, and the formula is:

senr(y,s,a,jm-pri-1) = newEnroll (y+5,s,jm)/ newEnroll (y-1,s,pri)

(3) The population of the third grade of primary school in year y by age and sex is the enrolled population of primary school in year y-2 by age and sex. The probability that the group in this grade can be enrolled in junior middle school 4 years later is the average enrollment rate that the group in this grade can be enrolled in the first grade of junior middle school four years later, and the formula is:

senr(y,s,a,jm-pri-2) = newEnroll (y+4,s,jm)/ newEnroll (y-2,s,pri)

(4) Similarly, we can calculate the probability of the group of each grade in primary school being enrolled in junior middle school in year y.

3.3.3 Enrollment rate from junior middle school to senior middle school

The steps of calculating this enrollment rate by sex and age in year *y* are as follows:

(1) The enrollment rate of the first grade of junior middle school in year y by age is the average enrollment rate that the group in this grade can be enrolled in the first grade of senior middle school three years later, and the formula is:

senr(y,s,a,sm-jm) = newEnroll (y+3,s,sm)/ newEnroll (y,s,jm)

(2) The population of the second grade of junior middle school in year y by age and sex is the enrolled population of junior school in year y-1 by age and sex. The probability that the group in this grade can be enrolled in senior middle school two years later is the average enrollment rate that the group in this grade can be enrolled in the first grade of senior middle school two years later, and the formula is:

senr(y,s,a,sm-jm-1) = newEnroll (y+2,s,sm)/ newEnroll (y-1,s,jm)

(3) Similarly, we can calculate the probability of the group of each grade in junior middle school being enrolled in senior middle school in year y.

3.3.4 Enrollment rate from senior middle school to college or university

The steps of calculating the enrollment rate from senior middle school to college by sex and age in year *y* are as follows:

(1) The enrollment rate of the first grade of senior middle school in year *y* by age is the average enrollment rate that the group in this grade can be enrolled in the first grade of college three years later, and the formula is:

senr(y,s,a,col-sm) = newEnroll (y+3,s,col)/ newEnroll (y,s,sm)

(2) The population of the second grade of senior middle school in year y by age and sex is the enrolled population of senior school in year y-1 by age and sex. The probability that the group in this grade can be enrolled in college two years later is the average enrollment rate that individuals in this grade can be enrolled in the first grade of college two years later, and the formula is:

senr(y,s,a,col-sm-1) = newEnroll (y+2,s,col)/ newEnroll (y-1,s,sm)

(3) Similarly, we can calculate the probability of the group of each grade in senior middle school being enrolled in college in year *y*.

The steps of calculating the enrollment rate from senior middle school to university by sex and age in year *y* are as follows:

(1) The enrollment rate of the first grade of senior middle school in year y by age is the average enrollment rate that the group in this grade can be enrolled in the first grade of university three years later, and the formula is:

senr(y,s,a,col-uni) =newEnroll (y+3,s,uni)/ newEnroll (y,s,sm)

(2) The population of the second grade of senior middle school in year y by age and sex is the enrolled population of senior school in year y-1 by age and sex. The probability that the group in this grade can be enrolled in university two years later is the average enrollment rate that the group in this grade can be enrolled in the first grade of university two years later, and the formula is:

senr(y,s,a,uni -sm-1) = newEnroll (y+2,s,uni)/ newEnroll (y-1,s,sm)

(3) Similarly, we can calculate the probability of the group of each grade in senior middle school being enrolled in university in year *y*.

Two points worth noting are as follows:

(1) By using the enrolled population in different years for calculating enrollment rates, an adjustment has already been made for the survival rate. Therefore, the survival rate is not included in the formula. We also assume that no one drops out, skips a grade, repeats a grade, or takes leaves for a year or more within a certain education category.

(2) We could only calculate the enrollment rate of primary school till 2007 for lack of data. We use 2007 enrollment rates for years after 2007. Likewise, for enrollment rates of junior middle school and high school, we fix the enrollment rates for 2012 and 2013 at the 2011 levels.

4. Growth rate of real wage

The datum used to calculate rural growth rate are rural CPI and average pure income of rural residents. Calculation method: rural real income is equal to average pure income of rural residents divided by rural CPI. Rural growth rate in T-1 period is equal to the income gap between rural real income in T and T-1 period divided by rural real income in T-1 period. The datum used to calculate urban growth rate are urban CPI and average wage of urban employees. Calculation method: urban real wage is equal to average wage of urban employees divided by urban CPI. Urban growth rate in T-1 period is equal to the income gap between urban real wage in T and T-1 period divided by urban real wage in T-1 period. The result shows that, for the 32-year period, 1985-2017, growth rate on average is 6.19% and 8.17% annually in the rural and urban sectors, respectively.

5. Discount rate

The discount rate we use is 4.58%, following Jorgenson and Yun (1990) and Jorgenson and Fraumeni (1992a). It is based on the rate of return on long-term investments in the private sector of the U.S. economy and also adopted by the OECD consortium (OECD 2010).

6. Calculation of human capital

6.1 Human capital of in-school population

The number of years discounted until they accumulate the higher level of human capital depends on the number of years it takes to complete the starting grade level and the current grade of enrollment within the starting grade level.

6.1.1 Human capital of population in primary school by age and sex

(1) If an individual in the first grade of primary school can advance to the next higher level of education, he could get human capital equal to that of someone who is currently six years older and whose educational attainment is junior middle school. We discount that income by 6 years to reflect the fact that it takes 6 years for him to reach junior middle school: $senr(y,s,a,jm\text{-}pri)*mi(y,s,a+6,jm)*R^6$

(2) If an individual in the second grade of primary school can advance to the next higher level of education, his human capital is calculated as: $senr(y,s,a,jm\text{-}pri\text{-}1)*mi(y,s,a+5,jm)*R^5$, discounted by 5 years as it takes him 5 years to reach junior middle school.

(3) Similarly, we can calculate the human capital of the group in each grade of primary school.

6.1.2 Human capital of the group in junior middle school and above by age and sex

Take junior middle school as an example.

(1) If an individual in the first grade of junior middle school can advance to the next higher level of education, he could get human capital equal to that of someone who is currently three years older and whose educational attainment is senior middle school. We discount that income by 3 years as it takes 3 years for him to reach senior middle school: $senr(y,s,a,sm\text{-}jm)*mi(y,s,a+3,sm)*R^3$

(2) If an individual in the second grade of junior middle school can advance to the next higher level of education, his human capital is calculated as:

$senr(y,s,a,sm\text{-}jm\text{-}1)*mi(y,s,a+2,sm)*R^2$, discounted by 2 years as it takes 2 years for him to reach senior middle school.

(3) Similarly, we can calculate the human capital of the group in each grade of junior middle school.

For the years that we do not separate enrollments for university and college (there are five categories for education level, and the last level is college and above), we get the human capital of the group in the first grade of senior middle school as:

$senr(y,s,a,col\text{-}sm)*mi(y,s,a+3,col)*R^3$

For grade 2 and 3 students, the human capital is given by:

$$senr(y,s,a,col\text{-}sm\text{-}1)*mi(y,s,a+2,col)*R^2$$

and

$$senr(y,s,a,col\text{-}sm\text{-}1)*mi(y,s,a+2,col)*R,$$

respectively.

For the years that separate university and college enrollments are available (there are six categories for education level, and the last level is university and above), we should use the human capital equation:

$senr(y,s,a,col\text{-}sm)*mi(y,s,a+3,col)*R^3+senr(y,s,a,uni\text{-}sm)*mi(y,s,a+3,uni)*R^3$,

as for senior middle school students, they can go to college or university after their graduation.

For grade 2 students, the human capital is calculated as:

$senr(y,s,a,col\text{-}sm\text{-}1)*mi(y,s,\ a+2,col)*R^2+senr(y,s,a,uni\text{-}sm\text{-}1)*mi(y,s,a+2,uni)*R^2$.

Similarly, we can calculate the human capital of the group in each grade of senior middle school.

Note that by using the average ratio of the sum of all students of any age in a year initially enrolled to the sum of all students of any age initially enrolled in the next higher education level X years later, an adjustment has already been made for age-specific survival rates. Accordingly, the survival rate does not appear in the formula.

6.2 Human capital of -out-of-school population

6.2.1 Calculation of out-of-school population

In-school population of age a, sex s, and education level e in year y, pop_inschool(y,s,a,e), is the sum of population of each grade:

$$\text{pop\_inschool}(y,s,a,e) = \sum_{n=0}^{y(e)} \text{pop\_inschool}(y, s, a, e)$$

where y(e) is the number of years to achieve education level e. The formula for calculating out-of-school population of age a, sex s, and education level e in year y is:

pop_noschool(y,s,a,e) = pop(y, s, a,e) - pop_inschool(y,s,a,e)

Note that following adjustment is made for negative values in out-of-school population.

(1) Reset negative out-of-school population for certain gender, age and education level to 0. The negative out-of-school population mainly appears in primary school for students aged 5-10.

(2) Add the weighted negative out-of-school population for certain gender, age and education level to the in-school population by grades, where the weights are the proportion of population in each grade by gender, age, and education level.

6.2.2 Human capital of -out-of-school population

The out-of-school population consists of people who are working. For people below the age of 60, the formula for human capital is:

mi(y,s,a,e) = ymi(y,s,a,e) + sr(y,s)*mi((y,s,a+1,e)*R

For those who are over 60, human capital is zero, i.e. ymi = 0.

7. Human capital stock in China: 1985-2017

The income estimated by the Mincer equation is the real yearly income (using 1985 as the based). We use CPI and real income to obtain the nominal yearly income.

Tables C.1- C.2 reports the real human capital in China with 1985 as the baseline year. Tables C.3-C.4 show the labor force human capital.

In all these tables, we report the results based on six education categories from 1985-2017. Due to data reasons, originally when we do the imputation we do not differentiate college and university before 2000; when we do human capital calculation we separate college and university before 2000 by using China Population Census 1990 and 2000. China Population Census 1990 recorded the population of university by age, sex and region. It is convenient for us to use China Population Census 1990 and 2000 to separate “university and above” from “college and above” before 2000. We use data from the China Educational Statistical Yearbook before 2000 to calculate the national university share in college and university enrollment. Then we assume that the ratio of university to college enrollment is the same in all provinces. We also assume that the ratio of university to college enrollment is the same across gender.

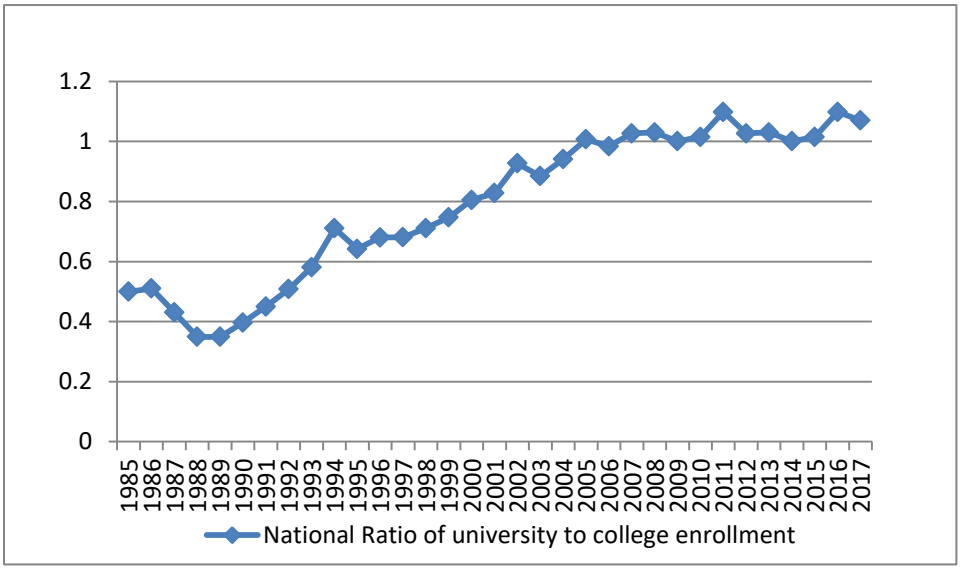

Figure C.7.1 National ratio of university to college enrollment, 1985-2017

Tables and figures of appendix C

Table C.1 Real Human Capital by Region and Gender, 1985-2017

Unit: Billion Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	9382	4927	9990	13160
1986	11417	5573	11155	13066
1987	12629	6411	12407	12989
1988	12896	6675	12705	12133
1989	13382	7147	12524	11012
1990	15076	8339	14160	11415
1991	17451	9990	16411	12018
1992	20247	11302	18184	12142
1993	20247	11302	18184	12142
1994	21811	12014	18540	11380
1995	21570	11648	17341	9843
1996	20724	11717	16895	9021

Year	Urban Male	Urban Female	Rural Male	Rural Female
1997	24211	13445	17490	8815
1998	26851	15538	19026	8909
1999	32887	18720	21088	9458
2000	40452	23537	23540	10051
2001	46759	28831	25873	10686
2002	50668	32178	28200	11429
2003	55466	34485	29886	11897
2004	61164	37812	31428	12346
2005	65057	40820	31833	12550
2006	70547	44035	32785	13145
2007	81535	49327	35737	14457
2008	88540	52283	35730	14846
2009	95518	55259	35656	15402
2010	108033	60934	38153	17046
2011	114815	63761	39119	18331
2012	128130	69360	38595	18895
2013	140023	73450	38917	19759
2014	159063	80404	39547	20974
2015	172379	85440	40944	22725
2016	185740	87791	43068	25341
2017	203057	93575	41661	26684

Note: The results are based on six education categories.

Table C.2 Per Capita Real Human Capital by Region and Gender, 1985-2017

Unit: Thousand Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	81.57	49.65	26.29	37.89
1986	95.19	54.31	29.40	37.38
1987	101.68	59.53	32.79	37.12

Year	Urban Male	Urban Female	Rural Male	Rural Female
1988	97.82	58.44	32.79	34.20
1989	96.41	59.41	32.09	31.12
1990	105.97	67.26	36.01	32.25
1991	119.23	77.42	41.15	33.46
1992	136.76	85.98	45.94	34.05
1993	144.49	89.05	46.71	31.81
1994	141.44	83.92	43.60	27.41
1995	133.27	81.15	42.38	25.00
1996	142.68	86.30	44.03	24.62
1997	148.72	95.27	49.50	25.90
1998	171.68	108.50	55.96	28.16
1999	200.49	129.06	63.69	30.70
2000	219.56	149.83	71.23	33.33
2001	226.57	158.22	78.67	35.98
2002	241.35	165.00	87.05	39.01
2003	257.20	174.35	94.42	41.70
2004	266.79	181.60	99.01	43.63
2005	277.51	187.09	105.26	47.05
2006	303.42	200.09	114.23	51.83
2007	321.68	209.69	118.23	55.57
2008	334.74	215.91	119.79	58.97
2009	367.44	233.36	130.34	66.84
2010	377.38	238.38	134.69	72.88
2011	404.27	249.66	133.02	75.56
2012	437.64	262.05	140.42	83.00
2013	485.58	280.56	146.77	90.74
2014	516.31	292.33	156.84	101.13
2015	544.61	294.75	169.11	115.24
2016	578.69	302.65	168.37	124.17
2017	609.77	308.38	178.16	142.62

Note: The results are based on six education categories.

Table C.3 Real Labor Force Human Capital by Region and Gender, 1985-2017

Unit: Billion Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	4089	1857	4024	5464
1986	4672	2136	4602	5507
1987	5307	2501	5246	5603
1988	5410	2615	5582	5343
1989	5640	2808	5639	4914
1990	6675	3386	6477	5149
1991	7327	3861	7633	5509
1992	7590	4106	8517	5618
1993	7407	4064	8740	5288
1994	6681	3790	8163	4565
1995	6584	3835	7963	4169
1996	7332	4219	8432	4120
1997	8542	4728	9145	4183
1998	10387	5680	10387	4479
1999	12552	6984	11665	4768
2000	15413	8379	12924	5069
2001	16953	9327	13949	5379
2002	18826	10218	14825	5650
2003	20644	11226	15663	5963
2004	22057	12184	15669	6023
2005	25364	13924	16067	6276
2006	29443	15707	18342	7190
2007	31929	16692	18869	7590
2008	34347	17612	19241	8042
2009	40151	20101	20842	9056
2010	46819	22892	21583	9857

Year	Urban Male	Urban Female	Rural Male	Rural Female
2011	50607	23944	21924	10459
2012	53276	24469	22063	10972
2013	58227	25926	22514	11819
2014	62109	26542	23230	12921
2015	68697	28188	24241	14427
2016	71013	28785	24525	15986
2017	73932	29306	25271	17923

Note: The results are based on six education categories.

Table C.4 Per Capita Real Labor Force Human Capital by Region and Gender, 1985-2017

Unit: Thousand Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	56.46	29.49	18.62	27.58
1986	61.78	32.78	21.07	27.26
1987	66.53	36.01	23.65	27.07
1988	63.22	35.12	24.01	25.07
1989	61.89	35.37	23.68	22.85
1990	69.94	40.69	26.60	23.67
1991	74.81	44.40	30.49	24.55
1992	77.31	46.36	33.81	24.79
1993	75.36	45.24	34.30	23.00
1994	67.74	40.97	31.92	19.66
1995	64.88	39.46	30.91	17.74
1996	66.84	40.62	32.62	17.57
1997	81.25	46.47	36.23	18.42
1998	93.81	53.28	41.53	20.04
1999	106.55	61.15	47.23	21.80

2000	107.33	63.52	52.81	23.52
2001	113.43	67.19	57.79	25.08
2002	123.52	72.06	63.44	27.04
2003	131.53	76.48	68.31	28.92
2004	136.51	79.67	70.69	29.93
2005	146.77	85.04	74.85	31.98
2006	161.38	92.42	83.58	36.25
2007	171.27	97.99	87.77	39.57
2008	178.14	101.84	90.02	42.57
2009	199.55	113.14	98.57	48.83
2010	217.98	122.42	102.23	53.69
2011	228.10	124.35	103.64	57.11
2012	240.73	127.74	109.21	63.00
2013	258.66	133.24	114.32	69.67
2014	270.83	133.66	121.52	78.04
2015	287.56	136.50	129.89	88.84
2016	299.61	138.73	134.86	100.22
2017	313.17	141.07	143.43	116.44

Note: The results are based on six education categories.

Appendix D Physical Capital Estimation

1. Two measurements of physical capital

For each province, we calculate variations of two measures of physical capital stock:

(1) Wealth capital stock (or: net capital stock): measures the monetary value of the physical capital stock. To be used in this report, in comparisons of the value of physical to human capital.

(2) Productive capital stock: measures the volume (or productive capacity) of physical capital. To be used, for example, in productivity analysis.

Note that when geometric depreciation is adopted, the wealth capital and productive capital stocks are identical.

In productivity analysis, what are of interest are the services rendered in a particular period by capital as an input to the production process. It is assumed that the services rendered by the productive capital stock in a particular period are in fixed proportion to the productive capital stock. In calculating aggregate growth of productive physical capital we therefore also refer to growth in capital services. (In productivity analysis, an analogue of capital services is labor services, with the services rendered by labor in the production of a particular volume of output in a particular period being assumed to be in constant proportion to the number of laborers or number of laborer-hours worked in that period.)

Our capital measures closely follow the OECD Manual (2009) on *Measuring Capital* and the physical capital chapter in the OECD Manual

(2001) on *Measuring Productivity*. For the case of a hyperbolic age-efficiency function, the methods used by the U.S. Bureau of Labor Statistics and the Australian Bureau of Statistics are consulted.

We calculate the two measures of physical capital stock in five variations:

(1) Wealth capital stock at the end of the year in (mid-year) 1985 prices, based on geometric depreciation.

(2) Wealth capital stock at the end of the year in current prices, based on a geometric age-price profile.

(3) An index of real growth in end-year wealth capital stock, based on a geometric age-price profile and with the 1985 value set equal to one.

(4) An index of real growth in capital services, based on a geometric depreciation and with the 1985 value set equal to one.

(5) An index of real growth in capital services, based on hyperbolic depreciation using parameters adopted by the U.S. Bureau of Labor Statistics and the Australian Bureau of Statistics and with the 1985 value set equal to one.

The first four variations of capital stock (and services) measures are derived using a modification of an OECD-provided model spreadsheet. The fifth variation follows from more elaborate, own calculations. (Own calculations for the first four variations confirm the results obtained via the modified OECD-provided spreadsheet.)

2. Data and data sources

For each province, the following data are needed:

(1) Investment values in form of gross fixed capital formation, with a breakdown by type of asset adopted from the investment statistics;

(2) Investment in fixed assets price index, with a breakdown by type of asset;

(3) CPI;

(4) Aggregate income accounts with a breakdown into labor remuneration, operating surplus, depreciation, and net taxes on production.

The source of the data for the most recent years is the statistical database on the NBS website. Historical data are obtained from *GDP 1952-1995* and *Sixty Years*. Occasionally the *China Statistical Yearbook* and provincial statistical yearbooks are consulted. All constant-price values are in 1985 prices, and real growth indices use 1985 as base year (with value one).

Provincial values of gross fixed capital formation (GFCF) are obtained from the NBS website and *Sixty Years*. These are the most up-to-date values that incorporate all benchmark revisions, up to and including the benchmark revision following the 2013 economic census. GFCF values do not come with a breakdown by type of asset.

The investment statistics provide a breakdown of total investment by type of asset: structures, equipment, and "others." These province- and year-specific proportions of structures, equipment, and "others" in total investment are applied to the provincial annual GFCF values. Investment data by type of asset are available since 2003 (NBS website). For each province, values for 1951-2002 are estimated by establishing the 1950 proportions, and then connecting these 1950 proportions linearly to the average 2003-2005 proportions. Approximate 1950 proportions of the three

types of assets in total economy-wide (national) investment are uniformly used for all provinces (structures 75%, equipment 20%, and "others" 5%).

Data on the investment in fixed assets price index are available for the years since 1991, including by type of asset (NBS website). For earlier years, price changes are obtained from nominal GFCF values together with GFCF real growth rates, both published in *GDP 1952-1995*. This GFCF deflator is applied equally to all three types of assets (structures, equipment, "others"). In the case of provinces (or years) with missing nominal GFCF values and/or missing GFCF real growth rates, the deflator of industry value-added is used as proxy (with values from *Sixty Years*).

CPI data are obtained from the NBS website.

Income accounts data are obtained in two steps in order to address statistical breaks and to ensure that income accounts data and aggregate expenditure data (including GFCF) are consistent. First, the share of each income component in aggregate income is calculated. The underlying income data for the years since 1993 are from the NBS website and for the years 1978 through 1992 from *GDP 1952-1995*. Shares for the years 1950-1977 are set equal to the average 1978-1982 shares. In a second step, absolute values are obtained by multiplying the share values by aggregate expenditures (using data from the same sources as reported above for GFCF, one of the components of aggregate expenditures).

Missing data are addressed through appropriate approximations. For example, (early) Chongqing GFCF data are constructed as

$$\text{Chongqing GFCF} = \frac{Sichuan\ GFCF}{\text{Sichuan GCF}} * Chongqing\ GCF \qquad (1)$$

With the data taken from *Sixty Years* (and GCF denoting gross capital

formation, i.e., GFCF plus inventory investment). A very occasional unreasonably extreme data point may be replaced by the mean of the previous and following years' values. A list of all special adjustments has been compiled.

3. Initial capital stock

The initial year of our capital stock series is 1952. The (province-specific) capital stock value W_{1952} is obtained equally for all our measures of capital as

$$W_{1952} = \frac{GFCF_{1953}}{\delta+\theta} - GFCF_{1953} \qquad (2)$$

$GFCF_{1953}$ is GFCF of the year 1953, θ is the asset-specific average annual (geometric) real growth rate of GFCF between 1953 and 1957, and δ is the asset-specific depreciation rate (using the double-declining balance method). For some but not all provinces, GFCF value would have been available for 1950-1952, and a judgment was made that the first somewhat reliable (non-erratic) post-war GFCF value is probably the 1953 value.

4. Methodology

We follow the method outlined in the OECD Manual (2009) on *Measuring Capital* and the physical capital chapter in the OECD Manual (2001) on *Measuring Productivity*. Following other countries' experiences as reported in the first manual, and our evaluation of the circumstances in China, average service lives of physical assets are taken to be 40 years for

structures, 16 years for equipment, and 25 years for "others."

The procedure comprises two stages. First, constant-price GFCF of a particular type of asset is subjected to a survival function and age-efficiency profile to obtain productive capital stock, or to a survival function and age-price profile to obtain wealth capital stock.

Second, to obtain the growth rate of aggregate capital services, the growth rates of different types of productive capital stock (structures, equipment, "others") are combined using a Tornqvist index with user costs as weights. Aggregate (nominal or constant-price) wealth capital stock is obtained by summing the asset-specific wealth capital stock, while the real growth rate of the aggregate wealth capital stock is obtained by combining the real growth rates of asset-specific wealth capital using a Tornqvist index, with current-price wealth capital values used in constructing the weights.

4.1 Geometric age-efficiency profile, single type of asset

We follow common practice in the case of a geometric age-efficiency profile, of not separately including a survival function in deriving asset-specific productive or wealth capital stock. With a geometric age-efficiency profile, age-efficiency and age-price profile are identical, and thereby asset-specific productive capital stock and wealth capital stock are identical. The formula for geometric age-efficiency is

$$g_n = (1 - \delta)^n \qquad (3)$$

Where n denotes age and δ denotes the rate of efficiency decline or the depreciation rate. The rate of efficiency decline (depreciation rate) is obtained using the double-declining balance method, as 2 divided by the

average service life. Starting at twice the average service life, efficiency (as well as the price) is set equal to zero.

4.2 Hyperbolic age-efficiency profile, single type of asset

The survival function is 1 minus the asset-specific cumulative normal distribution, with asset-specific average service lives given above, and a standard deviation equal to one-quarter of the average service life.

The age-efficiency profile is described by the hyperbolic function

$$g_n = \frac{(T-n)}{(T-b*n)} \qquad (4)$$

In this report, parameters for the hyperbolic function are set to those used by the U.S. Bureau of Labor Statistics and the Australian Bureau of Statistics. Specifically, with n denoting age, T is twice the average service life, and b is a shape parameter that takes the value 0.75 in the case of structures, and 0.5 otherwise.

In the case of a non-geometric age-efficiency profile, the age-price profile is not identical to the age-efficiency profile. But the two are connected: following the asset market equilibrium condition, the current year's price of an asset equals the discounted stream of future rental income from the asset, where each future period's rental income depends on the productive capacity (efficiency) of the asset at that point in time, and the current year's price of the asset thereby on the age-efficiency profile of the asset. A series of current year prices constitutes the age-price profile of an asset. Following the procedures employed by the U.S. Bureau of Labor Statistics and by the Australian Bureau of Statistics, a discount rate of 4% as a long-run average rate of return is assumed in deriving the age-price profile

from the age-efficiency profile.

4.3 Aggregate capital values and growth rates

To obtain the real growth rate of aggregate productive capital stock or of capital services (assumed to be a fixed proportion of the productive capital stock), the growth rates of the different types of assets—structures, equipment, and "others"—at a particular point in time t are aggregated using the Tornqvist index T:

$$T_t = \prod_{i=1}^{3} Z_{it}^{(Share_{it}+Share_{it-1})/2} \quad (5)$$

Where Z denotes the growth rate of constant-price productive capital stock K.

The asset-specific weight in the Tornqvist index is the arithmetic mean of a previous-year and a current-year value denoting the share of this asset's user cost U_i in aggregate user costs U:

$$. \qquad Share_{it} = U_{it} / \sum_{i=1}^{3} U_{it} \quad (6)$$

The user cost of a particular type of asset (type of productive capital) is defined as the rental rate times the current-price productive capital stock (q*K), with the rental rate covering depreciation and a rate of return, less appreciation of the asset during the period:

$$. \qquad U_{it} = \left(\delta_{it} + r_t - \frac{q_{it}-q_{it-1}}{q_{it}}\right) * q_{it} K_{it}^{P} \quad (7)$$

The rate of depreciation follows from the age-price profile, and the rate of appreciation is obtained from the investment in fixed assets price index. The rate of return is unknown and the asset-specific user costs, thus, are unknown.

To solve equation (7), the rate of return is assumed to be identical across all types of assets. An economy-wide (province-specific) value of user costs is obtained from the income accounts data as the sum of operating surplus, depreciation and a proportion of net taxes on production. The proportion of net taxes to include is "operating surplus plus depreciation" as a share of "operating surplus plus depreciation plus labor remuneration;" i.e., total income is attributed to labor (labor remuneration) and capital (operating surplus plus depreciation), and the final income component of net taxes on production is split proportionally between labor and capital. This economy-wide value of user costs equals the sum of the user costs of the three types of assets, which allows one to solve for the rate of return r_t in:

$$U_t = \sum_{i=1}^{3} U_{it} = \sum_{i=1}^{3} \left(\delta_{it} + r_t - \frac{q_{it} - q_{it-1}}{q_{it}}\right) * q_{it} K_{it}^{P} \qquad (8)$$

Once r_t is known, the asset-specific user costs (7) can be calculated, providing the shares (6) used in the Tornqvist index to obtain the real growth rate of capital services (5).

One shortcoming of this procedure is that in the first step, the age-price profile is derived using an assumed long-run rate of return, only to obtain a depreciation rate which then allows one to, in equation (8) solve for the current-year rate of return. Alternatively, one could not calculate an age-price profile and assume a depreciation rate in equations (7) and (8), thereby abandoning the consistency between age-efficiency and age-price profile. The advantage of this procedure is that one is not limited to the use of a rather unrealistic geometric age-efficiency profile.

The absolute value of the aggregate wealth capital stock, in constant or current prices, is simply the sum of the asset-specific wealth capital stock.

To obtain a real growth rate for aggregate wealth capital stock, asset-specific constant-price wealth capital stock is aggregated using the Tornqvist index, with current-price asset values used to calculate the shares that enter the weights.

Tables of appendix D

Table D.1 Wealth Capital Stock at Constant Prices, 1985-2017（hyperbolic）

Unit: 1 billion of 1985 Yuan

Province	1985	1990	1995	2000	2005	2017
Beijing	51	116	228	436	862	3181
Tianjin	38	67	115	202	376	2574
Hebei	95	147	244	483	870	4239
Shanxi	54	80	109	167	308	1590
Inner Mongolia	31	50	92	150	390	3422
Liaoning	102	163	253	358	628	2810
Jilin	40	63	99	151	275	2148
Heilongjiang	68	106	151	240	381	1764
Shanghai	71	132	253	502	850	2486
Jiangsu	99	220	481	954	1914	9169
Zhejiang	15	31	151	448	1097	4622
Anhui	46	80	130	222	382	2042
Fujian	31	50	93	196	363	2115
Jiangxi	43	64	104	180	371	1850
Shandong	122	213	351	618	1243	6071
Henan	99	162	259	478	892	6429
Hubei	70	106	176	352	615	3285
Hunan	48	73	103	165	284	1587
Guangdong	94	163	388	811	1592	7652
Guangxi	45	57	87	144	258	1918
Hainan	8	17	41	61	92	438

Province	1985	1990	1995	2000	2005	2017
Chongqing	47	61	96	180	389	2081
Sichuan	73	109	160	283	517	2416
Guizhou	29	40	53	86	164	892
Yunnan	75	89	135	215	345	2078
Tibet	8	10	15	20	40	270
Shaanxi	41	70	99	149	257	1547
Gansu	34	51	63	90	161	712
Qinghai	14	20	27	48	97	700
Ningxia	13	19	25	34	65	475
Xinjiang	32	52	103	172	298	1504
National	**2082**	**3237**	**5268**	**8781**	**15570**	**67548**

Table D.2 Wealth Capital Stock at Constant Prices, 1985-2017（geometric）

Unit: 1 billion of 1985 Yuan

Province	1985	1990	1995	2000	2005	2017
Beijing	43	98	192	363	720	2596
Tianjin	31	55	95	166	312	2136
Hebei	76	118	199	401	721	3480
Shanxi	43	64	87	134	255	1300
Inner Mongolia	25	40	76	122	336	2811
Liaoning	79	131	206	288	520	2251
Jilin	32	51	80	122	228	1753
Heilongjiang	56	86	122	194	309	1452
Shanghai	59	109	212	417	697	2003
Jiangsu	83	186	407	797	1602	7486
Zhejiang	12	26	136	388	940	3774
Anhui	37	66	107	182	315	1697
Fujian	25	41	78	165	302	1761
Jiangxi	34	51	85	148	311	1518
Shandong	100	175	286	508	1038	4963
Henan	80	131	211	395	742	5339

Hubei	56	85	144	293	508	2743
Hunan	39	58	82	133	233	1312
Guangdong	78	134	331	684	1333	6333
Guangxi	35	44	70	119	215	1583
Hainan	6	14	35	50	74	365
Chongqing	36	47	77	149	329	1735
Sichuan	60	88	128	232	427	1993
Guizhou	23	32	42	70	135	753
Yunnan	56	68	109	176	283	1764
Tibet	6	8	12	16	33	228
Shaanxi	33	57	79	119	210	1285
Gansu	27	40	49	72	132	588
Qinghai	11	16	21	39	81	596
Ningxia	11	15	19	27	54	400
Xinjiang	26	42	86	141	245	1255
National	**1672**	**2604**	**4290**	**7165**	**12825**	**55386**

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