Human Capital in China

2020

Principal Investigator

Haizheng Li

China Center for Human Capital and Labor Market Research

Central University of Finance and Economics

Beijing, China

December 2020

Despite the global pandemic of 2020, the research team has successfully completed the project by virtually working together online.

Connected via the cloud, all team members worked diligently and persistently no matter where they were during these challenging times.

We look forward to triumphing in the fight against the pandemic and wish health and peace for all mankind.

May the light of hope always lead us forward.

This project is funded by

Research Team Members

Principal Investigator

Haizheng Li
Special-term Professor

China Center for Human Capital and Labor Market Research (CHLR),

Central University of Finance and Economics (CUFE)

& Professor, Georgia Institute of Technology

Faculty Team Members

Belton Fleisher
Special-term Professor and Senior Fellow, CHLR (2008- present)

Professor Emeritus of Economics, Ohio State University

Scientific Editor of China Economic Review

Barbara Fraumeni
Special-term Professor and Senior Fellow, CHLR (2008- present)

Professor Emerita of Public Policy, University of Southern Maine

Carsten A. Holz
Special-term Professor, CHLR (2013- present)

Professor of Social Science

Hong Kong University of Science & Technology

Cynthia Bansak
Special-term Professor, CHLR (2018- present)

Professor of Economics

St. Lawrence University

Zhiqiang Liu
Special-term Professor, CHLR (2008- present)

Professor of Economics

State University of New York at Buffalo

Xiaojun Wang	Special-term Professor, CHLR (2008- present)
	Associate Professor of Economics
	University of Hawaii at Manoa
Sophie Xuefei Wang	Associate Professor, CHLR (2012- present)
Fanzheng Yang	Assistant Professor, CHLR (2013- present)
Ning Jia	Assistant Professor, CHLR (2015- present)
Nina Yin	Assistant Professor, CHLR (2015- present)
Shan Li	Assistant Professor, CHLR (2016- present)
Chen Huang	Assistant Professor, CHLR (2019- present)

2020 Student Team

Project Management Committee

Manager	Chaoqi Wang
Members	Lingyan Shi, Yiting Xu, Hanjun Wang

Graduate Students, CHLR

2019 students	Xiaoxue Chang, Xiaojie Gong, Xinwei Guo, Yufeng Hong, Li Li, Ruobing Li, Zuo Li, Ruohong Xu, Lei Shi, Rui Tong, Xiaoyu Xiang, Ziru Wang, Hao Zhong, Wei Zhang, Zhebin Zhang

Doctoral and postdoctoral students participating in this project：

Mingyu Ma	Doctoral Student, CHLR (2019- present)
Xin Li	Doctoral Student, CHLR (2019- present)
Yiting Xu	Doctoral Student, CHLR (2018- present)
Yan Su	Doctoral Student, CHLR (2017- present)
Xing Chen	Doctoral Student, CHLR (2015- 2020)
Yuzhe Ning	Doctoral Student, CHLR (2015- 2020)

Administrative Members at the CHLR

| Rong Huang | Executive Assistant to Director/Project Coordinator (2015- present) |
| Shujia Zhao | Project Coordinator (2018- present) |

2019 Student Team

Project Management Committee

| Manager | Mingyu Ma |
| Members | Xin Li , Yan Su , Xinli Xu, Zesen Ye |

Graduate Students, CHLR

| 2018 students | Xian Dong, Yue Du, Xiaoxuan He, Huan Liu, Lingyan Shi, Yabing Tang, Chaoqi Wang, Hanjun Wang, Guangyin Wen, Heng Xu, Hongyu Yang |

2018 Student Team

Project Management Committee

Manager	Shuning Yuan
Members	Ce Guo, Jiantao Ma

Graduate Students, CHLR

2017 students	Siyao Dai, Lingxiao Huang, Xin Li, Junjian Liu, Mingyu Ma, Xinli Xu, Zeshen Ye, Xin Zhang, Yong Zhang

2017 Student Team

Project Management Committee

Manager	Yue Sun
Members	Youfang Gao, Yue Guo, Wenjun Mao, Hongbin Pan

Graduate Students, CHLR

2016 students	Ce Guo, Kerui Geng, Xiaowen Liang, Jiantao Ma, Kun Yi, Shuning Yuan, Ping Zhang,

2016 Student Team

Project Management Committee

Manager	Liyuan Ma
Members	Zhiying Bian, Miaomiao Mo, Bing Wang

Graduate Students, CHLR

2015 students	Hongchen Ba, Youfang Gao, Yue Guo, Wenjun Mao,

Hongbin Pan, Yue Sun, Huiying Wang, Yi Yang,

Kanran Yin, Yisi Zeng, Qiuyue Zhang,

2015 Student Team

Project Management Committee

Manager	Xiang Zheng
Members	Xing Chen, Qiang Gao, Liyuan Ma, Yuzhe Ning, Xibo Wan, Bing Yan, Yangyang Zheng,

Graduate Students, CHLR

2014 students	Bing Wang, Jiapeng Dong, Wang Li, Xiang Wang, Shuli Shen, Jingyi Zhang, Zhiying Bian, Miaomiao Mo, Ni Zeng

2014 Student Team

Project Management Committee

Members	Yulong Chen, Hanqing You, Haibo Zhao, Xiang Zheng

Graduate Students, CHLR

2013 students	Xing Chen, Qiang Gao, Yiwei Gao, Qianqian He, Xiaowei Hou, Feifei Huang, Tian Jin, Guanqun Li, Sijia Li, Mengyang Liu, Yangyi Liu, Wenhua Ma, Liyuan Ma, Yuzhe Ning, Yujiao Shi, Zehao Shi, Yanxia Sun, Xibo Wan, Jie Wei, Xinran Xing, Bing Yan, Yueshan Zhang,

Cheng Zhao, Yangyang Zheng, Ye Zhou

2013 Student Team

Project Management Committee

  Members   Tingting Ding, Junzi He, Bo Li

Graduate Students, CHLR

2012 students   Shuping Chen, Yinghua Chen, Yulong Chen, Xiaojiao He,

                     Suyi Huang, Ping Ma, Yiwen Sun, Liyang Xie, Shan Ye,

                     Hanqing You, Chao Zhang, Junwu Zhang, Haibo Zhao,

                     Xiang Zheng

2012 Student Team

Project Management Committee

  Members   Lu Feng, Yang He, Bo Li, Wenwei Li, Yan Li, Qinyi Liu

Graduate Students, CHLR

2011 students   Tingting Ding, Junzi He, Junfeng Li, Tianjing Li, Shirui Wang,

                     Wenbo Wu

2011 Student Team

Graduate Students, CHLR

2010 students   Zhanwang Chang, Xiaotang Chen, Lu Feng, Yang He,

                     Bo Hu, Angran Li, Li Li, Wenwei Li, Yan Li, Yanchao Li,

Xiaoyang Liu, Liying Mu, Xianzhou Wu, Le Zhang, Linjun Zhu

Graduate Students, School of Economy and Trade, Hunan University

2010 students   Biao Luo, Lina Zhai, Li Zhang

2010 Student Team

Graduate Students, CHLR

2009 students   Jing Bai, Jing Fang, Chao Guo, XinGao, XiaoyanGan,

                       Jun Li, Jin Li,Tianyi Liu, Dandan Wu, YuanyuanXin,

                       Pengfei Xing, Yanqiu Yang, Chen Zhang, Linghua Zhang

Graduate Students, School of Economy and Trade, Hunan University

2009 students   Lin Ding, Hongling Wang, Qiujie Wu, Xiaomin Yan

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

2009 Student Team

Graduate Students, CHLR

  2008 students   Huajuan Chen, Yuhua Dong, Mengxin Du, Jinquan Gong,

                        Jingjing Jiang, Rui Jiang, Qian Li, Sen Li,

                        Chen Qiu, Xinping Tian, Mo Yang

Former Faculty Team Members:

Li Yu   Associate Professor, CHLR (2010-2018)

Fang Xia   Assistant Professor, CHLR (2013-2016)

Kang-Hung Chang   Associate Professor, CHLR (2009-2015)

Chun-Wing Tse   Assistant Professor, CHLR (2012-2015)

Ake Blomqvist   Special-term Professor, CHLR (2009-2011)

Song Gao   Assistant Professor, China Academy of Public Finance and Public Policy,

                         CUFE (2009-2010)

Former doctoral and postdoctoral students participated in this project:

Dazhi Guo   Doctoral Student, CHLR (2012-2017)

Yuefang Qiu   Doctoral Student, CHLR (2012-2017)

Junzi He   Doctoral Student, CHLR (2013-2017)

Yue Sun   Doctoral Student, CHLR (2013-2017)

Tang Tang   Doctoral Student, CHLR (2012-2016)

Bo Li   Doctoral Student, CHLR (2011-2014)

Na Jia   Doctoral Student, CHLR (2010-2013)

Yunling Liang   Doctoral Student, CHLR (2009-2012)

Qinyi Liu   Doctoral Student, Hunan University (2011-2014), Georgia Institute of

Technology (2014-2018)

Xiaobei Zhang   Doctoral Student, Hunan University (2010-2013)

Zhiyong Liu   Post-doctoral fellow, CHLR (2011-2013)

Former administrative Members at the CHLR

Jing Xiao   Graduate Coordinator (2010- 2018)

Beiwen Sun   Executive Assistant to Director (2011-2016)

Hao Deng   Graduate Coordinator / Executive Assistant to Director (2008-2011)

Ruiju Wang   Executive Assistant to Director (2008-2010)

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

Invited commentator of the Eleventh Human Capital Report (December 14, 2019)

Yaojiang Shi   Director, The Center for Experimental Economics in Education, China

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

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

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

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, Lowa 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

2020 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.

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 2020, 1 post-doctoral student, 10 doctoral students and 117 master students have graduated. Currently, the Center has 45 students, with 41 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 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.

The human capital project was established in 2009 and is one of the landmark achievements of the Central University of Finance and Economics. The project has been funded by the National Natural Science Foundation of China for ten consecutive years.

The project team has released the "China Human Capital Report" (Chinese and English version) every year in the annual international human capital conference. Participants at the conference included Nobel Prize winner Professor Arrow (deceased), Professor Dale Jorgenson of Harvard University, officials from the World Bank and OECD, and foreign scholars; Jiang Zhenghua, vice chairman of the National People's Congress, and He Keng, vice chairman of the Finance and Economics Committee , Long Guoqiang, deputy director of the Development Research Center of the State Council, Xu Xianchun, deputy director of the National Bureau of Statistics,

and many domestic scholars. Major media including Guangming Daily, People's Daily, etc. published news about the China Human Capital Reports upon its release every year.

China's human capital report series and all related data are freely available for public use. They can be downloaded at:

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

http://cedcdata.cufe.edu.cn/cedc/metadata/list.html

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):

- "Firm-level human capital and innovation: Evidence from China", Xiuli Sun, Haizheng Li*, Vivek Ghosal, has been accepted by China Economic Review, vol.59, 2020.
- "Human capital and leadership: the impact of cognitive and noncognitive abilities", Tingting Tong, Haizheng Li, Samuel Greiff, has been accepted by Applied Economics, vol. 51(53), pp. 5741-5752, 2019.
- "Regional Distribution and Dynamics of Human Capital in China 1985-2014", Barbara M. Fraumeni, Junzi He, HaizhengLi, Qinyi Liu, Journal of Comparative Economics, Volume 47, pp. 853-866.
- "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.
- "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.
- "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.
- "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:

- "Human Capital of Mainland China, Hong Kong and Taiwan," Xing Chen, Belton M. Fleischer, Haizheng Li, Yuzhe Ning, Xianfang Xiong, chapter 6 of, in Human Capital Measurement, Barbara M. Fraumeni, editor, Cambridge, MA, USA: Academic Press, forthcoming.
- "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. Speeches and Presentations:

- The Eleventh International Symposium on Human Capital, Plenary Session Presentation, "Measuring China's Human Capital-2019," Beijing, China, December 10, 2019.

- 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 and Others:

- 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, 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

Improvements in the 2020 Report

- Updated national and provincial human capital estimates for 1985-2018.

- Used more accurate demographic data from the Education Statistics Yearbook of China to impute the population by age, sex, education and region.

- Used updated survey data from Chinese Family Panel Studies (CFPS) 2018 and China Health and Nutrition Survey (CHFS) 2014 and 2016.

- Updated 2015 1% Demographic Sampling Survey data for three provinces.

- Separated employment rates for urban and rural areas and used age-group employment rates after 2005.

- Updated data on enrollment for secondary vocational education and for adult higher education before 2003.

- Updated age distribution of enrollment at each education level.

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:

Mainland: age 0-55 for females and age 0-60 for males

Hong Kong: age 0-60 for females and age 0-65 for males

Taiwan: age 0-60 for females and age 0-60 for males

- Labor force human capital:

Mainland: age 16-55 for female and 16-60 for male, excluding students

Hong Kong: age 15-60 for female and 15-65 for male, excluding students

Taiwan: age 15-60 for both male and female, 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 2018[2]. 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.

The following notes define terms and measures used through this report:

- Unless otherwise specified, the monetary values are measured in 1985 RMB.

- Average annual growth rates across years are calculated based on the simple average of annual growth rates.

- Real provincial-level human capital is calculated by adjusting with reference to the relevant provincial living-cost-adjustment index (LCI) and the Consumer Price Index (CPI) with 1985 as base year and Beijing as base province.

- We use the term "nation" and "mainland" interchangeably to refer to the 31 provinces (autonomous regions and municipalities) of the mainland China, excluding Hong Kong, Macau, and Taiwan.

- Due to data availability, the estimates of physical capital stock are updated only to 2017.

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[2] Due to the quality of the original data, the human capital stock results of Hong Kong and Taiwan in this report are shown since 1997.

For more details, refer to the comprehensive China Huan Capital Report 2020.

All the data and results are available at the China human capital database and are free for public use. The data can be downloaded at：

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

http://cedcdata.cufe.edu.cn/cedc/metadata/list.html

The Main Findings of the 2020 Report

A. Human Capital at National Level

I) Traditional Human Capital Measures

1. In 2018, the average age of the labor force at the national level was 38.4 years. The five provinces with the oldest labor force were Heilongjiang, Liaoning, Jilin, Chongqing, and Hunan, and the five provinces with youngest labor force were Guangdong, Xinjiang, Hainan, Guizhou and Tibet.

2. In 2018, the average years of school of the labor force at the national level was 10.4. The five provinces with highest years of school were Beijing, Shanghai, Tianjin, Jiangsu and Liaoning, and the five provinces with the lowest years of school were Gansu, Guizhou, Yunnan, Qinghai and Tibet.

3. In 2018, the proportion of the labor force with high school education or higher was 39.8%, with 20.7% in rural areas and 52.7% in urban areas.

4. In 2018, the proportion of the labor force with college education or above was 19.2%, with 5.4% in rural areas and 28.6% in urban areas.

II) The Jorgenson-Fraumeni (J-F) Based Human Capital Measures

5. The J-F measure of China's nominal total human capital reached 2613.7 trillion yuan in 2018, with 2288.0 trillion yuan (87.5%) in urban areas and 325.7 trillion yuan (12.5%) in rural areas.

6. Nominal human capital per capita was 2286 thousand yuan in 2018, 3130 thousand yuan for urban residents and 790 thousand yuan for rural residents. Average human capital for male was 2835 thousand yuan and for female was 1660 thousand yuan.

7. In 2018, the five provinces with highest human capital stock were Shandong, Guangdong, Henan, Jiangsu and Hebei, 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 Beijing, Shanghai, Tianjin, Zhejiang and Anhui, and the five provinces with lowest level were Tibet, Xinjiang, Yunnan, Gansu and Qinghai.

9. The five provinces with highest average labor force human capital were Beijing, Shanghai, Tianjin, Zhejiang and Anhui, and five provinces with the least were Hunan, Hainan, Yunnan, Gansu and Qinghai.

10. In 2018, the proportion of aged 0-15 among non-retired people at the national level was 22.7%, and the proportion of their human capital accounted for 51.0% of total human capital.

11. In 2018, the proportion of the population aged 25-45 to the total labor force was 55.7% at the national level, and their human capital accounts for 66.1% of the total labor force human capital.

12. China's total real human capital in 2018 was 11.2 times its level in 1985, having grown at an average annual rate of 7.8%. The average annual growth rate during the decade 2009-2018 was 9.0%.

13. From 1985 to 2018, rural human capital grew at an average annual rate of 3.0%, and urban human capital grew at 10.3%; while during the decade 2009-2018, the growth rate was 10.8% for urban areas but only 1.9% for rural areas. This decline in the average annual growth of rural human capital largely reflects China's rapid urbanization.

14. Urban human capital surpassed the rural human capital in 1993 and has remained higher since then.

15. Human capital per capita grew from 43.4 thousand yuan to 448.6 thousand yuan, at an average annual rate of 7.3% over the period 1985-2018 and at a rate of 9.0% over the years 2009-2018.

16. The average annual growth rate of human capital per capita during the period of 1985-2018 was 6.4% for urban and 4.9% for rural areas. For the years 2009-2018 the growth rates were 8.2% and 5.0%, respectively.

B. Human Capital in Hong Kong and Taiwan

17. In 2018, the average age of labor force was 39.0 years in Hong Kong and 39.5 years in Taiwan.

18. In 2018, the average years of school of the labor force were 12.4 years in Hong Kong and 13.7 years in Taiwan.

19. In 2018, the proportion of the labor force with high school education or above was 76.1% in Hong Kong and 88.2% in Taiwan.

20. In 2018, the proportion of the labor force with college education or above was 43.3% in Hong Kong and 56.0% in Taiwan.

21. In 2018, the proportion of aged 0-15 among non-retired people was 17.9% in Hong Kong, and they human accounted for 21.6% of total human capital in Hong Kong.

22. In 2018, the proportion of aged 0-15 among non-retired people was 17.0% in Taiwan, and they accounted for 20.4% of total human capital in Taiwan.

23. In 2018, the proportion of the population aged 25-45 to the total labor force was 55.7% in Hong Kong, and they accounted for 68.1% of total labor force human capital.

24. In 2018, the proportion of the population aged 25-45 to the total labor force was 55.0% in Taiwan, and they accounted for 72.9% total labor force human.

25. In Hong Kong, the average annual growth rate of J-F based total human capital and human capital per capita between 1997 and 2018 was 6.4%. Over the years 2009-2018, the rates were 4.9% and 5.2%, respectively.

26. In Taiwan, during 1997-2018, the average annual growth rate of J-F based total human capital was -0.9%, and for human capital per capita it was -0.6%; while over the years 2009-2018, the rates were -1.5% and -0.7%, 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 the 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.[3] 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 regional inequality. (Fleisher, Li and Zhao, 2009).

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[3] 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).

Despite its critical role in the Chinese economy, there was 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. 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. 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 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.[45] The work of this consortium and the World Bank effort (landge et al. 2018) will facilitate cross-country comparisons.

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[4] See Liu (2011).

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

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), and 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 in 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, and for urban and rural areas from 1985 to 2018. Our estimates include nominal values, real values, indexes, and quantity 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 the 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 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); 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.

Measures of human capital that have been used by researchers in many studies include:

(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[5] (2006);

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

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

We elaborate on the Jorgenson-Fraumeni approach in the next section.

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[5] There are four major indexes of human capital each of which covers at least 130 countries, one each by the Institute for Health Measurement and Evaluation (Lim et al., 2018), UNDP (UNDP 2019), World Bank (International Bank for Reconstruction and Development and the World Bank, 2018) and the World Economic Forum (WEF 2017).

2.1 Jorgenson-Fraumeni income-based approach

The Jorgenson-Fraumeni (J-F) method estimates human capital stock based on the expected future lifetime income of all individuals, which would be its asset price if human capital could be traded in the market like physical capital[6] 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 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,

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[6] 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. Even in the United States and other developed countries, wages do not fully reflect marginal productivity because labor markets are not perfectly competitive. Even so, wages are still representative of the human capital gains from an individual perspective, and they are a reasonablel a measure of human capital in that sense. With the improvement of the market mechanism in China, this limitation will gradually decrease. According to estimates provided in the current literature, wages are generally lower than labor＇s marginal productivity (see Fleisher, Li and Zhao, 2010). Therefore, from this perspective, our calculation can be interpreted as a conservative estimate of human capital.

we have opted to exclude them in this first approximation to estimating China's human capital.[7]

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 direct child rearing costs such as food and clothing. 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.

The cost of parental time is not included in measuring tangible human capital. Intangible human capital investment in formal and informal education includes both private and government costs. Private formal education costs include net rental for the private education sector's plant and equipment and students' expenditures on supplies. Estimated 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.

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[7] 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 the one by 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.

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.[8] 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 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.

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

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.[9] 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 parentally provided 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 a country's employed human capital endowment..

Finally, the Demography and Employment measure estimates the number of people who will be employed in the year 2030 in each country by examining at economic, demographic, and migratory trends.[10] 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.[11]

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[9] 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.

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

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

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 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 closely captures the variation in quality and relevance of formal education across time and countries.

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. Our method is more close related to that of in Laroche and Merette (2000) in that we also incorporate informal investments, such as work experience, into the model along with formal education.

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:

$$\ln\left(\frac{H}{L}\right) = \sum_e \sum_a \omega_{e,a} \ln\left(\rho_{e,a}\right)$$

（1）

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

（2）

where e and a denote years of formal schooling and age, respectively and $\rho_{\varepsilon,a} = L_{\varepsilon,a}/L$ 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 the attribute-based method, we need to obtain population data by age, gender and educational attainment for each year we study. Secondly, we need to estimate a gender-specific Mincer equation for each year. It is feasible to calculate a human capital measure based on this approach. In the attribute-based setup, measurement is based on 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 measure 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.[12]

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

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[12] This suggestion was confirmed as a reasonable modification by email communication with Dr. Reinhard Koman.

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 abroad is measured by remittances from workers outside the country. Governance/social capital is measured with a rule of law index.[13] 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).

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[13] It was proposed by the World Justice Project, which includes 8 aspects: Constraints on Government Powers, Absence of Corruption, Open Government, Fundamental Rights, Order & Security, Regulatory Enforcement, Civil Justice and Criminal Justice.

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 have used 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 59,58,57 and so forth to those aged 0,[14] and modified to China with various needed assumptions about the method and parameters.[15]

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. The backward recursion methods is based on five life stages, and calculation begins with 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 final stage is for retirement, individuals who are not in school and not

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[14] 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 that have adopted the J-F methodology.

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

working--older than 59 years old for males and older than 54 years old for females)):

$$mi_{y,s,a,e} = 0 \qquad\qquad (3)$$

where the subscript y, s, a, and e denote year, sex, age and educational attainment respectively, mi is the lifetime market labor income per capita.[16]

The fourth stage is for individuals who are working but not in school (23-59 years old for males and 23-54 years old for females). The equation for this stage is the same as equation 3.

$$mi_{y,s,a,e} = ymi_{y,s,a,e} + sr_{y,s,a} \cdot mi_{y,s,a+1,e} \cdot \frac{1+G}{1+R} \qquad (4)$$

where sr is the survival rate, defined as the current year probability of becoming one year older, G is the real income growth rate, and R is the discount rate, *ymi* denotes annual market income per capita.

The third stage is applied to individuals who are either in school or working (16-27 years old), as it is assumed that anyone who goes to school does not work, even part-time.[17] This stage is bounded by age 27 because of data limitations, and the age distribution of college and above are calculated by senior age distribution. For individuals who work, the equation is same as (4), for individuals who go to college or university, for example, at the first year of university, the equation becomes:

$$mi_{y,s,a,uni\_1} = sr_{y,s,a} \cdot sr_{y+1,s,a+1} \cdot sr_{y+2,s,a+2} \cdot sr_{y+3,s,a+3}$$
$$\cdot mi_{y,s,a+4,uni-completed} \cdot \left(\frac{1+G}{1+R}\right)^4 \qquad (5)$$

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[16] 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.

[17] 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.

For individuals who are in junior or senior high school, for example, at first year of senior high school, the equation becomes:

$$mi_{y,s,a,sm\_1} = [senr_{y,s,a,sm\_1-col\_1} \cdot mi_{y,s,a+3,col\_1}$$
$$+ notenr_{y,s,a,sm\_1-col\_1} \cdot mi_{y,s,a+3,sm-completed}] \cdot \left(\frac{1+G}{1+R}\right)^3 \quad （6）$$

where senr is the promotion rate, which is the probability of the number of students in e educational level entering into e+1 educational level, and notenr is the probability that someone who does not enroll in e+1 educational level will complete the e educational level. The calculation equation is

$$notenr_{y,s,a,sm\_1-col\_1} = sr_{y,s,a} \cdot sr_{y+1,s,a+1} \cdot sr_{y+2,s,a+2}$$
$$- senr_{y,s,a,sm\_1-col\_1} \quad （7）$$

The second stage is for someone going to school but not working (7-15 years old). The equation for students varies depending on the level of enrollment. For those enrolled in the first year of primary school, the equation is

$$mi_{y,s,a,pri\_1} = [senr_{y,s,a,pri\_1-jm\_1} \cdot mi_{y,s,a+6,jm\_1}$$
$$+ notenr_{y,s,a,pri\_1-jm\_1} \cdot mi_{y,s,a+6,pri-completed}] \cdot \left(\frac{1+G}{1+R}\right)^6 \quad （8）$$

The first stage is for individuals neither in school nor working (0-6 years old):

$$mi_{y,s,a,e} = sr_{y,s,a} \cdot mi_{y,s,a+1,e} \cdot \frac{1+G}{1+R} \quad （9）$$

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

$$MI(y) = \sum_s \sum_a \sum_e mi_{y,s,a,e} L_{y,s,a,e} \quad (10)$$

Similar equations can be applied to estimate lifetime nonmarket labor

income,[18] which can be added to lifetime market labor income to obtain total lifetime labor income:

$$LIFE(y) = \sum_s \sum_a \sum_e (mi_{y,s,a,e} + nmi_{y,s,a,e}) \cdot L_{y,s,a,e} \qquad (11)$$

3.2 Estimating 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 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 projections based on the basic Mincer (1974) equation. It has been shown that there are significant differences in the parameters of the earning equation across gender and between the rural and urban populations. 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 2018.

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, and 2011. The third data set is the Chinese Household Income Project (CHIP) for the year of 1988, 1995, 1999, 2002, 2007, and 2013. The fourth data set is the China Household Finance Survey

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[18] 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.

(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 a small number of respondents of 4,934 in 1986 to a larger 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 or above equals 16 years of schooling. Suppose that schooling begins at age 7, 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, as 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 socioeconomic, 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 2011, 2013, 2015 and 2017. Information of the statistics on household income starts from the year of 2010, 2012, 2014 and 2016. 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 uses only 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. Appendix C.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:

$$\ln\left(inc\right) = \alpha + \beta \cdot e + \gamma \cdot Exp + \delta \cdot Exp^2 + u \qquad (12)$$

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 (12) 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 report evidence consistent with 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 convention reported in published literature, we estimate equation (10) by ordinary least squares[19].

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 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 1985-2018. 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 little difference between males and females in rural areas.

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[19] 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).
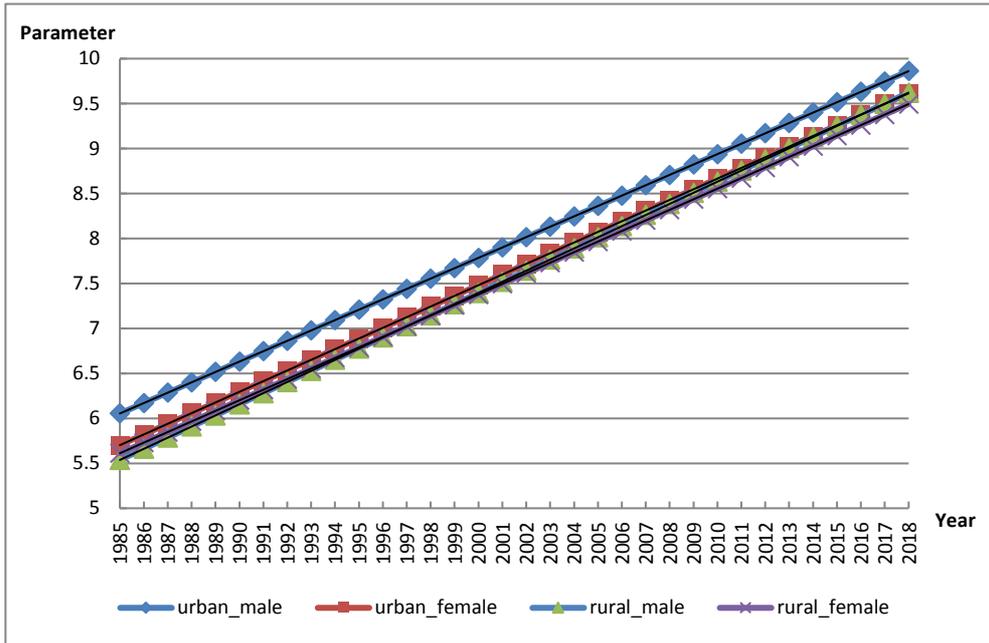
Figure 3.2.1 Mincer Intercepts by Gender and Location

Estimated regression parameter for years of schooling and the quadratic term of years of schooling permit measurement of the rate of return rate of return to education. Considering the current development of the Chinese economy and education, we assume that the rate of return to education follows a nonlinear trend. Figure 3.2.2 shows the trends of the return to education for males and females in rural and urban areas. The trends of returns to schooling vary across rural and urban areas, it shows that the rate of return to education for rural women is increasing year by year, while for urban and rural men, the corresponding rate shows a trend of first increasing and then decreasing. In addition, we find that the rate of return to education for males was lower than that for female in urban areas, and the rate of return 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 rate of return to education has been a common phenomenon. But many studies recently show that rate of return to education in urban areas follows a

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decreasing trend associated with increased enrollment. Wang, Fleisher, Li (2009) also find that female rates of return exceed male returns, and they argued that rising returns to education have been an ubiquitous phenomenon in transitional economies.
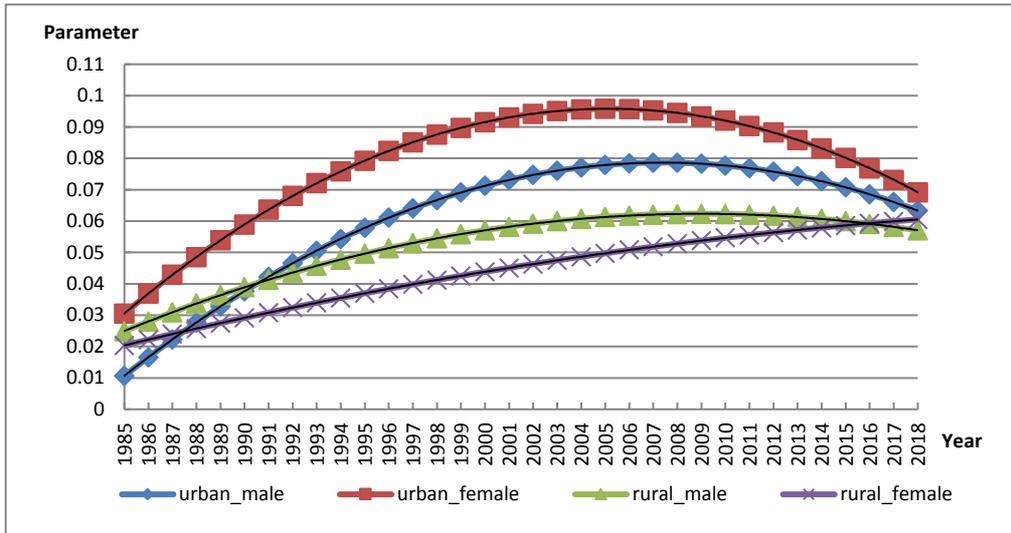
Figure 3.2.2 Rates of Return to Education by Gender and Location

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 rate of return to experience by gender and region. Where the curves slope negatively, the rate of return to experience 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.
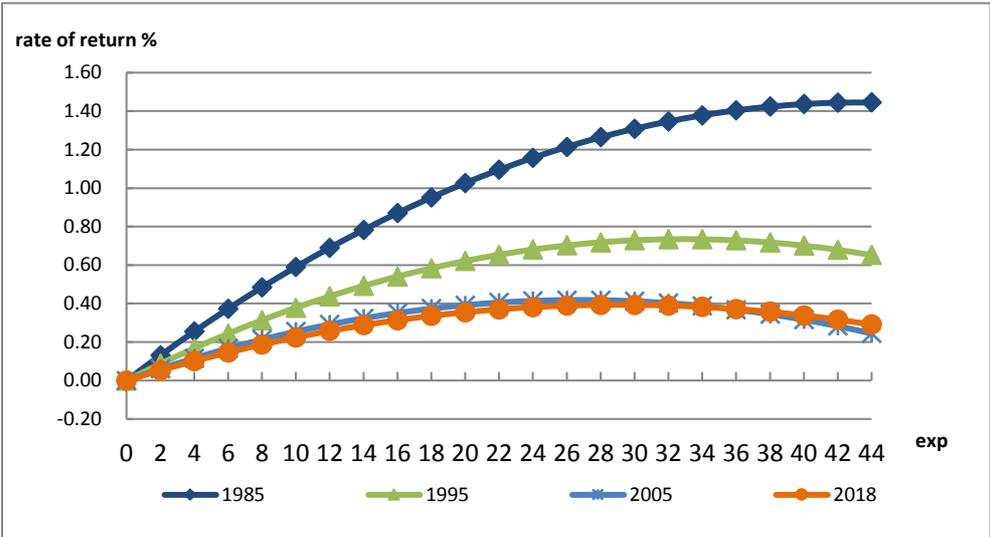
Figure 3.2.3 Return to Experience for Urban Males
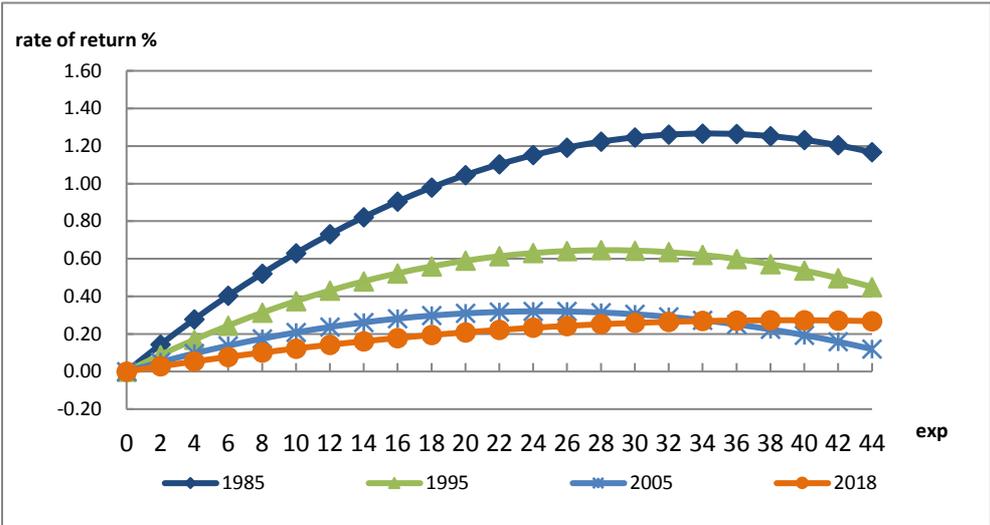
Figure 3.2.4 Return to Experience for Urban Females

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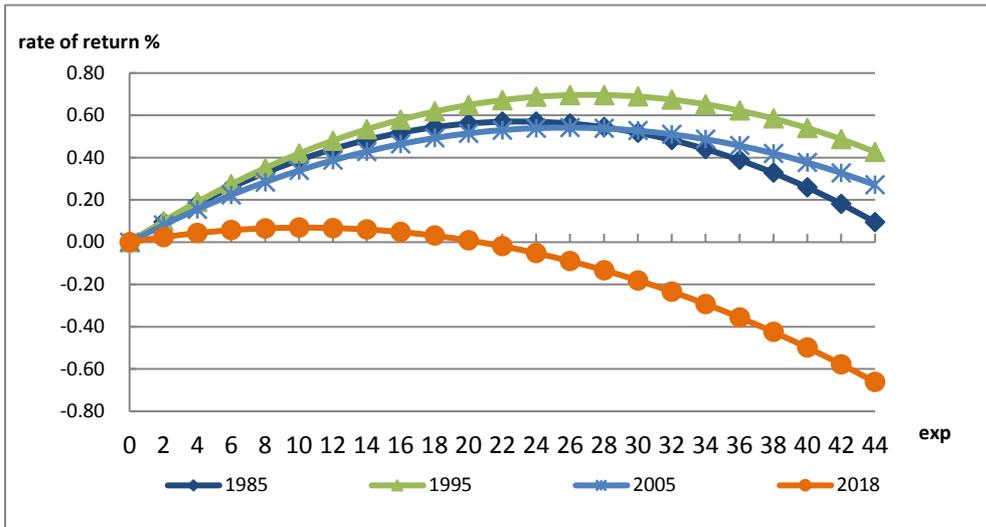
Figure 3.2.5 Return to Experience for Rural Males
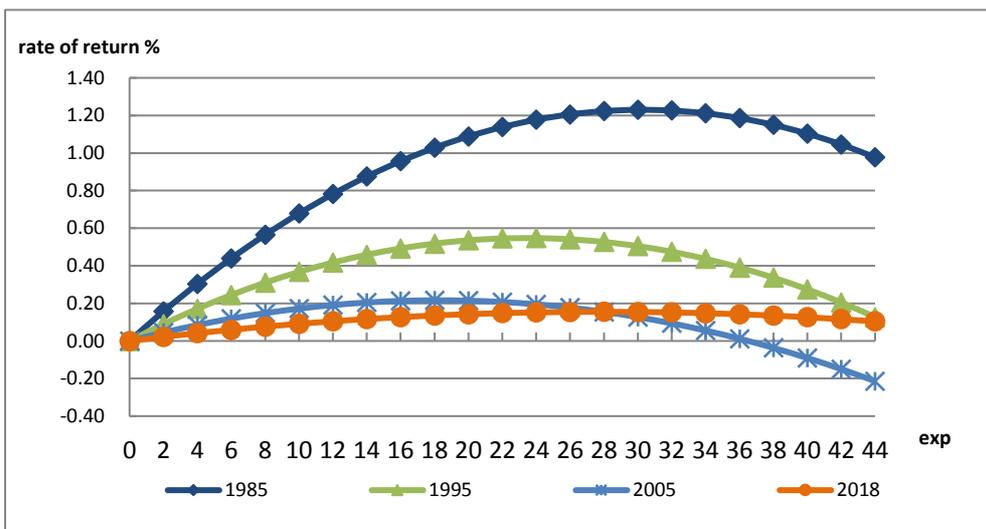
Figure 3.2.6 Return to Experience for Rural Females

3.2.2 Estimating current income using Mincer models at the provincial level

At the province level, we estimate the Mincer equation with macro data as follows:

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

（13）

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. The variable avwage represents the average employee nominal salary for the rural and urban population and reflects earning gaps across provinces. Avgdp stands for nominal GDP per capita. Ratio is the primary industry employment ratio of the total working population. The parameters of Sch·Avgdp and Sch·Ratio reflect the job market conditions 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 to the equation in order to make better use of the existing data and to aid in solving missing data problems as well as to make 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 $\beta_2 + \beta_3 \cdot Avgdp + \beta_4 \cdot Ratio$ 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 the ordinary least squares (OLS) to estimate equation (12). 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 a 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: 2003-2018 to estimate the age distribution (1982-2018) 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 2018. 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 2018. 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 2018. 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 obtain 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 age-income profile, and therefore the method of computing lifetime income will be different.

We first estimate a standard Mincer equation 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 or above, or for six categories of schooling where we divide college or 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 or 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.

To impute two critical components of the J-F human capital estimates, we proceed as described below.: 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. 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, where . *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.

Each continuing student is tracked from age of initial enrollment, through individual grade levels, until advancing to the next higher level. The number of years discounted until attaining the higher level of lifetime income depends on the number of years required to advance given the current grade of enrollment.

The terminal educational level is treated as a probabilistic event, allowing us to forecase lifetime income 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, $empr(y, s, a, e)$ 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 interpolate middle years' employment

rates using 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" Long table data
Population by age, sex and region in 2005	"China Population Census 2005"
Population by region, sex and education in 2005	"China Population Census 2005"
Population by age, sex and education in 2005	"China Population Census 2005"
The employed by age group, sex and education in 2005	"China Population and Employment Statistics Yearbook 2006"
Population by age, sex and region in 2010	"China Population Census 2010" Long table data
Population by region, sex and education in 2010	"China Population Census 2010" Long table data
Population by age, sex and education in 2010	"China Population Census 2010"
The employed by age group, sex and education in 2010	"China Population and Employment Statistics Yearbook 2011"
Population by age, sex and region in 2015	"China Population Census 2015"
Population by region, sex and education in 2015	"China Population Census 2015"
Population by age, sex and education in 2015	"China Population Census 2015"

Note:

1. The 1% sample population in 1987 is converted into the whole population by the actual sampling percentage of 0.999%6%.

2. The 1% sample population in 1995 is converted into the whole population by the actual sampling percentage of 1.02666%.

3. The working population in the long table data of "China Census 2000" is transformed into the working population of the whole country according to the sampling ratio of 9.5% in each province, autonomous region, and municipality.

4. The "China Census 2010" long form selects 10% of households to fill in the report. The working population in the long form data is converted into the national working population at a sampling ratio of 9.554% in each province, autonomous region, and municipality directly under the Central Government. Calculation method: Long form sampling ratio = Long table total population / Census total population.

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 using 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 and Hong Kong, employment rate $empr(y, s, a, e)$ includes data by age, sex and education for individuals older than 15 from 1985 to 2018 Taiwan and 1990 to 2016 (Hong Kong). 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 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.[20]

The data used to calculate the rural growth rate are real rural income, where real rural income is nominal income deflated with the rural CPI. The rural real income growth rate in period T 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 formula is below:

$$Gr\_Rate_T = (Real\_Income_T - Real\_Incom_{T-1})/Real\_Income_{T-1}$$

The data used to calculate the urban growth rate are real urban income, where real urban income is nominal income deflated with the urban CPI. The urban real income growth rate in period T 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 2018, the growth rate is on average 6.19% and 8.17% annually in the rural and urban sectors, respectively, and we use these in the J-F calculation.[21]

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

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[20] 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.

[21] 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.

growth rates for urban and rural areas are shown in Table 3.3.1, where we that .
each province grows at a fixed annual rate.

Table3.3.1 Provincial Growth Rate

Province	Urban	Province	Rural
Beijing	9.49%	Zhejiang	7.18%
Shanghai	9.21%	Fujian	7.10%
Anhui	8.75%	Henan	6.96%
Zhejiang	8.62%	Shandong	6.58%
Tianjin	8.58%	Hebei	6.57%
Inner Mongolia	8.50%	Jiangsu	6.55%
Hubei	8.42%	Guangxi	6.46%
Shandong	8.34%	Jiangxi	6.42%
Guizhou	8.31%	Jilin	6.40%
Sichuan	8.30%	Sichuan	6.39%
Chongqing	8.27%	Anhui	6.38%
Hainan	8.22%	Tianjin	6.34%
Nation	8.18%	Heilongjiang	6.30%
Xizang	8.17%	Chongqing	6.29%
Hebei	8.13%	Nation	6.21%
Jiangsu	8.06%	Guangdong	6.10%
Jiangxi	8.05%	Inner Mongolia	6.09%
Fujian	8.04%	Shaanxi	6.01%
Guangxi	8.03%	Ningxia	5.91%
Jilin	7.96%	Hubei	5.90%
Henan	7.95%	Liaoning	5.81%
Yunnan	7.94%	Shanxi	5.75%
Guangdong	7.81%	Hunan	5.48%
Shaanxi	7.76%	Hainan	5.46%
Liaoning	7.76%	Guizhou	5.44%
Ningxia	7.74%	Yunnan	5.44%
Xinjiang	7.72%	Gansu	5.40%
Heilongjiang	7.65%	Beijing	5.10%
Hunan	7.56%	Qinghai	4.99%
Shanxi	7.51%	Xinjiang	4.99%

| Gansu | 7.12% | Xizang | 4.70% |
| Qinghai | 6.24% | Shanghai | — |

For Hong Kong, the data used to calculate growth rate is the average wage index, which we adjust to derive a real wage index. Calculated using the 1980-2018 Hong Kong Real Wage Index published on the website of the Hong Kong Census and Statistics Department (1999Q1 = 100). Calculation method: The actual salary index is adjusted to 1999Q4=100. The actual salary growth rate in year T is equal to the difference between the actual salary index in year T and the actual salary in year T-1 divided by the actual salary index in year T-1. We obtain an average annual growth rate for Hong Kong of 2.91%.

For Taiwan, the data used to calculate growth rate is regular salary (1980-2016). Its calculation method: The consumer price index is adjusted to 1978 as the base period, the actual salary level is equal to the regular salary divided by the actual consumer price index, and the actual salary growth rate in year T is equal to the difference between the actual salary in year T and the actual salary in year T-1 The value is divided by the actual salary in T-1 year. The result shows that, the growth rate on average is 2.53% annually in Taiwan.

3.3.6 The discount rate

The discount rate that is used calculate the present value of   future --t 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)   as well as 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 To test the sensitivity of our results to the choice of discount rate, we use alternative discount rates 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%[22], the average benchmark lending rate over 5 years in China from 1996 to 2009, 5.51%[23], and the social discount rate based on the method from the World Bank, 8.14%.[24] Only results based on the discount rate of 4.58% are reported here.

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[22] 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.

[23] 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.

[24] 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 in China

4.1 Population imputation

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

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

$$L(y,e,a,s)=L(y\text{-}1,e,a,s)*(1\text{-}\delta(y,a,s))+IF(y,e,a,s)\text{-}OF(y,e,a,s)+EX(e,a,s)$$

(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.[25] Thus,

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

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

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

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

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, 1987-2018). 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 1.00 billion in 1982 to 1.49 billion in 2018. The urban population increased by 677 million, while the rural population decreased by 242 million (Figure 4.2.1[26]).

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data.

[26] Taking into account the consistency of the statistical caliber, the nation and the mainland in this report refer to the 31 provinces (autonomous regions and municipalities) of the mainland, excluding Hong Kong, Macau, and Taiwan.
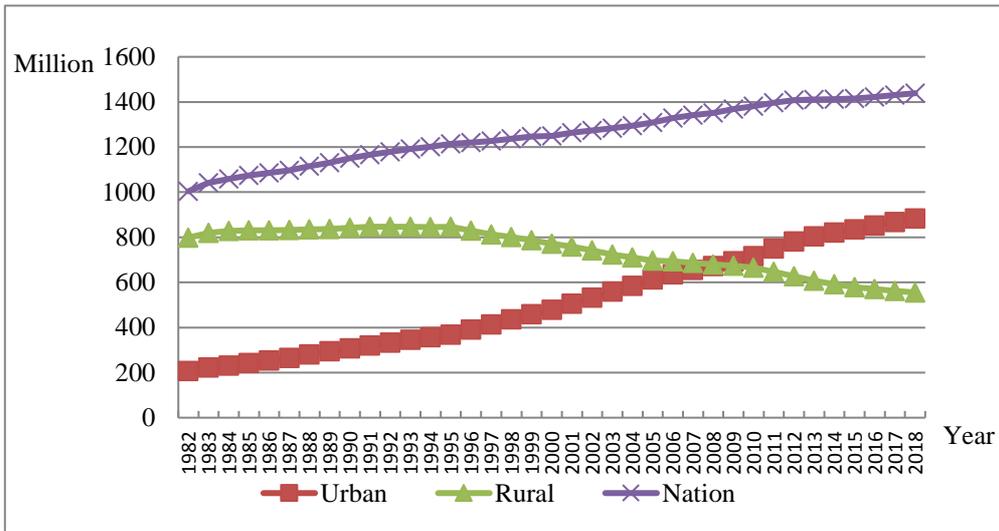
Figure 4.2.1 Population in China by Location 1982-2018

Figures 4.2.2-4.2.4 show the trend of national, urban and rural population classified by educational attainment from 1982 to 2018. The illiterate population fell from 397 million in 1982 to 207 million in 2000, but it was relatively stable from 2000 to 2018. The number of primary school graduates increased from 359 million in 1982 to the peak of 444 million in 1997, then declined gradually to 335 million in 2018. This decline is expected as more primary school graduates continue to receive higher levels of 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 498 million in 2018. Senior middle school graduates increased from 67 million in 1982 to 233 million in 2018, while college or above increased from only 6 million in 1982 to 201 million in 2018. The numbers of those who have achieved these two education levels have grown rapidly since the mid-1980s, especially after the implementation of college expansion plan in 1999. Although the proportions of the population who have achieved these education levels are still small, the

number of those 16 years is much more than the population of these two education levels in the 1980s and 1990s. Due to population growth, the number of 16 year olds by 2018 is much greater than the number of individuals with at least a senior middle school level of education. However, the growth of these groups in rural areas is much slower than that in the urban areas.
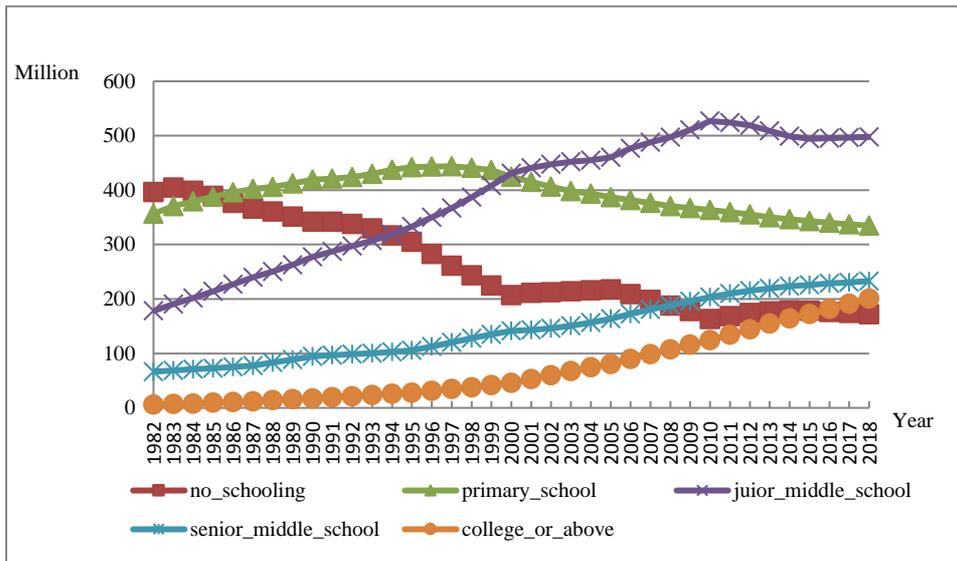
Figure 4.2.2 Population by Education Attainment in China 1982-2018
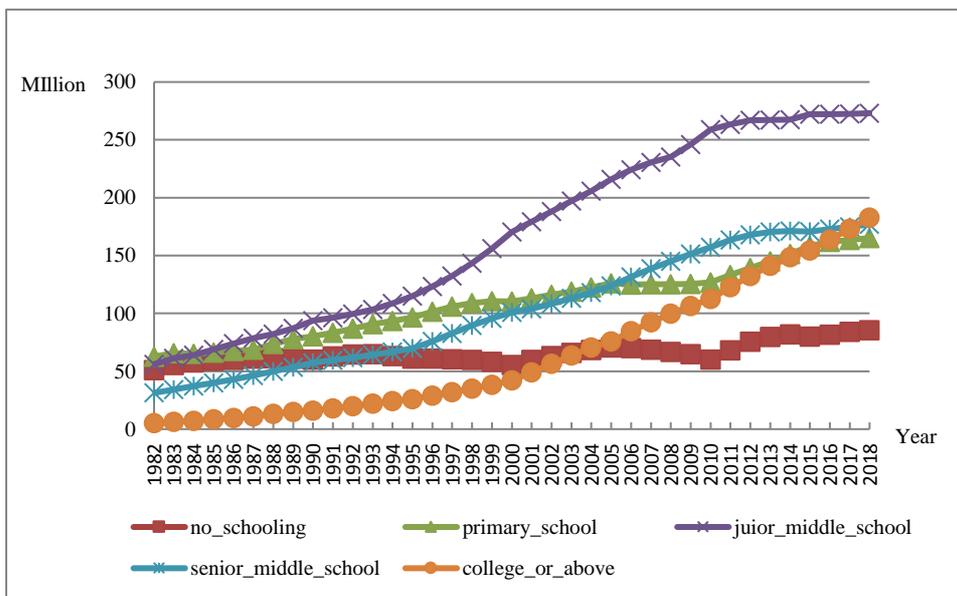
Figure 4.2.3 Urban Population by Educational Attainment 1982-2018
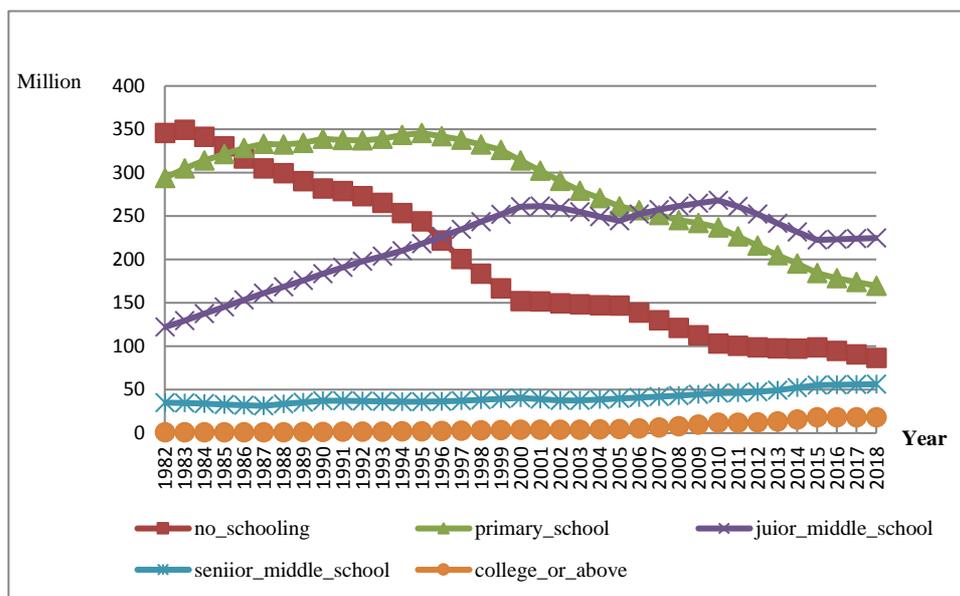
Figure 4.2.4 Rural Population by Educational Attainment 1982-2018

Figures 4.2.5 to 4.2.8 illustrate the increase in educational attainment over the years 1985, 1995, 2010 and 2015 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 individuals with primary and junior middle education while by 2010, junior middle had become the dominant education level. Junior middle school continues to be the dominant education level in 2015. 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 higher education levels also shrank considerably.
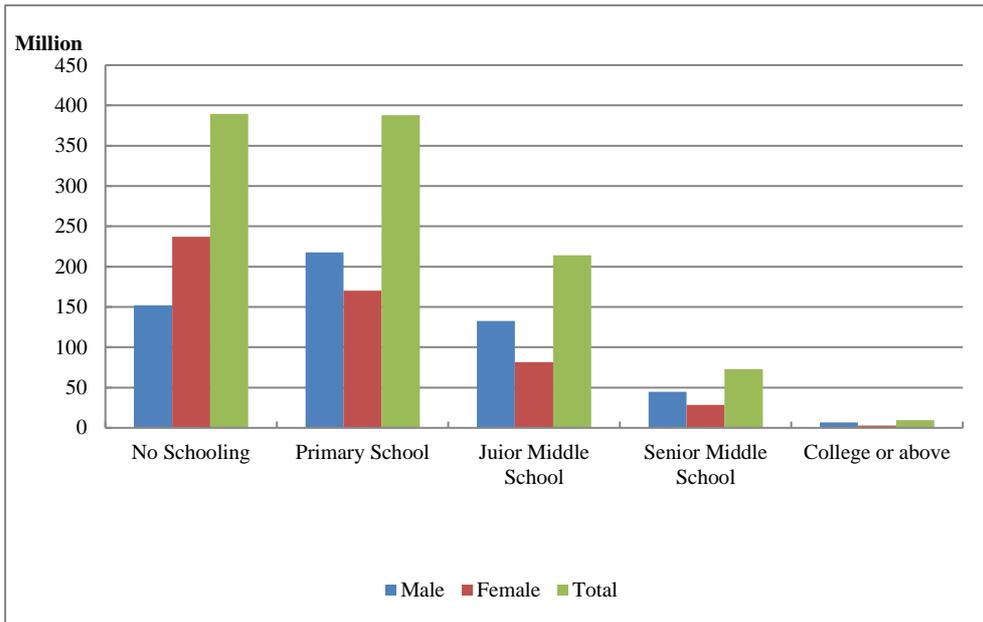
Figure 4.2.5 Population of Different Educational Levels by Gender, 1985
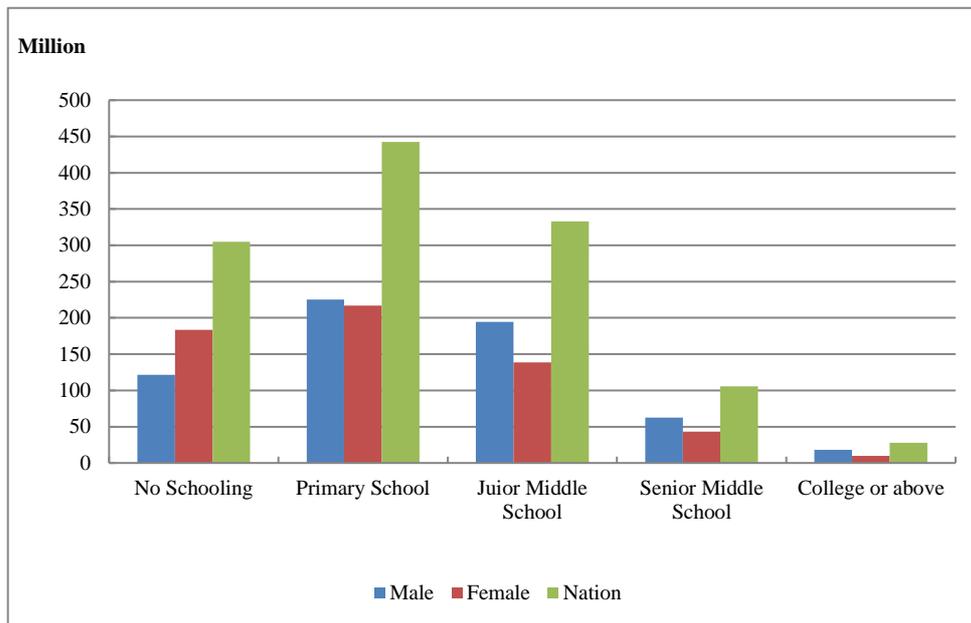
Figure 4.2.6 Population of Different Educational Levels by Gender, 1995

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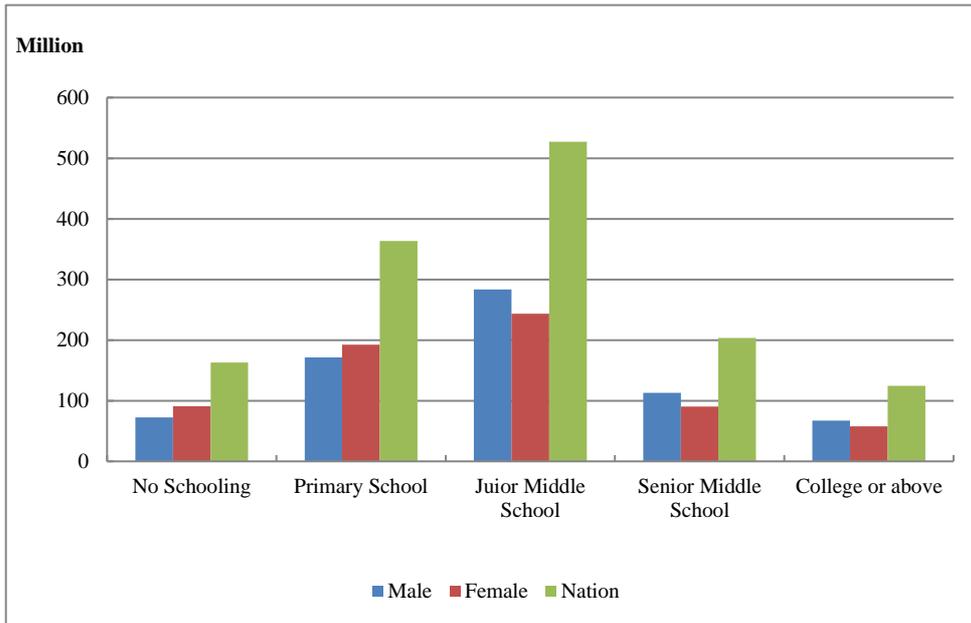
Figure 4.2.7 Population of Different Educational Levels by Gender, 2010
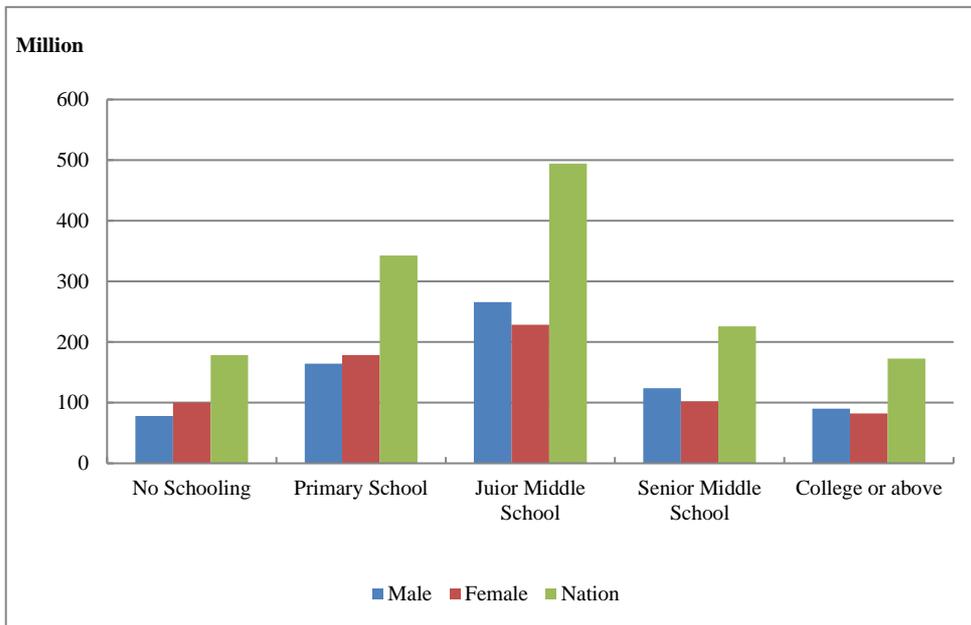
Figure 4.2.8 Population of Different Educational Levels by Gender, 2015

Chapter 5　Age and Education of the Labor Force

　　In order to know more about the aging of the labor force, education status and higher education penetration rate of each province, we calculated the average age of the labor force, the average number of years of education and the proportion of the population with high school or Above education levels in each province.

　　Through analysis of these three indicators, the results of the cross-provincial comparison of human capital in China can be explained to some extent. Further urban-rural comparisons help to determine the main reasons for the human capital urban-rural provincial disparities.

　　Through longitudinal comparison, we can see the trend of the three indicators over time, which is helpful to understand the growth of human capital in China.

5.1 Definition of the Labor Force and Education Levels

Definition of the Labor Force:

Mainland: age 16-55 for female excluding students and age 16-60 for male excluding students.

Hong Kong: age 15-60 for female excluding students and age 15-65 for male excluding students.

Taiwan: age 15-60 for female excluding students and age 15-60 for male excluding students.

Definitions of educational attainment levels are shown in the table below:

Table5.1.1 Levels of Educational Attainment before 2000

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

5.2 Average Age of the National Labor Force
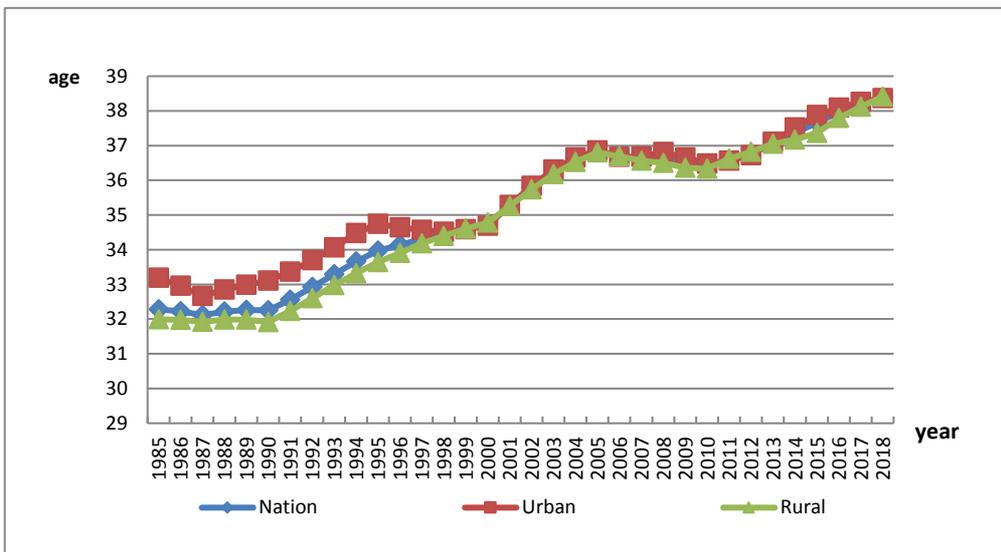
Figure5.2.1 Average Age of the National Labor Force[28]

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[28] Note: The average age of the national labor force is calculated according to census data and 1% sample data.

Figure 5.2.1 shows the average age of the labor force, which is calculated with census data and the 1% sample data. It is worth noting that in the 1987, 1995, and 2005 1% sample data, the age structures and education levels are questionable. For example, compare the 2000 1% sample data to the 2005 1% sample data. In 2000, the population with an education level of high school or above was 182.30 million; while in 2005, the population with the same education level was 215.72 million, which is 33.42 million more than in 2000. Total high school enrollment from 2001 to 2005 was 58.17 million. All of these figures can be accurate only if the number of deaths in this time period is as high as 24.76 million, accounting for 13.58% of individuals with a high school or above level of education in 2000.

Also, according to the 2005 1% sample data, the male population 20-24 years old was 37.73 million, this part of the population was 64.02 million in 2010 according to the census, an increase of 26.29 million. Taking into account deaths, this part of the population should have decreased in 2010. Due to minor statistical errors, there may have been an increase in 2010, but the population increase rate of 69.67% is too high. It can be seen from this that the age structure and education level data in the 2005 1% sample data are unreliable.

Considering the above situation, we only used census data for calculations in 2010 and before. After 2010, considering that the end point value has a greater influence on the population estimation results in recent years, we still use the results of census and 1% sample data. The result is shown in Figure 5.2.2.
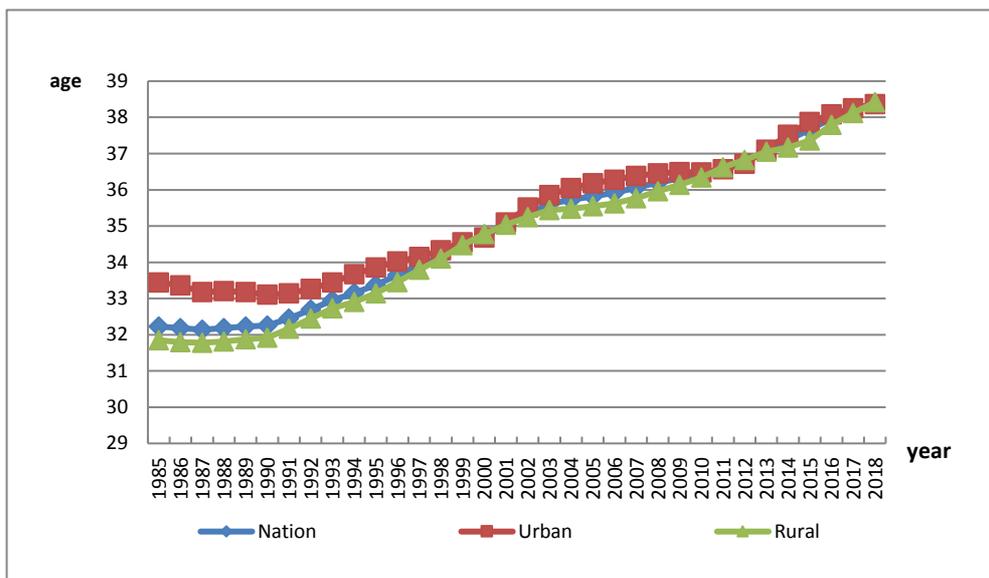
Figure5.2.2 Average Age of the National Labor Force[29]

Figure 5.2.2 shows from 1985 to 2018, the average age of the labor force in rural and urban areas and in the mainland all have an upward trend.

The national average age of labor force rose from age 32.23 in 1985 to age 38.39 in 2018, the average age of labor force in rural areas increased from age 31.85 in 1985 to age 38.42 in 2018, and the average age in urban increased from age 33.44 in 1985 to age 38.37 in 2018. After 2005, as the labor force (mainly young labor force) migrated into urban areas, the difference average age of labor force between the urban and rural gradually narrowed.

Table 5.2.1 Average Age of the National Labor Force（1985-2018）

Unit：Year (of age)

Year	Average Age of the Labor Force		
	Nation	**Urban**	**Rural**
1985	32.23	33.44	31.85
1986	32.19	33.36	31.80
1987	32.14	33.18	31.78

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[29] Note: The average age of the national labor force is calculated using census data in 1985-2010, 1% sample data in 2010-2018.

Year	Average Age of the Labor Force		
	Nation	**Urban**	**Rural**
1988	32.18	33.21	31.82
1989	32.23	33.18	31.87
1990	32.25	33.10	31.91
1991	32.45	33.15	32.16
1992	32.69	33.26	32.44
1993	32.95	33.44	32.73
1994	33.15	33.67	32.91
1995	33.37	33.85	33.14
1996	33.64	34.03	33.45
1997	33.92	34.14	33.79
1998	34.18	34.33	34.10
1999	34.50	34.55	34.48
2000	34.74	34.69	34.78
2001	35.06	35.10	35.03
2002	35.36	35.52	35.25
2003	35.61	35.85	35.44
2004	35.72	36.05	35.48
2005	35.82	36.18	35.54
2006	35.92	36.28	35.62
2007	36.05	36.38	35.77
2008	36.20	36.46	35.96
2009	36.31	36.49	36.14
2010	36.41	36.48	36.34
2011	36.59	36.57	36.62
2012	36.76	36.72	36.82
2013	37.08	37.11	37.05
2014	37.37	37.52	37.17
2015	37.66	37.88	37.36
2016	37.96	38.09	37.79
2017	38.20	38.25	38.11
2018	38.39	38.37	38.42
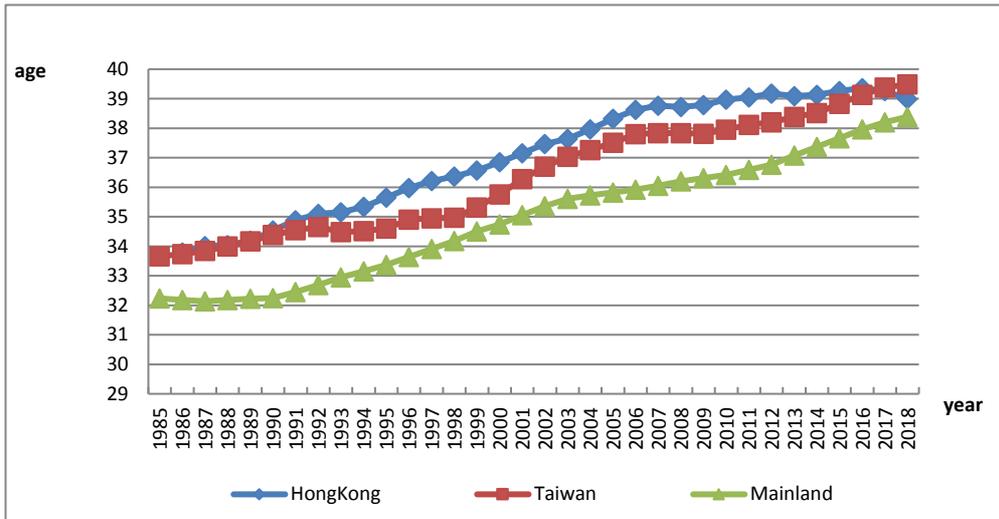
Figure5.2.3 Average Age of the Labor Force in Mainland, Hong Kong and Taiwan

Figure 5.2.3 shows the trends of the average age of the labor force in Mainland, Hong Kong and Taiwan. and Table 5.2.2 shows the specific data. The average age of the labor force in Hong Kong increased from 33.79 in 1986 to 38.99 in 2018, while that of Taiwan increased from 33.66 in 1985 to 39.49 in 2018. The labor force average age of Taiwan lies between that of Hong Kong and Mainland in 2017 and 2018 Taiwan exceeds Hong Kong.

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		33.66	32.23
1986	33.79	33.73	32.19
1987	34.00	33.85	32.14
1988	34.04	34.00	32.18
1989	34.19	34.17	32.23
1990	34.54	34.39	32.25
1991	34.88	34.55	32.45
1992	35.10	34.66	32.69
1993	35.16	34.48	32.95

Year	Average Age of the Labor Force		
	Hong Kong	**Taiwan**	**Mainland**
1994	35.34	34.51	33.15
1995	35.65	34.61	33.37
1996	35.97	34.90	33.64
1997	36.22	34.95	33.92
1998	36.36	34.97	34.18
1999	36.57	35.31	34.50
2000	36.85	35.76	34.74
2001	37.15	36.28	35.06
2002	37.47	36.70	35.36
2003	37.64	37.03	35.61
2004	37.97	37.26	35.72
2005	38.32	37.51	35.82
2006	38.62	37.80	35.92
2007	38.76	37.83	36.05
2008	38.72	37.84	36.20
2009	38.79	37.82	36.31
2010	38.96	37.96	36.41
2011	39.05	38.12	36.59
2012	39.18	38.20	36.76
2013	39.09	38.39	37.08
2014	39.13	38.52	37.37
2015	39.26	38.83	37.66
2016	39.36	39.13	37.96
2017	39.26	39.38	38.20
2018	38.99	39.49	38.39

5.3 Average Years of Schooling of the National Labor Force
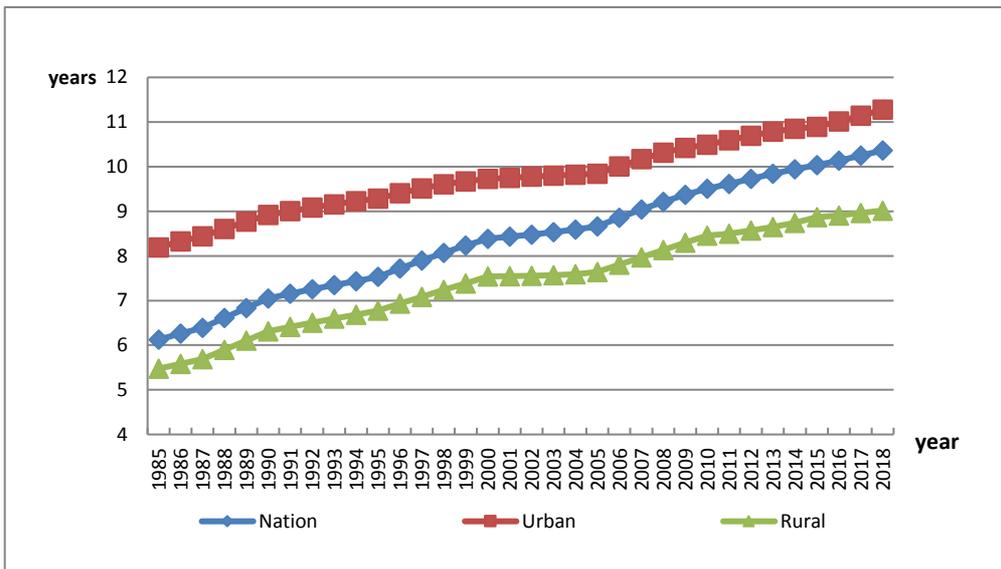
Figure5.3.1 Average Years of Schooling of the National Labor Force[30]
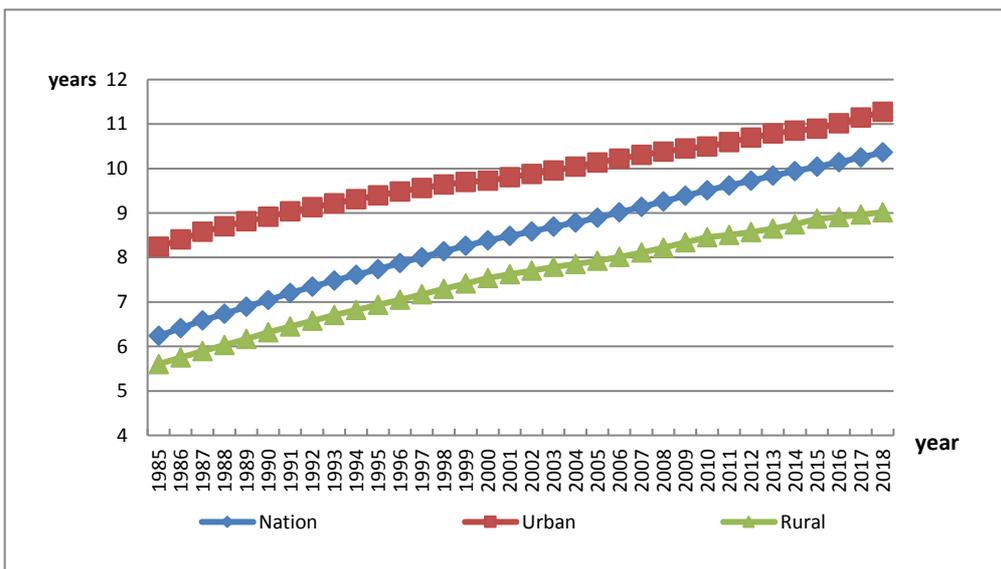
Figure5.3.2 Average Years of Schooling of the National Labor Force[31]

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[30] Note: The average age of the national labor force is calculated using census data and 1%-sample data.

[31] Note: The average age of the national labor force is calculated using census data in 1985-2010, 1% sample data in 2010-2018.

Figure 5.3.1 shows average schooling years of the national labor force, calculated on all the census data and 1% sample data. Because of the unreasonable age structure and education level in the data of 1% sample data in 1987, 1995 and 2005, 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 2018. The national average years of schooling increased from 6.24 years in 1985 to 10.36 in 2018. The rural average years of schooling increased from 5.60 in 1985 to 9.02 in 2018 while the urban average years increase from 8.24 to 11.27 during the same period.

Table5.3.1 Average Years of Schooling of the National Labor Force (1985-2018)

Unit: Year

Year	Average Years of Schooling		
	Nation	**Urban**	**Rural**
1985	6.24	8.24	5.60
1986	6.41	8.41	5.75
1987	6.58	8.58	5.89
1988	6.73	8.70	6.03
1989	6.89	8.81	6.17
1990	7.04	8.92	6.31
1991	7.20	9.03	6.45
1992	7.34	9.13	6.57
1993	7.48	9.22	6.70
1994	7.61	9.31	6.82
1995	7.74	9.39	6.94
1996	7.87	9.48	7.05
1997	8.00	9.56	7.17
1998	8.14	9.64	7.29
1999	8.26	9.69	7.41
2000	8.38	9.73	7.54
2001	8.48	9.80	7.62
2002	8.58	9.88	7.70

Year	Average Years of Schooling		
	Nation	**Urban**	**Rural**
2003	8.69	9.96	7.78
2004	8.79	10.04	7.85
2005	8.90	10.13	7.92
2006	9.01	10.22	8.01
2007	9.13	10.30	8.11
2008	9.26	10.37	8.22
2009	9.39	10.44	8.34
2010	9.51	10.49	8.46
2011	9.61	10.59	8.50
2012	9.73	10.69	8.57
2013	9.84	10.78	8.65
2014	9.94	10.85	8.74
2015	10.04	10.89	8.87
2016	10.14	11.01	8.91
2017	10.25	11.14	8.96
2018	10.36	11.27	9.02

Figure5.3.3 and Table 5.3.2 show the trends of average years of schooling of the labor force in the Mainland, Hong Kong and Taiwan. The labor force average years of schooling of Hong Kong increased from 8.65 in 1986 to 12.36 in 2018, while that of Taiwan increased from 8.86 in 1985 to 13.70 in 2018. 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.
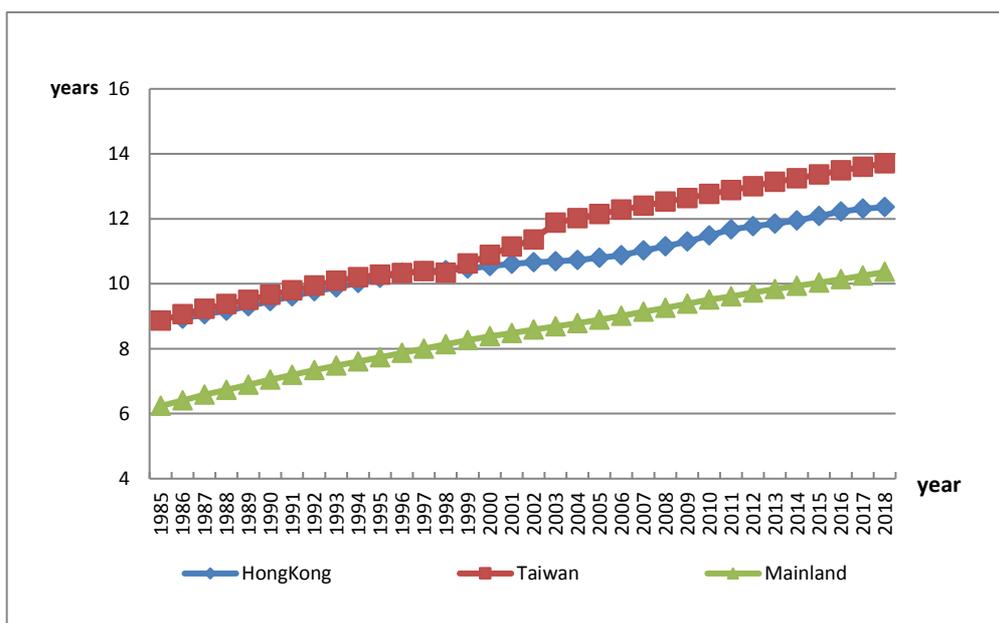
Figure 5.3.3 Average Years of Schooling of the Labor Force in Mainland, Hong Kong and Taiwan

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		8.86	6.24
1986	8.93	9.06	6.41
1987	9.06	9.23	6.58
1988	9.17	9.38	6.73
1989	9.30	9.50	6.89
1990	9.46	9.65	7.04
1991	9.61	9.80	7.20
1992	9.76	9.94	7.34
1993	9.88	10.09	7.48
1994	10.02	10.20	7.61
1995	10.18	10.28	7.74
1996	10.34	10.33	7.87

Year	Average Years of Schooling		
	Hong Kong	**Taiwan**	**Mainland**
1997	10.39	10.39	8.00
1998	10.42	10.34	8.14
1999	10.47	10.62	8.26
2000	10.54	10.89	8.38
2001	10.61	11.14	8.48
2002	10.66	11.35	8.58
2003	10.69	11.88	8.69
2004	10.73	12.02	8.79
2005	10.80	12.15	8.90
2006	10.88	12.28	9.01
2007	11.02	12.40	9.13
2008	11.15	12.52	9.26
2009	11.29	12.64	9.39
2010	11.48	12.76	9.51
2011	11.67	12.88	9.61
2012	11.77	13.00	9.73
2013	11.85	13.13	9.84
2014	11.95	13.24	9.94
2015	12.09	13.36	10.04
2016	12.22	13.49	10.14
2017	12.31	13.60	10.25
2018	12.36	13.70	10.36
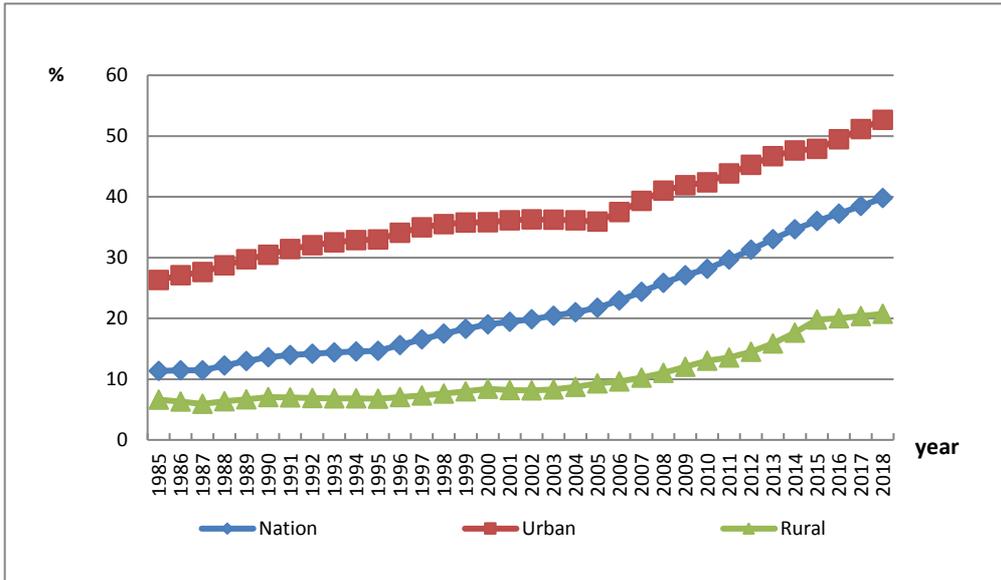
Figure5.3.4 Proportions of High School or Above in the Labor Force[32]
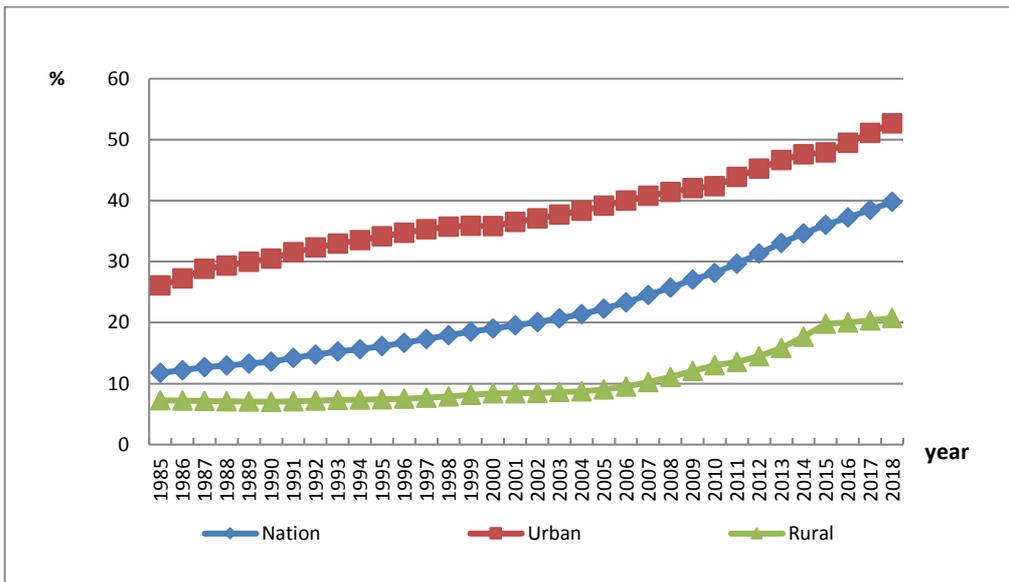
Figure5.3.5 Proportions of High School or Above in the Labor Force[33]

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[32] Note: The average age of the national labor force is calculated using census data and 1%-sample data.

[33] Note: The average age of the national labor force is calculated using census data in 1985-2010, 1% sample data in 2010-2018.

Figure 5.3.4 shows the proportion of high school education level or above in the labor force, which is calculated based on the census data and 1% sample data. Because of the unreasonable age structure and education level in the data of 1% sample data in 1987, 1995 and 2005, as before we use only census data to obtain the modified data shown in figure 5.3.5. It can be seen that the proportion as a whole shows a significant upward trend. The national proportion of labor force with at least high school education increased from 11.8% in 1985 to 39.8% in 2018, the rural proportion increased from 7.2% in 1985 to 20.7% in 2018, and the urban proportion increased from 26.1% in 1985 to 52.7% in 2018.

Table5.3.3 National Proportions of High School or Above of the National Labor Force (1985-2018)

Unit: %

Year	Proportions of High School or Above		
	Nation	**Urban**	**Rural**
1985	11.77	26.08	7.23
1986	12.16	27.25	7.20
1987	12.70	28.80	7.15
1988	12.98	29.35	7.10
1989	13.28	29.96	7.04
1990	13.60	30.46	7.01
1991	14.22	31.54	7.13
1992	14.75	32.33	7.22
1993	15.24	32.95	7.32
1994	15.65	33.55	7.35
1995	16.13	34.13	7.43
1996	16.69	34.75	7.53
1997	17.31	35.28	7.67
1998	17.93	35.70	7.91
1999	18.51	35.88	8.16
2000	19.01	35.82	8.41
2001	19.56	36.52	8.43
2002	20.09	37.09	8.48

Year	Proportions of High School or Above		
	Nation	**Urban**	**Rural**
2003	20.72	37.69	8.61
2004	21.38	38.33	8.74
2005	22.29	39.18	9.04
2006	23.34	40.03	9.53
2007	24.51	40.82	10.23
2008	25.72	41.44	11.07
2009	27.01	42.05	12.06
2010	28.15	42.36	13.01
2011	29.67	43.87	13.54
2012	31.30	45.26	14.51
2013	33.04	46.68	15.86
2014	34.65	47.62	17.66
2015	36.03	47.89	19.81
2016	37.22	49.48	20.03
2017	38.51	51.12	20.36
2018	39.78	52.69	20.74
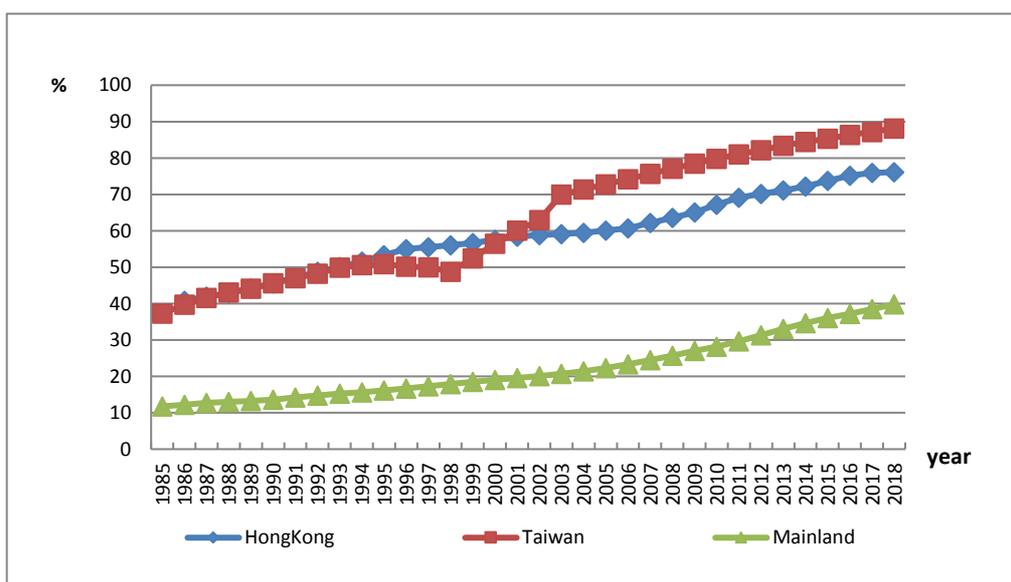
Figure 5.3.6 Proportions of High School Education or Above in the Labor Force of Mainland, Hong Kong and Taiwan

Figures 5.3.6 and Table 5.3.4 show the trends in proportions of population with high school educational attainment or above in the labor forces of Mainland, Hong Kong and Taiwan. The proportion in Hong Kong increases from 40.78% in 1986 to 76.09% in 2018 while that of Taiwan increases from 37.27% in 1985 to 88.16% in 2018. 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 or Above in the Labor Force of Mainland, Hong Kong and Taiwan

Unit: %

Year	Proportions of High School Education or Above		
	Hong Kong	**Taiwan**	**Mainland**
1985		37.27	11.77
1986	40.78	39.70	12.16
1987	41.94	41.57	12.70
1988	42.90	43.07	12.98
1989	44.11	44.11	13.28
1990	45.64	45.64	13.60
1991	47.13	47.02	14.22
1992	48.77	48.27	14.75
1993	50.07	49.88	15.24
1994	51.53	50.61	15.65
1995	53.29	50.84	16.13
1996	55.00	50.16	16.69
1997	55.50	49.95	17.31
1998	56.03	48.80	17.93
1999	56.63	52.47	18.51
2000	57.52	56.50	19.01
2001	58.40	60.10	19.56
2002	58.87	62.95	20.09
2003	59.09	69.94	20.72
2004	59.49	71.41	21.38
2005	60.06	72.80	22.29
2006	60.68	74.19	23.34

Year	Proportions of High School Education or Above		
	Hong Kong	**Taiwan**	**Mainland**
2007	62.17	75.71	24.51
2008	63.54	77.05	25.72
2009	65.08	78.50	27.01
2010	67.14	79.79	28.15
2011	69.09	81.05	29.67
2012	70.15	82.19	31.30
2013	71.10	83.38	33.04
2014	72.17	84.47	34.65
2015	73.72	85.31	36.03
2016	75.16	86.32	37.22
2017	75.92	87.16	38.51
2018	76.09	88.16	39.78
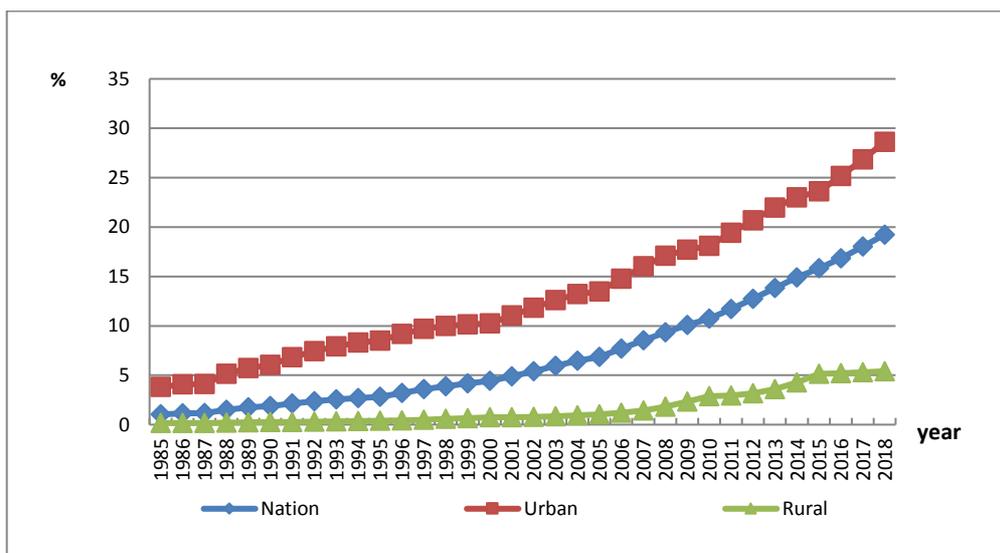
Figure 5.3.7 National Proportions of College Education or Above of the National Labor Force[34]

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[34] Note: The average age of the national labor force is calculated using census data and 1%-sample data.
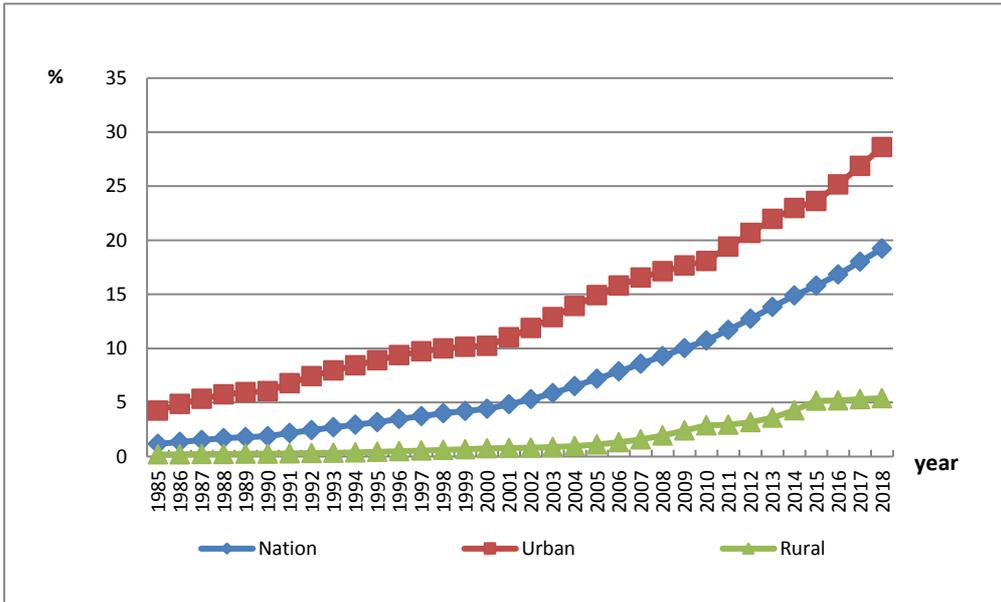
Figure 5.3.8 National Proportions of College Education or Above of the National Labor Force[35]

Figure 5.3.7 shows proportion workers with education of college or 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, thus we use only census data to obtain the modified data shown in Figure 5.3.8. Figure 5.3.8 shows national proportion of labor force with schooling of college or above in the labor force increased from 1.17% in 1985 to 19.24% in 2018. Among the rural proportion it increased from 0.19% in 1985 to 5.40% in 2018 while in the urban proportion the proportion increased from 4.25% to 28.61%. The trend is consistent with the improvement and expansion of higher education in China.

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[35] Note: The average age of the national labor force is calculated using census data.

Table 5.3.5 National Proportions of College or Above of the National Labor Force (1985-2018)

<div align="right">Unit: %</div>

Year	Proportions of College or Above		
	Nation	**Urban**	**Rural**
1985	1.17	4.25	0.19
1986	1.36	4.87	0.21
1987	1.53	5.33	0.22
1988	1.69	5.75	0.24
1989	1.81	5.95	0.26
1990	1.89	6.03	0.27
1991	2.17	6.78	0.29
1992	2.45	7.43	0.31
1993	2.70	7.96	0.34
1994	2.93	8.43	0.38
1995	3.19	8.89	0.43
1996	3.48	9.37	0.49
1997	3.75	9.72	0.55
1998	3.99	9.98	0.61
1999	4.22	10.15	0.68
2000	4.42	10.23	0.76
2001	4.83	11.01	0.77
2002	5.30	11.87	0.81
2003	5.87	12.88	0.87
2004	6.50	13.93	0.96
2005	7.18	14.93	1.10
2006	7.86	15.80	1.31
2007	8.57	16.55	1.58
2008	9.28	17.14	1.95
2009	10.03	17.68	2.42
2010	10.72	18.08	2.88
2011	11.69	19.40	2.94
2012	12.73	20.67	3.18
2013	13.84	21.97	3.60
2014	14.88	22.99	4.27
2015	15.82	23.62	5.14

Year	Proportions of College or Above		
	Nation	**Urban**	**Rural**
2016	16.85	25.15	5.20
2017	18.02	26.86	5.29
2018	19.24	28.61	5.40
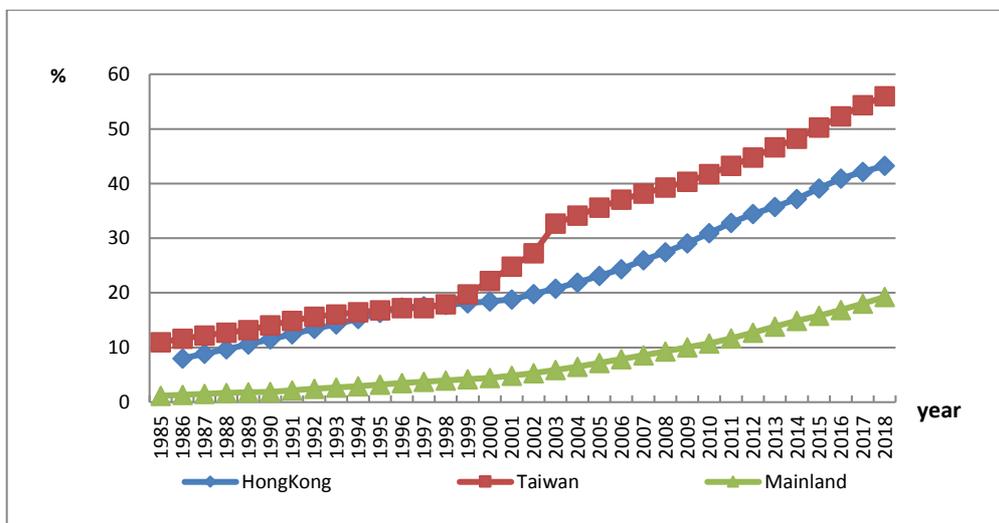
Figure 5.3.9 Proportions of College Education or Above in the Labor Force of Mainland, Hong Kong and Taiwan

Figures 5.3.9 and Table5.3.6 show the trends in the proportions of labor force with college educational attainment or above in the labor force of Mainland, Hong Kong and Taiwan. The proportion in Hong Kong increased from8.00% in 1986 to 43.25% in 2018, while that in Taiwan increased from 10.96% in 1985 to 55.97% in 2018. 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 or Above in the Labor Force of Mainland, Hong Kong and Taiwan

Unit: %

Year	Proportions of College Education or Above		
	Hong Kong	**Taiwan**	**Mainland**
1985		10.96	1.17
1986	8.00	11.60	1.36
1987	8.85	12.19	1.53
1988	9.67	12.72	1.69
1989	10.54	13.17	1.81
1990	11.50	14.05	1.89
1991	12.44	14.88	2.17
1992	13.42	15.65	2.45
1993	14.26	16.08	2.70
1994	15.25	16.49	2.93
1995	16.32	16.83	3.19
1996	17.31	17.24	3.48
1997	17.58	17.20	3.75
1998	17.80	17.92	3.99
1999	18.09	19.76	4.22
2000	18.44	22.16	4.42
2001	18.77	24.79	4.83
2002	19.78	27.29	5.30
2003	20.78	32.70	5.87
2004	21.89	34.14	6.50
2005	23.12	35.64	7.18
2006	24.37	37.06	7.86
2007	25.97	38.16	8.57
2008	27.46	39.31	9.28
2009	29.09	40.34	10.03
2010	30.97	41.74	10.72
2011	32.81	43.23	11.69
2012	34.44	44.75	12.73
2013	35.72	46.65	13.84
2014	37.21	48.23	14.88
2015	39.13	50.24	15.82
2016	40.92	52.31	16.85

Year	Proportions of College Education or Above		
	Hong Kong	**Taiwan**	**Mainland**
2017	42.17	54.35	18.02
2018	43.25	55.97	19.24

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 2018 among all provinces in China in descending order in the total, rural and urban labor forces. In general, the average age of the labor force is between 33 and 40 years (of age) in 2018, 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 (2018)

Unit: Year (of age)

Rank	Province	Average Age		
		Sub-Total	**Urban**	**Rural**
1	Heilongjiang	40.19	40.37	39.93
2	Liaoning	39.97	40.04	39.83
3	Jilin	39.73	39.81	39.64
4	Chongqing	39.42	39.34	39.59
5	Hunan	39.1	39.27	38.9
6	Zhejiang	39.01	38.52	40.09
7	Inner Mongolia	38.99	38.61	39.65
8	Hubei	38.86	38.49	39.42
9	Jiangsu	38.76	38.5	39.36
10	Hebei	38.61	38.52	38.73
11	Sichuan	38.52	38.23	38.84
12	Shanghai	38.37	38.37	-
13	Tianjin	38.28	38.21	38.64
14	Jiangxi	38.18	38.38	37.94
15	Fujian	38.09	37.84	38.59

Rank	Province	Average Age		
		Sub-Total	Urban	Rural
16	Shanxi	38.01	38.2	37.77
17	Shandong	37.96	37.95	37.98
18	Qinghai	37.95	38.31	37.51
19	Guangxi	37.74	37.53	37.95
20	Beijing	37.71	37.55	38.77
21	Shannxi	37.7	37.09	38.51
22	Henan	37.65	37.67	37.62
23	Gansu	37.63	37.62	37.64
24	Anhui	37.57	37.25	37.95
25	Yunnan	37.37	37.66	37.13
26	Ningxia	37.25	37.67	36.65
27	Guangdong	36.75	36.79	36.62
28	Xinjiang	36.68	37.92	35.67
29	Hainan	36.55	36.5	36.61
30	Guizhou	36.32	36.46	36.2
31	Tibet	35.37	33.64	36.32
	Mainland	38.39	38.37	38.42

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 2018 in the total, rural and urban labor forces. In general, the average years of education of the labor force in provinces with better economic development, such as Beijing, Shanghai, and Tianjin, are correspondingly longer; the average years of education in provinces with lower development levels, such as Tibet and Qinghai, and Yunnan are shorter. Judging from the comparison of urban and rural provincial areas, the urban labor force in all mainland provinces has more years of education than rural, and this difference will be even greater in economically underdeveloped provinces. For example, the difference in years of education between urban

and rural areas in Tibet is as high as 4.95 years, while the gap in Beijing is only 2.78.

Table 5.5.1 Average Years of Schooling of the Labor Force at Provincial Level (2018)

Unit: Year

Rank	Province	Average Years of Schooling		
		Sub-total	Urban	Rural
1	Beijing	12.98	13.34	10.56
2	Shanghai	11.97	11.97	-
3	Tianjin	11.31	11.65	9.5
4	Jiangsu	10.94	11.47	9.7
5	Liaoning	10.92	11.79	9.03
6	Hubei	10.74	11.7	9.29
7	Shannxi	10.73	11.76	9.39
8	Shanxi	10.71	11.58	9.57
9	Inner Mongolia	10.66	11.61	8.98
10	Hunan	10.63	11.55	9.54
11	Guangdong	10.53	10.93	9.46
12	Jilin	10.4	11.66	8.79
13	Chongqing	10.37	11.1	8.9
14	Shandong	10.31	11.65	8.76
15	Zhejiang	10.29	10.74	9.29
16	Hainan	10.29	11	9.3
17	Heilongjiang	10.28	11.35	8.73
18	Hebei	10.27	11.19	9.22
19	Henan	10.21	11.1	9.29
20	Anhui	10.2	11.19	9.02
21	Jiangxi	10.12	10.97	9.11
22	Fujian	10.12	10.73	8.91
23	Guangxi	9.94	11.08	8.74
24	Ningxia	9.94	11.07	8.36
25	Sichuan	9.94	11.14	8.63
26	Xinjiang	9.93	11.69	8.49
27	Gansu	9.72	11.56	8.22
28	Guizhou	9.21	10.48	8.08
29	Yunnan	9.11	10.61	7.89

Rank	Province	Average Years of Schooling		
		Sub-total	Urban	Rural
30	Qinghai	8.72	10.29	6.83
31	Tibet	7.16	10.36	5.41
	Mainland	10.36	11.27	9.02

Table 5.5.2 shows the 2018 provincial rankings for the proportion of labor force with high school education or above in the total, rural and urban labor forces. Beijing, Shanghai and Tianjin have the highest average years of schooling, while Tibet and Yunnan are at the bottom.

Table5.5.2 The Proportion of High School Education or Above of the Labor Force at Provincial Level (2018)

Unit：%

Rank	Province	The proportion of high school education or above		
		Sub-total	Urban	Rural
1	Beijing	72.3	76.77	42.75
2	Shanghai	59.25	59.25	-
3	Tianjin	50.17	55.62	21.5
4	Jiangsu	47.07	54.46	29.74
5	Hunan	44.81	58.66	28.38
6	Hubei	44.46	58.71	23.03
7	Shannxi	44.15	58.02	26.12
8	Inner Mongolia	44.11	57.17	21.02
9	Shanxi	43.5	56.96	25.88
10	Liaoning	43.08	56.72	13.55
11	Guangdong	43.06	49.17	26.94
12	Chongqing	41.14	51.35	20.77
13	Ningxia	39.39	53	20.37
14	Zhejiang	39.03	44.71	26.36
15	Fujian	37.95	45.89	22.45
16	Hainan	37.88	49.89	21.23
17	Jilin	37.78	57.35	12.69
18	Gansu	37.67	59.93	19.56
19	Shandong	37.19	57.43	13.57
20	Henan	36.88	51.55	21.78

Rank	Province	The proportion of high school education or above		
		Sub-total	Urban	Rural
21	Anhui	36.7	52.15	18.24
22	Jiangxi	36.58	49.14	21.7
23	Sichuan	36.33	52.42	18.71
24	Hebei	35.26	49.86	18.55
25	Heilongjiang	35.18	51.84	11.18
26	Xinjiang	34.64	63.13	11.35
27	Guangxi	32.97	49.82	15.26
28	Qinghai	30.93	46.28	12.47
29	Guizhou	29.23	45.56	14.84
30	Yunnan	27.52	45.23	13.17
31	Tibet	22.91	50.27	7.93
	Mainland	39.78	52.69	20.74

Table 5.5.3 shows the provincial rankings for the proportion of workers with college education or above in the labor force in 2018 in the total, rural and urban labor forces. The rankings are basically consistent with the rankings of the proportion of workers with high school education in general. However, because the permanent population includes many college students who are from other provinces, the number of college students is influenced by the number and quality of universities in the province, resulting in the ranking of the proportion of college-level or above education and the ranking of the proportion of high school level or above education is slightly different.

Table 5.5.3 Proportion of the Provincial Level labor Force with a College Education or Above (2018)

Unit: %

Rank	Province	The proportion of college education or above		
		Sub-total	Urban	Rural
1	Beijing	52.8	58.22	17.03
2	Shanghai	39.47	39.47	-
3	Tinajin	29.98	34.29	7.28
4	Liaoning	24.9	34.52	4.05
5	Jiangsu	24.24	30.74	8.98

Rank	Province	The proportion of college education or above		
		Sub-total	Urban	Rural
6	Shannxi	24.23	36.63	8.11
7	Inner Mongolia	23.85	33.38	7
8	Hubei	22.39	32.74	6.82
9	Zhejiang	21.05	26.54	8.81
10	Ningxia	20.55	30.47	6.69
11	Shanxi	19.65	29.59	6.64
12	Jilin	19.56	31.78	3.89
13	Chongqing	19.32	26.65	4.7
14	Fujian	18.98	25.47	6.3
15	Shandong	18.42	31.99	2.58
16	Gansu	18.25	33.44	5.89
17	Hunan	18	28.73	5.27
18	Heilongjiang	17.95	28.36	2.96
19	Guangdong	17.2	21.78	5.08
20	Sichuan	17.04	28.17	4.86
21	Anhui	16.95	26.78	5.21
22	Xinjiang	16.41	32.25	3.45
23	Hebei	16.33	26.85	4.29
24	Hainan	15.56	22.35	6.15
25	Jiangxi	15.12	23.78	4.87
26	Qinghai	15.01	23.75	4.5
27	Guangxi	14.78	25.55	3.48
28	Yunnan	13.65	25.67	3.9
29	Henan	13.38	22.58	3.9
30	Guizhou	12.61	22.11	4.23
31	Tibet	11.63	27.14	3.13
	Mainland	19.24	28.61	5.40

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 consumer price index (CPI) in 1985 as the base period to calculate the real value of national human capital. The reason for adopting this method is that: on the one hand, other published deflators are not available for recent years, which makes it inconvenient to update the calculation of real human capital, and the national statistical department updates the consumer price index every year. On the other hand, the real value of human capital calculated based on the consumer price index is smaller than the result calculated using capital deflator index of Zhang Jun et al. (2004) and Holz (2006). Therefore, we give a relatively conservative estimate of the real human capital stock in China.

Discussions of human capital categorized by gender and by region are important in our report, it can reflect the gender difference and urban-rural difference of human capital. Table 6.1.1 shows real human capital for the country as a whole based on 6-education categories, by gender, and by region. From 1985 to 2018, human capital increased 11 times from 42.12 trillion Yuan to 512.87 trillion Yuan, an average annual growth rate of 7.79%, lower than the average annual growth rate of the economy. The reason for this rapid growth lies in 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 have trended upward trend between 1985-2018. Rural real human capital increased from 25.12 trillion Yuan to 66.60 trillion Yuan – just more than doubling the level of human

capital over this time period; urban real human capital grew from 17.00 trillion Yuan to 446.273 trillion Yuan which is a 25 fold rise – or human capital rose over 25 times over this period in urban areas. The corresponding annual growth rates are 3.04% for rural areas and 10.29% for urban areas. Before 1993, urban real human capital is smaller than rural real human capital, while after 1993 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	42120	23036	19085	17000	25120
1986	46600	26801	19809	20170	26430
1987	49778	29139	20639	21888	27890
1988	47999	28609	19390	21289	26710
1989	46529	28261	18268	21399	25130
1990	52155	32054	20101	24945	27210
1991	58478	36261	22217	28478	30000
1992	63321	39528	23792	31151	32170
1993	63324	39812	23512	31644	31680
1994	58156	36693	21463	29506	28650
1995	56213	35527	20686	29093	27120
1996	59827	38152	21667	32627	27200
1997	67103	43042	24058	38353	28750
1998	77706	50061	27634	46096	31610
1999	90582	58296	32287	55842	34740
2000	102765	66219	36536	64885	37880
2001	115123	73885	41248	74783	40340
2002	128739	82870	45869	86199	42540
2003	141204	91279	49915	96394	44810
2004	150997	97224	53773	105397	45600
2005	162778	104485	58293	115568	47210
2006	185268	119476	65802	133448	51820
2007	202478	130381	72096	148528	53950
2008	216653	139251	77402	161153	55500
2009	247774	159242	88532	186314	61460
2010	271287	174740	96547	206707	64580

Year	National	Male	Female	Urban	Rural
2011	291902	187330	104572	229772	62130
2012	320214	205681	114533	258474	61740
2013	356865	229954	126920	295785	61080
2014	385557	250113	135443	323547	62010
2015	411238	268802	142436	347738	63500
2016	443475	290587	152879	379205	64270
2017	478953	315212	163751	413233	65720
2018	512873	338877	173995	446273	66600

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 1989. 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 therefore, the gap between urban and rural increased. From the perspective of population size, the reason for this different change in urban and rural areas lies in the fact that the early rural population is much higher than the urban population, which in turn makes the total rural human capital larger.

For example, in 1985 the rural population at 808 million was more than three times the size of the urban population at 251 million, however, by 2018, the population in rural China had fallen to 564 million, lower than the urban population of 831 million.

From other perspectives, there are two main reasons for the disparity in real human capital between urban and rural after 1998. One is the rapid urbanization process during the economic transition, as there was a large-scale migrated from rural to urban. The second reason for the growing disparity is the growing educational level gap between the population in urban and rural areas over this time period. In addition, we find that in the figure the real human

capital changes in urban are basically the same as the pattern of exponential growth that is observed in the whole country. To some extent, it can be concluded that the trend of national human capital is being driven by the trend of urban human capital.
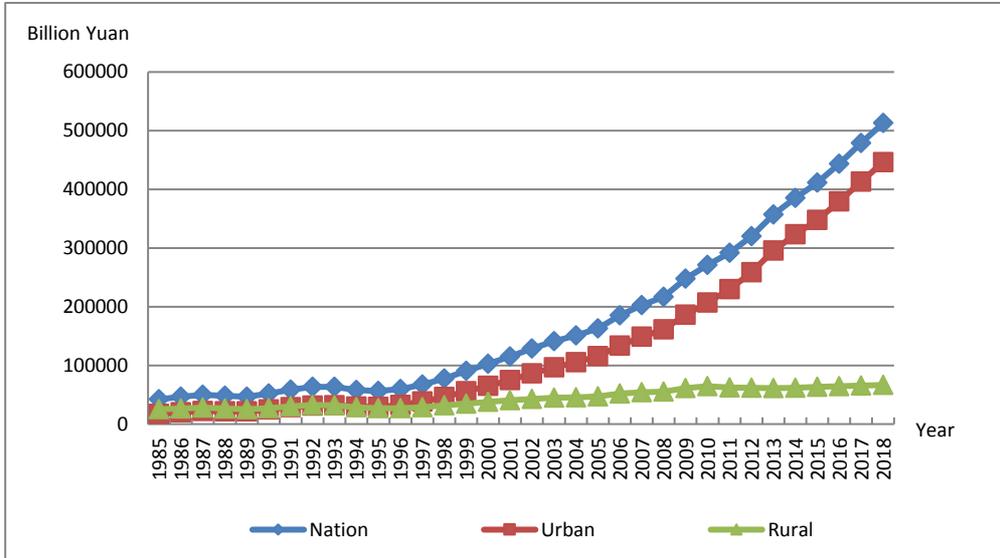
Figure 6.1.1 National Real Human Capital by Region,1985-2018

Table 6.1.2 shows the real human capital index of China from 1985 to 2018 and the real human capital index by gender and region based on 1985. It intuitively shows the trend of human capital.

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

Year	National	Male	Female	Urban	Rural
1985	100	100	100	100	100
1986	110.64	116.35	103.80	118.65	105.21
1987	118.18	126.49	108.15	128.75	111.03
1988	113.96	124.19	101.60	125.22	106.33
1989	110.47	122.68	95.72	125.87	100.04
1990	123.82	139.15	105.33	146.73	108.32
1991	138.84	157.41	116.41	167.51	119.43
1992	150.33	171.60	124.67	183.23	128.07
1993	150.34	172.83	123.20	186.14	126.11

Year	National	Male	Female	Urban	Rural
1994	138.07	159.29	112.46	173.56	114.05
1995	133.46	154.23	108.39	171.13	107.96
1996	142.04	165.62	113.53	191.92	108.28
1997	159.31	186.85	126.06	225.60	114.45
1998	184.48	217.32	144.80	271.14	125.84
1999	215.06	253.07	169.18	328.48	138.30
2000	243.98	287.46	191.44	381.67	150.80
2001	273.32	320.74	216.13	439.89	160.59
2002	305.65	359.75	240.34	507.04	169.35
2003	335.24	396.25	261.55	567.01	178.38
2004	358.49	422.06	281.76	619.97	181.53
2005	386.46	453.58	305.44	679.79	187.94
2006	439.85	518.65	344.79	784.97	206.29
2007	480.71	566.00	377.77	873.67	214.77
2008	514.37	604.50	405.57	947.93	220.94
2009	588.25	691.28	463.89	1095.94	244.67
2010	644.07	758.56	505.89	1215.89	257.09
2011	693.02	813.22	547.94	1351.57	247.33
2012	760.24	892.88	600.13	1520.40	245.78
2013	847.25	998.25	665.04	1739.87	243.15
2014	915.37	1085.76	709.69	1903.17	246.86
2015	976.34	1166.89	746.34	2045.47	252.79
2016	1052.88	1261.46	801.05	2230.57	255.85
2017	1137.10	1368.36	858.02	2430.72	261.62
2018	1217.63	1471.10	911.70	2625.07	265.13

6.2 Human capital per capita

Increases in real human capital are not only due to factors such as increased educational attainment, increased return on education, increased return of on-the-job training and "learning-by-doing", but also by factors like population growth, demographic changes (e.g., the size of retirement group), regional migration or urbanization (e.g., an individual can achieve higher value of human

capital by moving from a rural to an urban area). In order to further understand the dynamic changes of the national human capital, we calculated the per capita human capital. The so-called per capita human capital refers to the ratio of real human capital to non-retired population. Although human capital per capita is also affected by the age distribution of the population, it can eliminate the influence of the total population, so it can better reflect the development of human capital in a region.

Table 6.2.1 shows real human capital per capita for the country as a whole based on 6-education categories, by gender, and by region. From 1985 to 2018, the real human capital per capita in the country showed a growth trend, of which the real human capital per capita increased from 43.42 thousand yuan to 448.63 thousand yuan, an increase of about 9 times. China's average annual growth rate of real human capital per capita from 1985 to 2018 was about 7.27%. Such a high growth rate of real human capital per capita stems from China's rapid economic growth since 1978, the rapid expansion of the scale of "all forms" of education, the transformation of the market economic system (human capital can achieve higher value under market economy conditions) and the large scale of rural-urban migration. Judging from the calculation results of human capital per capita by region, from 1985 to 2018, the human capital per capita of urban has been higher than that of rural.

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	43.42	44.85	41.81	77.17	33.46
1986	47.62	51.55	43.19	87.69	35.30
1987	50.38	55.50	44.57	91.45	37.27
1988	47.87	53.46	41.47	84.17	35.62
1989	45.77	52.01	38.60	80.51	33.48
1990	50.43	58.00	41.75	89.69	35.97
1991	56.02	65.08	45.64	98.93	39.65
1992	60.14	70.46	48.38	104.59	42.63

Year	National	Male	Female	Urban	Rural
1993	59.81	70.83	47.35	102.94	42.18
1994	54.72	65.25	42.89	93.53	38.33
1995	52.58	63.04	40.91	89.82	36.39
1996	55.71	67.23	42.78	94.48	37.31
1997	62.22	75.43	47.37	104.58	40.34
1998	71.49	86.98	54.04	118.81	45.17
1999	82.77	100.42	62.82	136.82	50.61
2000	93.49	113.54	70.81	151.98	56.45
2001	104.37	126.69	79.35	166.99	61.56
2002	116.53	142.10	87.94	183.67	66.89
2003	127.71	156.81	95.33	196.76	72.73
2004	136.25	167.28	102.04	207.09	76.18
2005	146.70	179.93	110.22	218.76	81.27
2006	164.77	202.19	123.34	243.10	89.96
2007	178.63	218.07	134.61	262.16	95.05
2008	189.95	230.36	144.38	277.32	99.19
2009	214.75	259.65	163.80	310.56	111.13
2010	233.10	281.79	177.57	334.11	118.47
2011	249.28	299.92	191.38	354.87	118.66
2012	272.99	328.35	209.54	384.82	123.08
2013	305.82	369.76	232.88	430.72	127.13
2014	331.63	403.54	249.53	464.07	133.41
2015	356.30	437.57	263.82	493.52	141.16
2016	384.16	474.43	282.12	529.14	146.69
2017	416.48	516.32	303.52	570.09	154.49
2018	448.63	555.99	326.02	610.44	161.49

Figure 6.2.1 shows the trend of urban and rural real human capital per capita. From the figure, not only can we find that between 1985 and 2018, urban real human capital per capita is significantly higher than that of rural, but the real human capital per capita gap between urban and rural regions continues to widen. Although the real human capital per capita in urban and rural areas have both shown significant growth since 1997, the growth rate in urban is significantly higher than that in rural, and the absolute gap in real human capital per capita

between urban and rural areas has gradually widened. Based on Fleisher, Li and Zhao (2009), human capital is a significant contributing factor (total factor productivity) to economic growth.

Therefore, the increase in real human capital per capita gap between urban and rural regions will further widen the urban-rural economic gap, thereby exacerbating the uneven urban-rural development. 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.
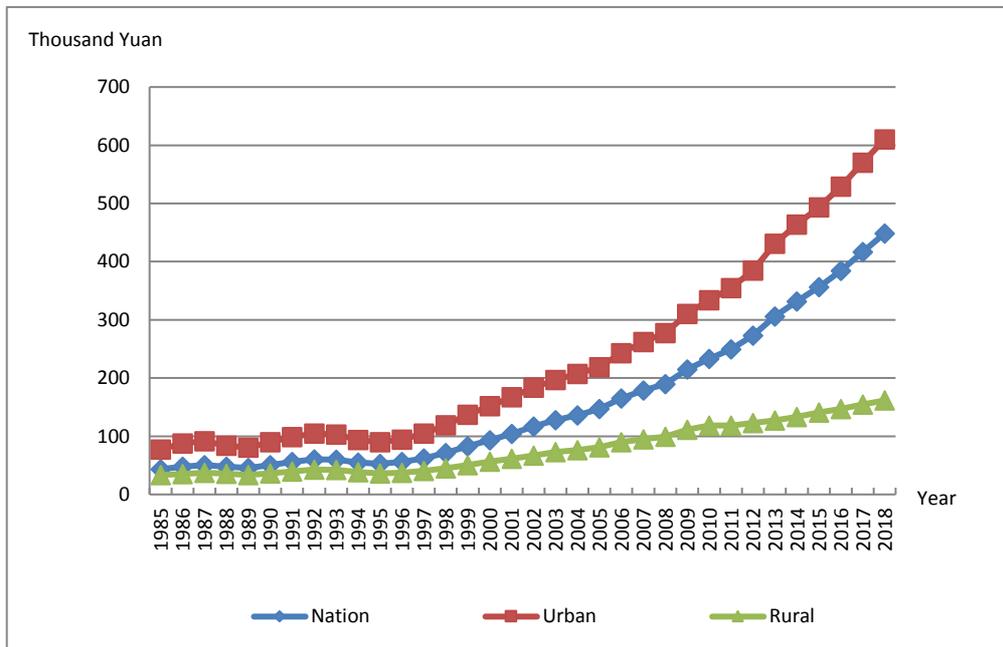
Figure 6.2.1 National Real Human Capital Per Capita by Region, 1985-2018
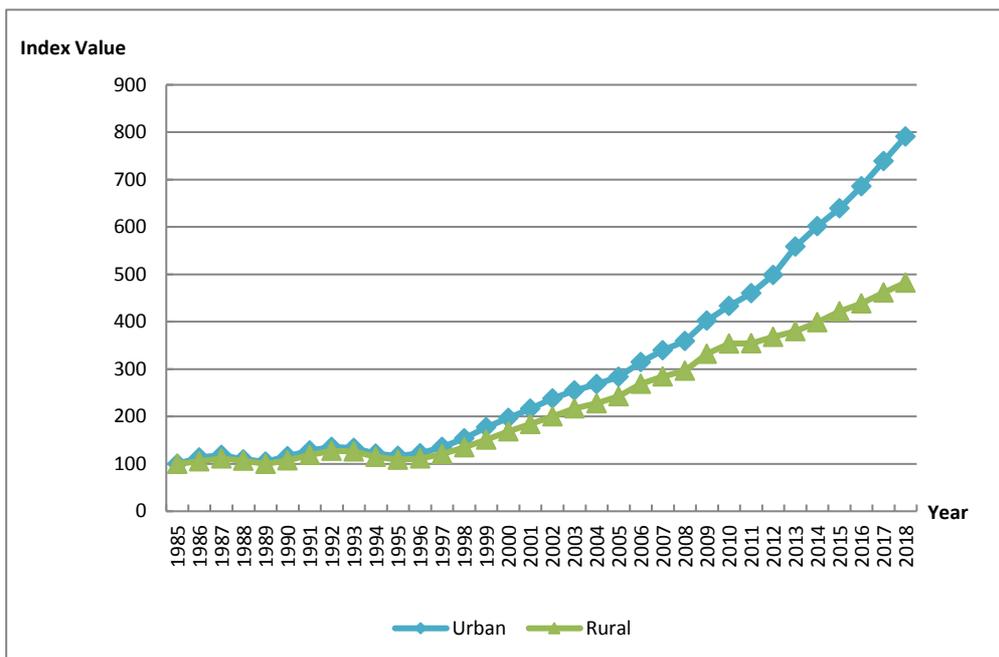
Figure 6.2.2 National Real Human Capital Per Capita Index by Region, 1985-2018

6.3 Labor force human capital

Labor force human capital is estimated in the same way as national human capital, using the J-F method. Labor force human capital refers to human capital of people who are capable of working. Labor force human capital refers to the human capital of those non-retired people over 16 years old and out-of-school.

6.3.1 National labor force human capital

Table 6.3.1 is the labor force human capital estimated using the national income parameters, population and discount rate of 4.58%. The first column is the nominal labor force human capital calculated according to the six education levels. The second column is the real labor force human capital calculated according to the six education levels. Real human capital in 1985 yuan is nominal human capital deflated by the consumer price index. The last column

of Table 6.3.1 also shows the ratio of nominal GDP to nominal labor force human capital.

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	17875	17875	9099	0.05
1986	20978	19704	10376	0.05
1987	24672	21595	12175	0.05
1988	28343	20876	15180	0.05
1989	32729	20421	17180	0.05
1990	37923	22953	18873	0.05
1991	43364	25342	22006	0.05
1992	49171	27013	27195	0.06
1993	55403	26524	35673	0.06
1994	62392	24072	48638	0.08
1995	70317	23132	61340	0.09
1996	80688	24453	71814	0.09
1997	92811	27293	79715	0.09
1998	106448	31481	85196	0.08
1999	120959	36208	90564	0.07
2000	137217	40844	100280	0.07
2001	150690	44448	110863	0.07
2002	165005	48933	121717	0.07
2003	181403	53067	137422	0.08
2004	199968	56205	161840	0.08
2005	221029	60906	187319	0.08
2006	260281	70570	219439	0.08
2007	299341	77360	270092	0.09
2008	339173	82728	319245	0.09
2009	390996	95921	348518	0.09
2010	450449	106848	412119	0.09
2011	503380	113082	487940	0.10
2012	561105	122654	538580	0.10

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
2013	611727	132774	592963	0.10
2014	669480	141844	641281	0.10
2015	725205	151407	685993	0.09
2016	794949	162536	740061	0.09
2017	867538	174489	820754	0.09
2018	941974	185484	900310	0.10

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 decreasing.

The ratio of nominal GDP to nominal labor force human capital can not only reflect the efficiency of human capital utilization in a region, but also reflect the impact of human capital on sustainable GDP growth from a certain aspect. On the one hand, the higher the ratio means that the higher the contribution of unit human capital to GDP, the higher the efficiency of human capital utilization; on the other hand, the slowdown of the ratio growth may also imply that the growth of GDP will slow down in the future. As shown in Figure 6.3.1, overall, from 1985 to 2018, the ratio of GDP to labor force human capital showed an upward trend but the growth rate slowed down.
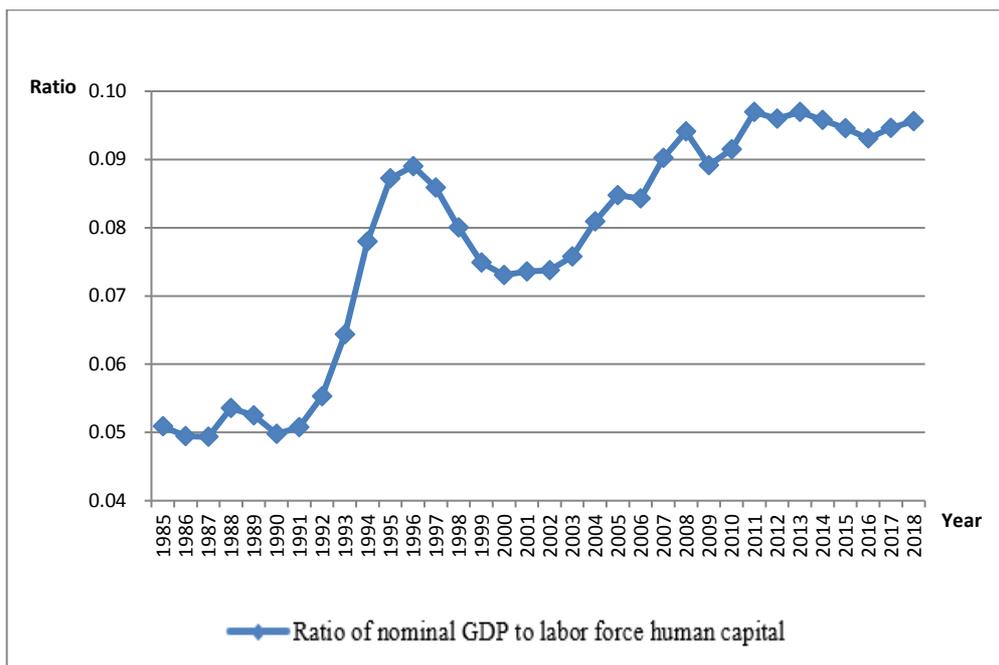
Figure 6.3.1 Nominal National Ratio of GDP to Labor Force Human Capital,

1985-2018

Tables 6.3.2 and 6.3.3 show the labor force human capital by gender and region respectively, compare the national human capital development status from gender and region. These results are based on the six education levels, the first three columns are nominal labor force human capital, and the last three columns are real labor force human capital.

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	17875	9889	7981	17875	9889	7981
1986	20978	11965	9013	19704	11230	8474
1987	24672	14428	10243	21595	12597	8999
1988	28343	16939	11404	20876	12425	8452
1989	32729	19903	12833	20421	12391	8033
1990	37923	23406	14523	22953	14159	8790

| Year	Nominal labor force human capital (Billions of Yuan)			Real labor force human capital (Billions of 1985 Yuan)		
	National	**Male**	**Female**	**National**	**Male**	**Female**
1991	43364	27152	16211	25342	15849	9496
1992	49171	31080	18081	27013	17039	9973
1993	55403	35262	20151	26524	16843	9681
1994	62392	39865	22527	24072	15353	8715
1995	70317	45029	25298	23132	14799	8333
1996	80688	52531	28157	24453	15908	8541
1997	92811	61160	31650	27293	17979	9312
1998	106448	70838	35610	31481	20947	10530
1999	120959	81019	39930	36208	24271	11944
2000	137217	92401	44806	40844	27523	13319
2001	150690	101463	49227	44448	29955	14493
2002	165005	111101	53904	48933	32976	15953
2003	181403	122045	59369	53067	35735	17333
2004	199968	134254	65714	56205	37762	18440
2005	221029	147848	73181	60906	40775	20137
2006	260281	174916	85366	70570	47454	23119
2007	299341	201257	98084	77360	52029	25330
2008	339173	227896	111307	82728	55588	27135
2009	390996	262841	128104	95921	64489	31432
2010	450449	303569	146850	106848	71991	34857
2011	503380	338357	165023	113082	75982	37100
2012	561105	378377	182748	122654	82676	39988
2013	611727	411741	199995	132774	89346	43439
2014	669480	455544	213946	141844	96461	45382
2015	725205	496127	229078	151407	103505	47892
2016	794949	543462	251457	162536	111028	51518
2017	867538	593724	273834	174489	119280	55219
2018	941974	645016	296918	185484	126852	58642

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. As shown in the table, both nominal and real labor force human capital have upward trend between 1985-2018. The national nominal and real labor force human capital both were increasing during 1985-2018. 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 0.02 trillion Yuan in 1998 to over 109.18 trillion Yuan in 2018. In 2018, the national real labor force human capital was 4 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	17875	7085	10790	17875	7085	10790
1986	20978	8618	12360	19704	8054	11650
1987	24672	10472	14200	21595	8995	12600
1988	28343	12163	16180	20876	8656	12220
1989	32729	14169	18560	20421	8671	11750
1990	37923	16443	21480	22953	9933	13020
1991	43364	19124	24240	25342	10992	14350
1992	49171	21961	27210	27013	11623	15390
1993	55403	24973	30430	26524	11384	15140
1994	62392	28222	34170	24072	10292	13780
1995	70317	32227	38090	23132	10062	13070
1996	80688	38968	41720	24453	11183	13270
1997	92811	47111	45700	27293	13113	14180
1998	106448	56248	50200	31481	15751	15730
1999	120959	65939	55020	36208	18708	17500
2000	137217	77077	60140	40844	21694	19150
2001	150690	86680	64010	44448	24228	20220
2002	165005	97805	67200	48933	27613	21320
2003	181403	109993	71410	53067	30777	22290
2004	199968	124468	75500	56205	33715	22490
2005	221029	141429	79600	60906	37706	23200

Year	Nominal labor force human capital			Real labor force human capital (Billions of 1985 Yuan)		
	National	Urban	Rural	National	Urban	Rural
2006	260281	170481	89800	70570	44780	25790
2007	299341	198841	100500	77360	49980	27380
2008	339173	227573	111600	82728	54168	28560
2009	390996	266296	124700	95921	63931	31990
2010	450449	313449	137000	106848	72918	33930
2011	503380	362080	141300	113082	79992	33090
2012	561105	415005	146100	122654	89274	33380
2013	611727	460827	150900	132774	99234	33540
2014	669480	511680	157800	141844	107394	34450
2015	725205	561105	164100	151407	116027	35380
2016	794949	623249	171700	162536	126226	36310
2017	867538	688138	179400	174489	137039	37450
2018	941974	755374	186600	185484	147334	38150

Figure 6.3.3 shows the trends of real labor force human capital for urban and rural, respectively. Before 1998, the real labor force human capital for the rural was higher than that for urban. After 1998, the real labor force human capital for urban increased more rapidly than that for rural, 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. In addition, the figure shows that the trend of the real labor force human capital in urban is basically the same as that in the whole country. It can be considered that the trend of the national real labor force human capital depends on the trend of urban labor force human capital.
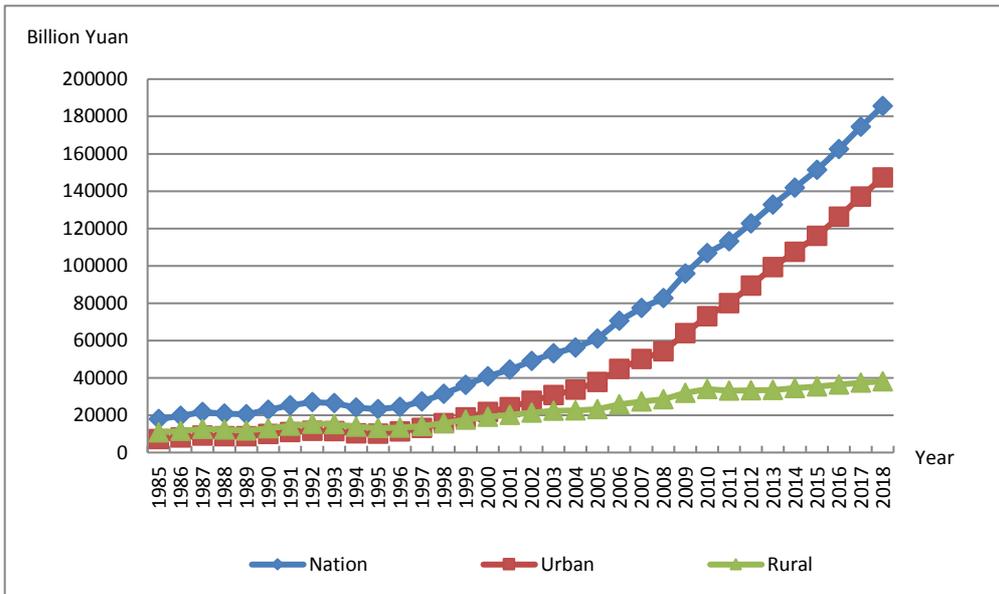
Figure 6.3.3 National Real Labor Force Human Capital by Region, 1985-2018

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.
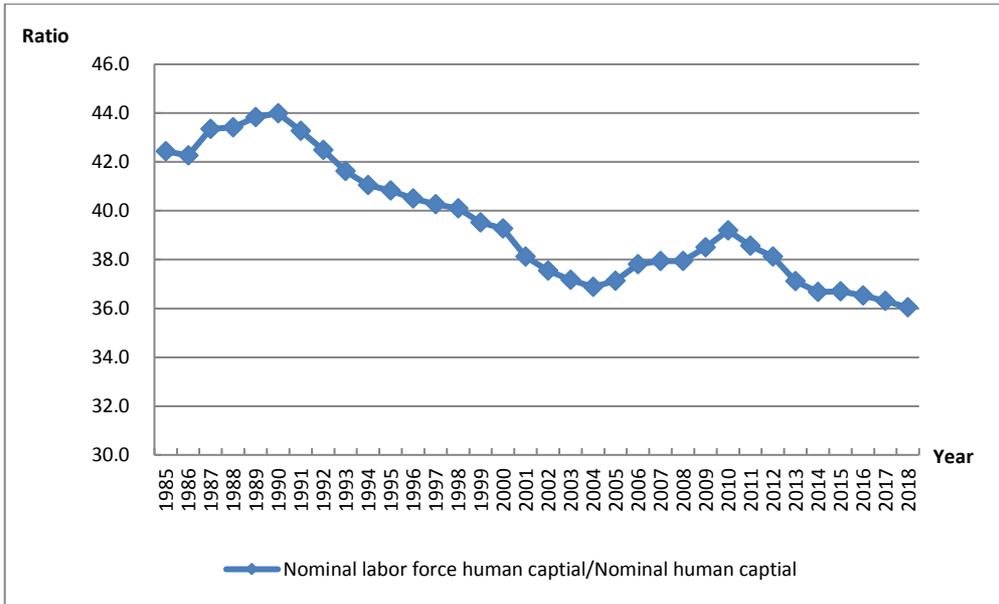
**Figure 6.3.4 National Ratio of Labor Force Human Capital to Total Human
Capital, 1985-2018**

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. Although
labor force human capital per capita is also affected by the age distribution of
the population, it can eliminate the impact of the labor force population, so it
can reflect the development status of labor force human capital per capita in a
region. The labor force human capital per capita refers to the ratio of the total
labor force human capital to the labor force population, and the labor force
population refers to the non-retired population over 16 years old who are out
of school.

Table 6.3.4 shows that the average labor force human capital in nominal
and real terms. The first column is the nominal labor force human capital per
capita calculated at six education levels, and the second column is the real labor
force human capital per capita under the six education levels. 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.

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	30.79	30.79
1986	35.07	32.94
1987	39.94	34.96
1988	44.93	33.09
1989	50.51	31.51
1990	56.83	34.40
1991	63.99	37.39
1992	71.58	39.33
1993	79.96	38.28
1994	89.16	34.40
1995	99.46	32.72
1996	112.85	34.20
1997	128.19	37.70
1998	144.63	42.77
1999	161.49	48.34
2000	180.08	53.60
2001	197.24	58.18
2002	215.41	63.88
2003	235.90	69.01
2004	258.69	72.71
2005	284.46	78.39
2006	329.89	89.44
2007	375.58	97.06
2008	421.86	102.90
2009	478.58	117.41
2010	543.36	128.89
2011	604.30	135.75
2012	673.59	147.24
2013	737.91	160.16
2014	808.55	171.31

Year	Nominal average labor force human capital （Thousands of Yuan）	Real average labor force human capital （Thousands of 1985 Yuan）
2015	880.10	183.75
2016	963.57	197.01
2017	1057.97	212.79
2018	1160.07	228.43

Tables 6.3.5 and 6.3.6 report the average labor force human capital by gender and by region separately at the six educational level. The first 3 columns are nominal labor force human capital per capita, the last 3 columns are real labor force human capital per capita.   From 1985-2018, the nominal and real labor force human capital per capita 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	30.79	32.30	29.08	30.79	32.30	29.08
1986	35.07	37.97	31.85	32.94	35.64	29.94
1987	39.94	44.45	34.95	34.96	38.81	30.70
1988	44.93	50.79	38.36	33.09	37.26	28.43
1989	50.51	57.89	42.19	31.51	36.04	26.41
1990	56.83	65.93	46.50	34.40	39.88	28.15
1991	63.99	75.42	51.03	37.39	44.03	29.89
1992	71.58	85.39	55.99	39.33	46.81	30.89
1993	79.96	96.61	61.45	38.28	46.14	29.52
1994	89.16	108.62	67.69	34.40	41.83	26.19
1995	99.46	122.03	74.85	32.72	40.11	24.65
1996	112.85	140.08	82.82	34.20	42.42	25.12
1997	128.19	160.53	92.27	37.70	47.19	27.15
1998	144.63	182.57	102.33	42.77	53.99	30.26
1999	161.49	204.59	113.12	48.34	61.29	33.84
2000	180.08	229.28	124.81	53.60	68.30	37.10

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
2001	197.24	252.39	135.99	58.18	74.51	40.04
2002	215.41	276.37	148.09	63.88	82.03	43.83
2003	235.90	303.59	161.77	69.01	88.89	47.23
2004	258.69	333.96	177.13	72.71	93.93	49.70
2005	284.46	366.87	195.67	78.39	101.18	53.84
2006	329.89	424.55	226.43	89.44	115.18	61.32
2007	375.58	480.33	259.48	97.06	124.18	67.01
2008	421.86	534.97	294.46	102.90	130.49	71.79
2009	478.58	604.23	335.35	117.41	148.25	82.28
2010	543.36	685.26	380.44	128.89	162.51	90.30
2011	604.30	758.65	426.42	135.75	170.36	95.86
2012	673.59	846.48	473.44	147.24	184.96	103.60
2013	737.91	927.35	519.47	160.16	201.23	112.83
2014	808.55	1026.00	557.15	171.31	217.26	118.18
2015	880.10	1125.00	598.12	183.75	234.71	125.04
2016	963.57	1235.14	653.14	197.01	252.34	133.81
2017	1057.97	1355.53	716.84	212.79	272.33	144.55
2018	1160.07	1476.01	791.78	228.43	290.28	156.38

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 1985-2018.

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	30.79	50.77	24.41	30.79	50.77	24.41
1986	35.07	58.20	27.45	32.94	54.39	25.87
1987	39.94	66.41	30.90	34.96	57.04	27.42
1988	44.93	72.91	34.87	33.09	51.89	26.34

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
1989	50.51	80.07	39.43	31.51	48.99	24.97
1990	56.83	87.69	44.75	34.40	52.97	27.11
1991	63.99	98.72	50.01	37.39	56.74	29.62
1992	71.58	110.37	55.79	39.33	58.41	31.55
1993	79.96	122.92	62.17	38.28	56.03	30.93
1994	89.16	136.39	69.34	34.40	49.74	27.95
1995	99.46	152.06	76.97	32.72	47.48	26.41
1996	112.85	172.02	85.35	34.20	49.36	27.14
1997	128.19	194.20	94.75	37.70	54.05	29.39
1998	144.63	216.44	105.25	42.77	60.61	32.98
1999	161.49	238.12	116.49	48.34	67.56	37.06
2000	180.08	261.94	128.89	53.60	73.73	41.05
2001	197.24	282.53	139.94	58.18	78.97	44.21
2002	215.41	306.15	150.35	63.88	86.43	47.69
2003	235.90	330.31	163.66	69.01	92.43	51.10
2004	258.69	358.71	177.51	72.71	97.17	52.88
2005	284.46	390.25	192.21	78.39	104.04	56.03
2006	329.89	452.37	217.62	89.44	118.82	62.50
2007	375.58	513.28	244.97	97.06	129.02	66.75
2008	421.86	573.60	274.06	102.90	136.53	70.12
2009	478.58	647.43	307.83	117.41	155.43	79.00
2010	543.36	732.80	341.36	128.89	170.47	84.56
2011	604.30	817.45	362.23	135.75	180.59	84.83
2012	673.59	911.87	386.34	147.24	196.16	88.26
2013	737.91	996.77	411.27	160.16	214.64	91.41
2014	808.55	1090.59	440.51	171.31	228.90	96.18
2015	880.10	1178.24	471.63	183.75	243.64	101.65
2016	963.57	1293.43	499.77	197.01	261.96	105.71
2017	1057.97	1421.86	533.36	212.79	283.16	111.37
2018	1160.07	1560.03	568.45	228.43	304.28	116.25

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 et al. 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) to 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 et al. 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%	
Europe & Central Asia	5.8	5.9	5.9	6.5	6.3	24
	7%	6%	6%	5%	5%	
Latin America & the Caribbean	9.1	9.1	8.7	8.4	8.2	22
	9%	9%	9%	9%	9%	
Middle East & North Africa	5.7	5.5	5.5	5.4	5.6	16
	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.

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 or above. Starting from 2000, college or above was further divided into two categories: three-year college, and four-year university or above.[36] With this more detailed information on educational attainment, we create a separate human capital series starting from 2000.[37]

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(2018 physical capital data has not been updated). This is not surprising, given that in most other countries human capital accounts for over 60% of national wealth.[38] 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. The trend in the ratio of human capital to physical capital indicates that the share of human capital is declining, but the rate of decline is gradually decreasing and has begun to show

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[36] 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 or above. Because we use the lower bound of schooling for this latter education category, the amount of human capital is underestimated.

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

[38] 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.

a steady upward trend. Since human capital is also related to population changes, we are still not sure whether this trend indicates that the policies adopted by the government are too focused on physical capital investment and cause relatively insufficient human capital investment.
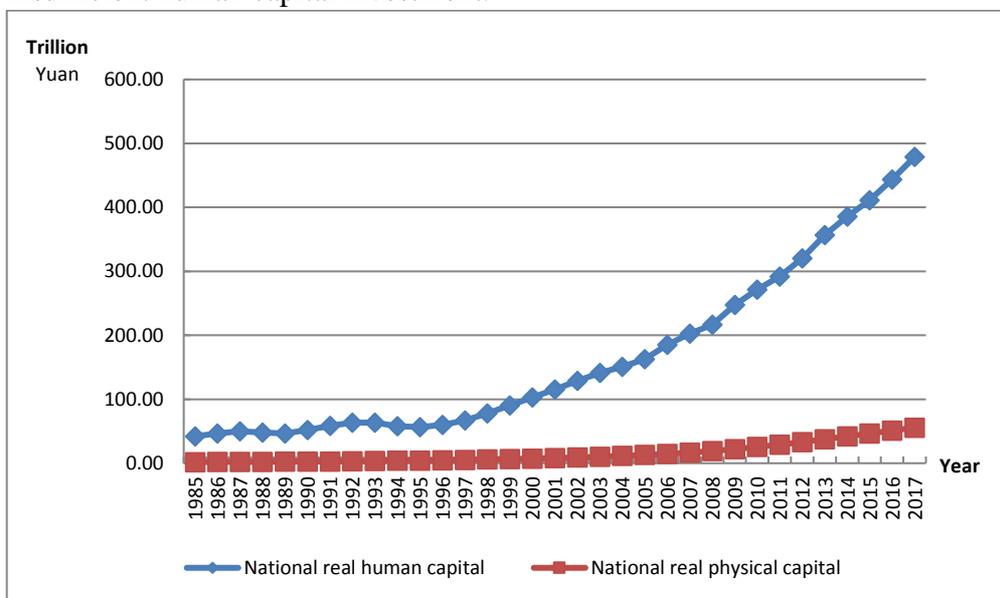
Figure 6.5.1 Human Capital and Physical Capital , 1985-2017
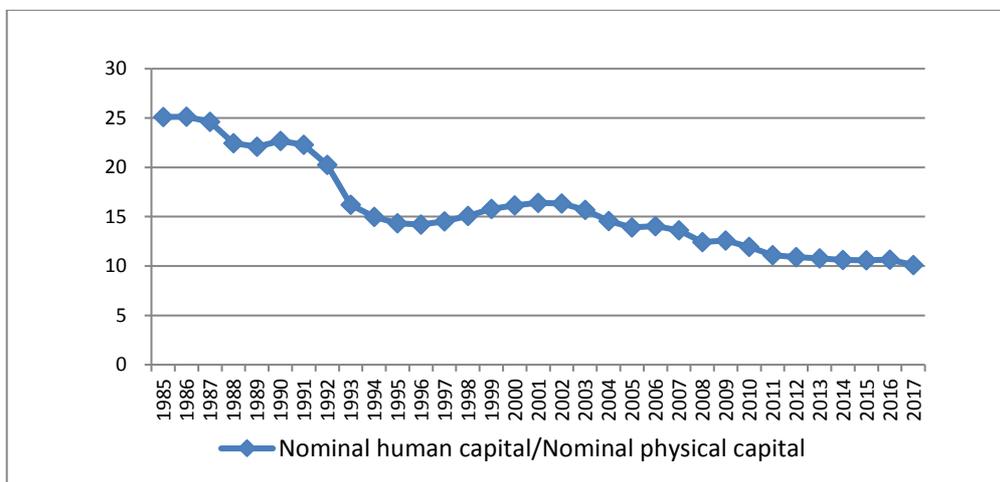
Figure 6.5.2 Human Capital and Physical Capital Ratio, 1985-2017

Chapter 7   Cross-province Comparison

By comparing the stocks of human capital across provinces and over time, we gain some understanding of the regional 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

The 6-education category nominal provincial human capital stocks in 2018 are shown in figure 7.1.1. Current year human capital is the nominal human capital adjusted by living cost and expressed in 1985 yuan for each province. The provinces are shown in descending order of their total real human capital stocks in 2018. 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 include: (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 Guangdong, Shandong,

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Henan, Jiangsu rank relatively higher. (2) Provinces at the top rank of human capital per capita (figure 7.1.1), such as Shanghai and Beijing, also rank high in terms of total stock but their total human capital is magnified by differences in their education levels and age structure.
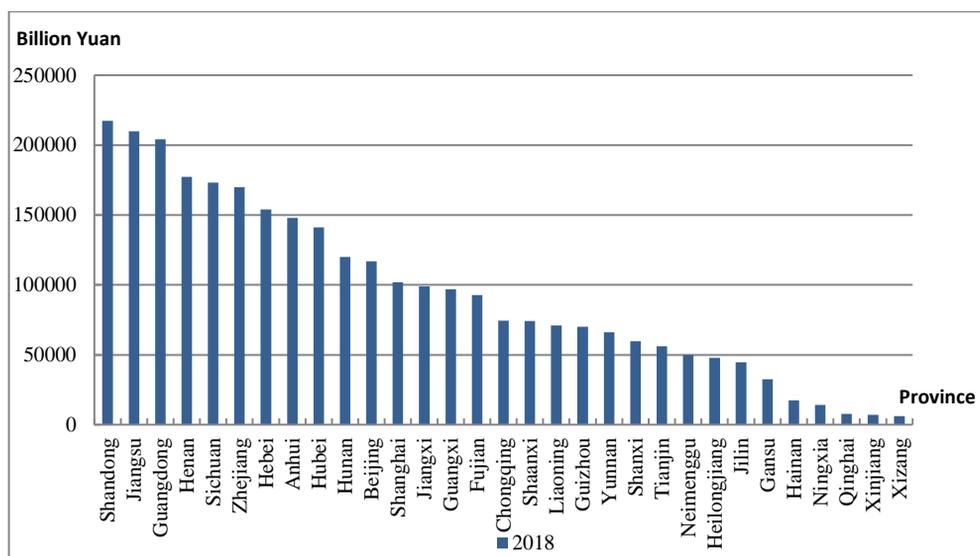
Figure 7.1.1 Provincial Real Human Capital in 2018

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).[39,40]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 Guangdong; Tibet ranks the lowest.

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

[40] 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.
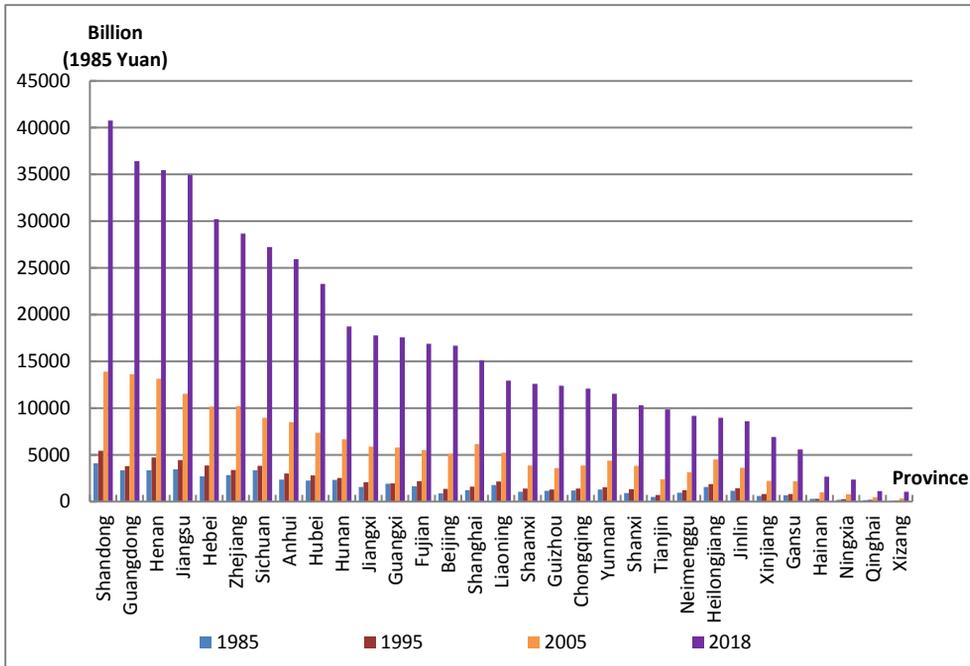
Figure 7.1.2 Provincial Real Human Capital

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 Beijing, Shanghai 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.
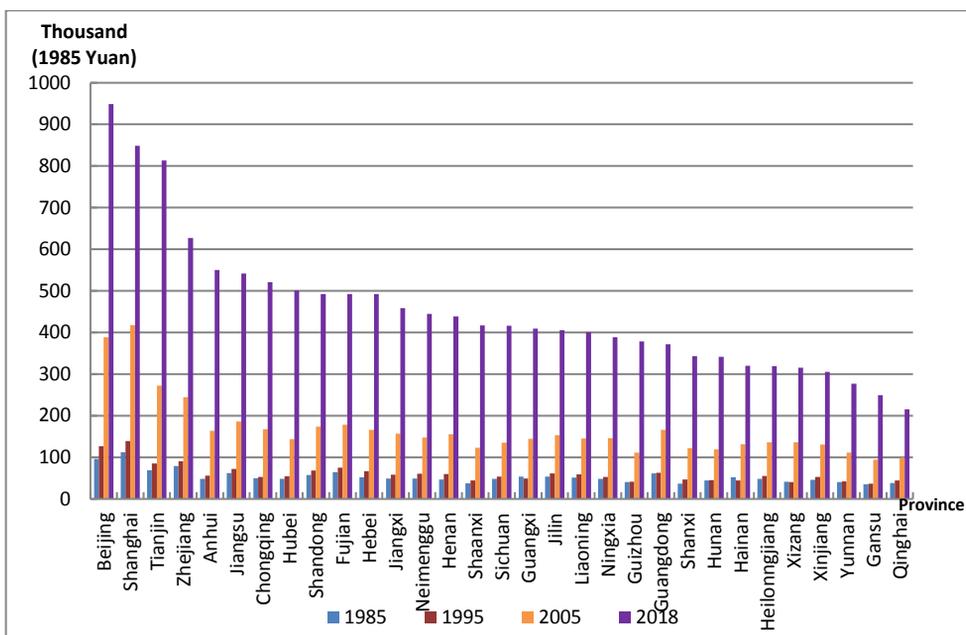
Figure 7.1.3 Provincial Real Human Capital Per Capita

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.
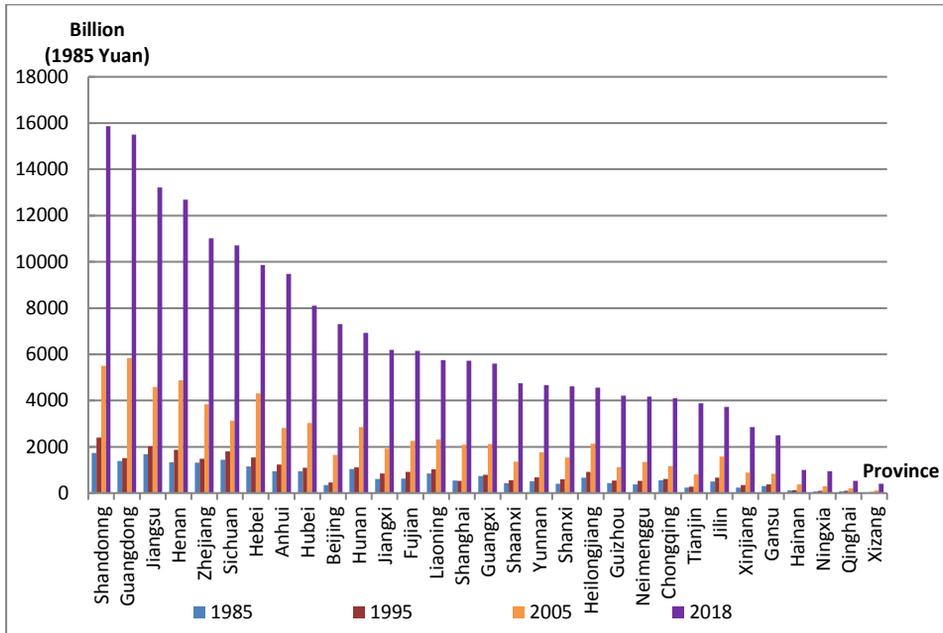
Figure 7.2.1 Provincial Real Labor Force Human Capital

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, Shanghai and Tianjin follow; Qinghai   at   the bottom.
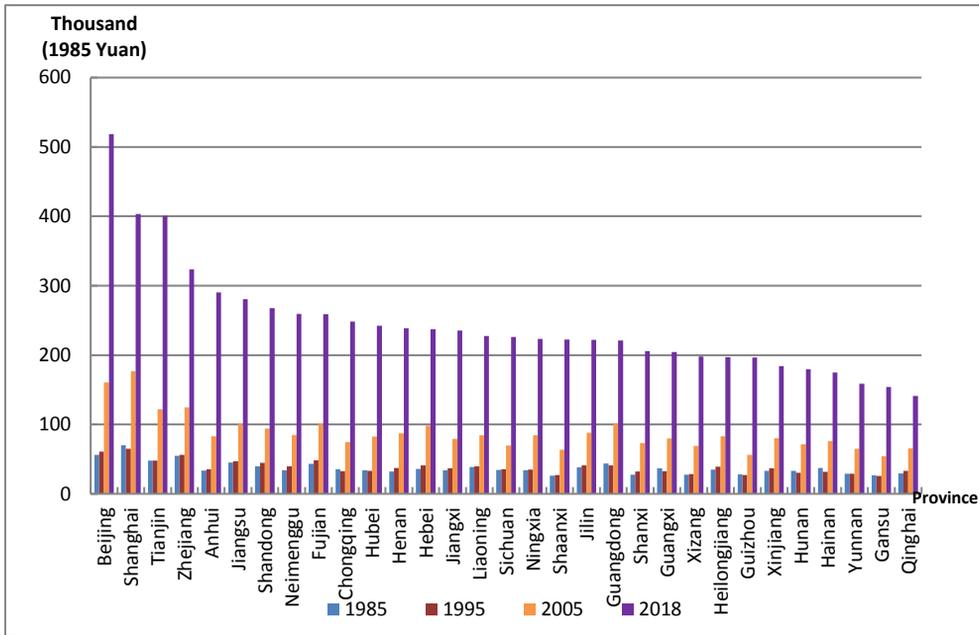
Figure 7.2.2 Provincial Real Average Labor Force Human Capital

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 2018, Heilongjiang ranks highest, followed by Qinghai and Neimenggu.
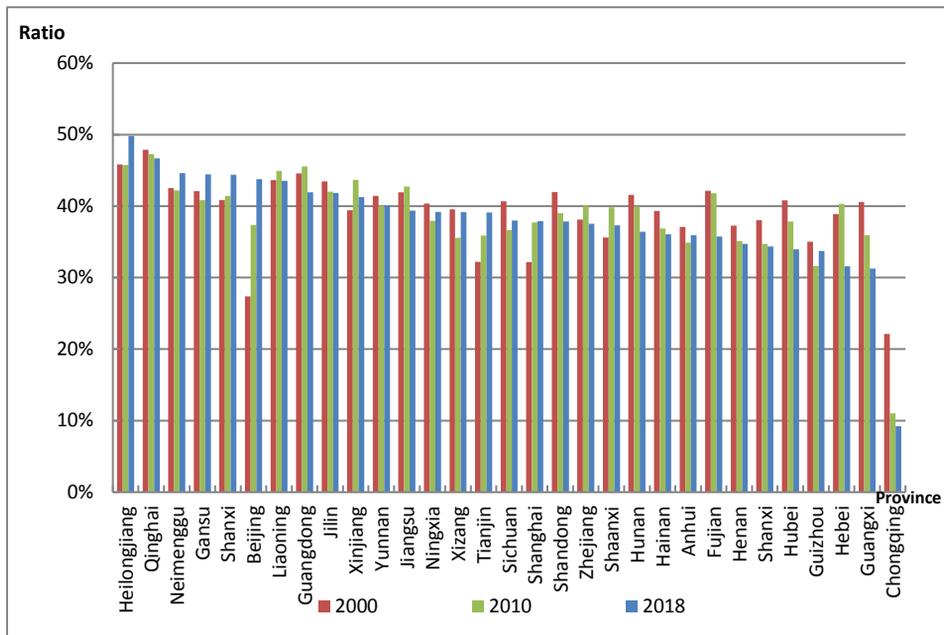
Figure 7.3.1 Ratio of Nominal Labor Force Human Capital to Total Nominal Human Capital

Figure 7.3.2 shows the comparison of human capital and human capital stock ratio of 0-15 years old in each province. 0-15 years old is the age that has not entered the labor market, and the human capital of this age group can be regarded as the reserve of human capital. To some extent, this ratio reflects the potential of local human capital in the future, which is mainly affected by the birth population, the number of students in school and the per capita human capital. In most provinces, this ratio shows an upward trend after 2010, which to a certain extent indicates that the demographic dividend has not disappeared, while the population decreases, the amount of human capital continues to grow. In 2018, Guangxi ranked first, followed by Hebei, Fujian and Hubei, and Heilongjiang ranked last.

Figure 7.3.3 shows the comparison of human capital and human capital stock ratio of 25-45 years old in each province. The age of 25-45 is the golden age for workers to work, and it is also the age of the most mobile population. Due to the great impact of population mobility, the ratio of

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human capital to human capital stock of 25-45 years old in some provinces with low ratio of 0-15 years old (such as Beijing) is also very high. In terms of the results, Shanghai, Beijing and Jiangsu ranked first, while Tibet and Guizhou ranked last.
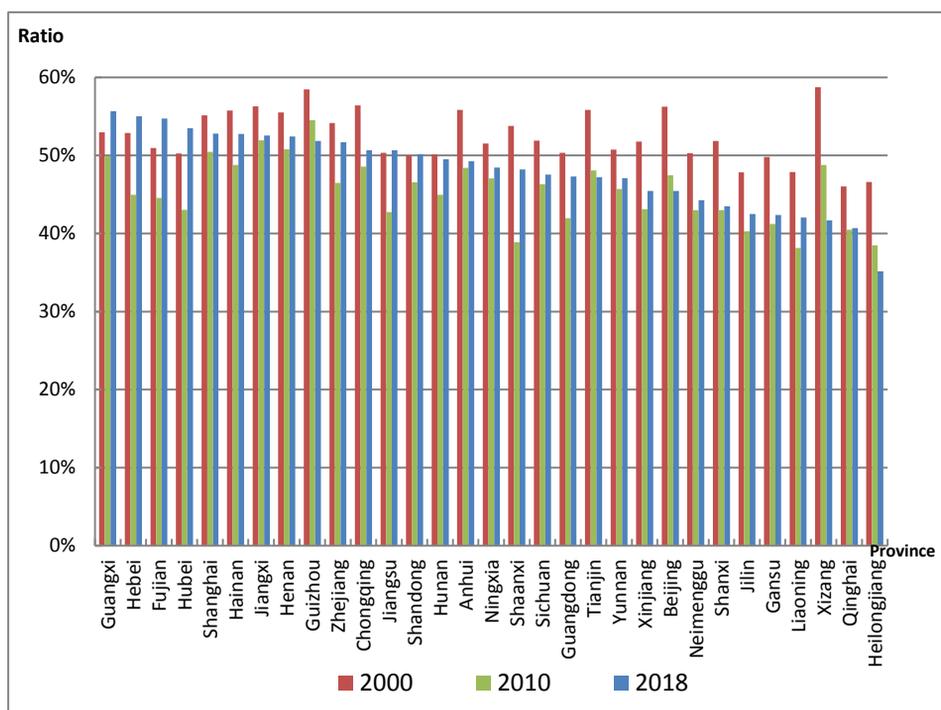
Figure 7.3.2 the ratio of human capital to human capital stock aged 0-15 in each province
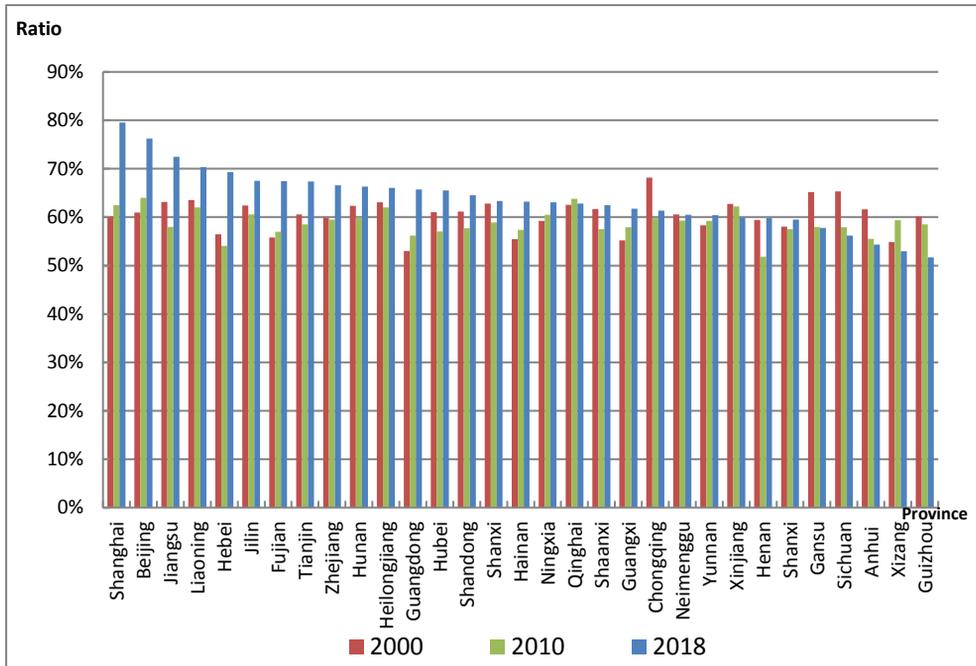
Figure 7.3.3 the ratio of human capital to human capital stock aged 25-45 in each province

Figure 7.3.4 shows the ratios of provincial nominal GDP to nominal labor force human capital. Jiangsu ranks at the top in 2018, followed by Chongqing, Fujian and Hunan; Beijing and Shanghai rank the bottom. These ratios reflect their persistent dispersion, and the continuing geographical disequilibrium in the allocation of labor and human capital in the Chinese economy.

Figure 7.3.5 shows the ratios of provincial nominal total human capital to nominal physical capital. Beijing ranks at the top in 2018, followed by Anhui, Shanghai and Jiangxi; Qinghai and Yunnan rank the bottom. 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.
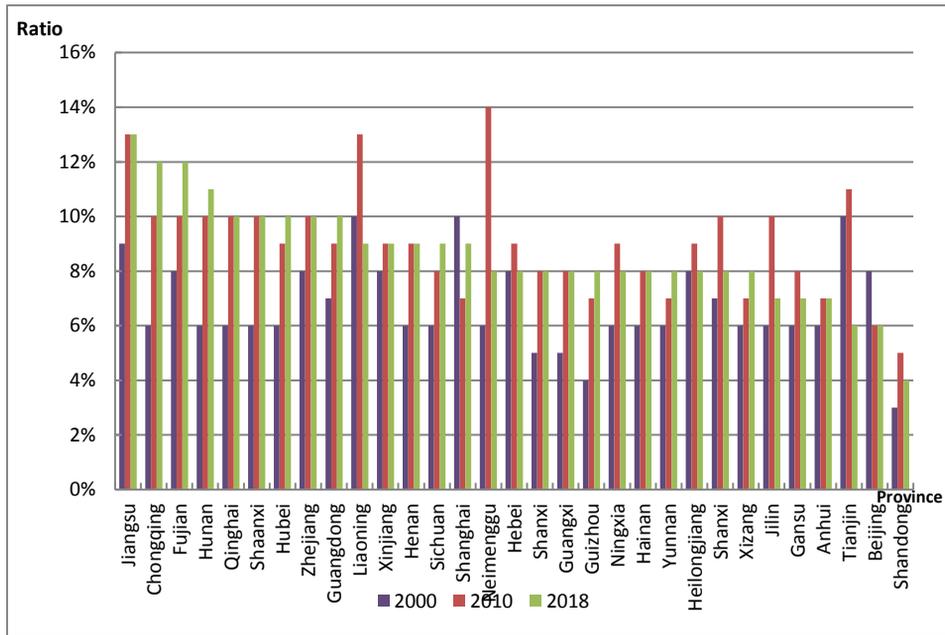
Figure 7.3.4 Ratio of Nominal GDP to Nominal Labor Force Human Capital
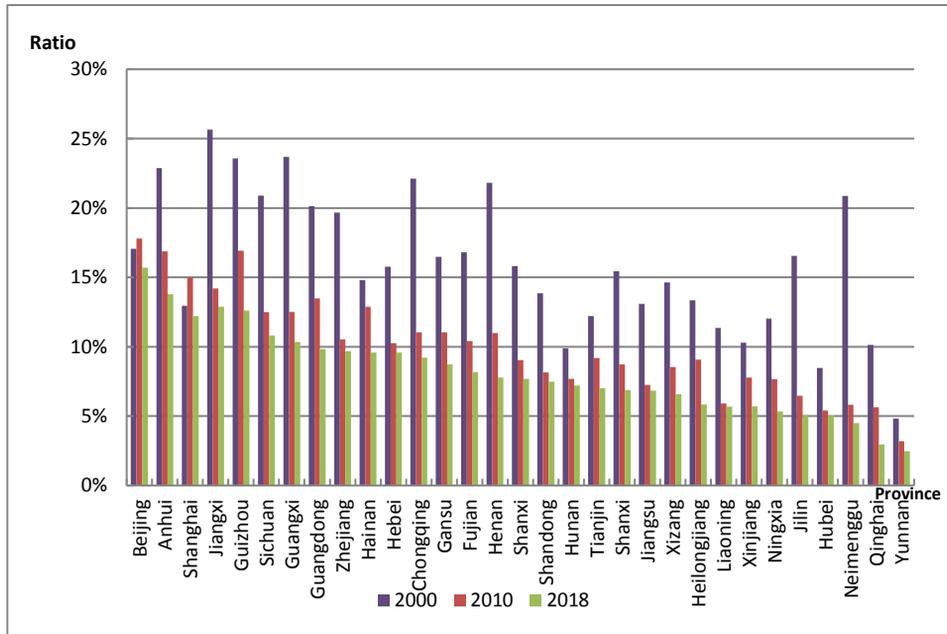
Figure 7.3.5 Ratio of Nominal Human Capital to Nominal Physical Capital

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. Column 1 is nominal human capital in six-education categories. Column 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	867	867	43
1986	978	916	51
1987	1170	1009	62
1988	1561	1118	75
1989	1816	1110	85
1990	2375	1377	99
1991	2912	1508	111
1992	3594	1694	128
1993	4275	1694	140
1994	4805	1524	160
1995	5018	1357	192
1996	6362	1541	222
1997	7676	1766	252
1998	9432	2119	287
1999	11821	2640	323
2000	14041	3030	364

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	15943	3337	410
2002	17855	3806	469
2003	19439	4135	544
2004	21736	4578	627
2005	24469	5077	721
2006	29781	6124	822
2007	36043	7239	934
2008	43131	8242	1036
2009	48524	9413	1149
2010	58520	11086	1296
2011	62584	11227	1432
2012	73245	12720	1600
2013	76427	12849	1767
2014	87815	14531	1937
2015	91885	14936	2119
2016	98216	15744	2351
2017	103919	16348	2604
2018	108209	16607	—

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 2018, the nominal human capital per capita increased from 93.4 thousand Yuan to 6.2 million Yuan, an increase of about 65 times; and the real human capital per capita increased from 93.4 thousand Yuan to

945.8 thousand Yuan, an increase of approximately 9 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 2018, 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.
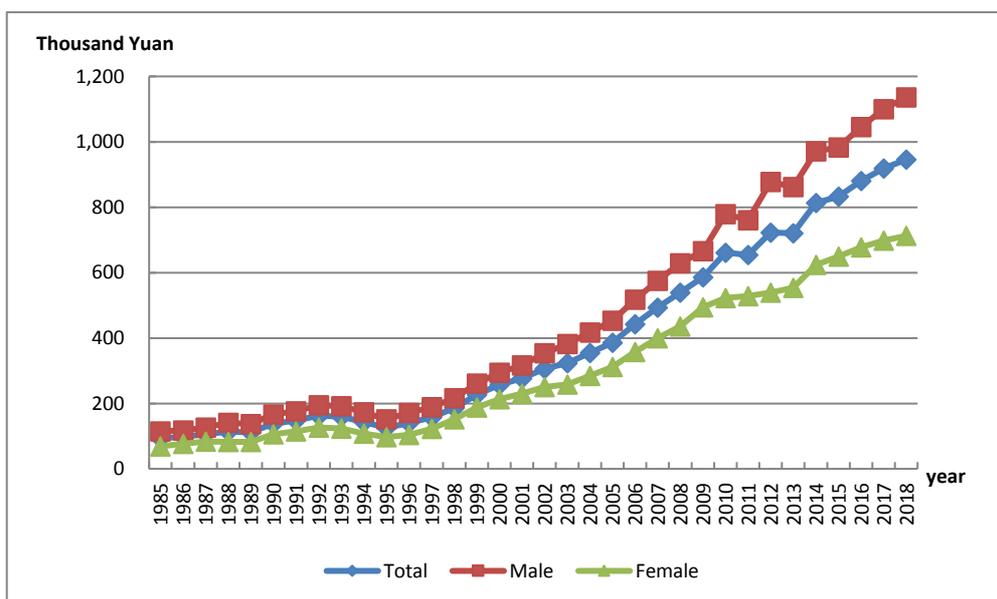
Figure BJ-2.1 Human Capital Per Capita by Gender for Beijing[41]，1985-2018

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	93.39	123.05	39.90	93.39	123.05	39.90
1986	104.67	137.64	45.95	98.01	128.88	43.02
1987	122.60	161.30	52.73	105.70	139.07	45.46

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[41] Note: The fluctuations for Beijing during 2010-2014 are probably caused by the drastic changes in high school admissions during this period. It affects the admission rates for high school and thus human capital values.

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	158.79	207.16	61.60	113.70	148.35	44.11
1989	183.31	233.31	71.44	112.01	142.56	43.65
1990	238.72	300.44	82.77	138.38	174.17	47.98
1991	285.32	358.37	93.16	147.81	185.66	48.26
1992	345.53	433.15	104.29	162.87	204.18	49.16
1993	403.75	502.19	116.49	159.93	198.93	46.15
1994	449.33	553.09	129.33	142.51	175.41	41.02
1995	464.27	561.56	141.93	125.53	151.83	38.37
1996	576.89	698.25	159.83	139.76	169.17	38.72
1997	686.43	830.62	179.98	157.93	191.11	41.41
1998	828.79	1003.74	201.49	186.22	225.53	45.27
1999	1017.97	1235.23	225.37	227.36	275.89	50.34
2000	1191.21	1442.99	252.54	257.06	311.39	54.50
2001	1322.73	1579.55	275.51	276.86	330.61	57.66
2002	1433.46	1684.52	295.65	305.53	359.04	63.02
2003	1522.02	1764.41	322.88	323.76	375.32	68.68
2004	1684.34	1938.80	350.69	354.74	408.33	73.86
2005	1861.79	2127.78	381.82	386.31	441.51	79.23
2006	2149.78	2445.67	428.46	442.09	502.94	88.11
2007	2453.74	2778.58	480.16	492.78	558.01	96.43
2008	2821.29	3190.49	537.02	539.10	609.64	102.61
2009	3021.73	3402.72	599.62	586.19	660.10	116.32
2010	3487.28	3921.37	661.24	660.65	742.88	125.27
2011	3644.19	4082.69	693.81	653.76	732.43	124.47
2012	4161.92	4657.55	732.01	722.80	808.87	127.13
2013	4288.56	4789.53	771.38	720.99	805.21	129.68
2014	4916.92	5505.87	816.52	813.61	911.07	135.11
2015	5126.28	5740.20	862.19	833.25	933.05	140.15

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	5490.96	6140.32	896.27	880.21	984.31	143.67
2017	5842.03	6523.12	934.13	919.03	1026.17	146.95
2018	6162.73	6869.22	971.55	945.83	1054.26	149.11

Figure BJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
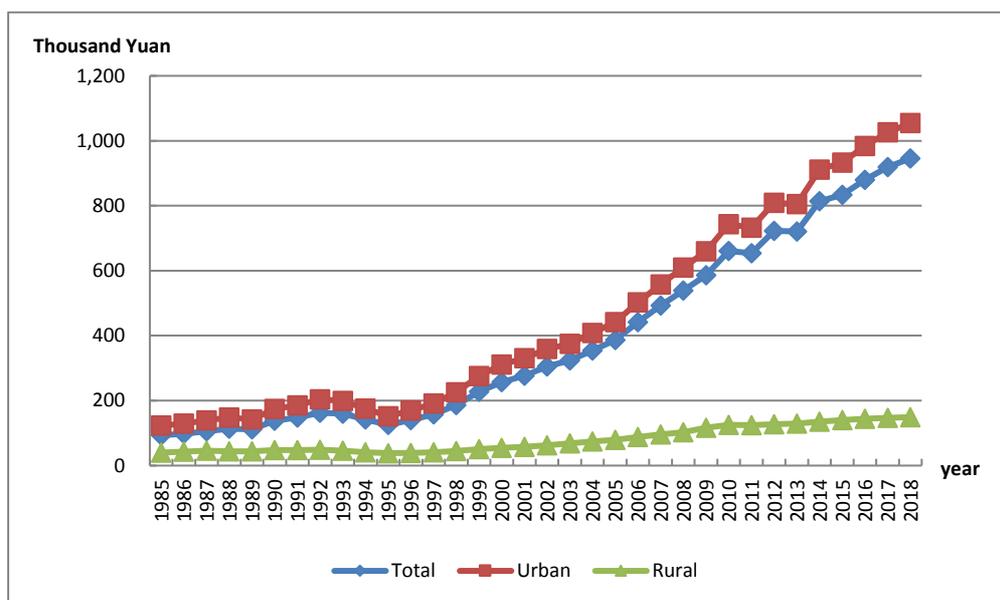
Figure BJ-2.2 Real Human Capital Per Capita by Region for Beijing, 1985-2018

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 2018, the nominal labor force human capital increased from 0.3 trillion Yuan to 47.3 trillion Yuan, an increase of more than 140 times; and the real labor force human capital increased from 0.3 billion Yuan to 7.3 trillion Yuan, an increase of approximately 21 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	335	335
1986	376	352
1987	458	395
1988	569	408
1989	676	413
1990	801	465
1991	975	505
1992	1138	536
1993	1314	520
1994	1474	467
1995	1667	451
1996	2031	492
1997	2458	565
1998	2911	654
1999	3368	752
2000	3845	830

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2001	4509	944
2002	5391	1149
2003	6280	1336
2004	6916	1457
2005	7851	1629
2006	10128	2083
2007	12812	2573
2008	15228	2910
2009	18304	3551
2010	21864	4142
2011	25045	4493
2012	28933	5025
2013	32413	5449
2014	35432	5863
2015	38810	6309
2016	41581	6666
2017	44498	7000
2018	47326	7263

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 2018, the nominal average labor force human capital increased from 54.3 thousand Yuan to 3.4 million Yuan, an increase of more than 60 times; and the real average labor force human capital increased from 54.3 thousand Yuan to 515.3 thousand Yuan, an increase of approximately 8 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	54.33	65.90	32.42	54.33	65.90	32.42
1986	60.53	72.96	37.23	56.67	68.31	34.86
1987	70.98	85.65	42.80	61.20	73.85	36.90
1988	85.55	101.87	49.69	61.27	72.95	35.58
1989	100.10	117.07	57.13	61.16	71.53	34.91
1990	117.01	134.33	65.44	67.83	77.87	37.94
1991	136.60	157.52	73.88	70.77	81.60	38.28
1992	155.99	180.23	82.26	73.53	84.96	38.78
1993	177.47	205.21	91.05	70.30	81.29	36.07
1994	197.59	228.08	99.99	62.67	72.34	31.71
1995	220.89	254.42	108.39	59.72	68.79	29.31
1996	259.18	298.13	125.64	62.79	72.23	30.44
1997	303.14	348.60	145.02	69.75	80.20	33.37
1998	346.10	397.20	166.46	77.77	89.25	37.40
1999	387.24	443.38	189.08	86.49	99.03	42.23
2000	430.81	492.36	212.43	92.97	106.25	45.84
2001	490.51	558.00	233.27	102.67	116.79	48.82
2002	563.44	638.11	253.59	120.09	136.01	54.05
2003	634.49	714.05	279.16	134.97	151.89	59.38
2004	691.02	773.61	305.99	145.53	162.93	64.44
2005	764.58	851.41	333.30	158.65	176.67	69.16
2006	921.12	1024.84	376.10	189.43	210.76	77.34
2007	1089.40	1209.56	422.14	218.78	242.91	84.78
2008	1238.24	1373.07	474.61	236.61	262.37	90.69
2009	1410.41	1560.95	532.77	273.61	302.81	103.35
2010	1600.63	1769.19	590.19	303.24	335.16	111.81

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
2011	1801.60	1995.22	620.36	323.20	357.94	111.29
2012	2044.84	2269.14	654.81	355.12	394.08	113.72
2013	2277.38	2533.11	690.61	382.87	425.87	116.11
2014	2501.73	2791.37	726.41	413.97	461.89	120.20
2015	2736.55	3058.77	762.86	444.82	497.19	124.00
2016	2926.94	3268.33	787.12	469.19	523.92	126.18
2017	3136.31	3497.57	813.89	493.39	550.21	128.04
2018	3357.71	3738.72	841.88	515.32	573.80	129.21

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. Column 1 is nominal human capital in six-education categories. Column 2 is real human capital in six-education categories. Column 3 is the real physical capital of Tianjin.

Table TJ-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	505	505	32
1986	607	569	37
1987	722	633	42
1988	849	637	47
1989	999	653	52
1990	1179	748	56
1991	1378	794	62
1992	1563	808	68
1993	1785	785	75
1994	2018	716	85
1995	2253	693	95
1996	2595	732	107
1997	2977	815	120
1998	3383	931	136
1999	4204	1169	151
2000	5403	1509	166

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	6054	1670	185
2002	6798	1883	208
2003	7365	2020	237
2004	8344	2237	271
2005	9169	2422	313
2006	11957	3112	363
2007	14629	3654	425
2008	17213	4079	508
2009	20443	4893	635
2010	23502	5435	788
2011	26963	5944	965
2012	31093	6674	1153
2013	34760	7237	1362
2014	39136	7997	1597
2015	41860	8410	1794
2016	45415	8937	1976
2017	49092	9461	2142
2018	53216	10055	—

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 2018, the nominal human capital per capita increased from 68.8 thousand Yuan to 4.4 million Yuan, an increase approximately 63 times; and the real human capital per capita increased from 68.8 thousand Yuan

to 829.7 thousand Yuan, an increase of approximately 11 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 2018 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.
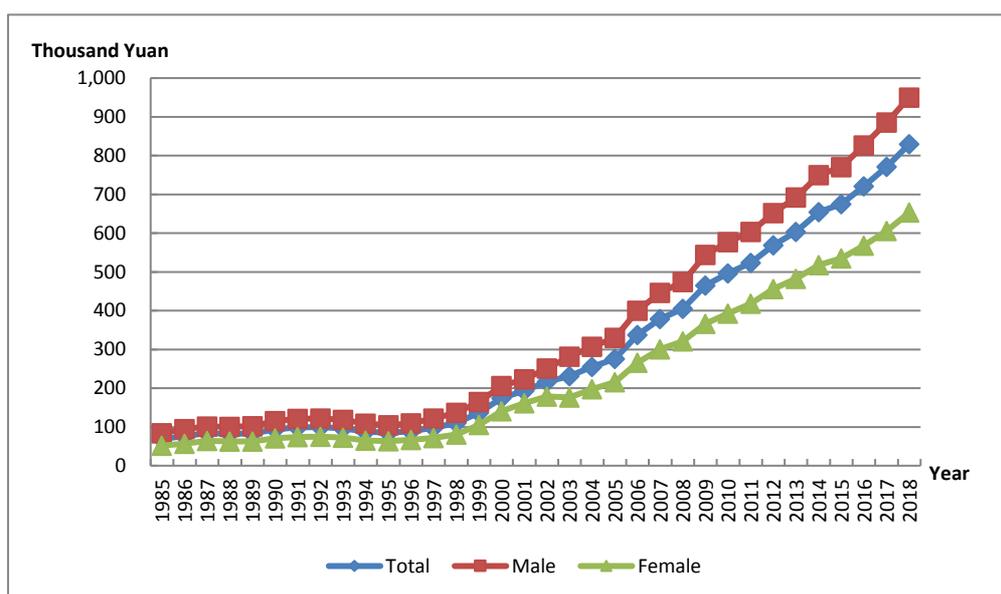
Figure TJ-2.1 Human Capital Per Capita by Gender for Tianjin，1985-2018

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	68.78	81.43	42.15	68.78	81.43	42.15
1986	81.65	97.31	49.01	76.45	91.11	45.89
1987	95.83	114.81	56.58	84.00	100.66	49.60
1988	110.10	130.31	66.05	82.58	97.73	49.53
1989	127.36	149.15	76.41	83.27	97.52	49.96
1990	148.38	172.15	87.69	94.19	109.28	55.66

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	171.74	199.52	101.78	98.94	114.93	58.63
1992	192.89	222.73	117.59	99.74	115.17	60.80
1993	219.03	252.11	134.61	96.31	110.85	59.19
1994	247.28	283.66	152.55	87.69	100.59	54.09
1995	275.72	314.48	170.82	84.79	96.72	52.54
1996	314.34	359.59	190.53	88.69	101.46	53.76
1997	357.43	408.81	214.24	97.82	111.88	58.63
1998	399.68	456.08	239.30	109.93	125.44	65.82
1999	490.93	568.05	264.54	136.54	157.98	73.57
2000	626.33	734.78	294.61	174.89	205.17	82.26
2001	701.83	822.37	321.46	193.64	226.90	88.70
2002	782.68	913.76	341.74	216.81	253.13	94.67
2003	843.60	976.34	372.29	231.38	267.79	102.11
2004	950.81	1098.13	402.38	254.92	294.42	107.88
2005	1043.83	1202.54	433.51	275.73	317.65	114.51
2006	1296.76	1499.43	487.43	337.47	390.22	126.85
2007	1516.88	1754.09	544.76	378.86	438.09	136.06
2008	1709.39	1975.12	605.38	405.07	468.03	143.45
2009	1942.32	2245.82	674.61	464.89	537.55	161.47
2010	2144.57	2479.42	742.62	495.96	573.39	171.74
2011	2374.64	2732.69	785.55	523.51	602.44	173.18
2012	2648.25	3033.56	833.78	568.47	651.19	178.98
2013	2899.76	3311.44	882.96	603.76	689.46	183.84
2014	3204.47	3653.12	935.65	654.76	746.42	191.18
2015	3360.11	3812.96	993.38	675.09	766.06	199.58
2016	3664.55	4160.40	1035.71	721.10	818.67	203.80
2017	4003.91	4541.41	1086.18	771.67	875.27	209.34
2018	4391.17	4974.18	1136.05	829.72	939.88	214.66

Figure TJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
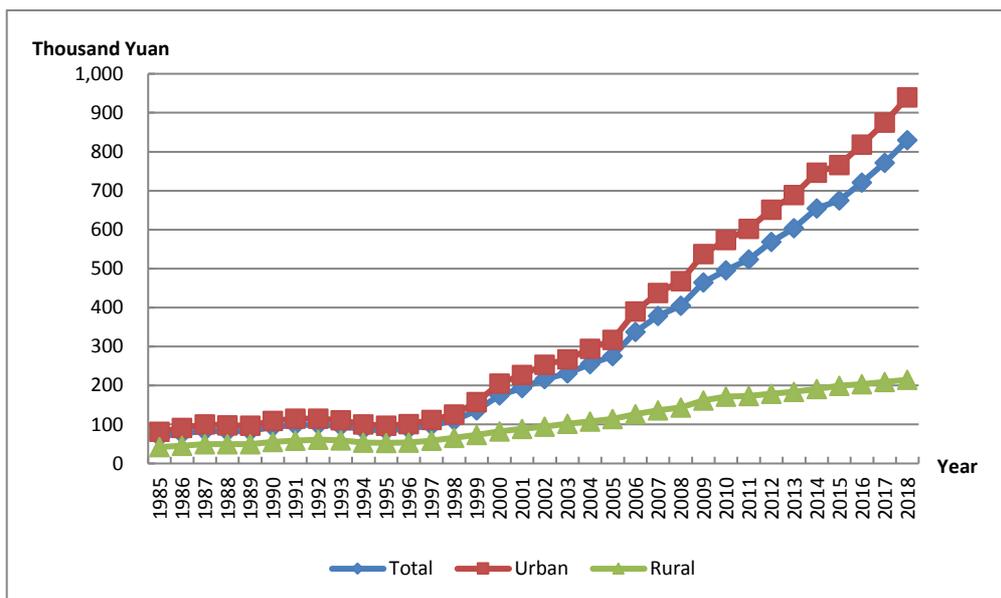
Figure TJ-2.2 Real Human Capital Per Capita by Region for Tianjin，1985-2018

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 2018, the nominal labor force human capital increased from 0.2

trillion Yuan to 20.8 trillion Yuan, an increase of more than 88 times; and the real labor force human capital increased from 0.2 trillion Yuan to 3.9 trillion Yuan, an increase of approximately 16 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	234	234
1986	271	254
1987	316	277
1988	370	278
1989	428	280
1990	490	311
1991	557	321
1992	634	328
1993	708	311
1994	787	279
1995	880	271
1996	1012	286
1997	1172	321
1998	1349	371
1999	1531	426
2000	1739	485
2001	1947	537
2002	2214	613
2003	2462	675
2004	2747	736
2005	3041	803
2006	3944	1026
2007	4883	1220
2008	5933	1406
2009	7089	1697

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	8433	1950
2011	9812	2163
2012	11493	2467
2013	12976	2702
2014	14782	3020
2015	16758	3367
2016	17956	3533
2017	19303	3720
2018	20808	3932

9.3.2 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 TJ-3.2 reports the nominal and real average labor force human capital by region. From 1985 to 2018, the nominal average labor force human capital increased from 47.4 thousand Yuan to 2.12 million Yuan, an increase of more than 44 times; and the real average labor force human capital from 47.4 thousand Yuan to 406.7 thousand Yuan, an increase of more than 7 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
1985	47.44	54.02	30.91	47.44	54.02	30.91
1986	53.98	61.29	35.72	50.54	57.39	33.44
1987	61.59	69.76	41.17	54.00	61.16	36.10

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	70.24	78.70	48.07	52.67	59.02	36.05
1989	79.45	88.09	55.36	51.95	57.60	36.20
1990	89.35	98.15	62.71	56.72	62.31	39.81
1991	100.37	109.71	72.26	57.82	63.20	41.63
1992	112.69	122.60	82.85	58.27	63.40	42.84
1993	125.48	135.90	94.12	55.18	59.76	41.38
1994	139.22	150.25	105.69	49.37	53.28	37.48
1995	154.84	166.89	117.45	47.62	51.33	36.12
1996	174.44	187.56	133.78	49.22	52.92	37.75
1997	197.88	212.78	151.10	54.15	58.23	41.35
1998	222.41	238.92	169.59	61.17	65.71	46.65
1999	246.87	264.98	187.37	68.66	73.69	52.11
2000	274.57	295.02	205.15	76.67	82.38	57.28
2001	304.87	328.20	225.37	84.11	90.56	62.18
2002	342.48	370.92	243.56	94.87	102.75	67.47
2003	378.27	410.33	263.92	103.75	112.55	72.39
2004	419.37	456.33	283.53	112.43	122.35	76.02
2005	462.27	504.89	299.10	122.11	133.37	79.01
2006	560.21	613.55	349.58	145.79	159.67	90.98
2007	654.26	717.08	400.87	163.41	179.10	100.12
2008	751.34	824.24	453.58	178.04	195.31	107.48
2009	851.20	934.00	510.93	203.74	223.56	122.29
2010	964.36	1060.61	565.92	223.02	245.28	130.87
2011	1082.35	1193.24	598.38	238.60	263.06	131.92
2012	1225.25	1353.15	639.54	263.01	290.47	137.28
2013	1354.73	1497.58	681.93	282.07	311.81	141.98
2014	1514.21	1677.57	721.76	309.39	342.77	147.47

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
2015	1677.54	1858.75	766.55	337.04	373.44	154.01
2016	1809.88	2012.81	797.34	356.14	396.08	156.90
2017	1969.28	2192.53	832.85	379.53	422.57	160.52
2018	2152.50	2399.35	868.90	406.72	453.36	164.18

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. Column 1 is nominal human capital in six-education categories. Column 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	2155	917	76
1986	2535	1071	85
1987	2927	1258	90
1988	3439	1459	121
1989	4000	1692	127
1990	4616	1952	148
1991	5349	2208	171
1992	6153	2478	247
1993	7052	2766	342
1994	8017	3094	419
1995	9004	3449	510
1996	10251	3929	618
1997	11666	4490	738
1998	13225	5131	840
1999	15094	5832	959
2000	17139	6661	1087
2001	19180	7487	1205

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	21406	8323	1320
2003	23828	9314	1511
2004	26528	10441	1837
2005	28887	11606	2164
2006	33365	13534	2542
2007	38191	15423	3065
2008	43257	17404	3966
2009	48510	19672	4458
2010	55057	22181	5365
2011	62851	24599	6630
2012	71213	27124	7667
2013	81151	29123	8715
2014	89405	31191	9804
2015	97086	33031	10625
2016	107099	35604	11663
2017	118011	38277	13527
2018	129720	40954	—

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 2018, the nominal human capital per capita increased from 42.1 thousand Yuan to 2.1 million Yuan, an increase of more than 49 times; and the real human capital per capita increased from 42.1 thousand Yuan to 0.4

million Yuan, an increase of approximately 9 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 2018, 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.
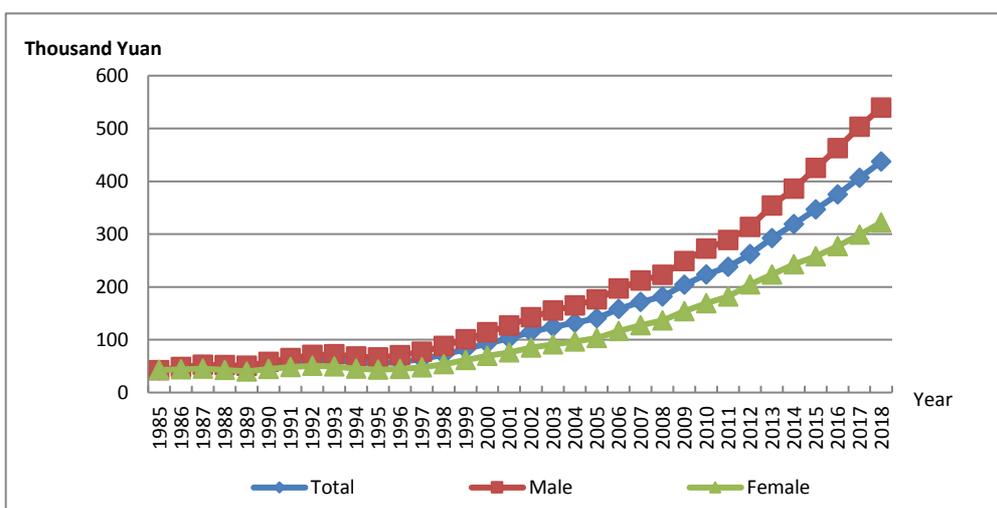
Figure HeB-2.1 Human Capital Per Capita by Gender for Hebei，1985-2018

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	42.14	72.96	35.84	42.14	72.96	35.84
1986	48.93	88.42	40.31	46.33	83.41	38.24
1987	55.65	100.53	45.33	48.95	87.65	40.05
1988	63.93	114.15	51.56	47.65	84.13	38.66
1989	73.09	129.48	58.47	45.45	82.34	35.88
1990	83.10	144.68	66.32	51.47	90.91	40.74
1991	95.37	167.78	74.30	57.09	98.90	44.92

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	108.69	191.84	83.10	61.51	104.22	48.36
1993	123.61	218.70	92.85	61.63	102.87	48.29
1994	139.74	246.94	103.49	57.04	93.00	44.85
1995	156.12	276.21	114.56	55.16	89.60	43.24
1996	176.43	313.30	126.42	58.01	94.45	44.68
1997	198.92	353.57	139.87	63.02	102.79	47.81
1998	222.50	394.93	154.45	71.50	116.32	53.82
1999	250.75	449.84	170.17	81.91	134.24	60.76
2000	283.46	509.76	189.05	92.61	151.37	68.11
2001	316.34	552.87	207.11	102.40	163.51	74.17
2002	353.04	609.92	223.16	114.78	182.95	80.32
2003	392.02	658.51	245.99	124.39	193.08	86.80
2004	434.85	714.87	269.86	132.12	202.13	90.86
2005	471.67	754.54	294.73	140.69	210.40	97.10
2006	540.37	849.58	331.29	157.98	232.94	107.32
2007	615.28	953.02	370.47	171.45	250.44	114.21
2008	694.36	1059.28	414.01	181.70	264.60	118.07
2009	774.65	1156.28	464.69	203.84	292.27	132.08
2010	876.75	1290.71	516.64	223.42	317.29	141.73
2011	990.72	1455.40	550.99	238.11	339.76	141.94
2012	1122.84	1640.98	587.89	262.29	373.15	147.80
2013	1291.55	1890.46	626.45	292.36	418.58	152.17
2014	1435.21	2090.68	671.12	318.93	455.17	160.14
2015	1575.49	2270.08	721.60	346.45	488.85	171.33
2016	1733.60	2489.28	766.67	375.09	528.13	179.34
2017	1914.44	2729.97	820.36	406.47	568.40	189.25
2018	2112.83	2987.09	880.07	437.25	606.76	198.27

Figure HeB-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
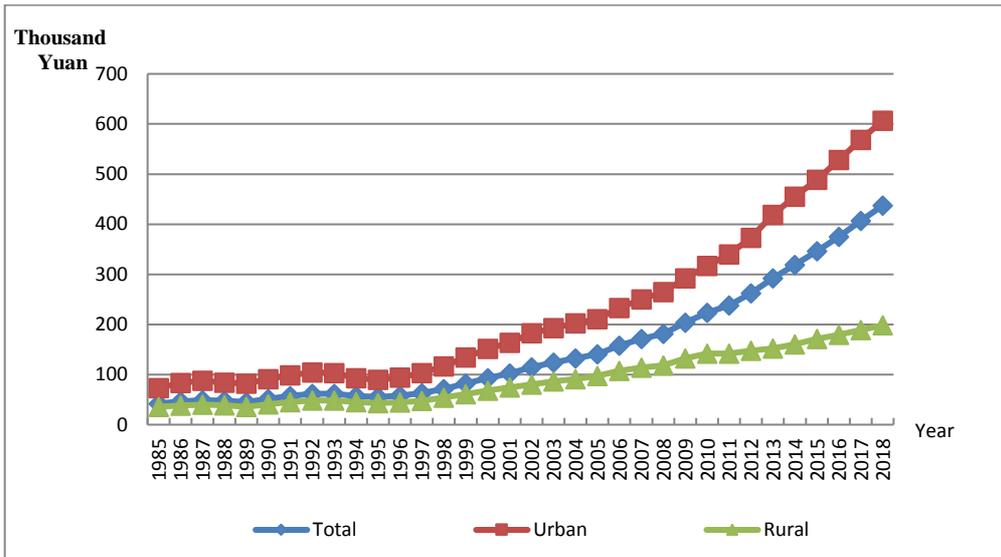
Figure HeB-2.2 Real Human Capital Per Capita by Region for Hebei，1985-2018

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 2018, the nominal labor force human capital increased from 0.9 trillion Yuan to 41.0 trillion Yuan, an increase of more than 44 times; and

the real labor force human capital increased from 0.9 trillion Yuan to 8.6 trillion Yuan, an increase of approximately 8 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	917	917
1986	1071	1014
1987	1258	1107
1988	1459	1088
1989	1692	1050
1990	1952	1208
1991	2208	1323
1992	2478	1409
1993	2766	1391
1994	3094	1279
1995	3449	1237
1996	3929	1313
1997	4490	1448
1998	5131	1682
1999	5832	1951
2000	6661	2236
2001	7487	2489
2002	8323	2780
2003	9314	3040
2004	10441	3260
2005	11606	3551
2006	13534	4050
2007	15423	4390
2008	17404	4631
2009	19672	5247
2010	22181	5719
2011	24599	5972

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	27124	6399
2013	29123	6658
2014	31191	6999
2015	33031	7337
2016	35604	7784
2017	38277	8216
2018	40954	8571

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 2018, the nominal average labor force human capital increased from 29.1 thousand Yuan to 983.1 thousand Yuan, an increase of more than 33 times; and the real average labor force human capital increased from 29.1 thousand Yuan to 205.8 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	29.11	46.63	25.61	29.11	46.63	25.61
1986	33.21	53.67	28.77	31.45	50.63	27.30
1987	37.93	61.76	32.38	33.37	53.85	28.61
1988	43.03	68.46	36.75	32.10	50.45	27.56
1989	48.67	75.71	41.68	30.22	48.15	25.58
1990	55.03	83.21	47.31	34.06	52.29	29.06
1991	61.63	93.46	52.48	36.94	55.09	31.73
1992	68.60	103.74	58.18	39.00	56.36	33.85

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	76.03	114.26	64.42	38.22	53.75	33.50
1994	84.27	124.76	71.55	34.84	46.98	31.01
1995	92.80	136.40	79.10	33.29	44.25	29.86
1996	104.35	155.06	87.64	34.88	46.75	30.98
1997	117.44	175.35	97.56	37.87	50.98	33.35
1998	131.22	194.89	109.06	43.01	57.40	38.00
1999	145.55	214.44	121.41	48.69	63.99	43.35
2000	162.50	238.05	135.33	54.55	70.69	48.75
2001	180.34	260.88	148.20	59.95	77.16	53.08
2002	197.97	284.07	160.98	66.13	85.21	57.94
2003	218.38	307.00	177.91	71.27	90.02	62.78
2004	241.18	331.81	196.54	75.30	93.82	66.18
2005	264.45	357.25	216.31	80.91	99.62	71.26
2006	305.32	415.71	242.66	91.37	113.98	78.61
2007	346.68	471.77	269.91	98.68	123.97	83.21
2008	390.33	528.00	299.32	103.86	131.89	85.36
2009	438.82	586.89	334.44	117.06	148.34	95.06
2010	494.47	656.68	368.50	127.49	161.43	101.09
2011	546.50	736.83	388.16	132.67	172.01	99.99
2012	605.76	821.91	409.84	142.91	186.90	103.04
2013	658.88	891.73	432.83	150.64	197.44	105.14
2014	713.75	965.40	458.53	160.16	210.18	109.41
2015	767.67	1028.31	487.28	170.53	221.44	115.70
2016	829.64	1120.16	514.17	181.38	237.66	120.27
2017	902.81	1221.39	547.73	193.78	254.30	126.36
2018	983.11	1332.09	583.87	205.76	270.59	131.54

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. Column 1 is nominal human capital in six-education categories. Column 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	768	768	43
1986	921	873	49
1987	1064	937	55
1988	1250	911	59
1989	1454	886	61
1990	1708	1018	64
1991	1977	1127	68
1992	2316	1235	72
1993	2693	1253	77
1994	3138	1166	82
1995	3588	1139	87
1996	4123	1212	92
1997	4680	1333	100
1998	5385	1553	111
1999	5959	1724	123
2000	6717	1867	135
2001	7766	2154	149

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	9070	2549	166
2003	10394	2862	188
2004	11673	3083	218
2005	12991	3350	256
2006	14915	3767	303
2007	16839	4060	359
2008	18625	4186	418
2009	20742	4681	504
2010	23472	5140	601
2011	26527	5519	716
2012	29830	6053	826
2013	32900	6480	948
2014	36298	7025	1065
2015	39365	7571	1172
2016	43079	8193	1262
2017	46945	8815	1304
2018	50836	9375	—

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 2018, the nominal human capital per capita increased from 30.8 thousand Yuan to 1.7 million Yuan, an increase of approximately 54 times; and the real human capital per capita increased from 30.8 thousand Yuan to 311.9 thousand Yuan, an increase of more than 9 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 2018, 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.
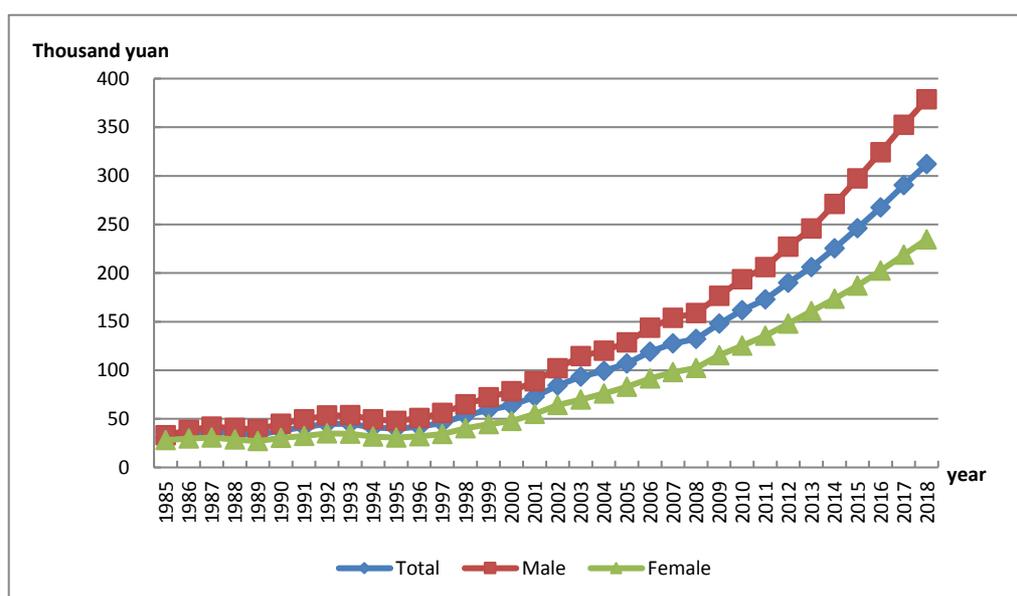
Figure SX-2.1 Human Capital Per Capita by Gender for Shanxi，1985-2018

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	30.79	55.53	22.75	30.79	55.53	22.75
1986	36.57	67.22	25.96	34.64	63.17	24.78
1987	41.73	74.95	29.63	36.77	64.92	26.52
1988	48.05	85.03	34.04	35.04	60.32	25.46
1989	55.19	96.25	38.93	33.62	58.71	23.69
1990	63.82	110.27	44.58	38.03	66.27	26.33

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	72.83	124.38	50.67	41.50	70.39	29.09
1992	84.06	143.78	57.52	44.80	74.58	31.57
1993	96.30	163.89	65.25	44.83	73.22	31.78
1994	110.74	189.26	73.76	41.14	67.16	28.87
1995	125.36	213.45	82.55	39.78	64.91	27.57
1996	142.92	244.68	91.93	42.00	68.70	28.62
1997	161.32	275.72	102.34	45.95	75.09	30.93
1998	184.70	318.30	113.93	53.27	87.83	34.96
1999	204.35	348.00	125.67	59.14	95.64	39.15
2000	229.92	387.62	139.93	63.92	101.74	42.32
2001	261.82	433.26	154.61	72.63	114.30	46.57
2002	299.98	491.90	169.04	84.29	132.69	51.28
2003	338.96	546.98	189.02	93.34	145.22	55.94
2004	376.42	600.77	209.60	99.42	153.96	58.86
2005	414.91	653.61	230.07	106.98	164.70	62.30
2006	471.03	734.21	256.73	118.96	181.74	67.82
2007	528.78	812.61	283.37	127.48	193.04	70.82
2008	587.77	892.42	310.48	132.11	198.13	72.05
2009	654.76	977.20	342.10	147.76	219.03	78.68
2010	737.45	1087.78	376.20	161.50	236.49	84.16
2011	830.82	1210.29	396.98	172.85	250.35	84.26
2012	936.34	1348.89	420.33	190.00	272.37	86.94
2013	1044.98	1492.17	444.15	205.82	292.76	88.99
2014	1164.69	1653.75	474.48	225.42	318.70	93.76
2015	1278.87	1802.24	510.59	245.97	345.25	100.19
2016	1406.02	1972.20	540.74	267.40	373.69	104.95
2017	1545.78	2159.05	578.43	290.24	403.45	111.71
2018	1691.31	2352.41	619.30	311.91	431.81	117.49

Figure SX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
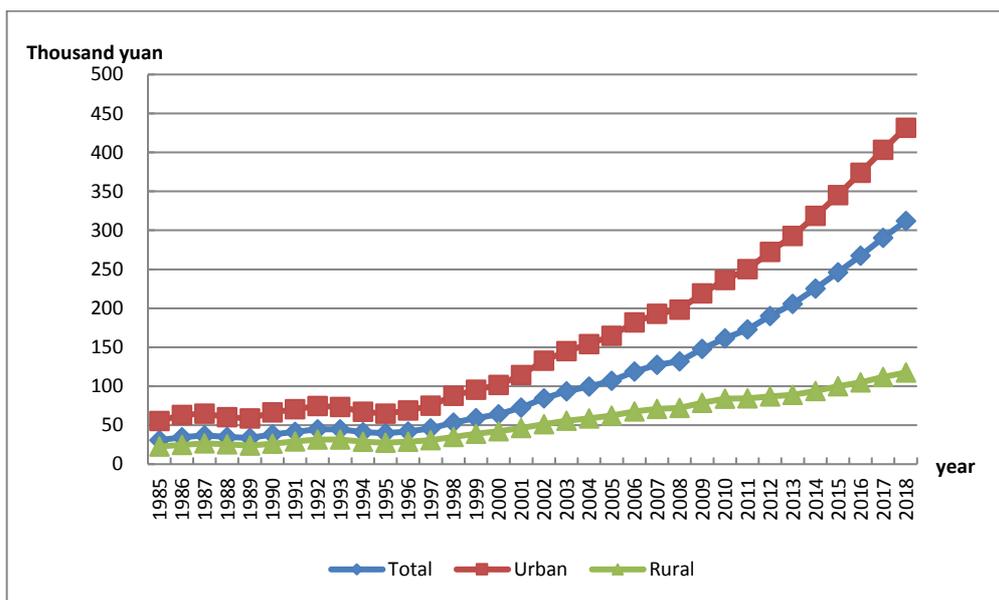
Figure SX-2.2 Real Human Capital Per Capita by Region for Shanxi，1985-2018

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 2018, the nominal labor force human capital increased from 0.3 trillion Yuan to 22 trillion Yuan, an increase of more than 65 times; and the real labor force human capital increased from 0.3 trillion Yuan to 4.1 trillion Yuan, an increase of approximately 11 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	336	336
1986	401	380
1987	476	419
1988	564	411
1989	664	405
1990	783	467
1991	911	519
1992	1050	560
1993	1203	562
1994	1378	514
1995	1563	498
1996	1756	519
1997	1968	564
1998	2202	640
1999	2433	711
2000	2716	764
2001	3077	865
2002	3481	992
2003	3945	1101
2004	4459	1190
2005	5030	1308
2006	5743	1461
2007	6529	1584
2008	7381	1667

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2009	8379	1897
2010	9571	2102
2011	10802	2254
2012	12201	2482
2013	13527	2670
2014	15050	2920
2015	16496	3180
2016	18374	3502
2017	20291	3821
2018	22263	4117

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 2018, the nominal average labor force human capital increased from 22.8 thousand Yuan to 994.6 thousand Yuan, an increase of approximately 43 times; and the real average labor force human capital increased from 22.8 thousand Yuan to 183.9 thousand Yuan, an increase of more than 7 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	22.77	39.12	17.13	22.77	39.12	17.13
1986	26.37	44.39	19.68	24.99	41.72	18.78

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
1987	30.36	49.99	22.55	26.76	43.30	20.18
1988	35.06	56.90	25.99	25.58	40.36	19.43
1989	40.33	64.44	29.82	24.57	39.31	18.14
1990	46.38	72.93	34.20	27.63	43.83	20.20
1991	52.65	82.07	38.99	30.01	46.45	22.39
1992	59.58	92.19	44.18	31.81	47.82	24.25
1993	67.24	103.28	49.89	31.40	46.15	24.29
1994	75.77	115.63	56.24	28.27	41.03	22.02
1995	84.83	128.83	62.82	27.05	39.17	20.98
1996	94.25	142.17	69.71	27.87	39.92	21.70
1997	104.75	156.95	77.32	30.04	42.74	23.37
1998	115.91	171.92	85.64	33.69	47.44	26.28
1999	127.10	186.66	94.15	37.15	51.30	29.33
2000	140.39	204.63	103.60	39.48	53.71	31.33
2001	156.52	225.85	115.26	43.99	59.58	34.72
2002	174.29	250.81	126.89	49.65	67.65	38.49
2003	194.14	275.94	141.46	54.16	73.26	41.87
2004	216.01	305.23	156.52	57.66	78.22	43.95
2005	239.94	337.66	172.20	62.37	85.08	46.63
2006	269.99	377.19	192.64	68.69	93.37	50.89
2007	302.74	420.18	213.48	73.42	99.81	53.35
2008	338.40	466.79	236.01	76.45	103.63	54.77
2009	379.39	519.08	261.97	85.87	116.35	60.25
2010	427.98	583.61	289.12	94.01	126.88	64.68
2011	479.11	656.48	308.11	99.96	135.80	65.40
2012	538.27	739.25	331.03	109.49	149.27	68.47
2013	596.75	818.49	355.77	117.79	160.58	71.29

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
2014	663.39	908.62	385.06	128.73	175.10	76.09
2015	729.79	993.04	417.26	140.69	190.23	81.88
2016	809.63	1107.91	443.25	154.33	209.93	86.03
2017	898.84	1234.56	473.13	169.27	230.70	91.37
2018	994.56	1370.06	503.14	183.90	251.49	95.45

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. Column 1 is nominal human capital in six-education categories. Column 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	821	821	25
1986	980	933	28
1987	1122	995	31
1988	1293	987	35
1989	1477	969	38
1990	1697	1087	41
1991	1922	1177	45
1992	2186	1253	52
1993	2458	1238	60
1994	2754	1127	68
1995	3074	1070	76
1996	3518	1136	83
1997	4067	1254	92
1998	4641	1439	101
1999	5202	1613	111

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	5984	1828	123
2001	6688	2028	136
2002	7615	2255	157
2003	8305	2408	197
2004	9327	2627	254
2005	10339	2845	337
2006	12062	3269	435
2007	13693	3550	556
2008	15500	3805	700
2009	17479	4302	899
2010	20421	4875	1123
2011	23052	5213	1371
2012	25192	5520	1659
2013	27948	5926	2007
2014	31275	6524	2274
2015	34085	7033	2531
2016	37068	7563	2717
2017	40112	8047	2818
2018	43038	8480	—

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 2018, the nominal human capital per capita increased from 42.2 thousand Yuan to 2.1 million Yuan, an increase of more than 48 times; and the real human capital per capita increased from 42.2

thousand Yuan to 411.1 thousand Yuan, an increase of approximately 9 times.

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 2018, 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.
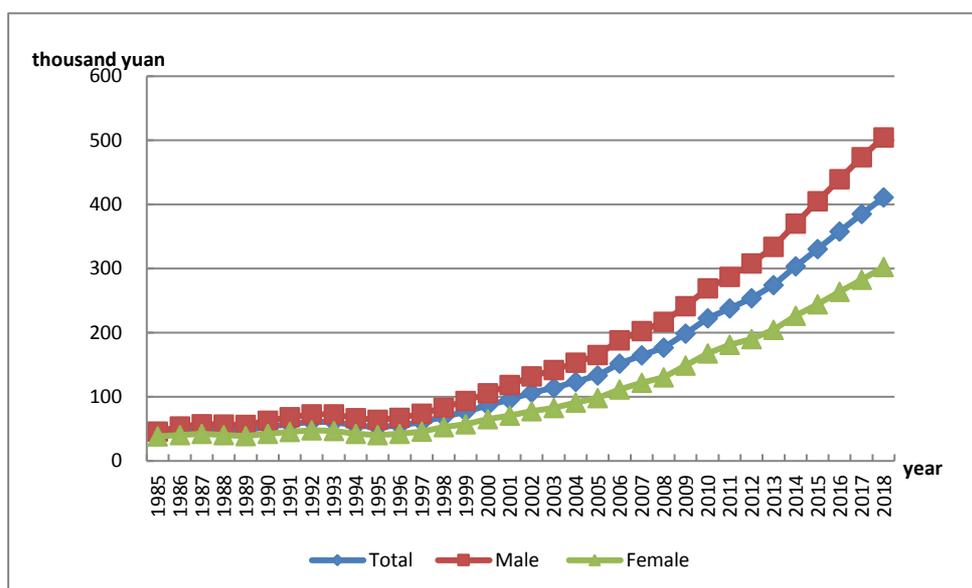
Figure NMG-2.1 Human Capital Per Capita by Gender for Inner Mongolia，1985-2018

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	42.21	64.49	31.00	42.21	64.49	31.00
1986	49.96	78.84	34.56	47.56	74.73	33.07

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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	56.45	88.77	38.68	50.04	77.55	34.92
1988	64.41	101.42	43.27	49.15	75.73	33.96
1989	73.08	115.10	48.30	47.96	74.93	32.05
1990	83.19	131.35	54.11	53.28	84.00	34.72
1991	93.88	148.42	60.34	57.49	89.54	37.78
1992	106.66	169.68	67.31	61.17	94.17	40.56
1993	120.22	191.69	75.05	60.55	92.75	40.20
1994	135.29	217.32	83.45	55.34	84.60	36.85
1995	151.64	244.84	92.37	52.77	81.39	34.57
1996	171.79	277.46	101.88	55.46	85.80	35.40
1997	196.81	319.49	112.25	60.68	94.45	37.40
1998	222.40	360.43	123.65	68.96	107.31	41.52
1999	247.08	396.81	135.98	76.62	117.79	46.08
2000	282.76	453.33	150.43	86.40	132.83	50.37
2001	315.78	500.84	163.74	95.74	145.88	54.56
2002	359.03	568.56	175.87	106.29	164.29	55.60
2003	392.29	608.33	192.18	113.75	173.18	58.70
2004	439.14	674.80	209.70	123.70	187.42	61.65
2005	484.03	734.12	228.72	133.19	199.90	65.09
2006	560.30	834.77	254.36	151.83	224.39	70.97
2007	635.37	928.87	282.44	164.71	239.39	74.91
2008	719.66	1035.48	312.46	176.66	253.19	77.96
2009	806.24	1136.38	352.84	198.44	278.70	88.21
2010	932.27	1297.10	396.60	222.53	308.85	95.79
2011	1053.10	1448.83	420.99	238.14	327.00	96.20
2012	1157.43	1568.93	451.23	253.62	342.79	100.60
2013	1294.05	1737.56	487.49	274.40	367.15	105.72
2014	1455.78	1940.62	535.74	303.68	403.20	114.81

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
2015	1602.08	2116.09	595.78	330.55	434.88	126.28
2016	1753.60	2299.80	646.78	357.78	467.49	135.47
2017	1918.78	2495.92	708.91	384.95	498.88	146.15
2018	2086.32	2691.74	778.46	411.09	528.50	157.49

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 the urban area remains larger than that in the rural area. Since 1997, the growths 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.
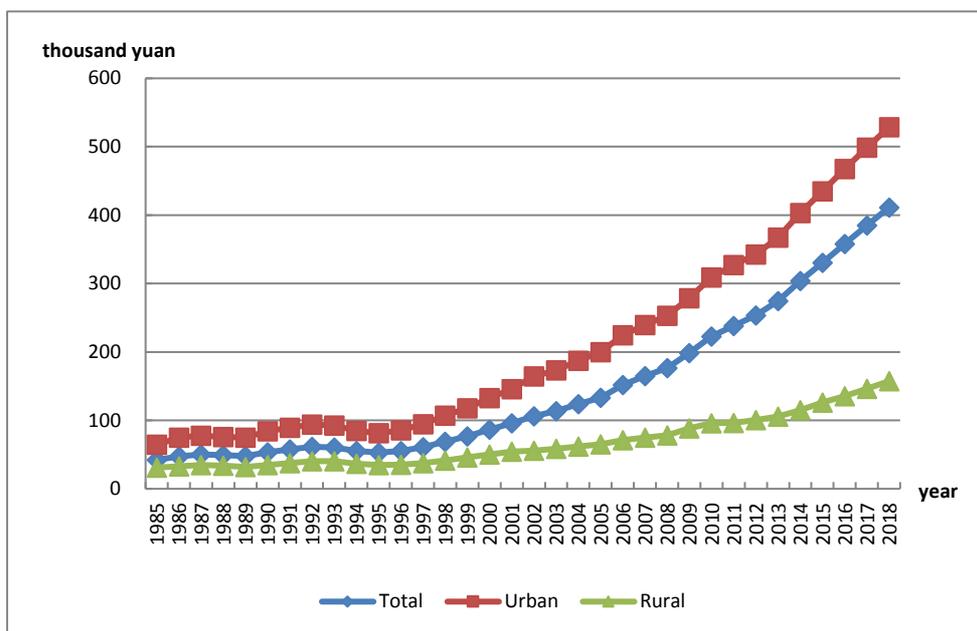
Figure NMG-2.2 Real Human Capital Per Capita by Region for Inner Mongolia，1985-2018

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 2018, the nominal labor force human capital increased from 0.3 trillion Yuan to 19.2 trillion Yuan, an increase of more than 58 times; and the real labor force human capital increased from 0.3 trillion Yuan to 3.8 trillion Yuan, an increase of approximately 11 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	324	324
1986	380	362
1987	455	404
1988	532	407
1989	623	409
1990	729	467
1991	829	509
1992	939	540
1993	1051	532
1994	1171	483
1995	1297	455
1996	1497	487
1997	1723	536
1998	1967	616
1999	2237	701
2000	2543	787

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2001	2823	868
2002	3129	936
2003	3466	1013
2004	3835	1088
2005	4264	1179
2006	4955	1349
2007	5647	1469
2008	6406	1576
2009	7355	1814
2010	8613	2059
2011	9555	2163
2012	10667	2342
2013	11789	2506
2014	13216	2765
2015	14766	3055
2016	16211	3316
2017	17731	3566
2018	19204	3792

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 2018, the nominal average labor force human capital increased from 28.9 thousand Yuan to 1.2 million Yuan, an increase of more than 40 times, and the real average labor force human capital increased from 28.9 thousand Yuan to 236.3 thousand Yuan, an increase of approximately 7 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	28.92	40.52	22.90	28.92	40.52	22.90
1986	32.98	46.30	25.63	31.41	43.89	24.52
1987	37.92	53.38	28.82	33.66	46.64	26.02
1988	43.31	61.55	32.27	33.12	45.96	25.34
1989	49.41	70.67	36.29	32.45	46.00	24.08
1990	56.20	80.61	40.96	36.00	51.55	26.29
1991	63.09	90.77	45.59	38.70	54.76	28.55
1992	70.71	102.02	50.71	40.72	56.62	30.56
1993	78.79	113.83	56.30	39.90	55.08	30.16
1994	87.47	126.47	62.59	36.05	49.23	27.64
1995	96.61	139.76	69.25	33.89	46.46	25.92
1996	108.97	158.07	76.57	35.46	48.88	26.61
1997	122.46	177.50	84.87	38.10	52.48	28.27
1998	136.58	196.81	94.11	42.76	58.59	31.61
1999	151.68	217.22	104.10	47.56	64.48	35.28
2000	168.59	240.34	114.93	52.15	70.42	38.49
2001	185.00	262.41	125.55	56.86	76.43	41.83
2002	202.95	287.84	135.76	60.70	83.17	42.92
2003	222.66	313.48	148.54	65.08	89.24	45.37
2004	244.31	342.07	162.04	69.28	95.01	47.64
2005	269.25	376.10	175.83	74.46	102.41	50.04
2006	308.87	426.98	197.80	84.06	114.77	55.19
2007	349.55	476.51	222.05	90.91	122.81	58.89
2008	393.56	528.85	249.37	96.84	129.31	62.22
2009	447.97	594.03	282.77	110.49	145.69	70.69

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	517.22	680.51	318.07	123.65	162.04	76.83
2011	574.09	753.83	339.09	129.98	170.14	77.49
2012	642.33	840.73	365.99	141.02	183.69	81.60
2013	714.34	930.86	397.65	151.84	196.69	86.24
2014	803.02	1041.96	438.36	167.97	216.49	93.94
2015	899.99	1158.45	487.83	186.18	238.07	103.40
2016	990.44	1270.37	528.27	202.57	258.23	110.65
2017	1091.97	1392.44	577.49	219.59	278.32	119.05
2018	1196.59	1516.68	630.77	236.30	297.79	127.61

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. Column 1 is nominal human capital in six-education categories. Column 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	1559	1559	79
1986	1866	1756	89
1987	2145	1865	100
1988	2542	1869	112
1989	2940	1827	122
1990	3353	2013	132
1991	3785	2157	144
1992	4261	2292	156
1993	4785	2247	174
1994	5310	2008	192
1995	5841	1902	207
1996	6654	2008	221
1997	7529	2197	236
1998	8453	2475	252
1999	9603	2840	268
2000	11088	3263	289
2001	12222	3592	313

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	13246	3932	340
2003	14348	4174	378
2004	15752	4404	434
2005	17172	4712	522
2006	19362	5246	627
2007	22009	5659	742
2008	24584	6034	884
2009	27278	6685	1036
2010	30854	7323	1220
2011	34115	7679	1427
2012	38206	8339	1655
2013	42327	8944	1887
2014	46117	9564	2103
2015	49205	10053	2199
2016	53354	10724	2225
2017	57471	11386	2261
2018	61908	11953	—

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 2018, the nominal human capital per capita increased from 45.5 thousand Yuan to 1.9 million Yuan, an increase of more than 41 times; and the real human capital per capita increased from 45.5 thousand Yuan to 369.8 thousand Yuan, an increase of approximately 7 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 2018, 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.
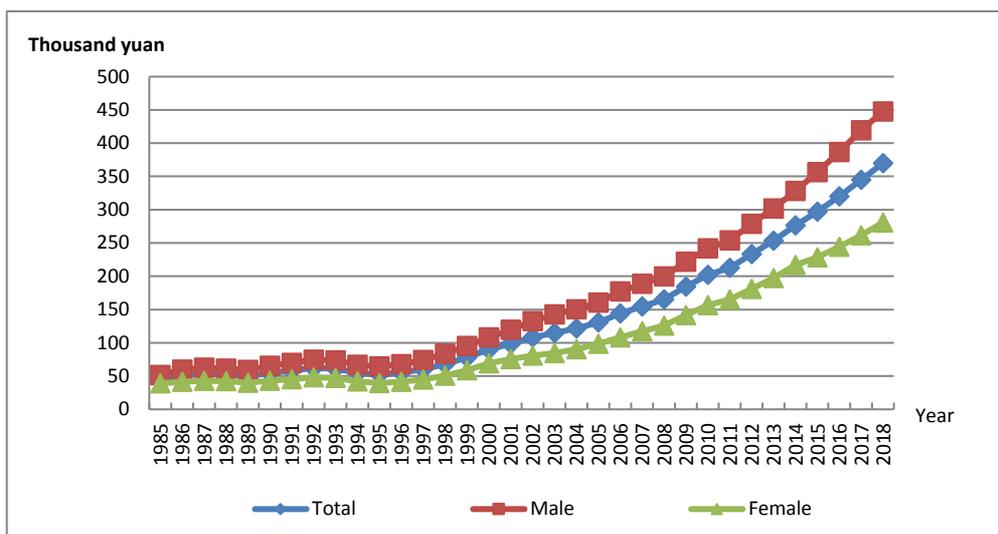
Figure LN-2.1 Real Human Capital Per Capita by Gender for Liaoning，1985-2018

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	45.53	61.22	32.68	45.53	61.22	32.68
1986	54.04	74.19	36.98	50.86	69.34	35.22
1987	61.41	83.93	41.87	53.40	71.44	37.76
1988	70.92	96.39	47.96	52.15	68.60	37.32
1989	80.64	108.19	54.53	50.11	65.70	35.33
1990	90.99	120.04	61.78	54.62	70.70	38.45
1991	102.37	134.89	69.85	58.33	74.95	41.72

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	115.22	151.73	78.63	61.97	77.99	45.91
1993	129.99	171.44	88.15	61.03	75.51	46.41
1994	145.50	191.74	98.31	55.01	66.97	42.81
1995	161.01	210.93	109.23	52.44	63.46	41.01
1996	182.92	241.67	121.14	55.20	67.20	42.58
1997	206.68	274.23	134.01	60.30	73.46	46.14
1998	231.64	307.32	147.82	67.81	82.49	51.56
1999	263.20	351.67	162.04	77.84	95.64	57.50
2000	304.60	411.43	177.62	89.64	111.89	63.22
2001	335.76	449.53	195.75	98.69	122.37	69.53
2002	363.61	481.10	212.37	107.94	132.42	76.43
2003	394.93	514.35	234.00	114.89	139.89	81.21
2004	434.93	561.74	255.37	121.61	148.62	83.37
2005	476.05	610.22	275.43	130.63	160.16	86.46
2006	532.43	680.59	307.21	144.26	176.69	94.92
2007	601.88	770.79	339.35	154.77	191.31	97.99
2008	672.57	861.94	372.65	165.09	204.91	102.00
2009	751.36	963.20	409.67	184.13	228.99	111.79
2010	851.26	1094.02	445.23	202.03	253.00	116.82
2011	945.48	1209.63	465.33	212.81	266.20	115.72
2012	1068.51	1363.10	485.74	233.22	291.53	117.85
2013	1199.95	1524.68	504.57	253.55	316.93	117.83
2014	1332.35	1688.61	530.22	276.31	344.79	122.11
2015	1453.54	1831.82	558.58	296.97	368.87	126.87
2016	1592.94	2005.61	578.74	320.17	397.89	129.12
2017	1742.24	2190.78	607.66	345.17	428.63	134.10
2018	1915.20	2404.36	640.77	369.78	458.49	138.63

Figure LN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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 LN-2.2 Real Human Capital Per Capita by Region for Liaoning，1985-2018

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 2018, the nominal labor force human capital increased from

0.7 trillion Yuan to 26.9 thousand billion Yuan, an increase of more than 35 times; and the real labor force human capital increased from 0.7 trillion Yuan to 5.2 trillion Yuan, an increase of approximately 6 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	747	747
1986	870	819
1987	1017	885
1988	1199	883
1989	1396	868
1990	1611	968
1991	1817	1037
1992	2024	1093
1993	2236	1057
1994	2461	940
1995	2718	895
1996	3080	942
1997	3496	1034
1998	3945	1173
1999	4370	1315
2000	4837	1453
2001	5276	1582
2002	5769	1746
2003	6280	1858
2004	6813	1934
2005	7395	2054
2006	8560	2345
2007	9783	2540
2008	10965	2715
2009	12188	3013

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	13856	3314
2011	15478	3511
2012	17156	3777
2013	18702	3986
2014	20017	4189
2015	21450	4421
2016	23232	4709
2017	25057	5006
2018	26939	5245

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 2018, the nominal average labor force human capital increased from 34.2 thousand Yuan to 1.1 million Yuan, an increase of more than 30 times; and the real average labor force human capital increased from 34.2 thousand Yuan to 207.8 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	34.16	43.94	25.27	34.16	43.94	25.27
1986	38.88	49.87	28.63	36.60	46.61	27.27
1987	44.23	56.58	32.40	38.49	48.16	29.22
1988	50.30	63.38	37.17	37.03	45.11	28.92
1989	56.78	70.47	42.38	35.32	42.79	27.46

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
1990	63.88	78.18	48.03	38.39	46.05	29.89
1991	71.12	86.51	54.36	40.60	48.07	32.47
1992	78.80	95.35	60.95	42.55	49.01	35.59
1993	87.09	104.94	67.88	41.17	46.22	35.74
1994	95.95	115.14	75.37	36.65	40.22	32.82
1995	105.81	126.72	83.33	34.83	38.12	31.28
1996	118.26	141.75	92.75	36.15	39.41	32.60
1997	132.46	159.16	102.72	39.19	42.63	35.36
1998	147.40	177.01	113.41	43.81	47.51	39.56
1999	161.86	194.05	123.80	48.72	52.77	43.93
2000	177.89	213.45	134.14	53.43	58.05	47.74
2001	193.66	230.74	146.40	58.06	62.81	52.00
2002	211.02	250.79	158.48	63.86	69.03	57.03
2003	229.24	269.98	173.46	67.84	73.43	60.20
2004	248.99	291.74	188.03	70.67	77.19	61.39
2005	270.44	316.39	201.58	75.13	83.04	63.28
2006	308.88	363.08	226.61	84.63	94.26	70.02
2007	349.53	413.09	251.19	90.75	102.53	72.53
2008	390.30	462.94	276.15	96.65	110.06	75.58
2009	434.89	516.93	304.03	107.51	122.89	82.97
2010	492.02	589.59	330.91	117.67	136.35	86.83
2011	550.59	664.16	354.12	124.88	146.16	88.07
2012	615.45	746.19	378.54	135.49	159.59	91.84
2013	679.88	826.80	402.28	144.90	171.86	93.94
2014	741.95	903.29	426.07	155.25	184.44	98.13
2015	810.92	986.45	452.82	167.13	198.64	102.85
2016	885.40	1082.96	474.45	179.47	214.85	105.85

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
2017	969.45	1190.71	499.64	193.68	232.96	110.26
2018	1067.12	1316.28	527.53	207.77	251.01	114.13

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	1007	433	32
1986	1187	502	38
1987	1350	594	44
1988	1576	695	54
1989	1823	807	67
1990	2096	932	73
1991	2395	1078	88
1992	2718	1225	112
1993	3059	1371	167
1994	3394	1524	200
1995	3765	1696	238
1996	4249	1930	272
1997	4761	2183	305
1998	5271	2454	331
1999	5942	2727	376

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	6973	3031	421
2001	8077	3338	469
2002	8752	3665	526
2003	9528	3992	597
2004	10302	4324	711
2005	11120	4679	854
2006	12431	5330	1089
2007	14132	6010	1448
2008	15870	6685	2003
2009	17459	7488	2463
2010	19958	8388	3086
2011	22314	9280	3853
2012	24856	10261	4492
2013	27052	11027	5120
2014	30987	11711	5770
2015	31404	12350	6277
2016	33773	13529	6739
2017	36078	14789	7557
2018	38325	16031	—

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 2018, the nominal human capital per capita increased from 46.0 thousand Yuan to 1.8 million Yuan, an increase of more than 38 times; and the real human capital per capita increased from 46.0 thousand Yuan

to 367.1 thousand Yuan, an increase of approximately 7 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 2018, 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，1985-2018

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	46.05	62.39	34.39	46.05	62.39	34.39
1986	54.13	75.96	38.36	51.25	71.66	36.50
1987	61.09	85.91	42.80	54.10	75.04	38.67
1988	69.71	97.24	48.60	51.54	69.85	37.50

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	79.14	109.60	55.13	49.63	67.35	35.66
1990	89.66	123.61	62.60	53.25	73.11	37.42
1991	101.76	139.51	70.01	56.80	77.04	39.78
1992	115.10	156.83	78.04	59.87	79.24	42.68
1993	129.76	175.67	86.82	60.44	78.40	43.64
1994	145.02	194.84	96.18	55.78	70.59	41.29
1995	161.24	214.84	106.66	53.75	67.62	39.61
1996	180.86	242.13	117.20	56.23	70.76	41.14
1997	201.60	270.88	128.62	60.36	76.34	43.53
1998	222.13	298.52	141.05	67.02	84.72	48.22
1999	249.59	339.17	154.12	76.60	98.32	53.44
2000	292.44	407.21	169.77	90.62	120.09	59.10
2001	339.38	479.53	185.17	103.53	139.33	64.14
2002	368.30	517.60	200.11	112.81	151.60	69.11
2003	402.30	561.39	220.56	121.75	162.64	75.05
2004	435.92	604.34	242.92	126.89	169.00	78.64
2005	472.06	651.45	264.89	135.33	179.65	84.16
2006	525.30	721.00	295.11	148.43	196.48	91.92
2007	595.27	819.20	327.39	160.23	213.83	96.11
2008	668.15	921.05	362.05	170.95	228.75	100.94
2009	733.42	1002.62	402.95	187.44	249.26	111.56
2010	839.54	1157.22	443.92	206.90	278.23	118.06
2011	942.16	1305.14	467.38	221.76	298.31	121.62
2012	1058.15	1471.57	493.47	242.42	328.11	125.38
2013	1168.58	1628.23	521.04	259.73	352.81	128.65
2014	1362.17	1927.71	554.50	296.19	409.11	134.89
2015	1411.94	1980.21	594.10	302.13	413.23	142.25
2016	1538.54	2153.80	623.47	323.69	442.81	146.50

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	1671.03	2330.32	657.33	345.80	472.02	151.73
2018	1811.81	2517.43	693.97	367.07	499.93	156.58

Figure JL-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, 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; however, the growth rate is significantly higher in the urban area than in the rural area. Therefore, the gap between urban and rural expanded rapidly.

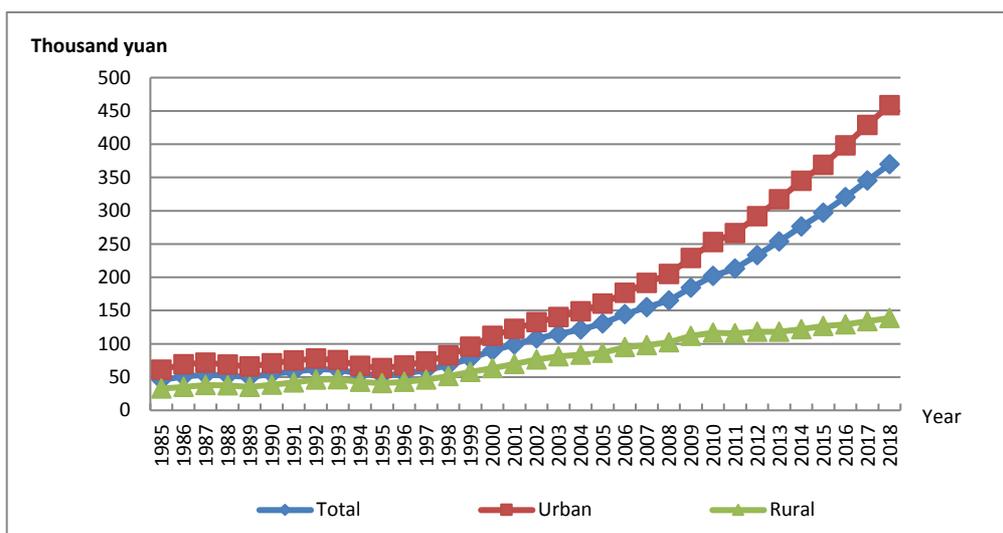**Figure JL-2.2 Real Human Capital Per Capita by Region for Jilin，1985-2018**

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 2018, the nominal labor force human capital increased from 0.4 trillion Yuan to 16.0 trillion Yuan, an increase of more than 36 times; and the real labor force human capital increased from 0.4 trillion Yuan to 3.3 trillion Yuan, an increase of approximately 7 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	433	433
1986	502	476
1987	594	527
1988	695	516
1989	807	507
1990	932	554
1991	1078	603
1992	1225	640
1993	1371	643
1994	1524	592
1995	1696	571
1996	1930	607
1997	2183	662
1998	2454	750
1999	2727	850
2000	3031	956
2001	3338	1041
2002	3665	1145
2003	3992	1232
2004	4324	1282
2005	4679	1367
2006	5330	1532

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2007	6010	1642
2008	6685	1736
2009	7488	1939
2010	8388	2094
2011	9280	2220
2012	10261	2389
2013	11027	2491
2014	11711	2595
2015	12350	2692
2016	13529	2895
2017	14789	3109
2018	16031	3296

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 2018, the nominal average labor force human capital increased from 32.7 thousand Yuan to 1.0 million Yuan, an increase of more than 28 times; and the real average labor force human capital increased from 32.7 thousand Yuan to 0.2 million 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
1985	32.71	42.56	25.70	32.71	42.56	25.70
1986	36.96	48.46	28.88	35.01	45.72	27.48
1987	42.21	56.04	32.43	37.45	48.95	29.30
1988	48.04	63.33	36.73	35.64	45.50	28.34
1989	54.24	70.67	41.77	34.10	43.42	27.02
1990	60.96	78.22	47.68	36.23	46.26	28.50
1991	68.98	88.30	53.11	38.56	48.76	30.18
1992	77.23	98.29	58.93	40.33	49.66	32.23
1993	85.86	108.43	65.28	40.25	48.39	32.81
1994	94.96	118.71	72.48	36.90	43.01	31.11
1995	104.88	129.86	80.43	35.31	40.87	29.87
1996	116.85	145.10	89.05	36.78	42.41	31.26
1997	129.83	161.82	98.13	39.38	45.60	33.21
1998	143.22	178.27	108.36	43.80	50.59	37.04
1999	156.51	194.13	119.28	48.78	56.28	41.36
2000	171.05	211.38	131.35	53.96	62.34	45.73
2001	187.23	231.24	142.80	58.36	67.19	49.47
2002	204.50	253.32	154.36	63.89	74.20	53.31
2003	221.91	272.27	169.97	68.51	78.88	57.83
2004	240.16	291.70	187.31	71.23	81.57	60.64
2005	259.46	312.19	205.62	75.82	86.09	65.33
2006	293.59	356.07	229.00	84.40	97.03	71.33
2007	329.91	402.76	253.54	90.14	105.13	74.43
2008	366.76	448.81	280.12	95.24	111.46	78.10
2009	409.58	501.19	311.81	106.08	124.60	86.33

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	457.74	562.89	343.75	114.26	135.34	91.42
2011	508.14	637.87	362.61	121.56	145.80	94.36
2012	564.69	719.81	384.93	131.45	160.50	97.80
2013	614.63	789.23	409.29	138.87	171.01	101.06
2014	662.84	853.86	437.03	146.89	181.21	106.32
2015	712.24	915.88	469.70	155.22	191.13	112.46
2016	784.78	1020.33	497.34	167.93	209.78	116.86
2017	867.32	1136.73	529.81	182.32	230.25	122.29
2018	955.50	1260.77	564.07	196.43	250.37	127.27

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

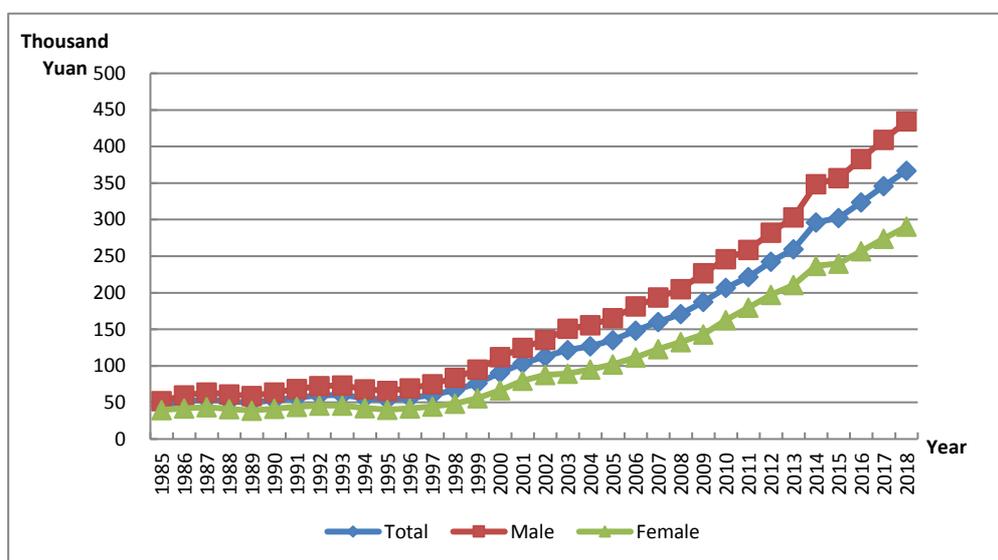| Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1985	1336	1336	56
1986	1588	1490	63
1987	1822	1577	70
1988	2101	1546	77
1989	2399	1540	81
1990	2738	1659	86
1991	3123	1767	91
1992	3523	1842	97
1993	3969	1809	103
1994	4456	1668	111
1995	4972	1604	122
1996	5545	1672	134
1997	6106	1765	148
1998	6741	1939	164
1999	7555	2242	179

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	8653	2607	195
2001	9985	2980	213
2002	10940	3284	233
2003	11860	3528	254
2004	13048	3728	280
2005	13994	3947	310
2006	15912	4396	349
2007	17872	4679	399
2008	19466	4825	460
2009	21587	5338	537
2010	24518	5825	625
2011	26518	5950	720
2012	28854	6266	836
2013	31366	6652	973
2014	33330	6964	1097
2015	35003	7231	1226
2016	37180	7573	1342
2017	39062	7851	1457
2018	40810	8040	—

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 2018, the nominal human capital per capita increased from 41.3 thousand Yuan to 1.5 million Yuan, an increase of more than 34 times; and the real human capital per capita increased from 41.3

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thousand Yuan to 0.3 million Yuan, an increase of approximately 6 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 2018, 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，1985-2018

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	41.29	52.36	32.98	41.29	52.36	32.98
1986	48.86	64.09	36.95	45.82	60.46	34.37
1987	55.49	72.81	41.43	48.01	62.62	36.15

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	63.35	82.50	47.04	46.61	59.82	35.36
1989	72.01	93.03	53.28	46.21	58.86	34.94
1990	81.63	104.48	60.49	49.46	62.60	37.32
1991	92.78	119.35	67.76	52.51	66.09	39.70
1992	104.52	134.28	75.91	54.63	67.78	42.00
1993	117.95	151.96	84.83	53.77	66.59	41.28
1994	132.44	171.03	94.67	49.58	61.43	37.98
1995	148.06	191.58	105.15	47.76	59.37	36.30
1996	165.67	215.61	116.02	49.94	62.10	37.86
1997	183.22	238.47	127.56	52.96	65.73	40.10
1998	202.38	262.76	140.78	58.22	71.77	44.39
1999	227.64	298.29	154.06	67.56	84.00	50.44
2000	263.34	352.23	168.63	79.35	100.49	56.80
2001	301.33	409.22	184.68	89.95	115.83	61.97
2002	328.64	446.37	199.69	98.66	127.23	67.34
2003	356.80	481.10	218.91	106.14	136.05	72.94
2004	392.50	529.08	238.96	112.15	144.55	75.69
2005	420.07	560.57	257.46	118.47	151.94	79.72
2006	475.80	633.93	287.95	131.45	168.79	87.07
2007	534.53	710.88	319.56	139.96	179.58	91.67
2008	588.82	780.60	353.48	145.95	187.80	94.59
2009	654.77	863.71	392.29	161.91	208.21	103.73
2010	745.77	989.71	431.35	177.19	230.30	108.74
2011	813.03	1077.13	450.46	182.42	237.57	106.74
2012	895.50	1186.87	471.79	194.46	253.44	108.66
2013	992.60	1320.30	492.58	210.51	276.38	110.03
2014	1080.95	1440.36	519.50	225.85	297.34	114.20
2015	1165.71	1549.48	550.91	240.81	316.39	119.79

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
2016	1260.04	1675.38	571.32	256.65	338.04	121.67
2017	1354.52	1799.18	596.92	272.23	358.71	124.87
2018	1451.32	1925.69	624.97	285.93	376.41	128.31

Figure HLJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, 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 areas both accelerated, and the growth rate is significantly higher in the urban areas than in the rural areas. Therefore, the gap between urban and rural human capital expanded rapidly.
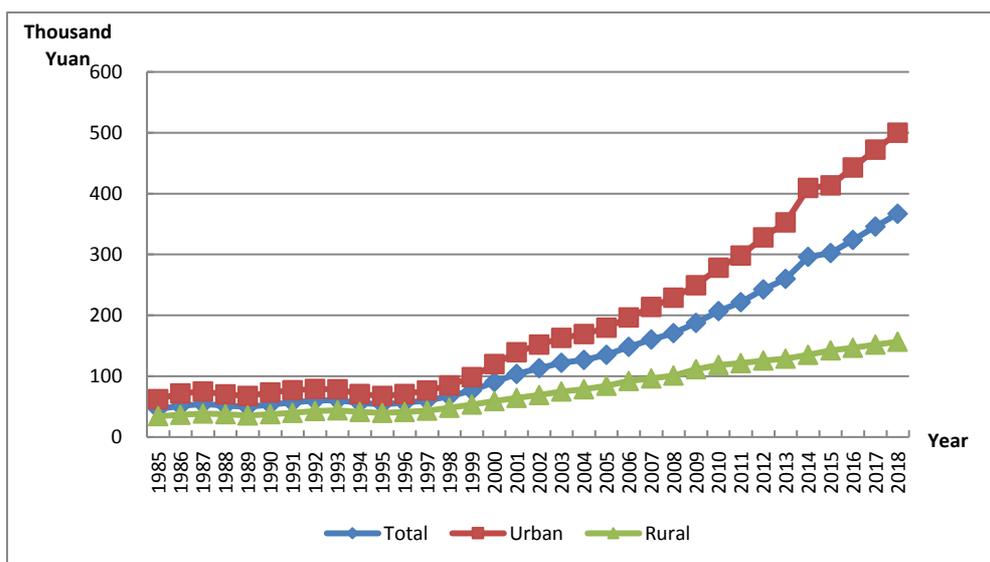

Figure HLJ-2.2 Real Human Capital Per Capita by Region for Heilongjiang，1985-2018

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 2018, the nominal labor force human capital increased from 0.6 trillion Yuan to 20.3 trillion Yuan, an increase of approximately 35 times; and the real labor force human capital increased from 0.6 trillion Yuan to 4.0 trillion Yuan, an increase of approximately 6 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	567	567
1986	671	630
1987	796	689
1988	935	688
1989	1092	701
1990	1271	770
1991	1471	833
1992	1683	881
1993	1914	874
1994	2167	814
1995	2437	789
1996	2705	819
1997	3011	875

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1998	3323	962
1999	3623	1085
2000	3965	1210
2001	4466	1353
2002	4982	1517
2003	5467	1649
2004	5933	1717
2005	6452	1841
2006	7354	2054
2007	8281	2193
2008	8966	2244
2009	9987	2491
2010	11206	2683
2011	12327	2785
2012	13469	2946
2013	14474	3090
2014	15300	3218
2015	16208	3370
2016	17581	3600
2017	18958	3828
2018	20322	4022

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 2018, the nominal average labor force human capital increased from 29.9 thousand Yuan to 0.9 million Yuan, an increase of approximately 28 times; and

the real average labor force human capital increased from 29.9 thousand Yuan to 0.2 million 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	29.88	36.86	24.26	29.88	36.86	24.26
1986	34.28	42.62	27.32	32.14	40.21	25.42
1987	39.25	49.07	30.75	33.97	42.20	26.84
1988	44.92	55.75	35.07	33.06	40.43	26.36
1989	51.16	62.92	40.02	32.85	39.81	26.25
1990	58.06	70.59	45.75	35.20	42.30	28.23
1991	65.72	80.10	51.49	37.23	44.36	30.17
1992	73.92	90.20	57.68	38.72	45.53	31.92
1993	82.99	101.40	64.45	37.92	44.43	31.36
1994	92.78	113.21	72.30	34.84	40.66	29.01
1995	103.25	126.04	80.44	33.42	39.06	27.77
1996	113.86	138.80	88.87	34.49	39.98	29.00
1997	125.93	153.57	98.00	36.60	42.33	30.81
1998	138.13	167.67	108.06	39.99	45.80	34.07
1999	150.33	181.57	118.23	45.00	51.13	38.71
2000	164.09	197.54	129.25	50.08	56.36	43.54
2001	180.56	217.37	141.70	54.72	61.53	47.54
2002	197.74	239.22	153.23	60.22	68.19	51.67
2003	214.53	258.25	167.06	64.70	73.03	55.67
2004	231.48	277.53	180.97	67.00	75.82	57.32
2005	249.74	299.00	194.71	71.24	81.04	60.29

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
2006	283.10	339.87	218.35	79.06	90.49	66.02
2007	318.03	382.10	243.87	84.21	96.52	69.96
2008	348.26	416.08	270.17	87.18	100.10	72.30
2009	388.37	463.64	300.35	96.86	111.77	79.42
2010	435.27	522.60	330.64	104.20	121.60	83.35
2011	480.33	585.28	350.00	108.51	129.09	82.94
2012	529.17	651.68	372.21	115.74	139.16	85.72
2013	577.02	715.54	395.53	123.20	149.79	88.35
2014	622.11	774.05	420.44	130.85	159.79	92.42
2015	672.39	837.19	448.19	139.81	170.94	97.45
2016	735.25	923.98	473.07	150.55	186.43	100.75
2017	804.10	1017.06	502.36	162.35	202.78	105.09
2018	877.93	1117.81	532.26	173.74	218.49	109.27

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. Column 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	1287	1287	59
1986	1621	1525	68
1987	1954	1701	79
1988	2384	1727	91
1989	2793	1746	100
1990	3277	1928	110
1991	3890	2070	119
1992	4443	2150	131
1993	4950	1993	148
1994	5514	1792	175
1995	6173	1690	213
1996	7278	1824	256
1997	8500	2073	298
1998	9994	2437	339

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
1999	12149	2918	378
2000	15509	3635	418
2001	17241	4041	461
2002	18943	4417	510
2003	21443	4996	564
2004	25116	5725	627
2005	29011	6548	699
2006	36933	8237	789
2007	44508	9618	892
2008	50247	10263	988
2009	58750	12048	1101
2016	65550	13038	1203
2011	69972	13229	1292
2012	75729	13928	1383
2013	79842	14354	1479
2014	86428	15130	1572
2015	87910	15029	1693
2016	92743	15363	1852
2017	97081	15813	2011
2018	100388	16094	—

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 2018, the nominal human capital per capita

increased from 119.5 thousand Yuan to 5.6 million Yuan, an increase of more than 46 times; and the real human capital per capita increased from 119.5 thousand Yuan to 904.5 thousand Yuan, an increase of approximately 7 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 2018, 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.
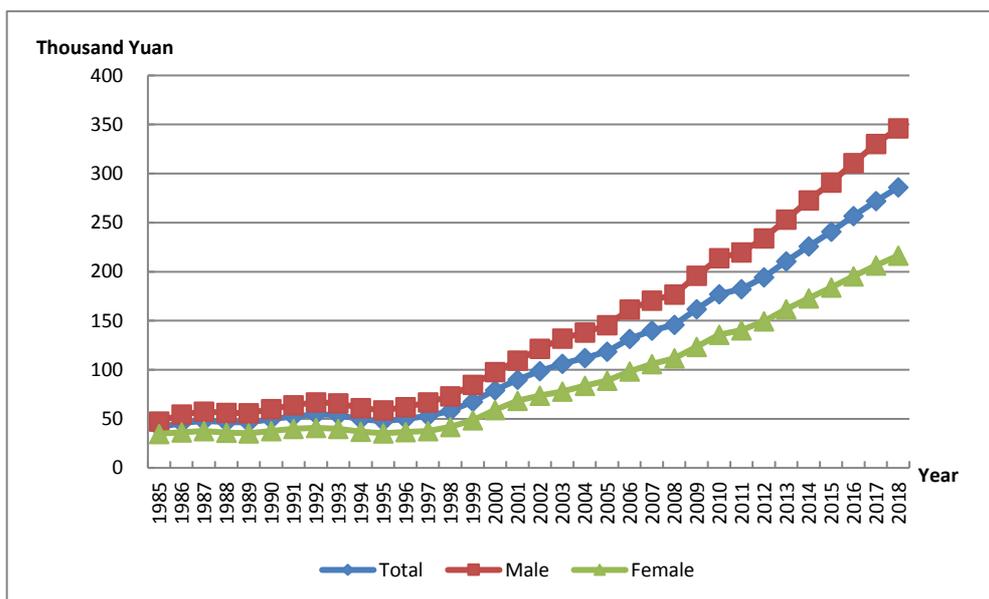

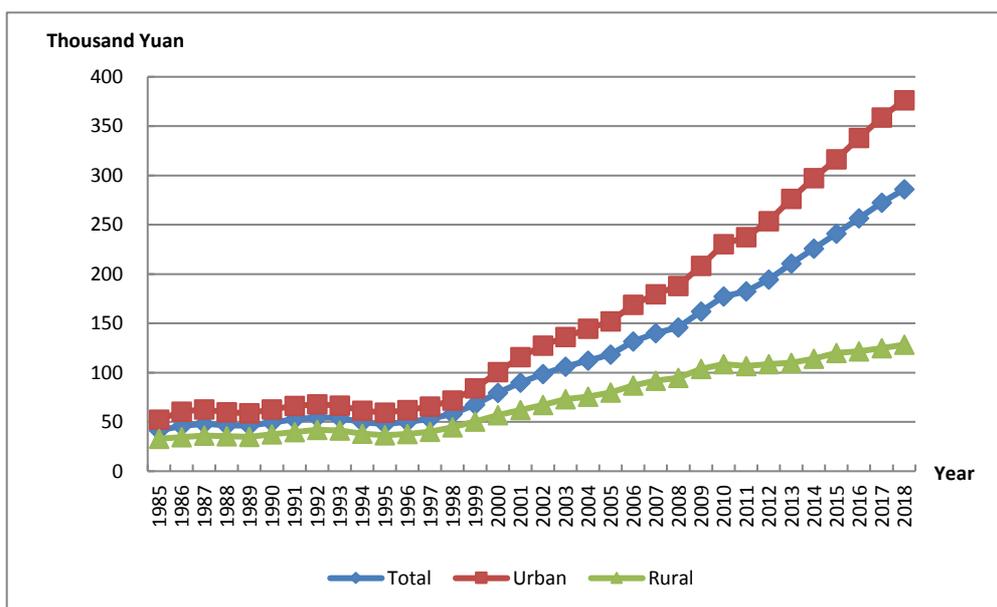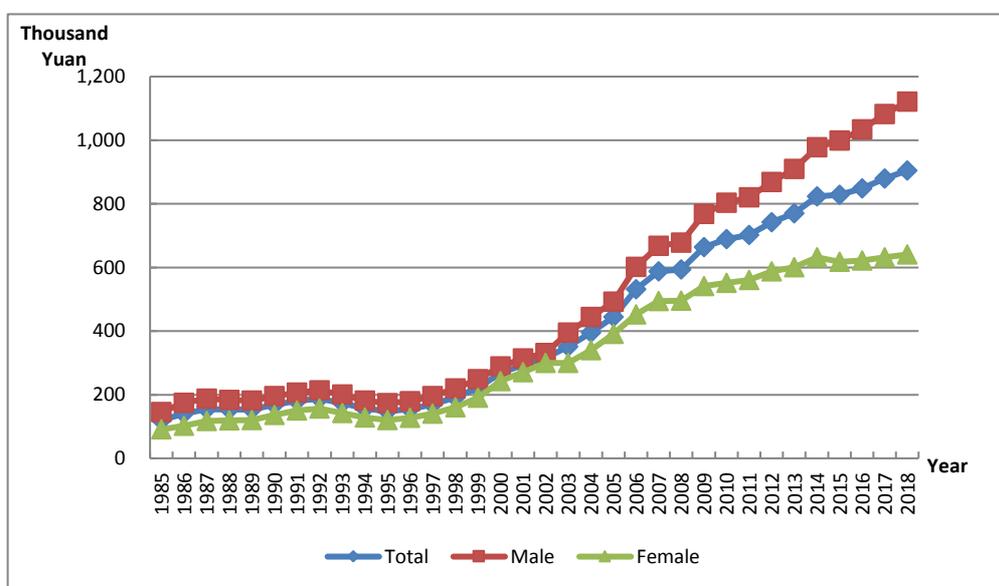**Figure SH-2.1 Human Capital Per Capita by Gender for Shanghai，1985-2018**

Table SH-2.1 Nominal and Real Human Capital Per Capita for Shanghai

Year	Nominal Human Capital Per Capita (Thousands of Yuan)	Real Human Capital Per Capita (Thousands of 1985 Yuan)
1985	119.54	119.54
1986	149.01	140.18
1987	177.01	154.04

Year	Nominal Human Capital Per Capita (Thousands of Yuan)	Real Human Capital Per Capita (Thousands of 1985 Yuan)
1988	211.36	153.15
1989	245.11	153.24
1990	286.23	168.34
1991	339.58	180.74
1992	386.88	187.20
1993	431.05	173.52
1994	481.82	156.54
1995	541.63	148.25
1996	617.01	154.66
1997	695.33	169.54
1998	787.05	191.90
1999	923.40	221.82
2000	1141.39	267.50
2001	1254.92	294.11
2002	1355.44	316.09
2003	1506.94	351.07
2004	1734.93	395.48
2005	1970.49	444.73
2006	2383.39	531.54
2007	2718.88	587.56
2008	2908.26	594.03
2009	3238.12	664.06
2010	3462.89	688.77
2011	3715.11	702.41
2012	4034.48	742.02
2013	4286.58	770.66
2014	4702.27	823.16
2015	4848.16	828.81
2016	5124.86	848.95

Year	Nominal Human Capital Per Capita (Thousands of Yuan)	Real Human Capital Per Capita (Thousands of 1985 Yuan)
2017	5400.27	879.62
2018	5642.08	904.53

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 2018 the nominal labor force human capital increased from 0.6 trillion Yuan to 38.0 trillion Yuan, an increase of more than 66 times; and the real labor force human capital increased from 0.6 trillion Yuan to 6.1 trillion Yuan, an increase of approximately 10 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	570	570
1986	661	622
1987	766	667
1988	903	654
1989	1050	656
1990	1193	702
1991	1349	718
1992	1516	734
1993	1686	679

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1994	1867	606
1995	2071	567
1996	2511	629
1997	3062	747
1998	3666	894
1999	4275	1027
2000	4989	1169
2001	5707	1337
2002	6608	1541
2003	7581	1766
2004	8683	1979
2005	9889	2232
2006	12175	2715
2007	14940	3229
2008	17943	3665
2009	21134	4334
2016	24735	4920
2011	26619	5033
2012	29066	5346
2013	31060	5584
2014	32901	5759
2015	34603	5915
2016	35910	5949
2017	37039	6033
2018	38048	6100

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 2018, the nominal average labor force human capital increased from 74.6 thousand Yuan to 2.7 million Yuan, an increase of more than 35 times; and the real average labor force human capital increased from 74.6 thousand Yuan to 429.9 thousand Yuan, an increase of approximately 5 times.

Table SH-3.2 Nominal and Real Average Labor Force Human Capital for Shanghai

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)	Real Average Labor Force Human Capital (Thousands of 1985 Yuan)
1985	74.60	74.60
1986	85.59	80.52
1987	97.95	85.24
1988	112.99	81.87
1989	129.10	80.72
1990	145.37	85.50
1991	164.13	87.36
1992	184.43	89.24
1993	205.71	82.81
1994	228.56	74.26
1995	253.73	69.45
1996	291.34	73.03
1997	334.85	81.65
1998	378.44	92.27
1999	419.93	100.88
2000	466.51	109.33
2001	524.61	122.95
2002	594.49	138.63
2003	667.35	155.47

Year	Nominal Average Labor Force Human Capital (Thousands of Yuan)	Real Average Labor Force Human Capital (Thousands of 1985 Yuan)
2004	748.92	170.72
2005	834.19	188.27
2006	967.66	215.81
2007	1115.51	241.07
2008	1262.61	257.90
2009	1412.60	289.69
2010	1574.86	313.24
2011	1715.78	324.40
2012	1896.01	348.71
2013	2056.28	369.68
2014	2220.07	388.64
2015	2371.41	405.40
2016	2474.80	409.96
2017	2578.78	420.04
2018	2681.46	429.89

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	2831	2831	83
1986	3292	3067	102
1987	3774	3241	123
1988	4475	3153	147
1989	5251	3145	166
1990	6193	3596	187
1991	7245	4036	212
1992	8425	4411	253
1993	9669	4283	303
1994	10950	3926	353
1995	12158	3767	408
1996	14063	3973	470
1997	16227	4477	538
1998	18377	5068	619
1999	21353	5924	704
2000	23936	6609	799

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	29946	8146	900
2002	30915	8503	1010
2003	33892	9222	1172
2004	37049	9675	1360
2005	39964	10196	1606
2006	46322	11617	1876
2007	54094	12971	2174
2008	60945	13861	2501
2009	69946	15949	2926
2010	79025	17341	3414
2011	89315	18564	3983
2012	102609	20734	4562
2013	116767	23010	5133
2014	128298	24709	5671
2015	137837	26095	6234
2016	151055	27918	6848
2017	165572	30043	7514
2018	180105	31917	—

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 2018, the nominal human capital per capita increased from 50.7 thousand Yuan to 2.79 million Yuan, an increase of more than 54 times; and the real human capital per capita increased from 50.7 thousand Yuan

to 495.1 thousand Yuan, an increase of approximately 9 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 women for Jiangsu. Both men and women saw increasing human capital from 1985 to 2018, 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.
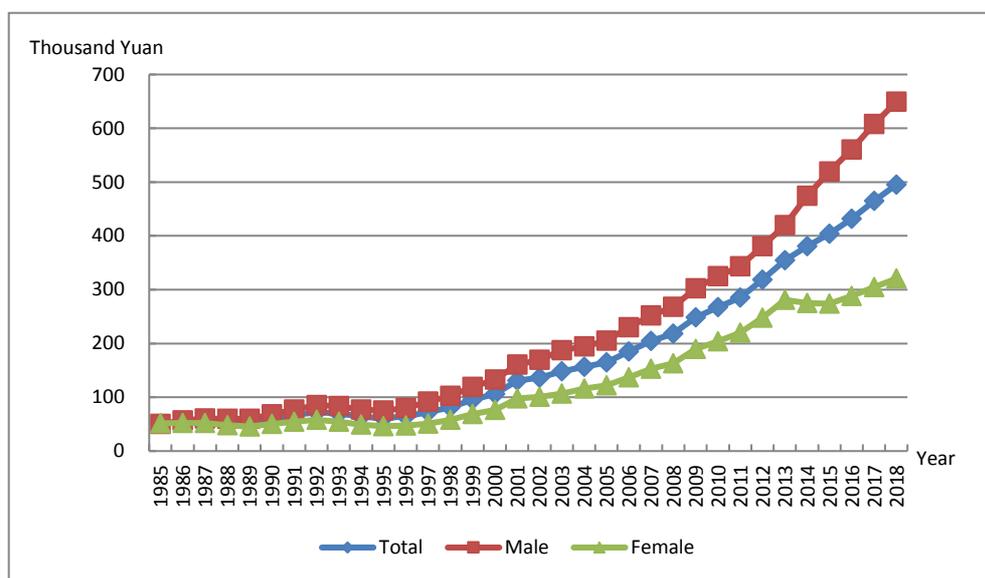
Figure JS-2.1 Real Human Capital Per Capita by Gender for Jiangsu，1985-2018

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	50.73	75.59	45.18	50.73	75.59	45.18
1986	58.35	91.25	50.77	54.36	85.76	47.14
1987	65.90	102.59	57.12	56.58	87.26	49.25
1988	76.79	119.66	65.14	54.11	83.01	46.26
1989	88.86	137.74	74.34	53.22	82.38	44.55
1990	103.27	160.95	85.11	59.96	93.09	49.52

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	119.62	189.31	95.51	66.64	101.67	54.53
1992	138.05	220.40	106.97	72.28	108.79	58.50
1993	157.68	250.99	119.69	69.85	104.37	55.81
1994	178.40	282.57	133.14	63.96	93.78	51.01
1995	197.66	304.16	149.12	61.25	86.87	49.55
1996	227.69	345.87	164.66	64.33	89.16	51.09
1997	261.91	391.39	182.19	72.26	99.60	55.42
1998	295.04	429.28	201.88	81.36	109.24	62.03
1999	342.79	497.87	222.15	95.10	128.49	69.08
2000	384.61	545.19	245.83	106.20	140.70	76.37
2001	480.97	705.77	273.05	130.84	181.96	83.57
2002	496.18	694.80	298.40	136.48	182.04	91.15
2003	545.57	742.43	333.68	148.45	192.79	100.72
2004	598.58	791.99	367.45	156.31	198.32	106.03
2005	646.35	830.42	399.39	164.90	203.87	112.55
2006	736.98	942.11	452.33	184.82	227.64	125.34
2007	851.80	1089.24	501.00	204.25	252.83	132.46
2008	958.91	1222.56	554.89	218.09	269.75	138.93
2009	1090.67	1382.32	616.09	248.69	306.22	155.03
2010	1219.77	1536.48	677.35	267.67	328.55	163.42
2011	1372.52	1723.06	710.36	285.27	350.64	161.78
2012	1574.19	1972.10	750.35	318.10	391.29	166.56
2013	1799.28	2245.05	793.24	354.57	435.53	171.79
2014	1976.77	2450.81	849.64	380.71	465.13	180.07
2015	2134.10	2614.20	914.51	404.02	487.85	190.96
2016	2336.23	2851.89	958.80	431.78	519.73	196.66
2017	2562.77	3114.93	1019.34	465.01	557.63	205.99
2018	2794.06	3383.97	1080.87	495.14	592.17	213.31

Figure JS-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remained larger than that in the rural area. Since 1997, the growth of human capital for rural and urban both accelerated, but the growth rate was significantly higher in the urban areas compared to rural areas. Therefore the gap between urban and rural expanded rapidly.
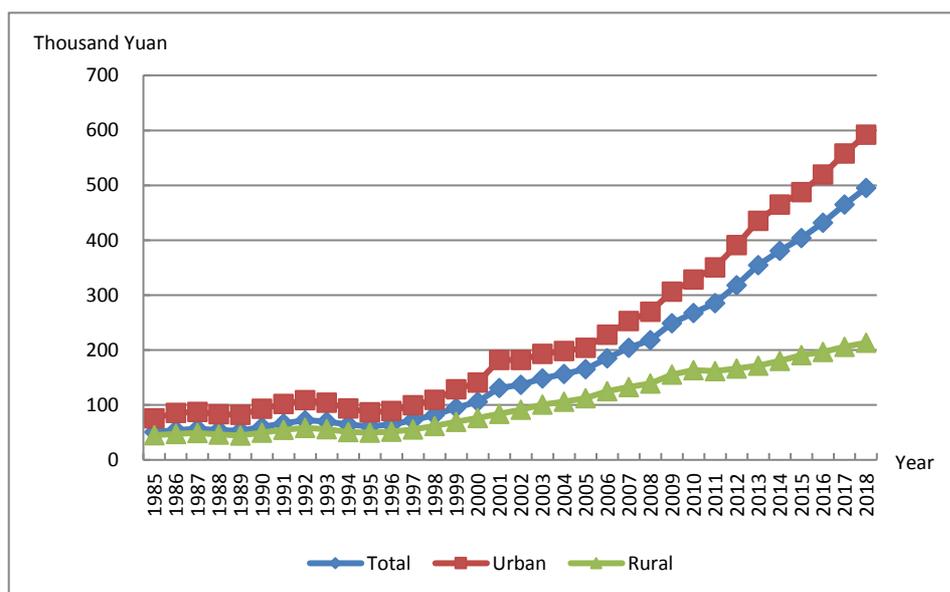
Figure JS-2.2 Real Human Capital Per Capita by Region for Jiangsu，1985-2018

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 2018, the nominal labor force human capital increased from 1.4 trillion Yuan to 66.6 trillion Yuan, an increase of more than 47 times; and the

real labor force human capital increased from 1.4 trillion Yuan to 11.9 trillion Yuan, an increase of approximately 8 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	1375	1375
1986	1599	1489
1987	1858	1596
1988	2186	1542
1989	2523	1511
1990	2902	1686
1991	3327	1863
1992	3786	2002
1993	4255	1909
1994	4768	1738
1995	5322	1675
1996	6052	1746
1997	6913	1948
1998	7855	2213
1999	8818	2504
2000	9867	2788
2001	10876	3030
2002	11969	3340
2003	13131	3608
2004	14293	3761
2005	15660	4022
2006	18547	4689
2007	21685	5252
2008	24488	5626
2009	28552	6577
2010	33023	7313

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	36934	7747
2012	41266	8419
2013	45417	9040
2014	50033	9726
2015	54584	10423
2016	58456	10902
2017	62510	11447
2018	66571	11902

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 2018, the nominal average labor force human capital increased from 36.9 thousand Yuan to 1.4 million Yuan, an increase of more than 37 times; and the real average labor force human capital increased from 36.9 thousand Yuan to 252.9 thousand Yuan, an increase of approximately 6 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	36.90	51.14	33.64	36.90	51.14	33.64
1986	41.76	58.26	37.99	38.89	54.76	35.28
1987	47.25	66.26	42.88	40.57	56.35	36.97
1988	54.34	74.25	49.33	38.34	51.51	35.03
1989	61.88	83.37	56.09	37.07	49.86	33.62

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
1990	70.26	93.09	63.76	40.82	53.84	37.10
1991	79.41	106.07	71.18	44.47	56.96	40.65
1992	89.43	119.87	79.26	47.30	59.17	43.35
1993	100.00	133.70	88.05	44.86	55.60	41.05
1994	111.63	148.53	97.71	40.70	49.29	37.43
1995	124.12	165.18	107.90	39.06	47.18	35.85
1996	139.90	184.37	119.56	40.37	47.52	37.09
1997	158.09	206.04	132.58	44.55	52.43	40.33
1998	177.23	226.92	147.21	49.94	57.74	45.23
1999	197.10	246.75	162.69	55.98	63.68	50.59
2000	218.29	267.53	180.08	61.68	69.04	55.94
2001	240.09	293.88	193.50	66.88	75.77	59.22
2002	263.64	324.03	205.35	73.56	84.90	62.73
2003	289.87	353.61	219.37	79.66	91.82	66.21
2004	316.92	381.84	236.14	83.40	95.62	68.14
2005	346.45	412.32	255.36	88.98	101.23	71.96
2006	401.41	473.33	301.61	101.49	114.37	83.57
2007	461.62	542.10	347.56	111.81	125.83	91.89
2008	519.22	608.70	390.03	119.29	134.31	97.66
2009	595.41	697.97	439.06	137.15	154.62	110.48
2010	676.65	795.57	487.18	149.83	170.12	117.54
2011	753.52	889.27	524.16	158.05	180.97	119.37
2012	842.81	998.65	563.27	171.95	198.14	125.03
2013	933.30	1104.93	603.95	185.78	214.35	130.80
2014	1029.88	1221.93	646.70	200.20	231.91	137.06
2015	1130.56	1333.64	691.99	215.88	248.88	144.49
2016	1217.35	1438.68	724.60	227.04	262.19	148.63

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
2017	1314.90	1553.74	765.28	240.79	278.15	154.65
2018	1414.67	1673.40	805.66	252.92	292.83	159.00

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	2348	2348	13
1986	2718	2560	15
1987	3112	2713	19
1988	3615	2601	26
1989	4170	2529	31
1990	4838	2873	36
1991	5655	3246	44
1992	6389	3427	57
1993	7359	3294	142
1994	8373	2991	247
1995	9356	2858	380
1996	11105	3089	516
1997	13153	3505	643
1998	15527	4105	766
1999	18114	4803	894
2000	20890	5470	1062

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	23521	6141	1255
2002	26159	6867	1498
2003	29085	7535	1893
2004	32921	8249	2427
2005	36083	8921	2880
2006	42127	10281	3411
2007	48720	11410	4114
2008	55366	12351	5100
2009	62414	14123	5588
2010	70090	15250	6657
2011	79149	16284	8080
2012	88012	17666	8906
2013	96726	18940	9886
2014	105817	20283	10935
2015	112992	21348	11678
2016	122778	22711	12853
2017	133306	24117	14892
2018	144079	25449	—

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 2018, the nominal human capital per capita increased from 65.1 thousand Yuan to 3.2 million Yuan, an increase of more than 47 times; and the real human capital per capita increased from 65.1 thousand Yuan to

556.3 thousand Yuan, an increase of approximately 8 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 2018, 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，1985-2018

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	65.09	80.28	59.47	65.09	80.28	59.47
1986	75.22	97.42	66.62	70.87	91.65	62.79
1987	85.54	111.50	75.02	74.57	94.58	66.46
1988	98.82	126.94	86.83	71.09	87.26	64.20
1989	113.80	145.07	99.72	69.02	85.38	61.65
1990	131.78	168.74	114.36	78.27	97.27	69.31

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	152.89	205.67	126.25	87.76	112.27	75.39
1992	172.09	230.20	139.66	92.30	115.07	79.58
1993	197.61	268.62	154.64	88.46	110.61	75.06
1994	224.28	306.66	171.04	80.11	101.26	66.46
1995	250.15	345.11	187.22	76.42	97.40	62.50
1996	292.73	403.49	203.22	81.42	103.71	63.41
1997	341.92	467.92	222.34	91.12	115.53	67.94
1998	397.76	538.05	247.75	105.15	132.19	76.24
1999	456.29	609.01	276.40	120.98	150.38	86.35
2000	519.97	680.57	315.43	136.16	166.55	97.48
2001	581.19	755.18	338.16	151.74	185.55	104.50
2002	641.70	828.00	358.23	168.45	205.91	111.48
2003	707.38	901.04	392.25	183.26	222.96	118.63
2004	793.50	1004.31	435.97	198.83	241.74	126.05
2005	863.68	1081.26	488.30	213.53	256.42	139.51
2006	985.95	1232.22	541.89	240.62	289.04	153.29
2007	1115.54	1388.29	598.74	261.26	313.42	162.23
2008	1236.47	1531.81	664.62	275.83	329.99	171.02
2009	1365.37	1675.22	744.27	308.96	365.63	195.03
2010	1499.84	1833.07	820.79	326.34	384.70	207.40
2011	1690.93	2081.13	856.30	347.88	414.77	204.90
2012	1879.54	2317.23	901.46	377.26	451.89	210.86
2013	2073.65	2548.49	953.08	406.04	485.81	217.71
2014	2274.30	2793.25	1013.25	435.94	522.03	226.47
2015	2440.93	2996.91	1080.82	461.16	552.36	238.24
2016	2656.59	3257.82	1122.57	491.41	588.67	243.06
2017	2892.34	3548.04	1176.14	523.27	627.93	249.67
2018	3149.25	3855.57	1229.80	556.26	667.01	255.44

Figure ZJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban areas remained larger than that in the rural areas. Since 1997, the growth of human capital for rural and urban areas both accelerated, with the growth rate is significantly higher in the urban area than in the 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，1985-2018

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 2018, the nominal labor force human capital increased from

1.1 trillion Yuan to 54.1 trillion Yuan, an increase of more than 49 times; and the real labor force human capital increased from 1.1 trillion Yuan to 9.7 trillion Yuan, an increase of approximately 8 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	1086	1086
1986	1260	1187
1987	1463	1276
1988	1687	1216
1989	1946	1182
1990	2231	1329
1991	2518	1457
1992	2831	1542
1993	3159	1450
1994	3504	1290
1995	3870	1223
1996	4524	1309
1997	5291	1472
1998	6145	1698
1999	7033	1951
2000	7961	2175
2001	8708	2371
2002	9499	2600
2003	10497	2821
2004	11622	3008
2005	12856	3278
2006	15255	3826
2007	17877	4291
2008	20835	4750

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2009	24280	5607
2010	28108	6233
2011	30550	6404
2012	33592	6862
2013	36941	7355
2014	40478	7882
2015	43742	8388
2016	47104	8838
2017	50618	9282
2018	54083	9677

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 2018, the nominal average labor force human capital increased from 45.4 thousand Yuan to 1.6 million Yuan, an increase of more than 34 times; and the real average labor force human capital increased from 45.4 thousand Yuan to 284.5 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	45.36	54.24	41.95	45.36	54.24	41.95
1986	51.47	62.33	47.09	48.48	58.64	44.38
1987	58.36	70.83	53.10	50.91	60.08	47.04
1988	66.80	78.09	61.82	48.15	53.68	45.71

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
1989	76.40	87.08	71.53	46.43	51.25	44.23
1990	87.10	96.85	82.51	51.88	55.83	50.01
1991	97.06	107.79	91.93	56.17	58.84	54.90
1992	108.25	119.49	102.83	58.96	59.73	58.60
1993	120.32	131.17	115.03	55.23	54.01	55.83
1994	132.92	142.45	128.30	48.94	47.04	49.86
1995	146.30	154.83	142.15	46.22	43.70	47.46
1996	167.43	186.30	156.37	48.45	47.89	48.79
1997	191.21	217.70	172.93	53.21	53.75	52.84
1998	216.62	246.75	192.52	59.86	60.62	59.25
1999	242.00	271.99	214.94	67.15	67.16	67.15
2000	268.46	297.70	238.91	73.35	72.85	73.83
2001	292.29	325.07	256.70	79.59	79.87	79.33
2002	317.41	354.86	274.08	86.88	88.25	85.30
2003	347.83	387.01	299.60	93.46	95.76	90.61
2004	381.50	422.47	328.16	98.73	101.69	94.88
2005	417.00	457.93	361.10	106.32	108.60	103.17
2006	481.66	540.06	396.85	120.81	126.68	112.26
2007	550.56	622.36	438.64	132.15	140.51	118.85
2008	622.42	707.62	486.43	141.91	152.44	125.17
2009	705.82	800.56	543.67	162.99	174.73	142.46
2010	791.99	901.01	601.52	175.62	189.09	152.00
2011	863.68	995.61	626.81	181.05	198.43	149.99
2012	952.49	1111.06	659.67	194.58	216.67	154.30
2013	1053.72	1234.30	697.36	209.79	235.29	159.29
2014	1158.74	1363.86	742.58	225.62	254.89	165.97
2015	1256.44	1485.39	790.69	240.93	273.77	174.28

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	1358.27	1614.51	815.56	254.85	291.74	176.59
2017	1469.00	1758.92	847.15	269.39	311.29	179.83
2018	1589.99	1911.69	876.64	284.48	330.72	182.09

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. Column 1 is nominal human capital in six-education categories. Column 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	1763	1763	38
1986	2058	1937	44
1987	2342	2023	50
1988	2716	1957	56
1989	3167	1940	61
1990	3758	2241	66
1991	4350	2460	71
1992	4965	2592	76
1993	5660	2569	84
1994	6434	2304	94
1995	7276	2273	107
1996	8326	2364	121
1997	9555	2674	136
1998	10952	3057	152
1999	12140	3462	166
2000	13916	3931	182
2001	16045	4499	200

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	18227	5156	220
2003	20586	5713	243
2004	23098	6125	277
2005	26004	6795	316
2006	29981	7735	363
2007	33951	8313	420
2008	38785	8943	487
2009	43665	10162	566
2010	49746	11219	664
2011	55497	11848	778
2012	62437	13022	908
2013	69962	14234	1049
2014	77109	15424	1202
2015	83073	16397	1359
2016	92775	17984	1530
2017	103877	19875	1701
2018	115582	21673	—

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 2018, the nominal human capital per capita increased from 36.2 thousand Yuan to 2.5 million Yuan, an increase of more than 67 times; and the real human capital per capita increased from 36.2 thousand Yuan to 460.1 thousand Yuan, an increase of approximately 12 times.

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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 2018, 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.
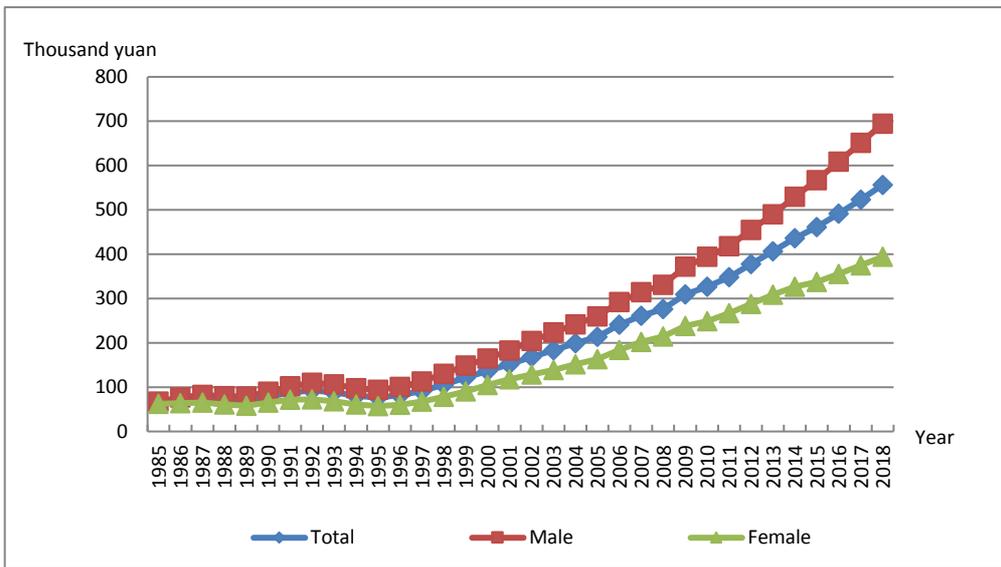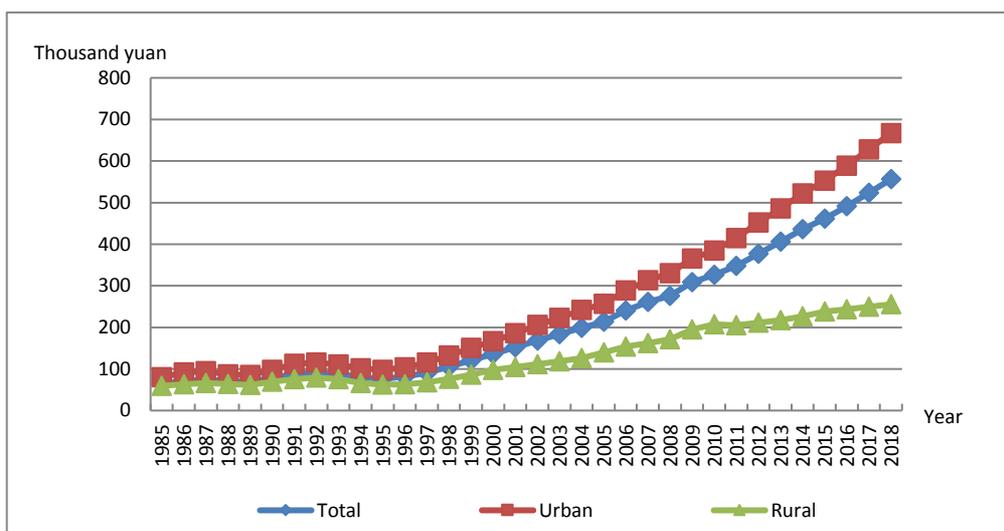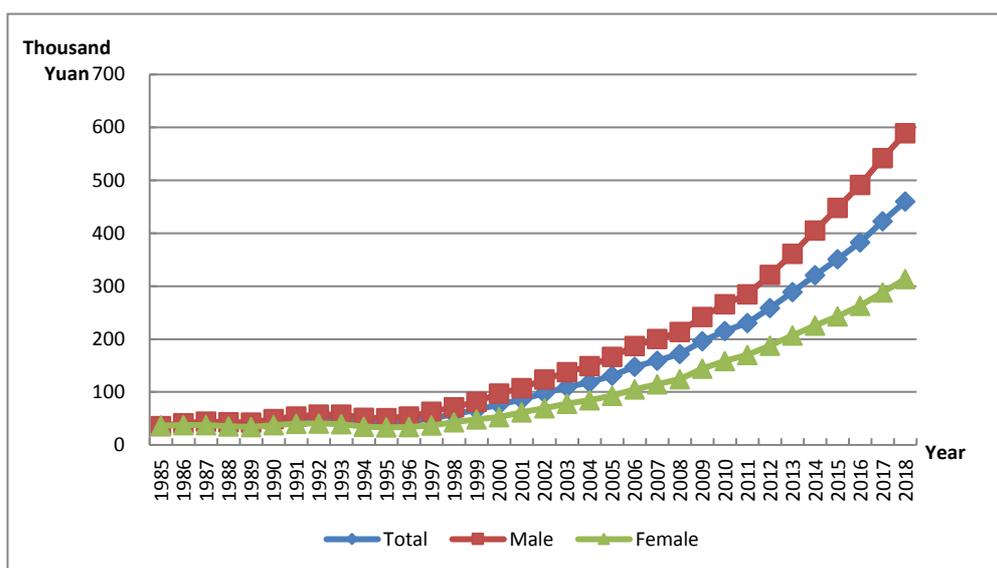

Figure AH-2.1 Human Capital Per Capita by Gender for Anhui，1985-2018

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	36.23	77.18	28.65	36.23	77.18	28.65
1986	42.12	93.95	32.12	39.64	88.80	30.16
1987	47.72	105.71	36.10	41.24	90.92	31.30
1988	54.70	119.52	41.14	39.42	84.67	29.95
1989	62.76	135.88	46.94	38.45	83.20	28.76
1990	72.93	158.87	53.69	43.50	94.81	32.01
1991	83.64	184.37	60.64	47.31	102.45	34.72

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	94.96	207.25	68.44	49.59	105.85	36.29
1993	107.72	234.02	77.19	48.89	104.47	35.46
1994	121.66	264.57	86.65	43.56	92.71	31.52
1995	136.49	295.39	96.93	42.64	89.31	31.01
1996	156.43	337.60	108.10	44.42	92.71	31.53
1997	180.31	387.73	120.47	50.47	104.49	34.89
1998	207.41	444.93	134.18	57.89	119.55	38.90
1999	232.53	483.70	148.27	66.30	133.16	43.86
2000	269.77	557.61	165.35	76.21	152.14	48.67
2001	306.52	602.26	184.32	85.94	164.32	53.56
2002	346.31	654.02	201.62	97.96	180.06	59.36
2003	393.63	712.87	224.64	109.24	192.79	65.03
2004	445.62	772.52	248.07	118.17	200.31	68.52
2005	502.52	836.23	271.66	131.30	214.69	73.64
2006	573.51	946.27	307.04	147.97	239.58	82.49
2007	651.75	1064.03	341.10	159.59	255.84	87.11
2008	745.01	1207.17	378.94	171.78	273.82	90.95
2009	841.49	1356.11	421.80	195.84	311.08	101.82
2010	956.42	1530.08	465.36	215.69	340.77	108.64
2011	1080.50	1700.96	499.09	230.68	359.42	110.03
2012	1240.34	1929.04	534.84	258.69	398.84	115.15
2013	1419.80	2181.53	572.11	288.87	440.47	120.16
2014	1604.22	2440.98	615.96	320.88	484.62	127.46
2015	1779.00	2675.50	664.50	351.13	524.36	135.74
2016	1977.46	2949.12	706.77	383.31	567.77	142.10
2017	2209.12	3266.26	758.49	422.68	620.75	150.84
2018	2453.56	3598.46	813.13	460.07	670.48	158.54

Figure AH-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
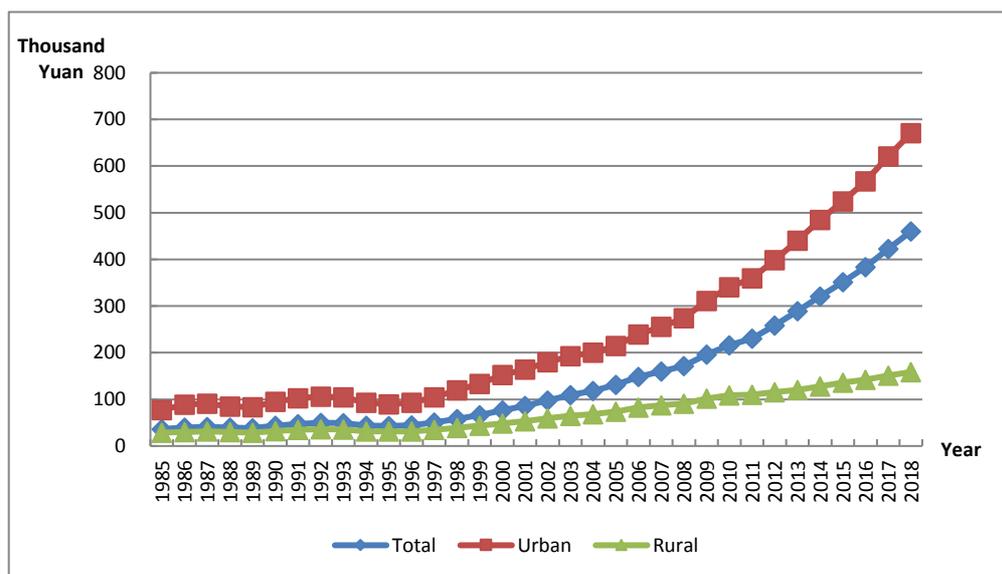
Figure AH-2.2 Real Human Capital Per Capita by Region for Anhui，1985-2018

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 2018, the nominal labor force human capital increased from 0.7 trillion Yuan to 41.5 trillion Yuan, an increase of more than 58 times; and the

real labor force human capital increased from 0.7 trillion Yuan to 7.8 trillion Yuan, an increase of approximately 10 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	707	707
1986	841	791
1987	1002	866
1988	1169	843
1989	1375	842
1990	1623	967
1991	1837	1040
1992	2075	1086
1993	2329	1060
1994	2622	942
1995	2945	924
1996	3324	949
1997	3757	1059
1998	4214	1185
1999	4667	1340
2000	5160	1469
2001	5789	1634
2002	6409	1825
2003	6900	1928
2004	7518	2005
2005	8460	2219
2006	10010	2594
2007	11565	2847
2008	13393	3104
2009	14971	3502
2010	17362	3933
2011	19462	4170

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	21560	4513
2013	23976	4896
2014	26313	5283
2015	27999	5547
2016	32160	6256
2017	36655	7037
2018	41494	7804

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 2018, the nominal average labor force human capital increased from 24.9 thousand Yuan to 1269.7 thousand Yuan, an increase of more than 50 times; and the real average labor force human capital increased from 24.9 thousand Yuan to 238.8 thousand Yuan, an increase of more than 9 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	24.86	47.80	20.34	24.86	47.80	20.34
1986	28.52	54.85	23.09	26.84	51.84	21.68
1987	32.78	62.81	26.25	28.34	54.02	22.76
1988	37.42	70.58	29.94	26.99	50.00	21.79
1989	42.78	79.46	34.30	26.21	48.66	21.02
1990	49.04	89.68	39.33	29.24	53.52	23.44
1991	54.74	99.18	43.99	31.01	55.11	25.19

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	61.20	109.51	49.24	32.03	55.93	26.11
1993	68.10	120.37	55.10	30.98	53.74	25.31
1994	75.77	132.15	61.80	27.22	46.31	22.48
1995	84.54	146.17	68.97	26.53	44.19	22.06
1996	95.27	163.43	76.77	27.19	44.88	22.39
1997	107.74	182.89	85.50	30.36	49.29	24.76
1998	120.82	202.27	94.90	33.98	54.35	27.51
1999	134.92	221.41	104.30	38.73	60.95	30.85
2000	149.95	241.98	114.78	42.70	66.02	33.79
2001	166.86	261.21	125.79	47.09	71.27	36.55
2002	184.33	284.05	135.29	52.47	78.20	39.83
2003	200.71	300.81	146.25	56.07	81.35	42.34
2004	221.74	325.54	156.05	59.12	84.41	43.11
2005	249.54	363.10	167.00	65.45	93.22	45.27
2006	290.43	422.07	194.12	75.25	106.86	52.15
2007	332.73	480.84	222.44	81.90	115.61	56.80
2008	381.96	552.32	250.91	88.51	125.28	60.22
2009	425.52	610.85	283.14	99.53	140.13	68.35
2010	489.08	707.71	312.31	110.80	157.62	72.91
2011	555.07	806.51	338.58	118.94	170.42	74.64
2012	627.75	913.28	367.46	131.41	188.83	79.11
2013	712.18	1038.92	396.51	145.43	209.77	83.28
2014	798.52	1162.83	429.36	160.31	230.86	88.85
2015	874.91	1263.52	461.77	173.33	247.63	94.33
2016	991.37	1442.42	491.65	192.84	277.70	98.85
2017	1124.98	1643.04	527.88	215.97	312.26	104.98
2018	1269.74	1859.62	564.98	238.81	346.49	110.16

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. Column 1 is nominal human capital in six-education categories. Column 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	1406	1406	25
1986	1631	1541	29
1987	1857	1613	33
1988	2152	1479	36
1989	2502	1446	39
1990	2940	1713	41
1991	3450	1943	44
1992	4019	2135	48
1993	4629	2125	55
1994	5377	1961	65
1995	6200	1951	78
1996	7168	2112	92
1997	8164	2350	108
1998	9205	2647	127
1999	10289	2983	146
2000	11641	3288	165
2001	13443	3825	183

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	14854	4233	204
2003	16175	4565	228
2004	17718	4798	261
2005	19339	5118	303
2006	22181	5816	354
2007	25595	6366	419
2008	29026	6898	503
2009	32517	7867	600
2010	37120	8682	701
2011	42458	9388	815
2012	47334	10181	941
2013	53139	11112	1083
2014	58838	12031	1235
2015	63474	12752	1401
2016	69749	13749	1578
2017	76738	14931	1766
2018	83963	16080	—

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 2018, the nominal human capital per capita increased from 56.2 thousand Yuan to 2.5 million Yuan, an increase of more than 43 times; and the real human capital per capita increased from 56.2 thousand Yuan to 469.0 thousand Yuan, an increase of approximately 7 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 2018, 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.
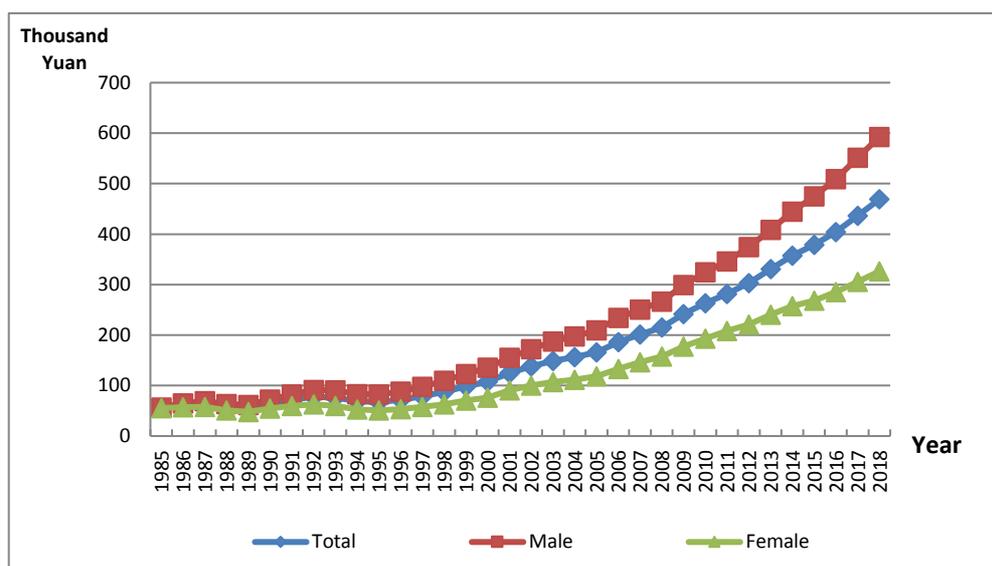
Figure FJ-2.1 Human Capital Per Capita by Gender for Fujian，1985-2018

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	56.20	76.46	50.68	56.20	76.46	50.68
1986	64.84	93.54	56.90	61.27	87.50	53.99
1987	73.26	106.97	63.78	63.64	90.48	56.08
1988	83.69	122.76	72.31	57.51	81.76	50.46
1989	95.71	141.03	82.12	55.32	79.06	48.20
1990	109.79	163.21	93.57	63.99	91.41	55.70
1991	127.51	192.49	104.53	71.82	103.06	60.77

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	146.67	221.01	116.65	77.92	109.57	65.14
1993	166.50	245.92	130.09	76.44	104.38	63.61
1994	189.35	274.08	145.30	69.06	92.99	56.61
1995	214.17	303.92	161.15	67.40	88.58	54.89
1996	244.11	344.80	177.26	71.94	94.01	57.28
1997	273.86	380.13	195.87	78.83	101.12	62.48
1998	305.35	416.62	216.67	87.80	110.83	69.46
1999	338.55	454.91	238.69	98.15	122.61	77.14
2000	380.72	507.46	266.17	107.53	132.53	84.92
2001	437.69	591.36	290.53	124.55	157.11	93.34
2002	484.51	654.98	310.45	138.07	175.41	99.94
2003	528.37	702.27	339.45	149.12	186.77	108.19
2004	577.72	758.87	368.59	156.46	194.44	112.64
2005	626.20	812.03	400.32	165.74	204.18	119.00
2006	708.98	912.73	452.93	185.89	227.00	134.24
2007	807.97	1037.90	506.48	200.97	245.61	142.42
2008	905.21	1155.33	564.61	215.13	261.62	151.78
2009	999.93	1259.59	631.57	241.91	290.17	173.43
2010	1125.68	1412.99	696.48	263.29	315.72	184.96
2011	1273.54	1605.66	733.06	281.61	341.03	184.88
2012	1408.94	1765.38	778.09	303.06	366.08	191.55
2013	1580.96	1979.22	829.06	330.59	400.02	199.51
2014	1749.23	2181.93	891.51	357.67	431.92	210.54
2015	1885.98	2332.07	964.18	378.91	453.93	223.89
2016	2051.71	2531.87	1033.26	404.42	483.64	236.39
2017	2244.17	2760.27	1116.47	436.66	520.51	253.40
2018	2449.18	3000.91	1206.70	469.04	557.52	269.83

Figure FJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
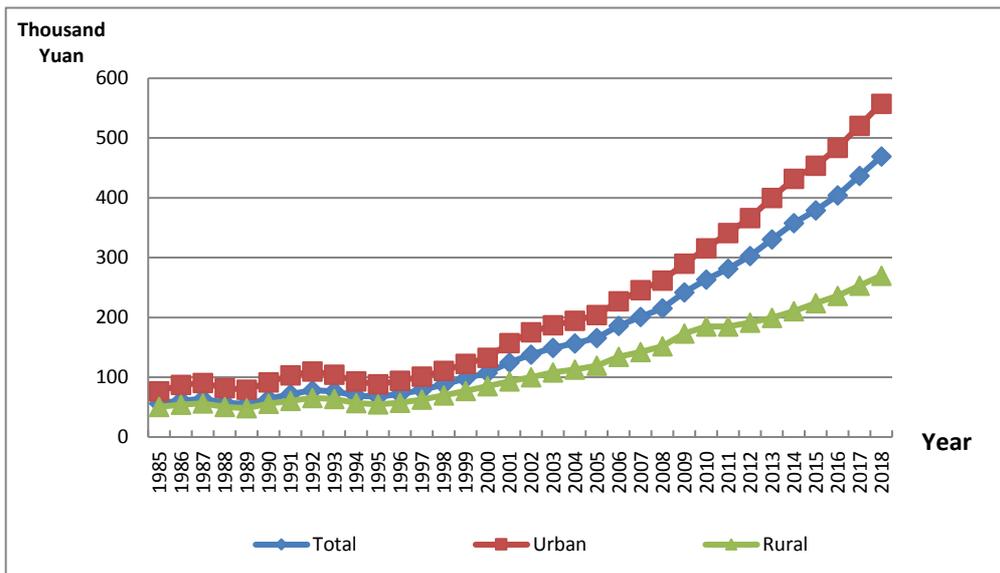
Figure FJ-2.2 Real Human Capital Per Capita by Region for Fujian，1985-2018

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 2018, the nominal labor force human capital increased from 0.5

trillion Yuan to 30.0 trillion Yuan, an increase of more than 55 times; and the real labor force human capital increased from 0.5 trillion Yuan to 5.8 trillion Yuan, an increase of approximately 10 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	537	537
1986	624	590
1987	728	632
1988	857	589
1989	1015	588
1990	1209	707
1991	1399	791
1992	1614	864
1993	1861	863
1994	2179	803
1995	2521	805
1996	2889	866
1997	3319	973
1998	3819	1119
1999	4318	1275
2000	4905	1413
2001	5404	1568
2002	5928	1720
2003	6477	1857
2004	7049	1937
2005	7698	2064
2006	8880	2359
2007	10247	2582
2008	11763	2829
2009	13488	3300

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	15511	3670
2011	17071	3825
2012	18775	4090
2013	20242	4288
2014	21826	4520
2015	23567	4791
2016	25533	5090
2017	27740	5456
2018	30013	5805

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 2018, the nominal average labor force human capital increased from 37.5 thousand Yuan to 1.3 million Yuan, an increase of more than 32 times; and the real average labor force human capital increased from 37.5 thousand Yuan to 224.1 thousand Yuan, an increase of approximately 6 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	37.54	50.08	33.90	37.54	50.08	33.90
1986	42.50	57.11	38.20	40.15	53.42	36.24
1987	48.08	64.76	43.14	41.79	54.78	37.94
1988	54.91	73.51	49.29	37.77	48.96	34.40

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
1989	62.80	83.30	56.53	36.35	46.70	33.18
1990	71.84	93.58	65.20	41.99	52.41	38.81
1991	81.62	107.54	72.65	46.18	57.58	42.23
1992	92.51	122.11	81.00	49.51	60.53	45.23
1993	104.69	137.51	90.57	48.52	58.37	44.29
1994	118.92	154.17	102.43	43.85	52.31	39.91
1995	134.09	172.51	114.38	42.79	50.28	38.96
1996	150.29	191.85	126.83	45.07	52.31	40.98
1997	168.61	213.11	140.90	49.45	56.69	44.94
1998	188.66	234.69	157.32	55.30	62.43	50.44
1999	208.59	255.04	174.33	61.60	68.74	56.34
2000	230.76	277.32	193.68	66.50	72.43	61.79
2001	251.37	303.09	206.84	72.97	80.52	66.45
2002	273.02	331.77	218.28	79.23	88.86	70.27
2003	296.03	358.38	233.61	84.89	95.31	74.46
2004	320.25	386.54	249.52	88.01	99.04	76.25
2005	346.28	415.67	267.85	92.83	104.52	79.62
2006	394.08	470.76	304.23	104.69	117.08	90.17
2007	447.40	533.05	342.63	112.74	126.14	96.35
2008	505.02	599.95	382.96	121.45	135.86	102.95
2009	568.83	671.52	430.89	139.15	154.70	118.32
2010	640.51	753.59	482.24	151.57	168.38	128.07
2011	701.53	831.83	509.43	157.18	176.68	128.48
2012	772.89	923.73	536.59	168.38	191.55	132.10
2013	840.16	1008.25	561.96	177.96	203.78	135.23
2014	912.86	1096.60	595.66	189.06	217.08	140.67
2015	988.19	1182.34	637.20	200.88	230.14	147.96

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	1066.23	1280.35	670.39	212.54	244.58	153.37
2017	1160.60	1396.65	711.48	228.28	263.37	161.48
2018	1262.19	1521.34	754.53	244.14	282.64	168.72

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. Column 1 is nominal human capital in six-education categories. Column 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	1252	1252	34
1986	1474	1378	39
1987	1688	1488	42
1988	1946	1419	44
1989	2238	1373	48
1990	2607	1562	51
1991	3009	1759	54
1992	3471	1932	60
1993	3998	1951	68
1994	4559	1752	76
1995	5161	1693	85
1996	5929	1788	95
1997	6714	1970	108
1998	7678	2227	120
1999	8819	2587	134
2000	10134	2947	148
2001	11790	3426	165
2002	13335	3854	190

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2003	14948	4276	223
2004	16631	4594	264
2005	18050	4895	312
2006	20821	5580	371
2007	23909	6104	441
2008	26994	6500	523
2009	30743	7452	615
2010	35343	8301	715
2011	39866	8855	822
2012	45634	9821	930
2013	51534	10778	1040
2014	56311	11482	1136
2015	61064	12247	1249
2016	67586	13263	1391
2017	74477	14306	1523
2018	81392	15288	—

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 2018, the nominal human capital per capita increased from 38.8 thousand Yuan to 2.1 million Yuan, an increase of more than 53 times; and the real human capital per capita increased from 38.8 thousand Yuan to 394.5 thousand Yuan, an increase of approximately 9 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 2018, 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.
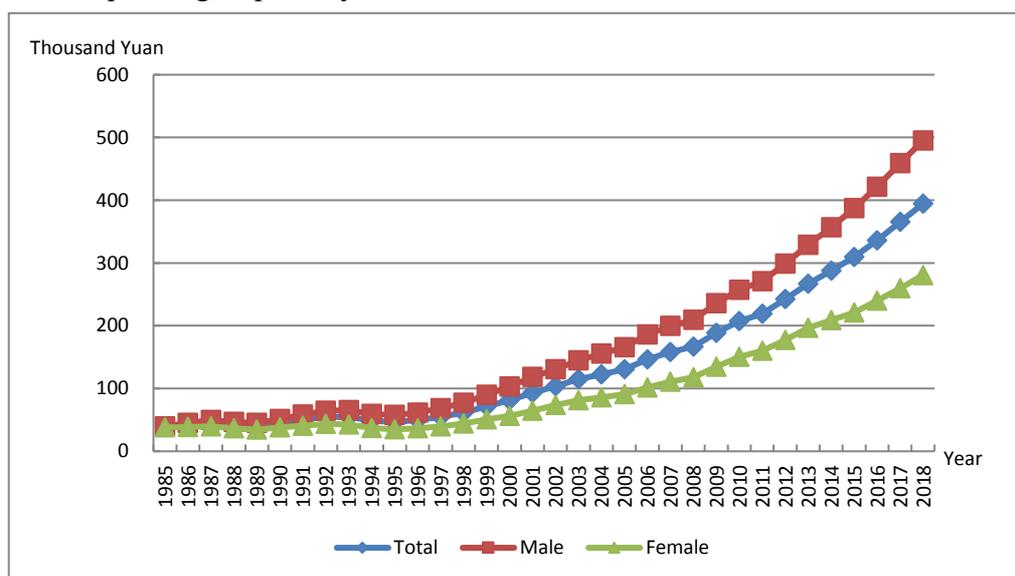
Figure JX-2.1 Human Capital Per Capita by Gender for Jiangxi，1985-2018

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	38.84	64.84	32.89	38.84	64.84	32.89
1986	45.14	79.44	37.16	42.21	74.94	34.60
1987	51.01	89.16	41.91	44.99	77.95	37.13
1988	57.88	99.19	47.85	42.19	70.11	35.41
1989	65.58	109.91	54.52	40.22	66.28	33.71
1990	74.96	124.84	62.23	44.90	74.18	37.43
1991	85.72	143.39	69.71	50.11	81.61	41.39

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	98.24	166.21	77.92	54.68	87.99	44.70
1993	112.45	191.24	87.12	54.88	87.43	44.43
1994	127.42	216.73	97.14	48.97	78.08	39.10
1995	143.17	242.70	107.64	46.96	74.80	37.03
1996	164.52	279.10	119.48	49.62	79.57	37.84
1997	186.46	312.23	133.06	54.72	86.42	41.28
1998	212.43	354.64	148.16	61.60	97.19	45.51
1999	243.42	408.81	164.77	71.41	113.05	51.59
2000	279.32	470.94	184.94	81.24	127.56	58.43
2001	319.96	530.85	203.04	92.98	144.07	64.67
2002	359.30	586.91	219.38	103.84	158.97	69.94
2003	400.91	636.98	243.29	114.69	170.99	77.10
2004	444.07	688.58	269.22	122.67	178.93	82.44
2005	481.23	725.55	294.88	130.50	185.76	88.35
2006	546.04	816.07	336.68	146.35	207.07	99.28
2007	619.23	922.53	380.29	158.08	224.22	106.00
2008	692.73	1026.89	428.51	166.81	235.68	112.36
2009	777.78	1145.65	483.30	188.54	264.52	127.75
2010	882.63	1308.74	536.32	207.31	293.60	137.21
2011	986.29	1449.40	566.42	219.07	309.37	137.23
2012	1125.47	1647.69	599.10	242.22	342.63	140.97
2013	1277.17	1859.46	632.11	267.10	377.78	144.50
2014	1409.95	2035.34	669.36	287.49	403.82	149.72
2015	1542.65	2200.19	713.44	309.39	430.07	157.22
2016	1713.01	2438.07	746.63	336.15	467.23	161.46
2017	1901.94	2701.62	787.14	365.33	507.58	167.05
2018	2100.41	2975.67	829.17	394.52	547.57	172.18

Figure JX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
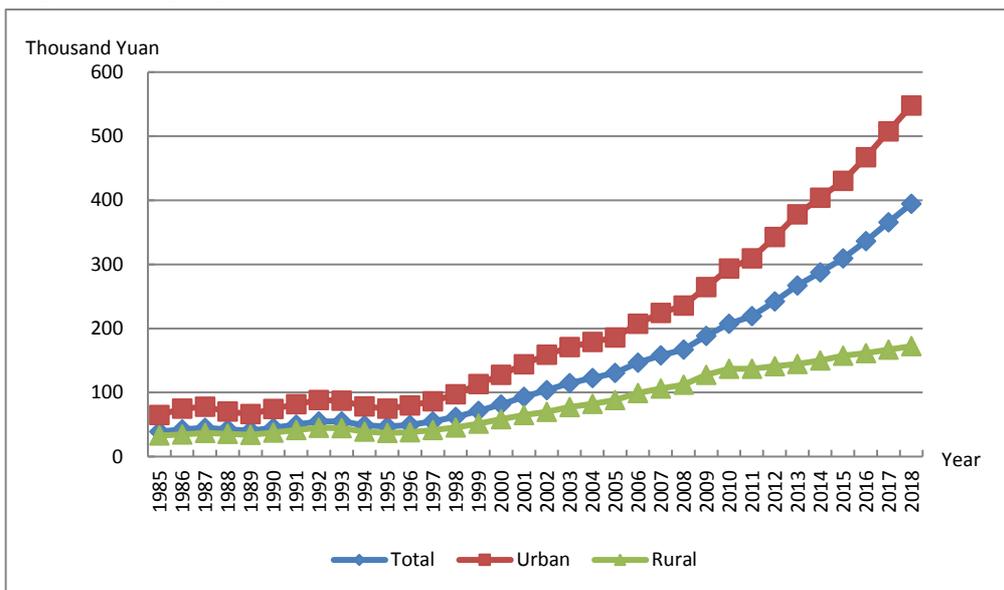
Figure JX-2.2 Real Human Capital Per Capita by Region for Jiangxi，1985-2018

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 2018, the nominal labor force human capital increased from 0.5 trillion Yuan to 27.6 trillion Yuan, an increase of more than 56 times; and the

real labor force human capital increased from 0.5 trillion Yuan to 5.2 trillion Yuan, an increase of approximately 10 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	482	482
1986	564	528
1987	659	582
1988	769	561
1989	911	559
1990	1087	651
1991	1245	730
1992	1415	791
1993	1596	786
1994	1803	701
1995	2015	669
1996	2321	709
1997	2651	790
1998	3009	887
1999	3388	1014
2000	3807	1137
2001	4192	1254
2002	4537	1351
2003	4896	1441
2004	5261	1492
2005	5678	1574
2006	6801	1857
2007	7981	2070
2008	9147	2235
2009	10489	2581
2010	12037	2869

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	13544	3048
2012	15108	3295
2013	16526	3504
2014	17964	3712
2015	19274	3916
2016	21664	4305
2017	24443	4752
2018	27647	5249

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 2018, the nominal average labor force human capital increased from 27.3 thousand Yuan to 1.1 million Yuan, an increase of more than 37 times; and the real average labor force human capital increased from 27.3 thousand Yuan to 197.3 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	27.34	42.89	23.29	27.34	42.89	23.29
1986	31.02	48.81	26.42	29.01	46.05	24.60
1987	35.14	55.43	29.91	31.00	48.47	26.50
1988	39.82	61.19	34.12	29.04	43.25	25.26
1989	45.41	67.83	39.22	27.85	40.91	24.25

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
1990	51.88	74.98	45.34	31.08	44.55	27.27
1991	58.06	83.73	50.64	34.01	47.65	30.07
1992	64.70	92.83	56.42	36.18	49.14	32.37
1993	71.87	102.10	62.85	35.41	46.68	32.05
1994	79.88	112.54	69.99	31.04	40.55	28.17
1995	88.27	123.92	77.20	29.31	38.19	26.56
1996	100.33	140.66	86.94	30.67	40.10	27.54
1997	113.38	158.16	97.59	33.79	43.78	30.28
1998	127.23	175.17	109.41	37.51	48.01	33.61
1999	141.56	191.40	122.24	42.37	52.93	38.27
2000	157.32	209.10	136.47	47.00	56.64	43.12
2001	171.60	227.07	146.62	51.33	61.63	46.70
2002	185.26	245.60	155.16	55.15	66.52	49.47
2003	200.09	262.31	165.88	58.90	70.41	52.57
2004	215.79	281.04	176.52	61.18	73.03	54.05
2005	233.03	301.18	188.28	64.61	77.11	56.41
2006	273.67	356.02	216.97	74.73	90.34	63.98
2007	316.17	411.88	247.77	82.00	100.11	69.06
2008	358.07	462.57	281.78	87.50	106.16	73.89
2009	404.59	517.18	320.34	99.55	119.41	84.67
2010	456.18	582.91	358.50	108.72	130.77	91.72
2011	508.52	664.05	377.47	114.45	141.74	91.45
2012	565.82	747.68	400.60	123.41	155.48	94.26
2013	621.04	824.60	424.03	131.66	167.53	96.93
2014	678.98	903.65	449.01	140.31	179.29	100.43
2015	736.38	977.57	474.71	149.60	191.09	104.61
2016	823.31	1111.75	502.24	163.61	213.05	108.61

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
2017	929.24	1273.55	534.61	180.66	239.27	113.46
2018	1051.60	1460.23	567.73	199.66	268.71	117.89

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. Column 1 is nominal human capital in six-education categories. Column 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	3390	3390	101
1986	4019	3849	115
1987	4711	4173	132
1988	5461	4083	148
1989	6338	4029	162
1990	7282	4475	176
1991	8343	4885	193
1992	9441	5199	214
1993	10638	5212	237
1994	12041	4777	261
1995	13534	4563	287
1996	15223	4668	319
1997	17062	5079	356
1998	19452	5808	399
1999	21954	6576	450
2000	24966	7426	509
2001	28549	8298	574

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of Yuan)	Real Physical Capital (Billions of Yuan)
2002	32604	9485	652
2003	36261	10397	749
2004	39924	11043	875
2005	45255	12294	1041
2006	51982	13972	1240
2007	59458	15322	1455
2008	66964	16413	1689
2009	75863	18594	1980
2010	84677	20164	2302
2011	93341	21146	2647
2012	103113	22859	3012
2013	114744	24893	3397
2014	127030	27005	3792
2015	141002	29577	4234
2016	155246	31878	4650
2017	170354	34438	4982
2018	186138	36719	—

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 2018, the nominal human capital per capita increased from 47.1 thousand Yuan to 2.25 million Yuan, an increase of more than 46 times; and the real human capital per capita increased from 47.1 thousand Yuan to 443.3 thousand Yuan, an increase of approximately 8 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 2018, 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.
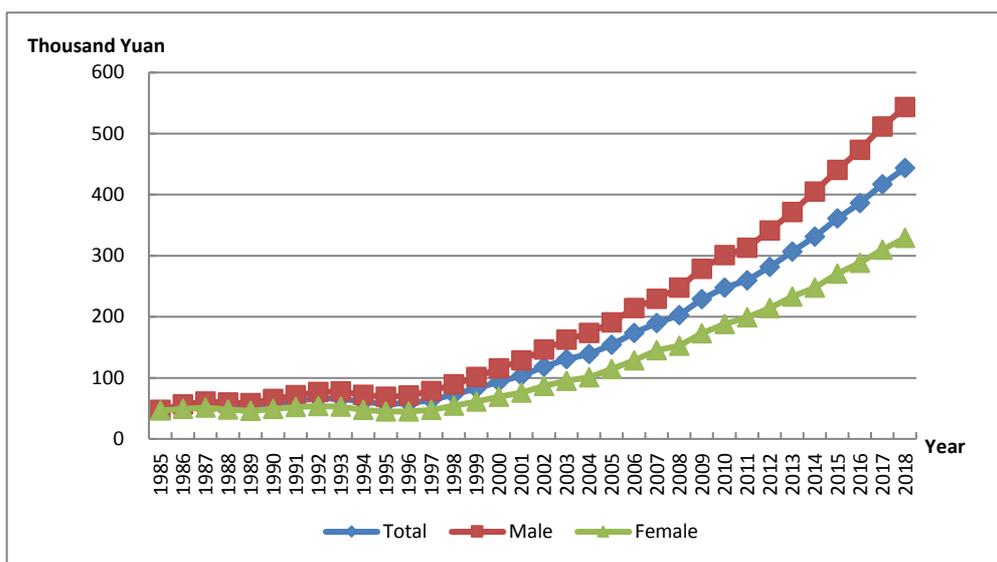
Figure SD-2.1 Human Capital Per Capita by Gender for Shandong，1985-2018

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

Year	Nominal Human Capital Per Capita			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1985	47.11	72.29	39.68	47.11	72.29	39.68
1986	55.09	89.10	44.53	52.75	84.86	42.77
1987	63.53	104.41	50.21	56.28	91.15	44.91
1988	72.33	117.30	56.95	54.08	84.90	43.54
1989	82.61	134.32	64.47	52.51	84.03	41.45
1990	93.88	151.20	72.99	57.70	92.19	45.12
1991	106.76	173.16	82.17	62.51	99.42	48.85

Year	Nominal Human Capital Per Capita			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	120.15	193.25	92.30	66.16	102.17	52.46
1993	134.87	214.72	103.29	66.07	99.06	53.03
1994	152.04	241.03	115.18	60.33	88.67	48.59
1995	170.43	271.72	126.69	57.46	85.58	45.33
1996	191.54	306.47	139.38	58.74	87.36	45.75
1997	214.31	340.66	153.60	63.80	94.09	49.24
1998	243.58	389.47	169.18	72.72	107.90	54.78
1999	274.79	439.46	185.62	82.30	121.75	60.96
2000	314.19	498.12	206.68	93.45	136.36	68.35
2001	355.13	551.15	225.81	103.22	149.24	72.93
2002	405.33	622.99	241.27	117.92	170.91	78.00
2003	455.21	682.33	261.12	130.52	185.89	83.17
2004	501.75	735.94	284.20	138.78	195.04	86.54
2005	566.86	819.01	309.24	154.00	214.69	91.96
2006	644.79	928.10	349.71	173.31	240.87	102.96
2007	735.37	1059.04	393.90	189.50	264.80	110.13
2008	826.86	1184.38	441.87	202.67	282.84	116.33
2009	934.01	1332.02	498.09	228.92	318.28	131.03
2010	1040.88	1476.06	555.51	247.86	342.76	142.02
2011	1145.21	1621.68	597.15	259.44	359.67	144.16
2012	1270.27	1791.59	641.20	281.60	389.18	151.76
2013	1414.05	1992.99	687.21	306.77	425.32	157.91
2014	1557.80	2191.92	740.92	331.17	458.11	167.67
2015	1719.79	2418.36	801.19	360.74	498.46	179.69
2016	1881.06	2626.33	870.94	386.26	529.67	191.88
2017	2063.18	2856.56	956.44	417.08	567.03	207.81
2018	2247.41	3093.89	1050.77	443.34	599.75	222.30

Figure SD-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
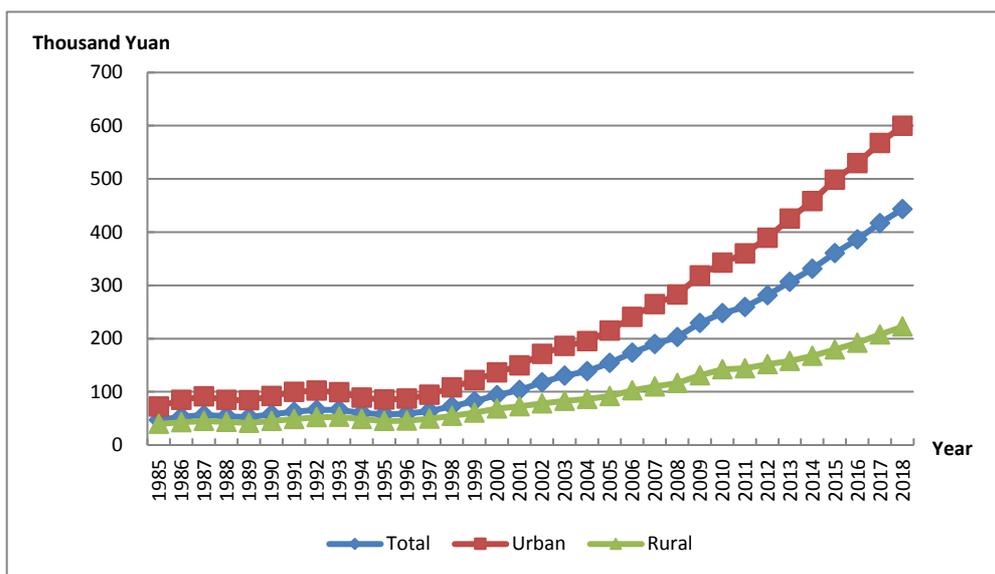
Figure SD-2.2 Real Human Capital Per Capita by Region for Shandong，1985-2018

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 2018, the nominal labor force human capital increased from

1.4 trillion Yuan to 70.4 trillion Yuan, an increase of more than 48 times; and the real labor force human capital increased from 1.4 trillion Yuan to 14 trillion Yuan, an increase of approximately 9 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	1423	1423
1986	1678	1608
1987	1990	1763
1988	2333	1745
1989	2724	1732
1990	3152	1937
1991	3615	2118
1992	4126	2275
1993	4664	2287
1994	5271	2096
1995	5928	2005
1996	6637	2043
1997	7480	2234
1998	8406	2522
1999	9360	2821
2000	10473	3138
2001	11807	3472
2002	13139	3884
2003	14346	4192
2004	15513	4368
2005	17179	4740
2006	20148	5491
2007	22993	5995
2008	25955	6426

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2009	29254	7241
2010	33031	7938
2011	36221	8268
2012	39906	8914
2013	43962	9601
2014	48751	10437
2015	53855	11384
2016	59236	12263
2017	64648	13177
2018	70413	14004

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 2018, the nominal average labor force human capital increased from 32.5 thousand Yuan to 1189.4 thousand Yuan, an increase of more than 35 times; and the real average labor force human capital increased from 32.5 thousand Yuan to 236.6 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	32.51	47.62	28.04	32.51	47.62	28.04
1986	37.22	55.37	31.45	35.65	52.74	30.21
1987	42.67	63.84	35.41	37.81	55.73	31.67
1988	48.87	72.53	39.97	36.56	52.50	30.55

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
1989	55.48	81.39	45.35	35.27	50.92	29.16
1990	62.74	90.19	51.59	38.57	54.99	31.90
1991	70.72	101.23	57.92	41.45	58.12	34.43
1992	79.48	113.47	64.78	43.82	59.99	36.82
1993	88.95	126.22	72.28	43.62	58.23	37.10
1994	99.54	140.50	80.41	39.59	51.69	33.92
1995	110.93	156.20	89.03	37.52	49.20	31.86
1996	123.31	173.47	97.85	37.96	49.45	32.12
1997	137.83	194.02	107.53	41.17	53.59	34.47
1998	153.42	215.20	118.00	46.02	59.62	38.21
1999	169.31	236.69	128.57	51.02	65.57	42.22
2000	188.03	261.67	140.42	56.34	71.63	46.44
2001	207.14	282.19	156.27	60.92	76.41	50.47
2002	227.31	304.92	170.80	67.19	83.65	55.22
2003	247.77	325.13	187.85	72.41	88.58	59.83
2004	267.00	344.01	203.68	75.18	91.17	62.02
2005	294.16	377.02	218.73	81.16	98.83	65.04
2006	341.49	444.39	246.15	93.06	115.33	72.47
2007	389.05	508.55	276.46	101.45	127.15	77.30
2008	439.17	572.34	309.77	108.73	136.68	81.55
2009	494.16	640.70	349.12	122.31	153.09	91.84
2010	557.01	724.16	388.28	133.86	168.16	99.27
2011	611.84	804.14	414.11	139.67	178.35	99.97
2012	678.68	898.26	444.23	151.61	195.13	105.14
2013	748.93	999.93	475.69	163.55	213.39	109.31
2014	826.29	1109.76	513.52	176.91	231.94	116.21
2015	908.17	1223.87	558.01	191.97	252.26	125.15

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	993.89	1335.07	607.81	205.76	269.25	133.91
2017	1090.19	1454.57	666.84	222.22	288.73	144.88
2018	1189.41	1584.44	732.30	236.56	307.14	154.92

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. Column 1 is nominal human capital in six-education categories. Column 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	2704	2704	80
1986	3144	2994	93
1987	3600	3234	117
1988	4202	3169	124
1989	4904	3084	141
1990	5765	3598	163
1991	6634	4074	194
1992	7529	4426	253
1993	8485	4516	349
1994	9476	4041	407
1995	10562	3864	484
1996	12523	4122	574
1997	14755	4678	676
1998	16802	5455	759
1999	19505	6511	838
2000	21183	7134	971
2001	24530	8180	1089

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	27223	9045	1204
2003	30316	9909	1413
2004	33829	10476	1780
2005	37234	11280	2125
2006	43666	13040	2597
2007	50355	14251	3327
2008	57225	15105	4404
2009	65069	17255	5201
2010	72004	17960	6545
2011	83176	20069	8400
2012	94477	22179	10009
2013	105477	24014	11668
2014	114698	25602	13440
2015	120216	26486	14866
2016	131179	28343	16589
2017	142356	30303	19638
2018	152933	31807	—

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 2018, the nominal human capital per capita increased from 38.1 thousand Yuan to 1.89 million Yuan, an increase of more than 48 times; and the real human capital per capita increased from 38.1 thousand Yuan to 393.4 thousand Yuan, an increase of approximately 9 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 2018, 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.
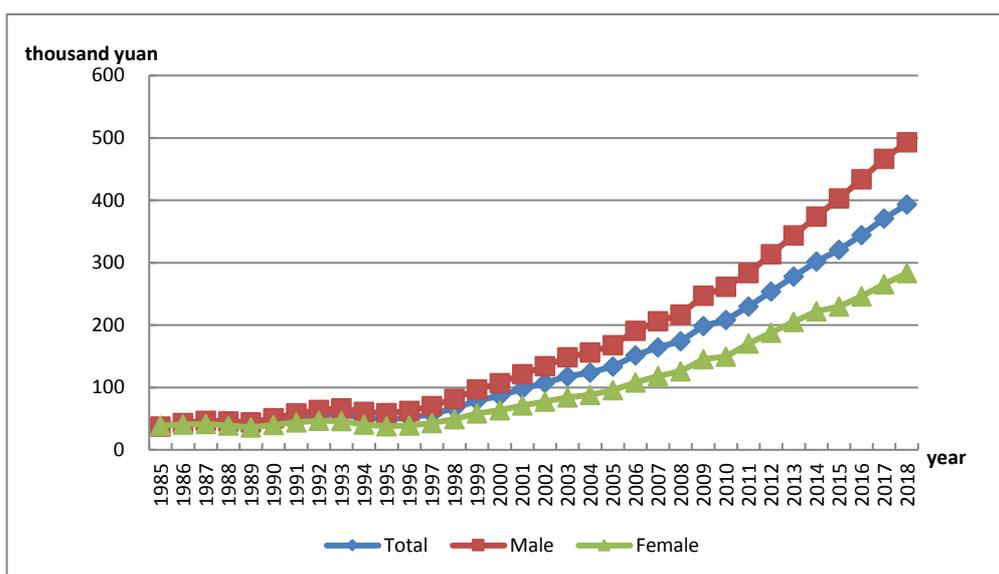
Figure HeN-2.1 Human Capital Per Capita by Gender for Henan，1985-2018

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	38.14	66.91	33.02	38.14	66.91	33.02
1986	43.80	82.17	36.85	41.72	76.94	35.33
1987	49.35	93.21	41.37	44.34	80.96	37.67
1988	56.32	106.09	46.91	42.47	75.84	36.16
1989	64.17	120.42	53.18	40.36	74.92	33.61
1990	73.53	139.05	60.42	45.89	86.08	37.84

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	83.98	162.59	67.96	51.57	95.77	42.57
1992	95.03	186.19	76.28	55.87	101.84	46.43
1993	107.32	212.23	85.35	57.13	104.95	47.10
1994	120.20	239.54	95.02	51.26	92.98	42.46
1995	134.02	267.38	105.42	49.03	88.78	40.50
1996	156.26	313.01	117.12	51.43	94.92	40.57
1997	181.61	362.70	130.46	57.57	107.41	43.50
1998	205.03	398.35	145.25	66.57	120.49	49.88
1999	235.97	460.61	160.89	78.77	144.23	56.90
2000	257.18	474.36	179.10	86.62	149.88	63.85
2001	293.33	530.90	199.91	97.82	166.58	70.77
2002	323.20	567.37	219.13	107.38	178.38	77.11
2003	360.35	610.10	245.63	117.79	188.61	85.24
2004	400.15	657.49	272.66	123.92	192.84	89.78
2005	440.42	702.86	300.20	133.42	201.91	96.81
2006	507.85	796.72	345.73	151.66	226.16	109.85
2007	580.67	894.06	394.66	164.33	240.76	118.97
2008	658.05	996.16	448.54	173.70	251.88	125.31
2009	749.42	1114.00	512.95	198.73	285.03	142.74
2010	834.18	1207.30	576.04	208.07	298.74	145.35
2011	952.42	1371.60	625.80	229.80	322.05	157.91
2012	1080.36	1539.81	680.77	253.62	352.36	167.76
2013	1220.95	1727.16	737.41	277.98	384.12	176.57
2014	1351.80	1894.64	800.74	301.74	413.08	188.73
2015	1455.01	1992.91	871.54	320.57	428.96	202.96
2016	1593.06	2159.97	938.13	344.20	456.66	214.19
2017	1741.67	2335.80	1018.05	370.75	486.54	229.68
2018	1891.39	2510.43	1104.66	393.38	510.66	244.33

Figure HeN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
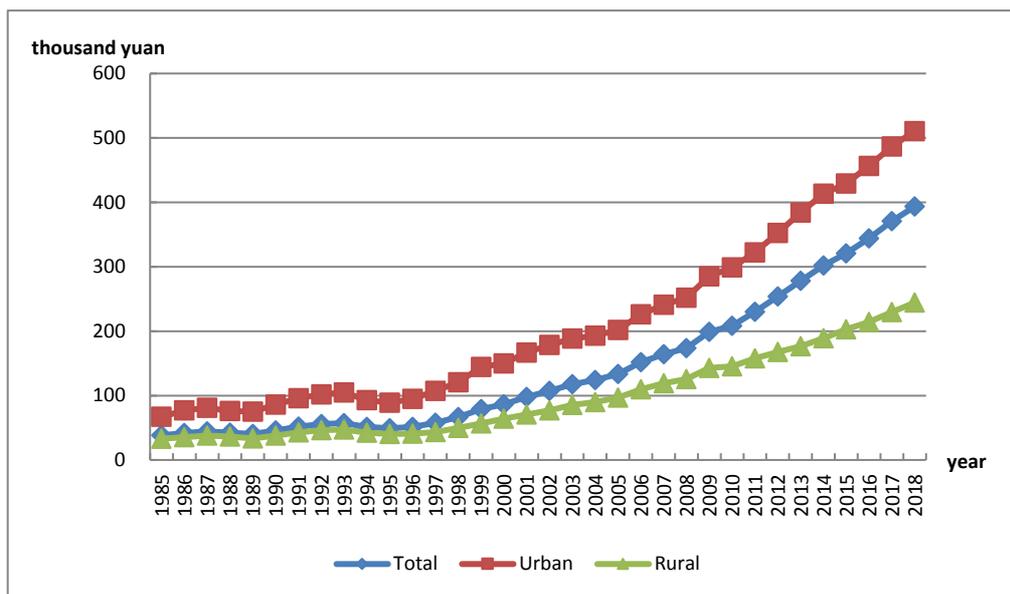
Figure HeN-2.2 Real Human Capital Per Capita by Region for Henan，1985-2018

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 2018, the nominal labor force human capital increased from 1.1 trillion Yuan to 53.1 trillion Yuan, an increase of more than 48 times; and

the real labor force human capital increased from 1.1 trillion Yuan to 11.1 trillion Yuan, an increase of approximately 9 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	1075	1075
1986	1258	1199
1987	1483	1332
1988	1727	1304
1989	2029	1277
1990	2397	1497
1991	2664	1640
1992	2967	1755
1993	3283	1760
1994	3644	1573
1995	4061	1505
1996	4702	1569
1997	5425	1743
1998	6139	2022
1999	6982	2366
2000	7888	2690
2001	8901	3006
2002	9799	3292
2003	10800	3571
2004	11968	3750
2005	13377	4098
2006	15747	4747
2007	18055	5155
2008	20252	5389
2009	22362	5972
2010	25265	6311
2011	28542	6924

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	31693	7483
2013	34482	7903
2014	36661	8248
2015	38559	8564
2016	42957	9356
2017	47651	10227
2018	53072	11129

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 2018, the nominal average labor force human capital increased from 25.9 thousand Yuan to 997.6 thousand Yuan, an increase of more than 37 times; and the real average labor force human capital increased from 25.9 thousand Yuan to 209.2 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	25.91	43.66	22.66	25.91	43.66	22.66
1986	29.45	50.95	25.43	28.06	47.71	24.39
1987	33.54	59.31	28.61	30.14	51.52	26.05
1988	37.85	65.51	32.46	28.58	46.83	25.02
1989	42.89	72.81	36.97	26.98	45.30	23.36
1990	48.76	81.07	42.22	30.46	50.19	26.44
1991	54.18	90.50	46.77	33.37	53.31	29.29

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	60.03	100.30	51.98	35.51	54.86	31.64
1993	66.44	110.44	57.74	35.62	54.61	31.86
1994	73.39	120.91	64.34	31.67	46.93	28.75
1995	81.44	133.23	71.65	30.18	44.24	27.53
1996	92.97	154.85	79.51	31.01	46.96	27.54
1997	105.60	176.19	88.47	33.92	52.18	29.50
1998	118.46	192.72	98.46	39.01	58.29	33.81
1999	132.17	210.90	109.11	44.79	66.04	38.59
2000	147.72	230.40	120.90	50.37	72.80	43.10
2001	164.26	251.71	132.53	55.46	78.98	46.92
2002	179.19	270.10	143.78	60.21	84.92	50.60
2003	196.46	286.12	158.58	64.97	88.45	55.03
2004	215.52	306.61	174.23	67.52	89.93	57.37
2005	238.40	331.58	192.42	73.04	95.25	62.05
2006	278.28	389.65	220.21	83.88	110.61	69.97
2007	319.24	443.87	250.42	91.14	119.53	75.49
2008	359.55	493.01	283.56	95.67	124.66	79.22
2009	402.95	538.81	321.51	107.61	137.86	89.47
2010	457.69	608.68	360.33	114.34	150.62	90.92
2011	513.35	686.16	390.12	124.54	161.11	98.44
2012	572.07	762.64	422.96	135.08	174.52	104.23
2013	628.09	829.44	457.70	143.94	184.47	109.60
2014	676.40	877.47	499.25	152.18	191.31	117.67
2015	727.52	922.32	544.37	161.59	198.52	126.77
2016	805.95	1025.04	592.67	175.53	216.71	135.32
2017	895.70	1139.64	650.78	192.24	237.38	146.82
2018	997.59	1272.36	715.16	209.18	258.82	158.18

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. Column 1 is nominal human capital in six-education categories. Column 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	1826	1826	39
1986	2165	2067	43
1987	2508	2228	49
1988	2904	2170	54
1989	3310	2128	57
1990	3815	2384	58
1991	4465	2656	61
1992	5132	2790	66
1993	5902	2712	71
1994	6753	2466	76
1995	7653	2326	83
1996	8635	2401	91
1997	9954	2680	100
1998	11335	3098	110
1999	13225	3694	121
2000	14596	4100	134
2001	17993	5021	148

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	18636	5219	164
2003	21000	5750	182
2004	23051	6017	205
2005	24892	6316	234
2006	28010	6996	270
2007	31623	7529	318
2008	35530	7972	377
2009	40064	9031	448
2010	45763	10019	537
2011	52009	10763	633
2012	61796	12419	742
2013	70105	13701	859
2014	78317	14999	983
2015	85670	16168	1096
2016	95406	17628	1210
2017	105787	19227	1316
2018	117006	20850	—

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 2018, the nominal human capital per capita increased from 38.8 thousand Yuan to 2.5 million Yuan, an increase of more than 63 times; and the real human capital per capita increased from 38.8 thousand Yuan to 0.4 million Yuan, an increase of approximately 11 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 2018, 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.
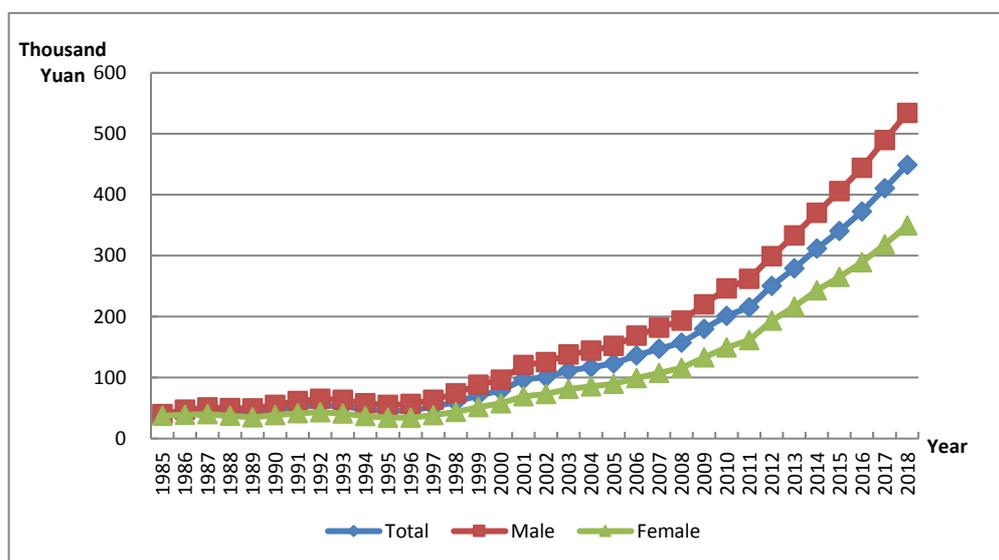
Figure HuB-2.1 Real Human Capital Per Capita by Gender for Hubei，1985-2018

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	38.77	71.94	28.95	38.77	71.94	28.95
1986	45.34	85.46	32.52	43.30	81.08	31.21
1987	51.66	96.00	36.62	45.88	83.79	33.03
1988	58.92	107.94	41.06	44.03	78.18	31.60
1989	66.57	118.96	46.02	42.80	75.52	29.96
1990	75.87	134.66	51.73	47.40	83.57	32.54
1991	87.96	157.12	58.42	52.32	91.81	35.47

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	100.67	178.29	65.92	54.74	94.28	37.03
1993	115.00	202.44	74.33	52.84	90.11	35.51
1994	131.42	229.67	83.63	48.00	80.50	32.19
1995	148.95	256.98	93.65	45.27	74.99	30.06
1996	166.61	282.76	103.94	46.32	74.88	30.92
1997	192.48	324.97	115.65	51.82	83.88	33.21
1998	218.65	369.87	128.27	59.76	97.51	37.21
1999	254.60	430.35	141.71	71.12	116.73	41.82
2000	280.08	459.80	156.64	78.67	124.72	47.07
2001	347.11	587.50	172.65	96.86	158.72	51.99
2002	360.24	582.62	187.64	100.89	158.67	56.05
2003	408.24	655.16	209.57	111.77	173.90	61.80
2004	448.46	708.07	232.85	117.06	179.86	64.90
2005	485.82	757.22	256.45	123.27	187.28	69.19
2006	546.74	840.90	287.46	136.55	205.11	76.11
2007	619.31	943.80	320.28	147.44	219.87	80.69
2008	700.85	1056.43	356.97	157.26	233.28	83.74
2009	796.94	1187.78	399.96	179.64	264.13	93.82
2010	918.35	1363.38	444.71	201.06	294.93	101.18
2011	1041.68	1526.89	476.40	215.56	313.08	101.96
2012	1245.56	1819.80	512.14	250.31	362.97	106.42
2013	1428.10	2066.59	549.32	279.10	401.36	110.82
2014	1627.20	2332.13	591.72	311.63	444.05	117.15
2015	1804.62	2547.92	639.66	340.57	478.44	124.53
2016	2014.81	2825.09	689.27	372.27	519.57	131.29
2017	2258.13	3137.21	753.52	410.41	567.33	141.83
2018	2520.09	3473.70	824.97	449.06	615.87	152.54

Figure HuB-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 2010, the growths 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.
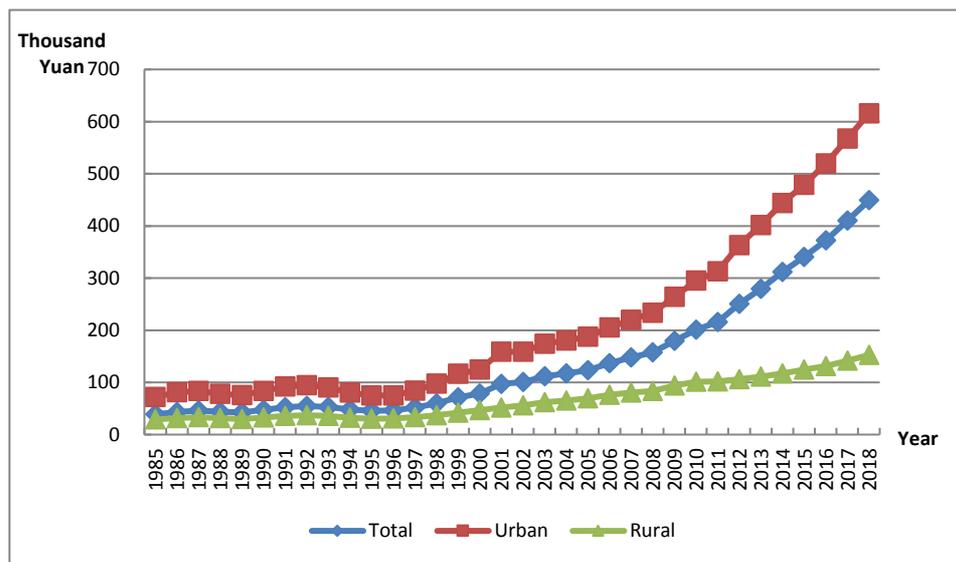
Figure HuB-2.2 Real Human Capital Per Capita by Region for Hubei，1985-2018

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 2018, the nominal labor force human capital increased from 0.8 trillion Yuan to 39.7 trillion Yuan, an increase of more than 51 times; and

the real labor force human capital increased from 0.8 trillion Yuan to 7.1 trillion Yuan, an increase of approximately 8 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	755	755
1986	897	857
1987	1061	944
1988	1219	914
1989	1404	904
1990	1606	1004
1991	1834	1094
1992	2082	1137
1993	2344	1083
1994	2627	967
1995	2933	898
1996	3427	961
1997	3995	1085
1998	4515	1245
1999	5180	1459
2000	5954	1689
2001	6622	1875
2002	7390	2093
2003	8095	2248
2004	8956	2367
2005	9826	2521
2006	11032	2784
2007	12334	2966
2008	13681	3094
2009	15373	3488
2010	17323	3815
2011	19812	4118

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	22665	4575
2013	25349	4973
2014	27673	5320
2015	30122	5703
2016	33250	6162
2017	36450	6647
2018	39729	7104

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 2018, the nominal average labor force human capital increased from 27.0 thousand Yuan to 1.2 million Yuan, an increase of more than 43 times; and the real average labor force human capital increased from 27.0 thousand Yuan to 0.2 million Yuan, an increase of approximately 7 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	26.98	44.54	21.80	26.98	44.54	21.80
1986	31.07	50.91	24.59	29.68	48.30	23.60
1987	35.48	57.69	27.68	31.56	50.35	24.97
1988	40.01	63.52	31.18	30.00	46.01	23.99
1989	45.27	69.87	35.15	29.14	44.35	22.89
1990	50.74	76.02	39.65	31.72	47.18	24.94
1991	57.06	85.28	44.29	34.04	49.83	26.90
1992	64.18	95.18	49.35	35.04	50.33	27.72

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	71.53	105.36	55.02	33.03	46.90	26.28
1994	79.63	116.04	61.23	29.31	40.67	23.57
1995	88.71	128.56	67.49	27.17	37.52	21.66
1996	101.12	146.51	75.83	28.36	38.80	22.56
1997	115.93	166.67	85.00	31.48	43.02	24.41
1998	128.75	183.33	95.05	35.49	48.34	27.57
1999	144.85	203.41	105.76	40.80	55.17	31.21
2000	162.33	225.80	117.78	46.05	61.25	35.39
2001	180.02	248.35	130.75	50.98	67.09	39.37
2002	200.31	276.46	143.80	56.72	75.29	42.95
2003	220.23	300.07	160.29	61.15	79.65	47.27
2004	243.75	329.53	178.19	64.43	83.70	49.66
2005	267.25	359.41	195.73	68.58	88.89	52.81
2006	300.31	401.55	218.79	75.79	97.95	57.93
2007	336.84	449.41	243.33	80.99	104.70	61.30
2008	376.02	497.91	269.93	85.03	109.95	63.32
2009	424.69	559.77	300.71	96.36	124.48	70.54
2010	480.63	634.24	331.21	105.85	137.20	75.36
2011	547.39	730.50	355.03	113.79	149.78	75.99
2012	628.28	843.41	382.66	126.82	168.22	79.52
2013	707.83	954.20	410.39	138.88	185.32	82.79
2014	787.58	1058.26	438.77	151.41	201.50	86.87
2015	870.77	1162.40	466.21	164.87	218.27	90.76
2016	963.18	1287.87	501.65	178.50	236.86	95.56
2017	1072.48	1429.56	546.87	195.57	258.52	102.94
2018	1188.10	1580.47	593.60	212.45	280.21	109.75

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. Column 1 is nominal human capital in six-education categories. Column 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	1778	1778	39
1986	2068	1963	46
1987	2359	2042	55
1988	2746	1893	69
1989	3156	1837	77
1990	3693	2141	128
1991	4284	2380	146
1992	4864	2450	182
1993	5475	2358	256
1994	6148	2111	318
1995	6866	1982	381
1996	7825	2092	444
1997	8953	2325	497
1998	10151	2624	565
1999	11706	3010	626
2000	13185	3344	707
2001	14793	3784	791

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	16632	4271	878
2003	18470	4633	1006
2004	20729	4967	1194
2005	22944	5372	1407
2006	25935	5984	1668
2007	29186	6370	2066
2008	33000	6778	2674
2009	36855	7596	3141
2010	41300	8256	3890
2011	47253	8957	4934
2012	53736	9990	5864
2013	60427	10795	6882
2014	67419	11741	8011
2015	73231	12576	8996
2016	80267	13529	10069
2017	87572	14542	11663
2018	94662	15424	—

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 2018, the nominal human capital per capita increased from 34.1 thousand Yuan to 1.7 million Yuan, an increase of more than 50 times; and the real human capital per capita increased from 34.1 thousand Yuan to 0.3 million Yuan, an increase of approximately 7 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 2018, 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.
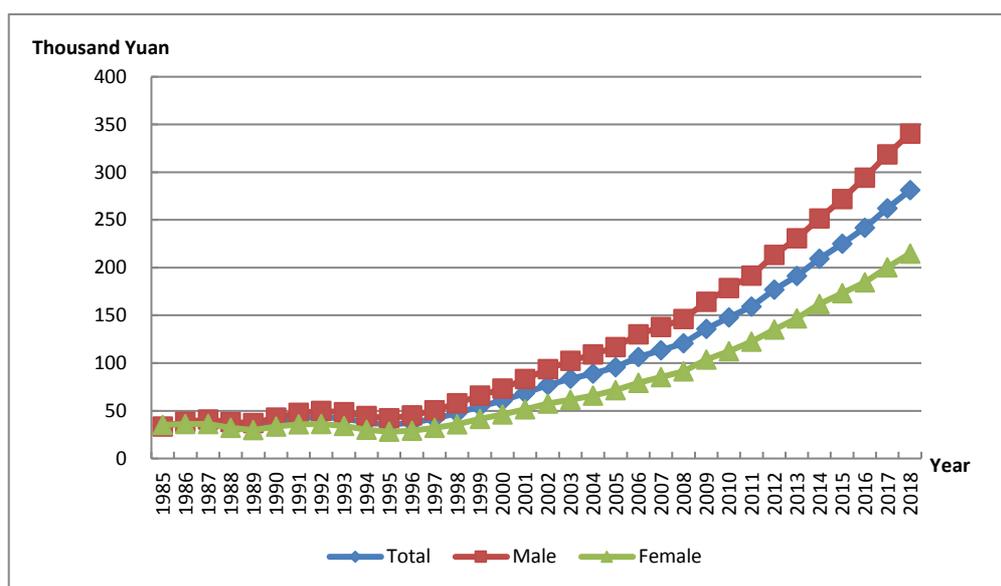
Figure HUN-2.1 Human Capital Per Capita by Gender for Hunan，1985-2018

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	34.13	64.62	28.10	34.13	64.62	28.10
1986	39.43	77.75	31.38	37.42	73.77	29.80
1987	44.58	87.60	35.15	38.59	74.67	30.68
1988	51.33	101.68	39.44	35.38	68.95	27.45
1989	57.99	113.93	44.40	33.75	65.87	25.95
1990	66.27	131.27	50.17	38.43	75.44	29.26
1991	76.02	149.85	55.99	42.23	81.94	31.46

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	86.27	169.39	62.43	43.45	81.61	32.51
1993	97.44	188.91	69.47	41.96	77.52	31.08
1994	109.76	211.17	77.23	37.69	69.44	27.51
1995	123.07	233.67	85.37	35.52	65.06	25.45
1996	140.65	265.78	93.83	37.60	69.03	25.85
1997	161.45	304.26	103.26	41.93	76.72	27.75
1998	184.04	346.78	113.86	47.57	87.01	30.57
1999	212.01	403.90	125.31	54.52	101.75	33.18
2000	239.26	451.90	138.54	60.68	112.38	36.18
2001	267.66	491.38	153.06	68.47	123.55	40.25
2002	299.91	542.35	167.11	77.01	136.92	44.21
2003	332.84	581.44	186.54	83.48	144.76	47.41
2004	371.29	636.08	207.22	88.97	152.13	49.82
2005	409.16	686.50	227.63	95.80	160.81	53.24
2006	461.52	759.51	255.31	106.50	175.11	59.01
2007	519.28	839.43	284.31	113.33	183.97	61.47
2008	587.89	936.64	317.89	120.75	194.02	63.99
2009	659.13	1025.29	357.08	135.85	213.02	72.17
2010	739.08	1134.57	398.21	147.74	228.64	77.99
2011	840.03	1272.85	426.02	159.24	243.13	79.01
2012	951.48	1422.13	457.81	176.88	265.80	83.57
2013	1071.37	1580.12	491.04	191.40	283.65	86.18
2014	1201.22	1752.28	529.13	209.20	306.29	90.79
2015	1310.33	1883.30	573.69	225.03	324.33	97.36
2016	1434.65	2049.30	613.86	241.80	346.33	102.24
2017	1578.86	2233.64	664.44	262.18	371.54	109.46
2018	1725.11	2419.48	720.02	281.09	394.95	116.29

Figure HUN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
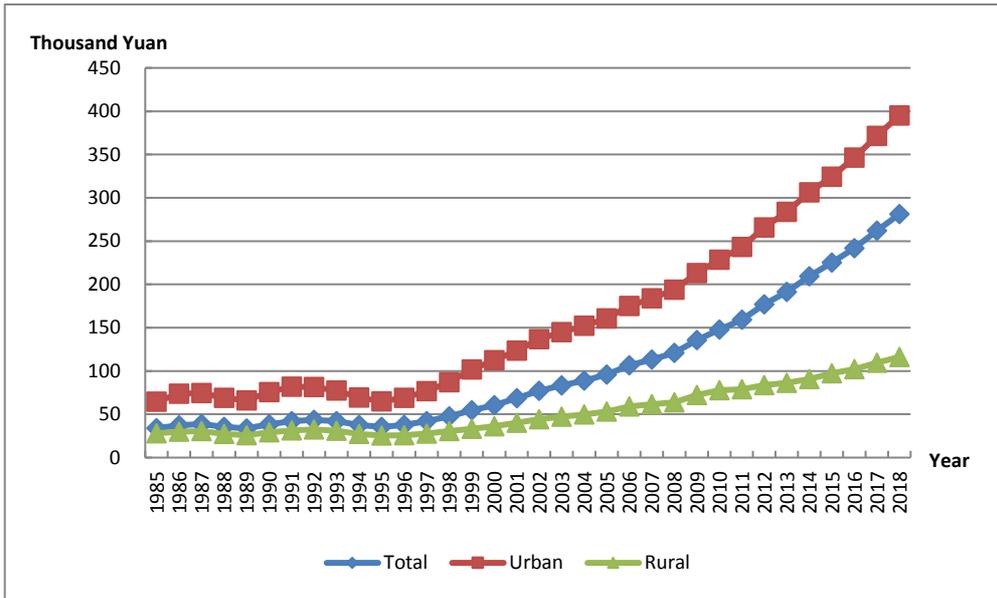
Figure HUN-2.2 Real Human Capital Per Capita by Region for Hunan，1985-2018

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 2018, the nominal labor force human capital increased from 0.8 trillion Yuan to 34.5 trillion Yuan, an increase of more than 42 times; and the real labor force human capital increased from 0.8 trillion Yuan to 5.6 trillion Yuan, an increase of approximately 6 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	786	786
1986	920	874
1987	1079	935
1988	1245	860
1989	1441	839
1990	1694	983
1991	1930	1074
1992	2158	1094
1993	2402	1042
1994	2663	921
1995	2940	854
1996	3383	910
1997	3861	1011
1998	4322	1128
1999	4874	1264
2000	5478	1401
2001	6114	1576
2002	6768	1752
2003	7580	1908
2004	8539	2048
2005	9578	2242
2006	10891	2514
2007	12152	2647
2008	13474	2757
2009	14889	3058
2010	16502	3287
2011	18489	3494
2012	20656	3830
2013	22731	4052

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2014	24663	4287
2015	26578	4557
2016	29072	4893
2017	31698	5258
2018	34488	5613

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 2018, the nominal average labor force human capital increased from 25.3 thousand Yuan to 0.9 million Yuan, an increase of more than 34 times; and the real average labor force human capital increased from 25.3 thousand Yuan to 145.7 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	25.28	42.64	21.79	25.28	42.64	21.79
1986	28.73	48.63	24.53	27.27	46.14	23.29
1987	32.62	55.28	27.63	28.27	47.13	24.11
1988	37.08	62.90	31.06	25.60	42.66	21.62
1989	41.79	70.57	35.04	24.34	40.80	20.48
1990	47.52	79.72	39.79	27.58	45.81	23.21
1991	53.54	89.81	43.96	29.81	49.11	24.70
1992	59.48	98.27	48.71	30.14	47.34	25.37

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	66.09	107.58	53.85	28.67	44.15	24.09
1994	73.00	117.28	59.43	25.25	38.56	21.17
1995	80.51	127.38	65.33	23.39	35.47	19.48
1996	91.38	145.85	72.73	24.59	37.88	20.04
1997	103.02	164.56	81.00	26.97	41.49	21.77
1998	114.60	180.26	90.32	29.92	45.23	24.25
1999	127.11	198.14	100.26	32.96	49.91	26.55
2000	141.28	217.43	111.08	36.13	54.07	29.01
2001	157.23	239.44	122.17	40.53	60.21	32.13
2002	173.35	262.79	133.27	44.87	66.34	35.26
2003	194.03	288.62	147.60	48.82	71.86	37.51
2004	216.58	318.77	163.53	51.94	76.24	39.32
2005	240.41	350.77	179.77	56.27	82.16	42.05
2006	271.64	390.58	200.82	62.71	90.05	46.41
2007	302.90	429.68	222.81	65.99	94.17	48.17
2008	336.49	469.89	246.49	68.86	97.34	49.62
2009	375.09	513.40	273.55	77.03	106.67	55.29
2010	416.57	565.61	301.02	82.99	113.98	58.95
2011	465.93	637.25	319.21	88.04	121.72	59.20
2012	520.70	715.02	340.96	96.55	133.64	62.24
2013	574.22	785.88	364.18	102.36	141.07	63.92
2014	626.59	849.49	390.60	108.91	148.49	67.02
2015	678.31	907.96	420.93	116.31	156.36	71.44
2016	738.78	993.63	452.40	124.34	167.92	75.35
2017	813.68	1092.45	492.19	134.98	181.72	81.08
2018	895.16	1202.46	535.77	145.69	196.29	86.53

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. Column 1 is nominal human capital in six-education categories. Column 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	3567	1491	78
1986	4203	1714	91
1987	4731	1979	107
1988	5464	2317	159
1989	6336	2724	182
1990	7357	3199	213
1991	8406	3588	239
1992	9620	3997	330
1993	11031	4415	485
1994	12367	4899	632
1995	13879	5546	846
1996	16651	6900	1022
1997	20096	8649	1169
1998	24381	10735	1321
1999	28992	12987	1482
2000	34633	15430	1721

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	38457	16799	1947
2002	43831	18612	2210
2003	48820	20688	2602
2004	54373	23026	3182
2005	59645	25516	3745
2006	70002	29188	4348
2007	81177	33703	5135
2008	90861	38911	6368
2009	102382	45006	7103
2010	114081	51958	8458
2011	127740	55694	10278
2012	142381	60576	11918
2013	156269	65993	13747
2014	172049	71617	15783
2015	183726	76963	17447
2016	197582	82990	19603
2017	212225	89070	23106
2018	227225	95204	—

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 2018, the nominal human capital per capita increased from 65.6 thousand Yuan to 2.3 million Yuan, an increase of more than 34 times; and the real human capital per capita increased from 65.6

thousand Yuan to 0.5 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 2018, 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.
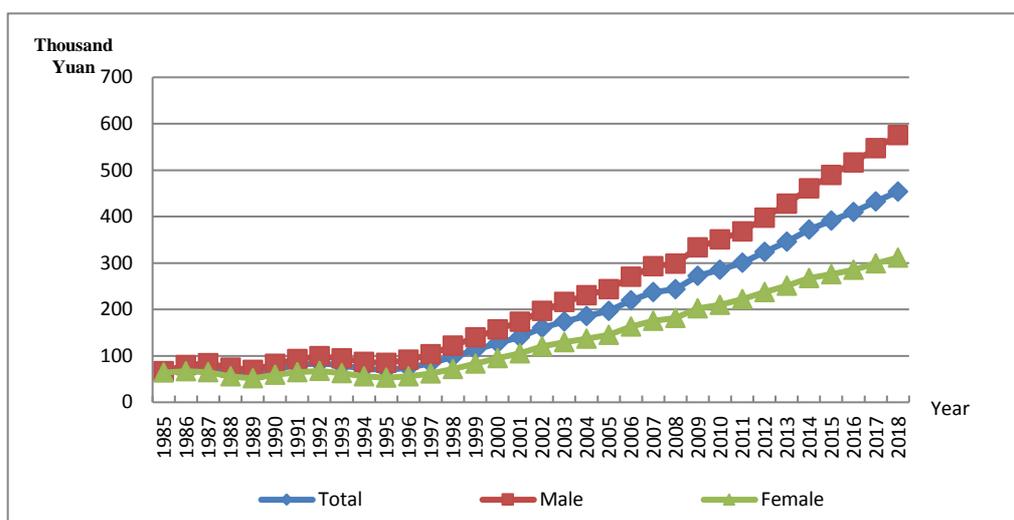
Figure GD-2.1 Human Capital Per Capita by Gender for Guangdong，1985-2018

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	65.57	96.21	54.04	65.57	96.21	54.04
1986	77.37	116.29	60.98	73.67	111.07	57.91
1987	87.57	127.54	68.76	75.04	107.99	59.53
1988	99.24	144.37	77.42	65.71	94.39	51.84
1989	113.10	164.72	86.91	61.28	88.35	47.54
1990	128.81	186.35	97.64	71.56	102.62	54.72

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	145.48	211.54	109.29	79.91	113.87	61.32
1992	164.94	240.45	122.21	84.51	119.41	64.74
1993	187.69	275.80	136.14	79.17	112.26	59.80
1994	207.78	300.01	151.55	71.99	100.93	54.34
1995	229.22	324.99	167.90	69.57	96.67	52.22
1996	262.45	366.84	185.68	74.38	101.79	54.22
1997	301.54	414.74	204.93	83.71	112.71	58.96
1998	347.27	472.11	225.59	97.92	130.52	66.16
1999	392.81	525.61	246.82	112.62	147.67	74.09
2000	450.42	591.61	275.18	126.93	162.64	82.61
2001	496.05	646.15	300.37	140.63	179.06	90.53
2002	557.40	727.17	322.95	159.99	204.37	98.72
2003	611.55	784.44	353.86	174.28	218.94	107.73
2004	669.88	848.54	383.94	185.39	230.83	112.72
2005	725.56	904.12	411.26	196.35	241.12	117.56
2006	824.75	1026.88	453.59	219.18	269.02	127.62
2007	926.04	1146.68	495.35	237.19	289.69	134.66
2008	1004.36	1228.99	539.43	243.60	294.30	138.61
2009	1096.19	1329.66	590.61	272.21	326.23	155.17
2010	1183.95	1426.21	640.37	285.03	339.40	163.03
2011	1316.45	1587.72	665.15	300.47	358.82	160.35
2012	1458.94	1761.98	692.85	323.57	387.37	162.32
2013	1598.94	1931.60	725.00	345.87	414.61	165.32
2014	1758.37	2128.39	767.42	371.76	446.57	171.39
2015	1878.32	2275.98	813.18	390.97	470.01	179.28
2016	2014.76	2433.73	850.63	409.58	490.81	183.86
2017	2163.11	2606.21	896.57	432.68	516.81	192.25
2018	2319.09	2782.86	944.23	453.89	539.96	198.70

Figure GD-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
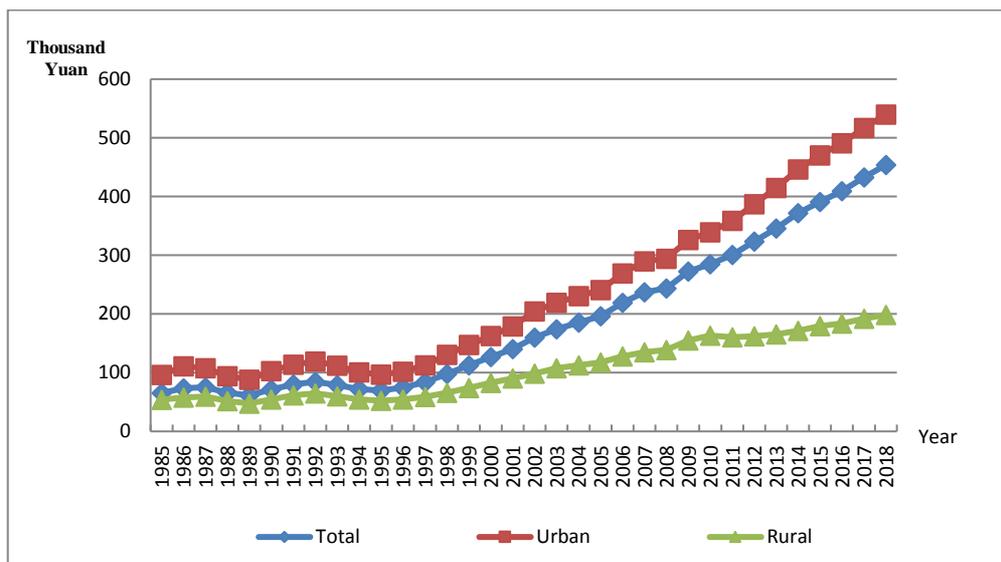
Figure GD-2.2 Real Human Capital Per Capita by Region for Guangdong，1985-2018

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 2018, the nominal labor force human capital increased from 1.5 trillion Yuan to 95.2 trillion Yuan, an increase of more than 63 times;

and the real labor force human capital increased from 1.5 trillion Yuan to 18.7 trillion Yuan, an increase of approximately 13 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	1491	1491
1986	1714	1632
1987	1979	1694
1988	2317	1533
1989	2724	1475
1990	3199	1777
1991	3588	1969
1992	3997	2045
1993	4415	1861
1994	4899	1696
1995	5546	1682
1996	6900	1954
1997	8649	2398
1998	10735	3023
1999	12987	3719
2000	15430	4343
2001	16799	4760
2002	18612	5343
2003	20688	5897
2004	23026	6373
2005	25516	6907
2006	29188	7763
2007	33703	8644
2008	38911	9450
2009	45006	11192
2010	51958	12525
2011	55694	12737

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	60576	13469
2013	65993	14313
2014	71617	15186
2015	76963	16068
2016	82990	16923
2017	89070	17876
2018	95204	18695

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 2018, the nominal average labor force human capital increased from 46.8 thousand Yuan to 1.4 million Yuan, an increase of more than 27 times; and the real average labor force human capital increased from 46.8 thousand Yuan to 0.3 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	46.84	64.91	39.08	46.84	64.91	39.08
1986	53.84	74.00	43.87	51.27	70.68	41.66
1987	61.98	84.09	49.26	53.07	71.20	42.64
1988	70.14	94.46	55.61	46.41	61.76	37.23
1989	79.56	106.43	62.55	43.08	57.09	34.22
1990	90.25	119.60	70.34	50.12	65.86	39.42
1991	99.97	132.08	78.04	54.87	71.10	43.78
1992	110.75	145.74	86.03	56.68	72.38	45.57

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	122.05	160.22	94.32	51.45	65.22	41.43
1994	134.55	176.33	103.48	46.58	59.32	37.11
1995	149.89	195.37	115.04	45.47	58.11	35.78
1996	174.13	225.45	128.60	49.31	62.55	37.55
1997	202.73	259.14	143.10	56.21	70.42	41.17
1998	232.05	291.74	158.78	65.35	80.65	46.57
1999	260.30	321.14	175.56	74.55	90.22	52.70
2000	289.54	350.02	193.61	81.49	96.22	58.12
2001	312.74	375.75	209.56	88.61	104.13	63.16
2002	340.84	409.84	224.01	97.84	115.19	68.47
2003	372.24	444.73	242.77	106.09	124.13	73.91
2004	407.04	484.61	260.88	112.66	131.83	76.59
2005	444.65	525.97	278.89	120.36	140.27	79.73
2006	493.78	582.24	311.00	131.33	152.54	87.50
2007	550.61	646.68	344.66	141.22	163.37	93.70
2008	612.02	716.09	380.12	148.63	171.47	97.67
2009	679.36	791.15	423.64	168.95	194.11	111.30
2010	752.36	875.80	465.60	181.36	208.42	118.53
2011	807.25	941.67	487.06	184.62	212.81	117.42
2012	874.67	1025.15	514.21	194.48	225.38	120.47
2013	948.61	1115.45	545.25	205.75	239.43	124.34
2014	1026.30	1207.81	581.98	217.62	253.42	129.98
2015	1100.60	1299.47	617.23	229.78	268.35	136.08
2016	1179.86	1394.21	643.67	240.59	281.17	139.13
2017	1266.28	1497.52	675.22	254.14	296.96	144.79
2018	1357.90	1603.79	705.44	266.65	311.18	148.45

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. Column 1 is nominal human capital in six-education categories. Column 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	1526	1526	35
1986	1754	1652	38
1987	1979	1741	41
1988	2211	1622	42
1989	2477	1486	44
1990	2800	1639	44
1991	3184	1812	46
1992	3601	1934	50
1993	4097	1825	56
1994	4685	1655	63
1995	5311	1584	71
1996	6044	1689	79
1997	6873	1907	87
1998	7833	2241	97
1999	8866	2595	108
2000	10111	2967	119

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	11137	3251	131
2002	12588	3706	145
2003	14425	4201	162
2004	16387	4570	184
2005	18124	4932	215
2006	20758	5570	255
2007	23918	6052	306
2008	26747	6272	371
2009	30429	7298	476
2010	33626	7826	619
2011	38587	8483	783
2012	43644	9297	952
2013	49073	10225	1088
2014	54779	11177	1224
2015	59392	11941	1368
2016	65942	13046	1521
2017	73245	14245	1587
2018	81135	15414	—

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 2018, the nominal human capital per capita increased from 42.5 thousand Yuan to 1.9 million Yuan, an increase of more than 43 times; and the real human capital per capita increased from 42.5 thousand Yuan to 0.4

million Yuan, an increase of approximately 7 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 2018, 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.
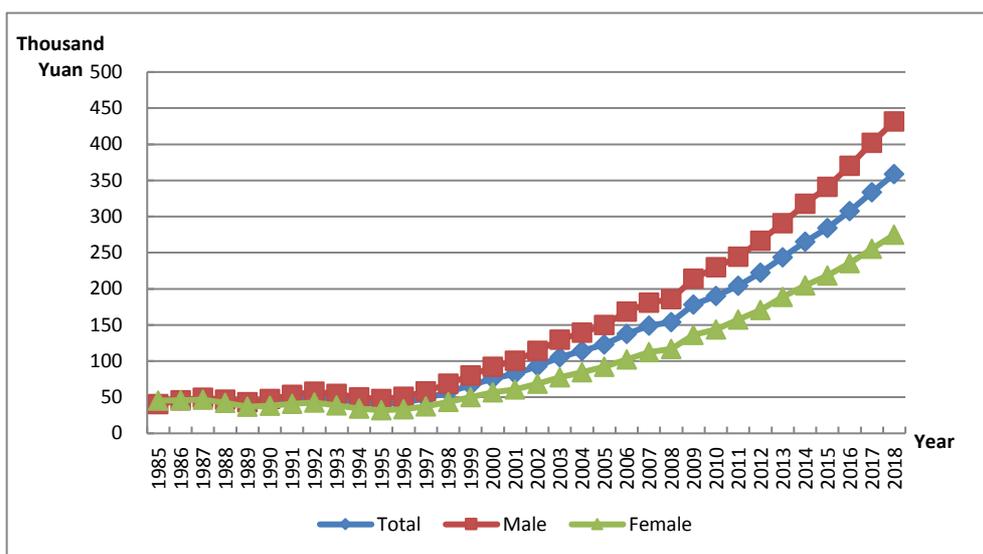
Figure GX-2.1 Human Capital Per Capita by Gender for Guangxi，1985-2018

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	42.54	79.53	36.78	42.54	79.53	36.78
1986	48.55	97.81	40.52	45.72	92.10	38.15
1987	54.49	112.32	44.67	47.93	95.97	39.76
1988	60.55	123.56	49.26	44.41	85.63	37.03
1989	66.93	134.68	54.30	40.15	77.97	33.11
1990	73.93	146.77	59.96	43.28	86.44	35.01
1991	83.68	167.59	66.65	47.63	96.11	37.79

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	94.18	188.82	74.26	50.58	101.20	39.95
1993	106.16	213.65	82.84	47.29	92.87	37.42
1994	120.16	242.15	92.43	42.44	83.94	33.00
1995	134.73	271.62	102.17	40.18	79.79	30.76
1996	152.82	305.18	112.40	42.71	84.98	31.50
1997	174.88	348.78	123.83	48.52	96.44	34.43
1998	199.41	392.32	136.33	57.05	111.72	39.16
1999	226.66	438.23	149.71	66.35	128.39	43.79
2000	258.76	485.36	167.47	75.92	142.20	49.24
2001	281.57	499.29	183.01	82.20	144.40	54.02
2002	316.45	552.93	197.23	93.16	161.69	58.63
2003	362.07	622.53	217.72	105.44	180.42	63.89
2004	409.01	694.59	239.46	114.07	193.38	66.99
2005	451.92	753.03	261.87	122.97	203.54	72.10
2006	513.24	836.87	294.07	137.73	222.61	80.23
2007	589.24	950.91	328.35	149.11	239.53	83.88
2008	656.45	1037.26	366.19	153.95	242.83	86.22
2009	743.24	1160.29	413.28	178.26	277.46	99.80
2010	817.27	1250.01	460.89	190.22	290.49	107.64
2011	929.89	1412.23	495.69	204.42	310.49	108.98
2012	1044.14	1564.81	536.14	222.42	333.37	114.22
2013	1169.75	1735.24	583.34	243.74	362.10	121.04
2014	1299.78	1912.51	636.55	265.21	390.51	129.62
2015	1412.64	2053.97	696.86	284.01	413.19	139.80
2016	1554.34	2233.71	758.23	307.51	442.27	149.57
2017	1715.43	2433.11	832.76	333.62	472.77	162.48
2018	1889.27	2642.42	919.19	358.93	501.41	175.49

Figure GX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
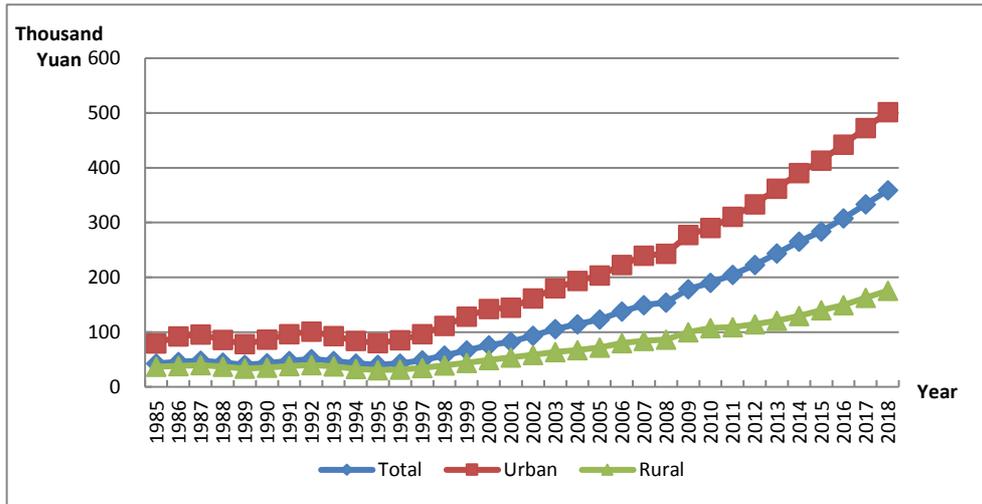
Figure GX-2.2 Real Human Capital Per Capita by Region for Guangxi 1985-2018

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 2018, the nominal labor force human capital increased from 0.6 trillion Yuan to 25.3 trillion Yuan, an increase of more than 42 times; and the real labor force human capital increased from 0.6 trillion Yuan to 4.8 trillion

Yuan, an increase of approximately 7 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	580	580
1986	670	631
1987	774	681
1988	870	639
1989	990	595
1990	1150	673
1991	1290	734
1992	1436	771
1993	1621	723
1994	1859	657
1995	2141	639
1996	2460	688
1997	2756	765
1998	3139	898
1999	3568	1045
2000	4103	1204
2001	4565	1334
2002	4962	1463
2003	5350	1560
2004	5927	1654
2005	6495	1771
2006	7516	2022
2007	8542	2165
2008	9594	2251
2009	10800	2594
2010	12072	2812
2011	13437	2954
2012	14848	3164

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2013	16355	3406
2014	17787	3628
2015	18917	3802
2016	20995	4152
2017	23136	4501
2018	25349	4819

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 2018, the nominal average labor force human capital increased from 29.3 thousand Yuan to 0.93 million Yuan, an increase of more than 30 times; and the real average labor force human capital increased from 29.3 thousand Yuan to 0.2 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	29.34	51.97	25.53	29.34	51.97	25.53
1986	32.90	59.73	28.21	30.98	56.25	26.57
1987	36.96	68.41	31.23	32.52	58.45	27.80
1988	40.79	73.81	34.49	29.97	51.15	25.92
1989	45.19	79.67	38.37	27.14	46.13	23.39
1990	50.39	86.33	43.11	29.50	50.85	25.17
1991	56.31	98.09	47.16	32.04	56.25	26.74

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	62.28	107.76	51.93	33.46	57.75	27.93
1993	69.32	120.10	57.51	30.92	52.20	25.97
1994	77.94	133.92	64.30	27.56	46.42	22.96
1995	87.89	150.49	71.77	26.23	44.21	21.60
1996	99.74	171.33	79.00	27.89	47.71	22.14
1997	111.69	187.73	87.30	30.98	51.91	24.27
1998	125.71	207.60	96.60	35.97	59.12	27.75
1999	141.02	227.64	106.88	41.28	66.69	31.26
2000	159.04	251.16	119.00	46.68	73.58	34.99
2001	174.26	271.76	129.37	50.93	78.60	38.19
2002	188.25	290.72	138.94	55.50	85.02	41.30
2003	202.93	306.04	151.49	59.18	88.69	44.45
2004	223.40	334.57	163.88	62.33	93.15	45.84
2005	244.24	362.01	176.95	66.58	97.85	48.72
2006	280.99	416.39	198.36	75.58	110.76	54.12
2007	318.51	468.85	221.75	80.71	118.10	56.65
2008	357.14	518.57	248.37	83.80	121.40	58.48
2009	400.10	570.46	281.47	96.08	136.41	67.97
2010	446.13	627.43	315.49	103.90	145.81	73.68
2011	493.90	697.41	333.88	108.58	153.33	73.41
2012	545.31	768.65	356.83	116.19	163.75	76.02
2013	599.65	840.05	383.63	124.88	175.30	79.60
2014	648.78	896.08	419.15	132.34	182.97	85.35
2015	691.87	936.80	458.03	139.05	188.45	91.89
2016	762.04	1034.60	493.09	150.71	204.85	97.27
2017	840.69	1139.58	536.37	163.56	221.43	104.65
2018	925.36	1250.20	584.20	175.92	237.23	111.53

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. Column 1 is nominal human capital in six-education categories. Column 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	252	252	6
1986	293	280	8
1987	329	287	9
1988	382	261	10
1989	446	240	12
1990	520	269	14
1991	604	302	17
1992	702	330	22
1993	807	316	25
1994	922	284	30
1995	1022	277	35
1996	1177	306	38
1997	1359	350	41
1998	1611	427	44
1999	1851	498	47
2000	2178	580	50
2001	2296	620	54

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	2648	719	57
2003	3107	846	62
2004	3497	916	67
2005	3942	1018	74
2006	4663	1188	82
2007	5242	1273	92
2008	5945	1355	104
2009	6648	1524	118
2010	7414	1624	138
2011	8227	1705	160
2012	9286	1870	191
2013	10483	2056	227
2014	11773	2260	266
2015	12828	2436	297
2016	14205	2625	331
2017	15627	2804	366
2018	16963	2974	—

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 2018, the nominal human capital per capita increased from 45.2 thousand Yuan to 2.0 million Yuan, an increase of more than 44 times; and the real human capital per capita increased from 45.2 thousand Yuan to 0.4 million Yuan, an increase of approximately 7 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 2018, 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.
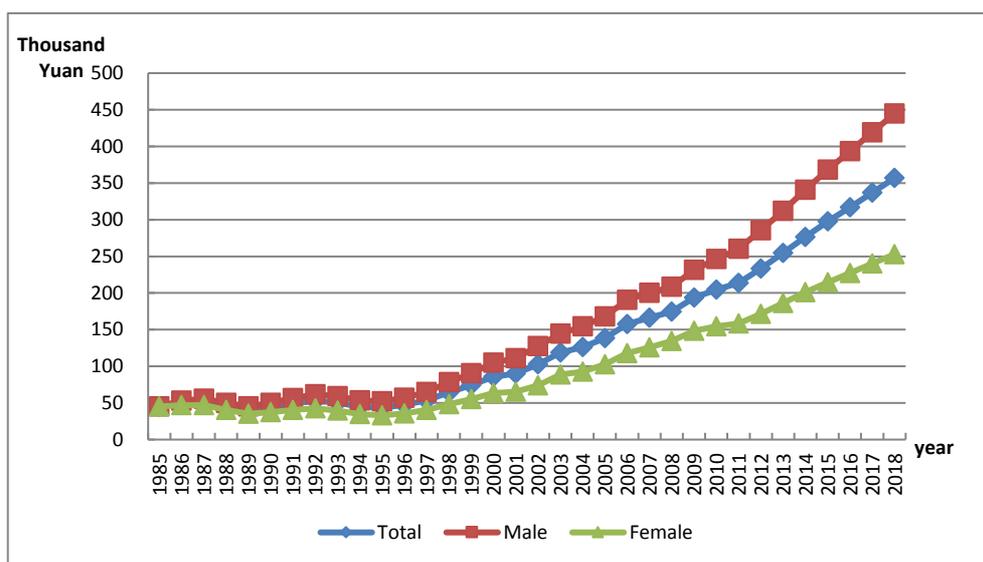
Figure HaN-2.1 Human Capital Per Capita by Gender for Hainan，1985-2018

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	45.21	87.76	36.61	45.21	87.76	36.61
1986	52.49	108.37	40.26	50.20	104.51	38.31
1987	59.20	122.39	44.22	51.58	107.49	38.32
1988	66.70	133.51	49.32	45.54	90.69	33.81
1989	75.40	148.00	54.84	40.55	79.60	29.49
1990	85.74	166.31	60.81	44.32	89.80	30.25
1991	98.48	188.97	67.73	49.16	98.11	32.52

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	112.84	213.35	75.44	53.08	101.62	35.03
1993	128.23	237.29	83.93	50.19	91.37	33.45
1994	144.79	262.71	92.98	44.67	80.54	28.91
1995	159.88	282.69	101.38	43.32	78.36	26.62
1996	181.65	322.36	111.35	47.21	85.26	28.20
1997	207.41	368.50	122.22	53.40	96.03	30.86
1998	243.19	437.90	133.72	64.45	116.92	34.95
1999	276.22	494.04	146.27	74.34	133.11	39.29
2000	322.22	572.56	161.55	85.79	151.98	43.31
2001	333.25	558.19	175.23	89.95	149.97	47.79
2002	378.28	627.29	186.88	102.74	170.23	50.86
2003	436.72	714.07	203.84	118.86	194.95	54.98
2004	481.46	774.40	221.44	126.07	204.87	56.13
2005	535.12	833.75	254.97	138.19	217.74	63.55
2006	618.52	957.40	282.66	157.55	247.06	68.87
2007	684.72	1044.23	311.52	166.28	257.62	71.47
2008	766.48	1157.85	342.70	174.67	269.23	72.27
2009	844.51	1262.64	379.27	193.65	295.07	80.79
2010	934.18	1388.31	416.66	204.58	310.47	83.89
2011	1031.37	1502.76	435.58	213.76	318.55	81.35
2012	1159.00	1665.14	461.20	233.34	342.02	83.49
2013	1296.97	1842.41	490.98	254.43	368.12	86.40
2014	1440.21	2034.94	532.39	276.46	397.84	91.14
2015	1566.80	2200.25	579.05	297.51	425.06	98.64
2016	1714.63	2387.04	621.13	316.81	448.15	103.23
2017	1876.96	2588.53	669.11	336.79	470.91	109.13
2018	2035.28	2779.95	718.07	356.78	493.88	114.26

Figure HaN-2.2 shows the trend of real human capital per capita by region.

From 1985 to 2018, the real human capital per capita in the urban area remains

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larger than that in the rural area. Since 1997, the growths 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.
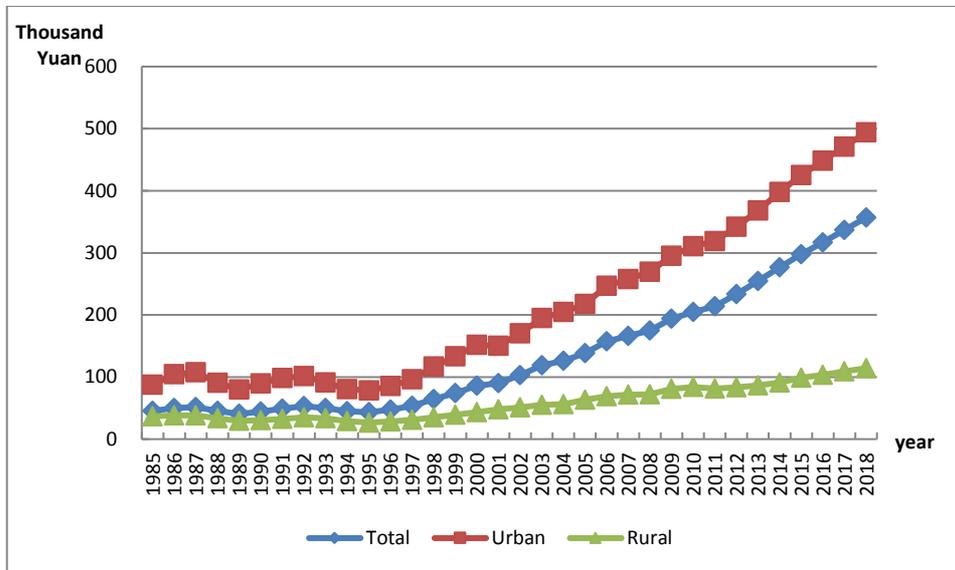
Figure HaN-2.2 Real Human Capital Per Capita by Region for Hainan，1985-2018

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 2018, the nominal labor force human capital increased from 0.1 trillion Yuan to 6.1 trillion Yuan, an increase of more than 63 times; and the real labor force human capital increased from 0.1 trillion Yuan to 1.1 trillion Yuan, an increase of approximately 10 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	95	95
1986	112	107
1987	132	115
1988	154	105
1989	181	98
1990	216	112
1991	250	125
1992	288	135
1993	331	130
1994	383	118
1995	440	119
1996	498	129
1997	570	147
1998	654	173
1999	748	201
2000	856	228
2001	943	255
2002	1047	284
2003	1160	315
2004	1307	341
2005	1460	376
2006	1656	420
2007	1875	453
2008	2121	479
2009	2409	548
2010	2732	592
2011	3060	626
2012	3448	685
2013	3834	742

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2014	4257	805
2015	4614	864
2016	5122	934
2017	5626	999
2018	6113	1061

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 2018, the nominal average labor force human capital increased from 32.3 thousand Yuan to 1.1 million Yuan, an increase of more than 32 times; and the real average labor force human capital increased from 32.3 thousand Yuan to 0.19 million Yuan, an increase of approximately 5 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	32.27	55.35	27.23	32.27	55.35	27.23
1986	36.55	63.97	30.08	34.93	61.69	28.62
1987	41.49	73.54	33.22	36.13	64.59	28.79
1988	46.90	80.99	37.06	32.04	55.01	25.41
1989	53.35	90.40	41.37	28.69	48.62	22.24
1990	60.90	101.38	46.31	31.44	54.74	23.04
1991	69.13	113.54	51.43	34.45	58.95	24.69
1992	78.33	126.97	56.89	36.84	60.48	26.41

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	88.57	141.38	62.93	34.68	54.44	25.08
1994	99.92	156.73	69.94	30.83	48.05	21.75
1995	112.41	173.36	77.09	30.44	48.05	20.24
1996	125.17	191.91	84.35	32.52	50.76	21.36
1997	140.58	214.29	92.62	36.17	55.84	23.38
1998	157.49	237.91	101.98	41.71	63.52	26.65
1999	175.10	261.62	112.31	47.12	70.49	30.17
2000	195.10	288.27	123.39	51.97	76.52	33.08
2001	210.67	309.89	132.97	56.90	83.26	36.26
2002	228.85	336.87	141.67	62.17	91.42	38.55
2003	248.53	362.83	153.01	67.58	99.06	41.27
2004	273.03	396.91	164.26	71.26	105.00	41.64
2005	299.58	420.70	187.48	77.08	109.87	46.73
2006	334.66	467.33	207.67	84.84	120.60	50.60
2007	372.55	517.21	229.82	89.91	127.60	52.73
2008	413.12	569.46	255.56	93.30	132.41	53.89
2009	458.33	626.77	287.33	104.17	146.47	61.20
2010	509.45	693.93	319.33	110.42	155.18	64.29
2011	564.45	769.65	340.83	115.54	163.15	63.65
2012	628.31	856.29	367.69	124.87	175.88	66.56
2013	691.41	938.30	398.44	133.80	187.48	70.12
2014	756.57	1021.01	435.61	143.11	199.61	74.57
2015	816.64	1092.65	474.63	152.94	211.08	80.85
2016	896.27	1200.27	506.73	163.47	225.34	84.21
2017	984.08	1317.35	540.21	174.68	239.65	88.10
2018	1072.90	1434.56	571.24	186.16	254.86	90.89

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. Column 1 is nominal human capital in six-education categories. Column 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	859	859	37
1986	997	957	39
1987	1132	989	44
1988	1316	937	48
1989	1528	930	47
1990	1830	1098	48
1991	2144	1202	50
1992	2503	1262	54
1993	2885	1226	60
1994	3363	1101	69
1995	3855	1057	78
1996	4434	1109	87
1997	5109	1237	98
1998	5525	1387	115
1999	6386	1615	132
2000	7668	2005	149

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	8060	2072	171
2002	8859	2287	198
2003	10282	2639	234
2004	11971	2962	278
2005	12393	3042	330
2006	13629	3267	387
2007	16027	3670	451
2008	18459	4002	520
2009	21095	4649	603
2010	23958	5116	700
2011	27407	5558	817
2012	31295	6185	941
2013	34987	6733	1072
2014	38850	7344	1216
2015	42926	8010	1374
2016	46993	8614	1555
2017	51165	9286	1738
2018	55651	9902	—

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 2018, the nominal human capital per capita increased from 35.8 thousand Yuan to 2.4 million Yuan, an increase of

more than 65 times; and the real human capital per capita increased from 35.8 thousand Yuan to 0.4 million Yuan, an increase of approximately 11 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 2018, 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.
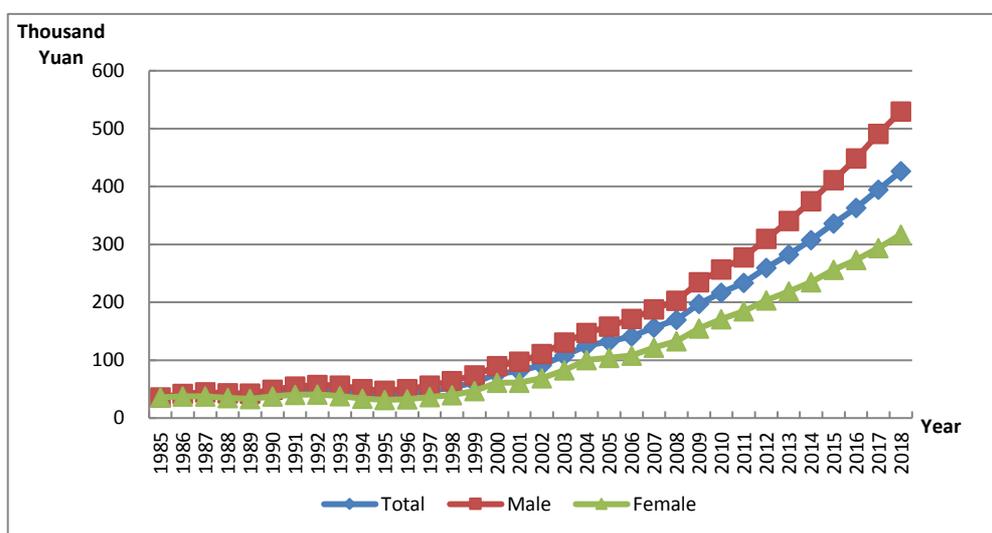
Figure CQ-2.1 Human Capital Per Capita by Gender for Chongqing，1985-2018

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	35.81	70.63	27.26	35.81	70.63	27.26
1986	41.70	85.36	30.35	40.02	81.92	29.13
1987	47.30	96.71	33.81	41.34	84.53	29.55
1988	70.63	27.26	35.81	70.63	27.26	35.81
1989	63.07	122.85	43.21	38.37	74.73	26.29
1990	73.35	141.76	49.49	44.01	85.05	29.69

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	85.36	163.23	55.10	47.86	91.52	30.89
1992	98.55	185.06	61.40	49.69	93.31	30.96
1993	112.31	204.46	68.73	47.70	86.85	29.19
1994	129.53	232.76	76.94	42.42	76.23	25.20
1995	145.97	257.83	86.17	40.04	70.72	23.63
1996	167.87	297.07	94.48	41.98	74.28	23.62
1997	194.18	345.65	103.77	47.00	83.66	25.12
1998	209.90	361.76	115.56	52.70	90.83	29.02
1999	243.04	425.10	127.76	61.46	107.49	32.31
2000	292.94	528.99	142.08	76.60	138.32	37.15
2001	314.35	535.75	153.08	80.82	137.75	39.36
2002	354.08	583.12	164.95	91.41	150.53	42.58
2003	421.05	676.38	184.60	108.05	173.56	47.37
2004	504.75	806.86	210.03	124.90	199.66	51.97
2005	539.64	835.26	236.51	132.48	205.05	58.06
2006	589.22	887.23	267.81	141.26	212.70	64.20
2007	684.48	1011.22	302.12	156.73	231.54	69.18
2008	783.41	1134.37	337.99	169.86	245.97	73.29
2009	895.46	1280.29	381.39	197.32	282.12	84.04
2010	1014.73	1428.26	422.86	216.67	304.97	90.29
2011	1153.27	1590.23	443.94	233.86	322.46	90.02
2012	1312.82	1780.12	470.55	259.46	351.82	93.00
2013	1468.33	1960.13	500.49	282.57	377.21	96.32
2014	1627.83	2148.26	537.40	307.73	406.10	101.59
2015	1803.21	2358.64	581.05	336.50	440.15	108.43
2016	1982.47	2575.25	612.57	363.41	472.08	112.29
2017	2175.81	2806.81	650.21	394.90	509.43	118.01
2018	2396.41	3067.42	691.31	426.41	545.81	123.01

Figure CQ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
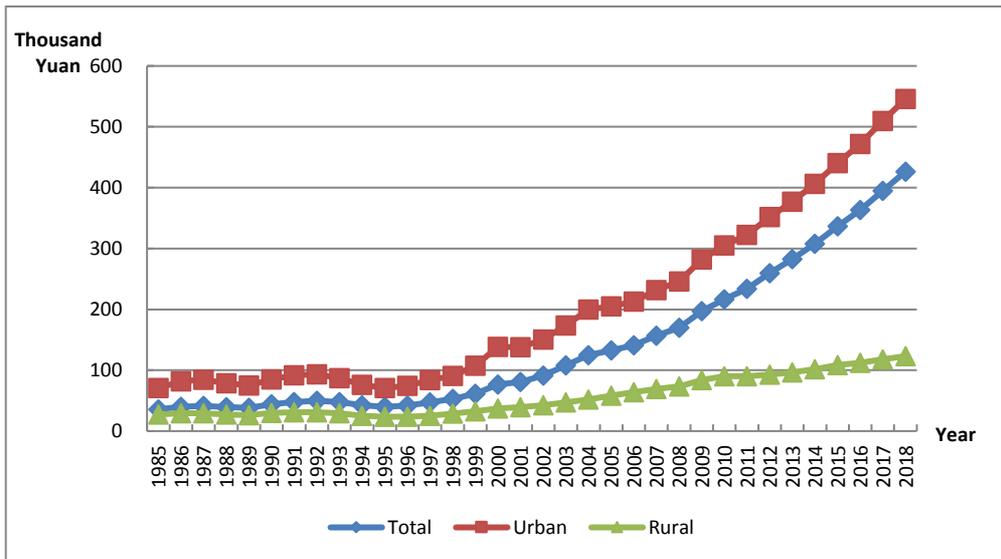
Figure CQ-2.2 Real Human Capital Per Capita by Region for Chongqing，1985-2018

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 2018, the nominal labor force human capital increased from 0.4 trillion Yuan to 18.5 trillion Yuan, an increase of more than 46 times;

and the real labor force human capital increased from 0.4 trillion Yuan to 3.3 trillion Yuan, an increase of approximately 7 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	392	392
1986	462	443
1987	547	478
1988	636	453
1989	755	459
1990	909	545
1991	1030	577
1992	1168	589
1993	1309	556
1994	1460	478
1995	1624	445
1996	1824	456
1997	2043	495
1998	2279	572
1999	2512	635
2000	2767	724
2001	2971	764
2002	3152	814
2003	3317	851
2004	3489	863
2005	3668	901
2006	4379	1050
2007	5199	1190
2008	5997	1300
2009	6867	1513
2010	7986	1705
2011	9097	1845

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	10247	2025
2013	11345	2183
2014	12497	2362
2015	13528	2524
2016	15125	2773
2017	16796	3048
2018	18505	3293

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 2018, the nominal average labor force human capital increased from 25.4 thousand Yuan to 1.1 million Yuan, an increase of more than 43 times; and the real average labor force human capital increased from 25.4 thousand Yuan to 0.2 million Yuan, an increase of approximately 7 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	25.42	45.86	20.56	25.42	45.86	20.56
1986	28.98	52.46	23.23	27.81	50.35	22.30
1987	33.14	60.06	26.30	28.96	52.50	22.99
1988	38.00	67.23	29.81	27.07	47.89	21.24
1989	43.81	75.42	34.17	26.65	45.88	20.78
1990	50.59	84.38	39.61	30.35	50.62	23.76
1991	56.91	93.89	43.70	31.91	52.64	24.50

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	63.90	103.88	48.41	32.22	52.38	24.41
1993	71.27	113.82	53.58	30.27	48.35	22.76
1994	79.14	124.18	59.18	25.92	40.67	19.38
1995	87.69	135.43	65.11	24.05	37.15	17.86
1996	98.32	153.13	71.42	24.59	38.29	17.86
1997	109.91	171.65	78.71	26.61	41.55	19.05
1998	122.18	189.94	87.12	30.68	47.69	21.87
1999	134.41	207.20	96.18	33.98	52.39	24.32
2000	147.92	226.43	106.12	38.68	59.21	27.75
2001	163.49	246.61	113.16	42.04	63.41	29.10
2002	179.30	266.25	119.90	46.29	68.73	30.95
2003	195.70	283.22	128.44	50.21	72.68	32.96
2004	214.91	304.73	136.09	53.18	75.41	33.68
2005	235.37	326.20	144.56	57.79	80.08	35.49
2006	279.21	387.53	163.14	66.94	92.90	39.11
2007	327.14	448.41	192.24	74.90	102.67	44.02
2008	375.35	508.13	220.92	81.38	110.18	47.90
2009	428.99	574.16	250.66	94.53	126.52	55.23
2010	493.94	656.24	282.44	105.47	140.12	60.31
2011	555.31	732.29	303.28	112.60	148.49	61.50
2012	621.57	812.38	327.74	122.84	160.56	64.77
2013	685.90	887.66	353.86	131.99	170.82	68.10
2014	748.87	957.86	387.53	141.56	181.07	73.26
2015	808.47	1021.64	420.50	150.87	190.65	78.47
2016	901.48	1142.74	448.45	165.25	209.48	82.21
2017	1004.53	1274.63	481.19	182.32	231.34	87.33
2018	1120.48	1421.86	519.28	199.38	253.00	92.40

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	2335	2335	60
1986	2695	2573	67
1987	3051	2722	74
1988	3459	2571	79
1989	3974	2457	84
1990	4660	2776	88
1991	5349	3093	94
1992	6155	3329	101
1993	7020	3244	106
1994	7962	2938	116
1995	8999	2791	129
1996	10286	2907	145
1997	11801	3166	162
1998	13208	3553	185
1999	15168	4131	207
2000	17141	4656	233
2001	19275	5110	261

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	21194	5623	293
2003	23255	6073	330
2004	25514	6347	375
2005	27637	6756	428
2006	32508	7737	495
2007	38343	8586	577
2008	43999	9366	669
2009	49558	10462	778
2010	55979	11434	901
2011	64216	12414	1036
2012	72942	13707	1183
2013	80818	14748	1337
2014	89231	16007	1491
2015	96468	17052	1649
2016	106493	18442	1826
2017	117288	19981	1998
2018	128389	21483	—

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 2018, the nominal human capital per capita increased from 33.6 thousand Yuan to 2.0 million yuan, an increase of approximately 57 times; and the real human capital per capita increased from 33.6 thousand Yuan to 0.3 million Yuan, an increase of approximately 9 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 2018, 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.
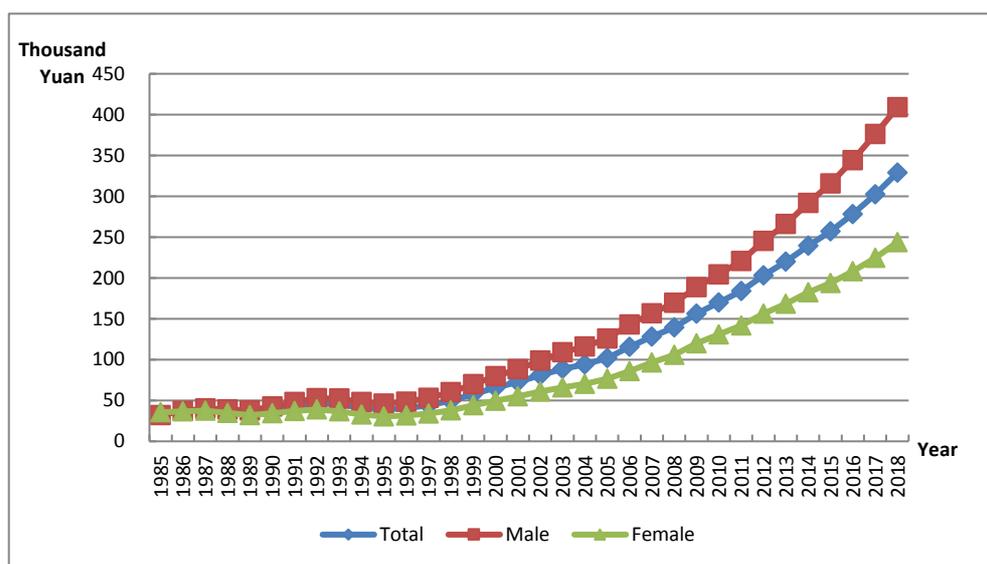
Figure SC-2.1 Human Capital Per Capita by Gender for Sichuan，1985-2018

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	33.63	65.14	28.32	33.63	65.14	28.32
1986	38.78	79.75	31.52	37.04	76.10	30.10
1987	43.83	90.58	35.16	39.11	78.50	31.80
1988	49.82	101.05	39.39	37.02	71.26	30.06
1989	56.79	113.46	44.26	35.11	67.92	27.85
1990	65.39	129.92	50.01	38.95	76.63	29.97
1991	74.69	148.18	55.63	43.18	83.79	32.65

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1992	85.65	169.23	61.81	46.33	87.15	34.68
1993	97.66	188.79	68.75	45.13	83.17	33.06
1994	110.73	210.75	76.15	40.86	72.59	29.89
1995	125.26	235.38	84.13	38.85	68.13	27.92
1996	143.38	272.09	93.43	40.52	71.73	28.41
1997	164.78	316.68	103.96	44.21	79.43	30.11
1998	184.72	352.90	115.66	49.69	88.69	33.67
1999	212.70	416.11	128.10	57.92	106.60	37.67
2000	241.99	473.83	143.24	65.74	121.76	41.87
2001	273.80	531.15	157.27	72.59	134.07	44.76
2002	304.85	581.71	170.39	80.88	147.57	48.49
2003	339.38	630.49	189.12	88.62	156.97	53.34
2004	378.69	690.96	208.77	94.21	164.45	55.97
2005	417.49	744.81	228.94	102.05	174.31	60.41
2006	485.97	844.21	257.48	115.66	192.94	66.42
2007	572.36	971.51	287.89	128.16	209.66	70.06
2008	655.10	1082.09	321.59	139.45	223.05	74.11
2009	739.99	1199.21	362.90	156.21	245.55	82.84
2010	831.56	1322.04	405.61	169.85	261.94	89.83
2011	950.68	1487.51	430.54	183.78	280.43	90.12
2012	1081.02	1667.97	461.17	203.15	305.88	94.64
2013	1203.97	1832.10	494.15	219.71	326.83	98.65
2014	1334.63	2016.35	533.30	239.41	353.69	105.10
2015	1452.91	2174.31	578.82	256.82	376.13	112.27
2016	1605.82	2383.40	617.88	278.08	404.22	117.85
2017	1774.78	2614.35	662.73	302.35	435.97	125.40
2018	1966.56	2864.04	713.86	329.06	469.63	132.81

Figure SC-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, 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.
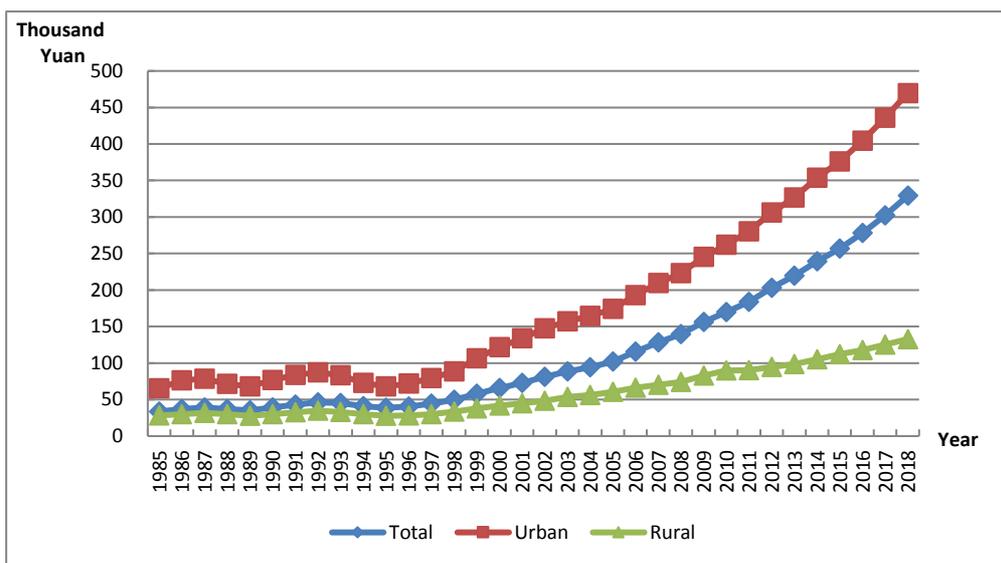
Figure SC-2.2 Real Human Capital Per Capita by Region for Sichuan，1985-2018

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 2018, the nominal labor force human capital increased from 1.0 trillion Yuan to 48.8 trillion Yuan, an increase of more than 47 times; and

the real labor force human capital increased from 1.0 trillion Yuan to 8.3 trillion Yuan, an increase of approximately 7 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	1008	1008
1986	1180	1127
1987	1395	1246
1988	1629	1214
1989	1938	1200
1990	2336	1392
1991	2639	1529
1992	2987	1626
1993	3340	1554
1994	3716	1387
1995	4093	1286
1996	4595	1317
1997	5161	1405
1998	5758	1572
1999	6347	1756
2000	6973	1925
2001	7435	2002
2002	7835	2110
2003	8299	2201
2004	8779	2216
2005	9269	2299
2006	11229	2711
2007	13285	3020
2008	15491	3345
2009	17596	3769
2010	20500	4247
2011	23286	4560

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	26176	4986
2013	29051	5372
2014	32115	5841
2015	34800	6234
2016	39219	6879
2017	43925	7580
2018	48752	8259

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 2018, the nominal average labor force human capital increased from 24.0 thousand Yuan to 1.0 million Yuan, an increase of more than 41 times; and the real average labor force human capital increased from 24.0 thousand Yuan to 0.2 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	24.00	42.79	20.60	24.00	42.79	20.60
1986	27.34	49.13	23.20	26.10	46.88	22.16
1987	31.23	56.44	26.22	27.90	48.92	23.72
1988	35.57	62.95	29.74	26.50	44.39	22.70
1989	40.77	70.86	33.94	25.25	42.42	21.36

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
1990	47.05	79.94	38.98	28.04	47.15	23.36
1991	52.58	88.85	43.07	30.47	50.24	25.28
1992	58.89	98.33	47.74	32.05	50.64	26.79
1993	65.65	107.89	52.74	30.55	47.53	25.36
1994	72.72	118.09	58.05	27.15	40.68	22.79
1995	80.19	128.82	63.37	25.20	37.29	21.03
1996	90.34	147.27	69.83	25.89	38.82	21.24
1997	101.69	167.30	77.23	27.69	41.96	22.37
1998	113.59	186.80	85.60	31.02	46.95	24.92
1999	125.42	205.07	94.64	34.70	52.54	27.83
2000	138.59	225.34	104.38	38.26	57.90	30.51
2001	150.18	243.77	111.22	40.43	61.53	31.65
2002	161.75	261.34	117.85	43.56	66.30	33.54
2003	175.16	279.53	126.44	46.46	69.59	35.66
2004	189.86	299.42	135.97	47.92	71.27	36.46
2005	205.43	319.06	146.17	50.96	74.67	38.57
2006	245.44	383.11	168.65	59.26	87.56	43.51
2007	289.26	445.85	194.34	65.76	96.22	47.29
2008	335.27	508.58	222.24	72.38	104.83	51.22
2009	380.19	563.39	255.75	81.44	115.36	58.38
2010	436.40	638.68	290.27	90.41	126.55	64.28
2011	492.78	723.90	309.40	96.50	136.47	64.77
2012	553.40	811.67	332.81	105.41	148.85	68.30
2013	614.19	895.67	358.85	113.58	159.78	71.64
2014	676.11	979.82	390.71	122.97	171.87	77.00
2015	732.62	1047.54	424.70	131.25	181.21	82.38
2016	820.48	1179.87	454.70	143.91	200.10	86.72

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
2017	917.01	1323.68	489.87	158.24	220.74	92.69
2018	1028.51	1482.00	529.90	174.25	243.01	98.59

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	961	961	23
1986	1109	1053	25
1987	1242	1097	27
1988	1386	1029	29
1989	1562	978	30
1990	1793	1100	32
1991	2074	1214	34
1992	2362	1281	35
1993	2709	1265	37
1994	3109	1181	39
1995	3523	1099	42
1996	4029	1148	45
1997	4614	1271	49
1998	5163	1420	55
1999	5826	1614	62
2000	6681	1858	70

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	7801	2126	80
2002	8457	2327	92
2003	9392	2551	105
2004	10679	2786	120
2005	11866	3063	136
2006	13575	3445	155
2007	15385	3673	178
2008	17391	3865	204
2009	19863	4474	234
2010	22139	4843	274
2011	25724	5355	316
2012	29559	5994	371
2013	33542	6639	433
2014	37931	7334	498
2015	41842	7940	571
2016	47093	8814	662
2017	53004	9822	755
2018	58734	10681	—

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 2018, the nominal human capital per capita increased from 33.4 thousand Yuan to 1.8 million Yuan, an increase of more than 52 times; and the real human capital per capita increased from 33.4 thousand Yuan to 0.3

million Yuan, an increase of approximately 9 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 2018, 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.
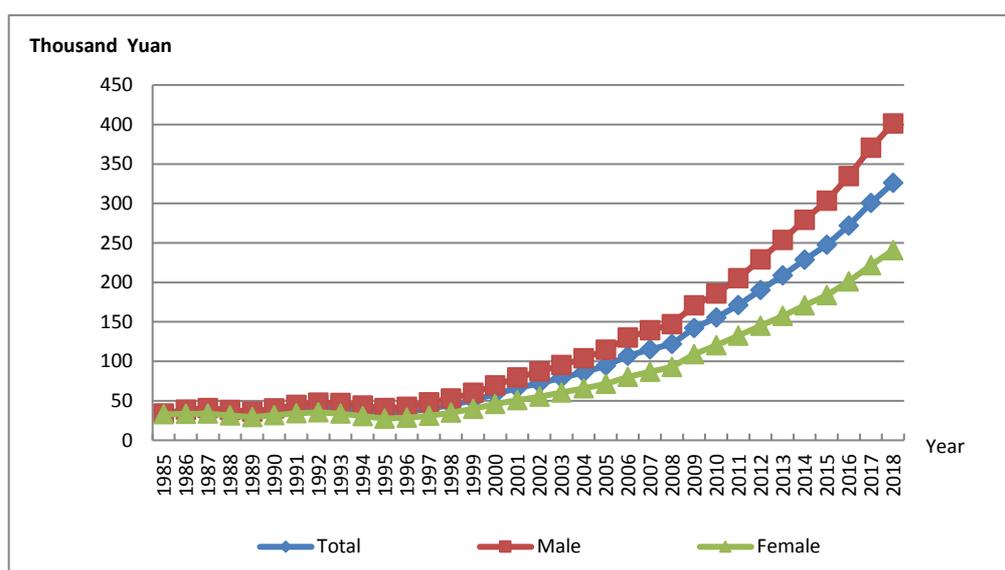
Figure GZ-2.1 Human Capital Per Capita by Gender for Guizhou，1985-2018

Table GZ-2.1 Nominal and Real Human Capital Per Capita by Region for Guizhou

Year	Nominal Human Capital Per Capita			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
1985	33.37	73.25	24.94	33.37	73.25	24.94
1986	38.11	90.30	27.12	36.18	84.87	25.93
1987	42.55	103.99	29.53	37.59	89.09	26.68
1988	47.15	115.30	32.51	35.01	81.30	25.07
1989	52.81	130.05	35.78	33.08	77.78	23.22
1990	59.49	147.21	39.52	36.47	87.08	24.95

Year	Nominal Human Capital Per Capita			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	68.30	171.77	43.34	39.98	97.80	26.03
1992	77.18	191.89	47.62	41.87	100.51	26.76
1993	87.56	215.83	52.45	40.89	97.62	25.36
1994	99.16	243.05	57.74	37.68	90.11	22.59
1995	110.80	266.31	63.42	34.55	82.63	19.90
1996	126.19	310.56	69.71	35.96	87.12	20.29
1997	144.86	366.66	76.59	39.89	99.48	21.56
1998	161.96	412.82	84.29	44.53	111.44	23.82
1999	183.25	472.67	92.62	50.75	129.02	26.25
2000	210.96	548.21	102.33	58.65	150.84	28.95
2001	243.13	626.49	112.50	66.26	168.34	31.48
2002	262.33	653.65	122.25	72.18	177.59	34.45
2003	290.71	696.55	135.54	78.96	187.56	37.44
2004	329.52	770.74	148.96	85.96	200.52	39.08
2005	366.12	827.35	162.50	94.49	213.97	41.75
2006	420.75	913.80	182.82	106.77	232.60	46.05
2007	481.37	1008.50	205.28	114.92	242.41	48.15
2008	548.94	1110.49	230.71	121.99	249.46	49.74
2009	630.76	1244.12	262.30	142.07	283.44	57.12
2010	710.54	1363.51	296.11	155.43	301.30	62.85
2011	822.80	1522.52	321.34	171.29	319.51	65.08
2012	937.39	1676.62	354.21	190.09	342.59	69.78
2013	1055.19	1826.31	390.47	208.85	364.08	75.05
2014	1183.14	1997.45	433.19	228.76	388.86	81.31
2015	1303.78	2150.16	482.04	247.41	410.39	89.14
2016	1451.78	2343.37	535.32	271.72	441.06	97.63
2017	1622.66	2559.67	597.32	300.70	476.53	108.29
2018	1791.60	2762.84	670.11	325.82	504.27	119.81

Figure GZ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, 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.
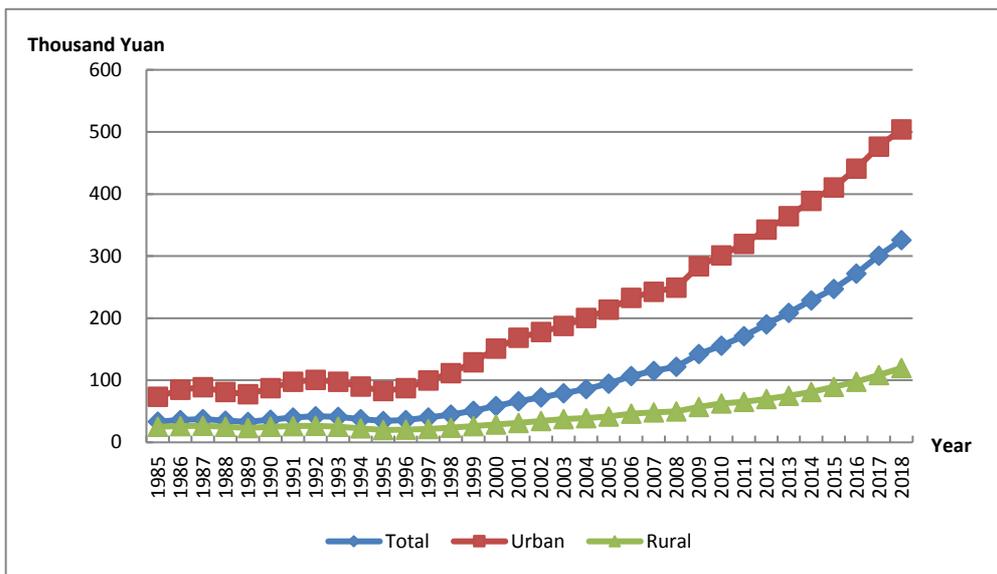
Figure GZ-2.2 Real Human Capital Per Capita by Region for Guizhou，1985-2018

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 2018, the nominal labor force human capital increased from 0.4 trillion Yuan to 2.0 trillion Yuan, an increase of more than 55 times; and the real labor force human capital increased from 0.4 trillion Yuan to 3.6 trillion

Yuan, an increase of approximately 9 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	351	351
1986	406	386
1987	475	420
1988	542	403
1989	631	396
1990	749	460
1991	849	498
1992	965	525
1993	1102	516
1994	1267	483
1995	1451	453
1996	1601	457
1997	1744	482
1998	1920	530
1999	2114	587
2000	2340	653
2001	2577	706
2002	2795	772
2003	3004	818
2004	3309	864
2005	3673	947
2006	4286	1086
2007	4910	1169
2008	5533	1224
2009	6246	1400
2010	6995	1524

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	8139	1688
2012	9308	1880
2013	10503	2071
2014	11739	2260
2015	12924	2442
2016	14996	2796
2017	17326	3200
2018	19808	3594

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 2018, the nominal average labor force human capital increased from 23.3 thousand Yuan to 0.9 million Yuan, an increase of more than 38 times; and the real average labor force human capital increased from 23.3 thousand Yuan to 0.2 million Yuan, an increase of approximately 6 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	23.30	45.60	17.90	23.30	45.60	17.90
1986	26.06	52.56	19.67	24.74	49.39	18.80
1987	29.25	60.72	21.72	25.88	52.03	19.62
1988	32.68	67.95	23.96	24.31	47.91	18.47
1989	36.81	76.57	26.64	23.10	45.79	17.29

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**
1990	41.75	86.49	29.98	25.64	51.16	18.92
1991	46.55	96.03	32.72	27.30	54.68	19.65
1992	51.99	106.70	35.84	28.29	55.89	20.14
1993	58.22	118.63	39.48	27.28	53.66	19.09
1994	65.15	131.49	43.80	24.83	48.75	17.14
1995	73.11	146.65	48.09	22.81	45.50	15.09
1996	80.94	164.33	52.28	23.11	46.10	15.22
1997	88.82	181.14	57.14	24.53	49.14	16.08
1998	98.01	200.35	62.68	27.05	54.08	17.71
1999	107.62	219.80	68.90	29.91	60.00	19.53
2000	118.99	242.94	75.70	33.18	66.85	21.41
2001	130.39	264.84	81.50	35.70	71.17	22.80
2002	141.53	286.51	87.20	39.09	77.84	24.57
2003	152.37	303.27	94.87	41.50	81.66	26.21
2004	166.73	328.07	103.57	43.54	85.35	27.17
2005	183.85	358.99	112.25	47.41	92.84	28.84
2006	215.32	416.56	126.74	54.58	106.03	31.93
2007	249.01	473.77	142.48	59.29	113.88	33.42
2008	283.63	526.74	160.05	62.75	118.33	34.51
2009	322.32	582.01	182.10	72.25	132.60	39.65
2010	364.35	641.49	205.25	79.38	141.75	43.56
2011	416.76	719.69	225.27	86.45	151.03	45.62
2012	471.71	797.10	249.38	95.30	162.88	49.13
2013	526.45	868.07	277.58	103.80	173.05	53.35
2014	579.55	931.51	313.69	111.58	181.35	58.88
2015	631.19	983.83	355.39	119.28	187.78	65.72
2016	716.71	1109.86	397.92	133.61	208.90	72.57

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
2017	816.12	1251.29	448.32	150.75	232.95	81.28
2018	923.95	1398.66	505.43	167.65	255.28	90.37

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	1087	1087	57
1986	1255	1186	59
1987	1438	1272	61
1988	1608	1188	63
1989	1813	1129	66
1990	2083	1264	69
1991	2375	1397	76
1992	2747	1476	84
1993	3183	1413	92
1994	3718	1393	100
1995	4257	1319	109
1996	4889	1397	120
1997	5573	1528	132
1998	6838	1844	148
1999	8003	2173	163
2000	8306	2300	177

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	9497	2662	192
2002	10769	3034	208
2003	12116	3375	230
2004	13468	3538	256
2005	15044	3897	284
2006	17209	4381	317
2007	19472	4686	352
2008	21880	4991	387
2009	24123	5480	451
2010	26956	5905	550
2011	30741	6440	671
2012	34259	6989	811
2013	37562	7428	969
2014	41450	8007	1151
2015	45020	8527	1348
2016	49064	9159	1558
2017	53258	9852	1768
2018	57378	10449	—

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 2018, the nominal human capital per capita increased from 34.1 thousand Yuan to 1.4 million Yuan, an increase of more than 39 times; and the real human capital per capita increased from 34.1 thousand Yuan to 0.3

million Yuan, an increase of approximately 6 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 2018, 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.
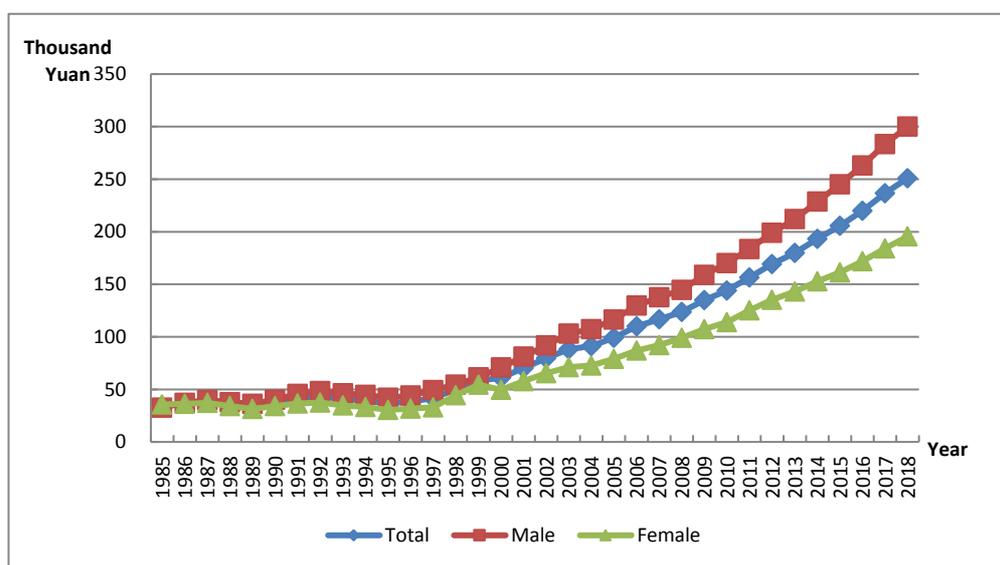

Figure YN-2.1 Real Human Capital Per Capita by Gender for Yunnan，1985-2018

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	34.08	32.67	35.59	34.08	32.67	35.59
1986	38.91	39.30	38.48	36.77	37.19	36.30
1987	43.73	45.09	42.20	38.66	39.89	37.28
1988	48.82	51.27	46.04	36.07	37.85	34.06
1989	54.59	58.15	50.50	34.01	36.23	31.47
1990	61.61	66.31	56.22	37.39	40.28	34.08

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1991	70.25	77.33	62.11	41.34	45.52	36.54
1992	80.57	90.01	69.64	43.28	48.34	37.43
1993	92.20	104.15	78.32	40.92	46.26	34.73
1994	105.25	119.58	88.54	39.43	44.84	33.13
1995	118.41	135.65	98.31	36.70	42.07	30.43
1996	134.63	154.56	111.37	38.46	44.17	31.80
1997	152.16	179.42	120.24	41.71	49.21	32.94
1998	184.79	202.51	164.04	49.83	54.55	44.32
1999	214.43	227.03	199.67	58.22	61.47	54.41
2000	220.69	256.11	179.24	61.12	70.84	49.74
2001	250.78	290.09	205.04	70.30	81.14	57.67
2002	282.93	327.09	231.53	79.71	91.93	65.50
2003	316.79	370.91	254.03	88.25	103.10	71.03
2004	346.95	408.69	275.29	91.15	107.15	72.58
2005	382.70	450.33	303.91	99.14	116.46	78.98
2006	431.96	510.82	340.38	109.95	129.82	86.88
2007	484.99	573.08	382.43	116.71	137.70	92.24
2008	541.59	635.24	432.97	123.55	144.70	99.00
2009	593.72	699.63	470.97	134.86	158.75	107.18
2010	657.69	776.85	519.78	144.08	170.09	113.99
2011	746.34	875.75	596.60	156.35	183.34	125.08
2012	830.06	975.71	662.14	169.33	198.99	135.13
2013	910.06	1072.30	723.67	179.96	212.06	143.11
2014	1000.50	1184.25	791.76	193.26	228.80	152.89
2015	1085.78	1293.51	851.87	205.65	245.12	161.24
2016	1178.18	1407.44	921.62	219.94	262.95	171.82
2017	1278.52	1528.97	997.42	236.50	283.21	184.09
2018	1378.03	1644.37	1077.18	250.95	300.00	195.54

Figure YN-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, 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.
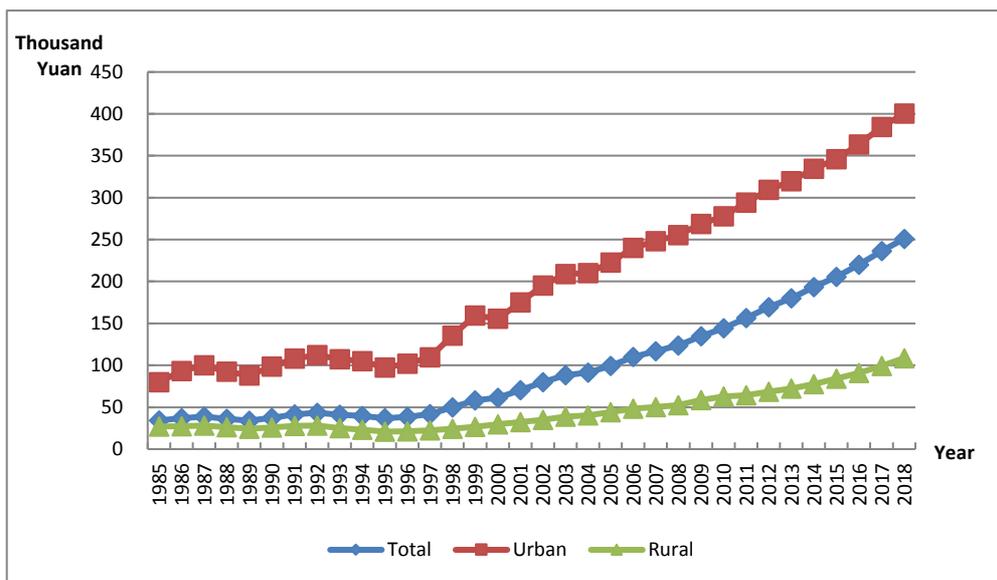

Figure YN-2.2 Real Human Capital Per Capita by Region for Yunnan，1985-2018

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 2018, the nominal labor force human capital increased from 0.4 trillion Yuan to 23.0 trillion Yuan, an increase of more than 53 times. The

real labor force human capital increased from 0.4 trillion Yuan to 4.2 trillion Yuan, an increase of approximately 9 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	421	421
1986	489	462
1987	578	511
1988	662	489
1989	773	481
1990	918	557
1991	1052	619
1992	1211	651
1993	1390	616
1994	1625	607
1995	1875	578
1996	2137	607
1997	2419	660
1998	2732	733
1999	3066	825
2000	3442	946
2001	3821	1059
2002	4185	1163
2003	4681	1287
2004	5328	1383
2005	6015	1541
2006	6842	1722
2007	7666	1823
2008	8544	1924
2009	9530	2139
2010	10788	2338
2011	11999	2487

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	13353	2699
2013	14744	2892
2014	16137	3092
2015	17483	3288
2016	19228	3563
2017	21081	3870
2018	22994	4157

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 2018, the nominal average labor force human capital increased from 24.1 thousand Yuan to 0.78 million Yuan, an increase of more than 31 times. The real average labor force human capital increased from 24.1 thousand Yuan to 0.14 million Yuan, an increase of approximately 5 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	24.06	50.74	19.37	24.06	50.74	19.37
1986	27.11	58.82	21.36	25.61	56.13	20.07
1987	30.73	68.42	23.64	27.17	60.79	20.84
1988	34.44	76.58	26.24	25.45	56.18	19.48
1989	38.87	86.45	29.30	24.22	53.80	18.28
1990	44.16	51.56	29.70	26.79	31.58	17.91
1991	49.82	111.49	36.25	29.31	65.79	21.29

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	56.16	125.65	39.99	30.18	67.16	21.59
1993	63.10	140.48	44.23	27.96	63.20	19.36
1994	71.18	157.20	49.43	26.57	60.29	18.05
1995	79.88	175.26	54.68	24.65	55.87	16.39
1996	89.18	193.78	60.22	25.34	56.94	16.59
1997	99.30	213.33	66.34	27.09	59.93	17.59
1998	110.13	232.07	73.14	29.54	63.66	19.19
1999	121.35	250.85	80.11	32.66	69.65	20.87
2000	134.22	271.25	87.83	36.89	77.17	23.25
2001	148.38	295.14	95.86	41.12	85.59	25.22
2002	161.72	318.45	104.18	44.93	93.00	27.28
2003	179.66	345.83	115.08	49.38	99.70	29.83
2004	200.38	380.32	127.52	51.99	103.34	31.22
2005	221.79	415.78	140.26	56.81	111.09	33.99
2006	248.33	456.86	156.29	62.50	119.79	37.21
2007	275.31	498.22	173.05	65.47	123.35	38.90
2008	304.78	539.44	191.23	68.65	126.72	40.56
2009	338.09	584.88	212.38	75.90	136.68	44.94
2010	378.74	643.79	234.75	82.09	144.94	47.95
2011	418.53	702.29	251.03	86.74	150.87	48.88
2012	464.15	767.22	270.42	93.80	160.02	51.47
2013	509.93	827.17	293.04	100.01	166.85	54.31
2014	553.51	875.93	321.12	106.07	172.21	58.41
2015	597.50	918.54	353.62	112.37	176.70	63.49
2016	652.03	992.73	387.54	120.83	188.34	68.42
2017	714.36	1075.98	427.44	131.14	202.51	74.50
2018	780.01	1161.12	470.89	141.00	215.09	80.94

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. Column 1 is nominal human capital in six-education categories. Column 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	65	65	6
1986	79	74	7
1987	93	82	7
1988	106	80	8
1989	116	75	8
1990	128	79	8
1991	146	82	9
1992	171	89	9
1993	196	89	10
1994	221	79	11
1995	245	73	12
1996	296	82	13
1997	355	93	14
1998	418	108	14
1999	503	131	15
2000	520	135	16
2001	660	171	17

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	801	205	19
2003	871	221	22
2004	1013	251	27
2005	1174	287	33
2006	1402	336	40
2007	1512	352	47
2008	1697	373	56
2009	1881	408	66
2010	2102	446	81
2011	2495	503	93
2012	2667	519	109
2013	2931	551	130
2014	3228	588	154
2015	3572	638	176
2016	3926	683	201
2017	4297	736	229
2018	4679	790	—

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 2018, the nominal human capital per capita increased from 35.8 thousand Yuan to 1.6 million Yuan, an increase of more than 43 times;

and the real human capital per capita increased from 35.8 thousand Yuan to 266.6 thousand Yuan, an increase of approximately 6 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 2018, 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.
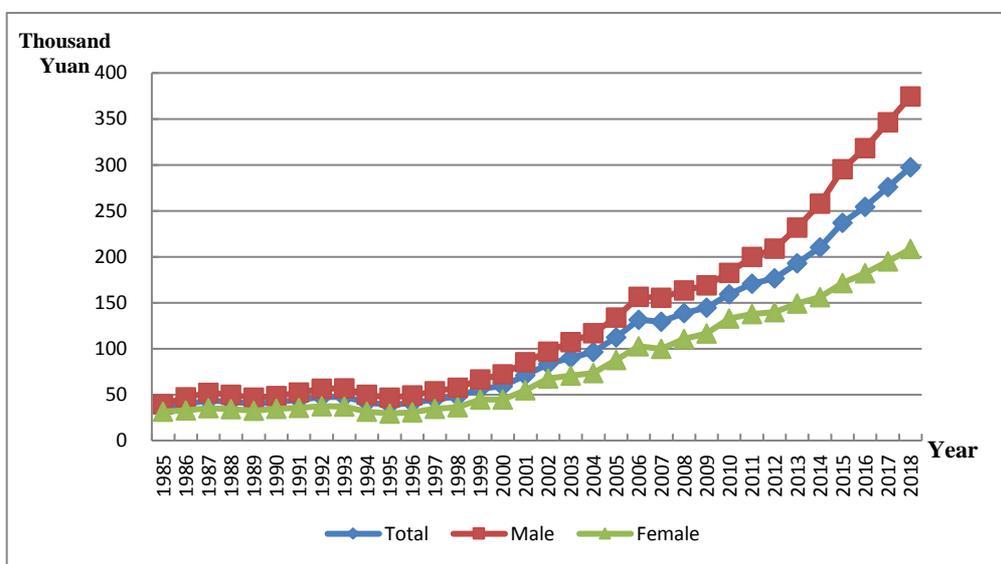

Figure XZ-2.1 Human Capital Per Capita by Gender for Tibet，1985-2018

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	35.79	124.00	21.31	35.79	124.00	21.31
1986	43.09	155.62	23.30	40.40	145.43	21.93
1987	50.00	178.61	25.45	43.87	154.06	22.84
1988	56.25	199.55	28.58	42.52	146.12	22.52

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	62.15	218.26	31.80	40.20	137.89	21.21
1990	68.34	243.39	35.43	42.13	146.16	22.57
1991	77.84	274.88	38.95	43.90	150.89	22.79
1992	89.45	317.94	43.17	46.32	160.12	23.27
1993	99.56	352.84	47.93	45.36	154.25	23.16
1994	108.76	385.98	53.41	38.85	134.45	19.76
1995	116.67	417.79	59.31	34.89	119.98	18.67
1996	137.90	474.81	65.69	38.03	124.52	19.49
1997	161.95	537.81	72.74	42.33	134.59	20.44
1998	187.54	600.24	80.43	48.69	150.51	22.27
1999	222.55	701.21	89.03	57.75	176.89	24.53
2000	225.69	649.84	97.86	58.57	163.28	27.01
2001	285.17	816.32	106.13	73.84	206.76	29.03
2002	344.94	963.67	113.82	88.41	241.66	31.17
2003	370.80	982.06	125.42	94.28	244.32	34.04
2004	418.35	1089.94	138.70	103.86	265.84	36.40
2005	470.82	1198.52	152.32	115.24	288.01	39.62
2006	547.63	1379.53	170.35	131.27	325.32	43.27
2007	577.47	1402.09	189.36	134.22	321.32	46.17
2008	637.03	1525.30	210.33	140.08	330.71	48.51
2009	695.81	1639.90	234.13	150.88	350.37	53.33
2010	774.13	1831.16	259.14	164.23	382.82	57.76
2011	907.73	2151.99	283.59	183.05	427.65	60.37
2012	960.16	2225.10	303.68	186.97	426.81	62.52
2013	1045.43	2385.80	323.15	196.57	442.16	64.22
2014	1135.43	2547.56	346.84	206.94	457.06	67.25
2015	1245.88	2765.55	370.79	222.40	485.96	70.62
2016	1353.92	2951.84	404.26	235.56	505.56	75.12

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	1466.49	3143.17	442.36	251.09	529.85	80.82
2018	1579.88	3332.31	485.68	266.60	554.52	86.83

Figure XZ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
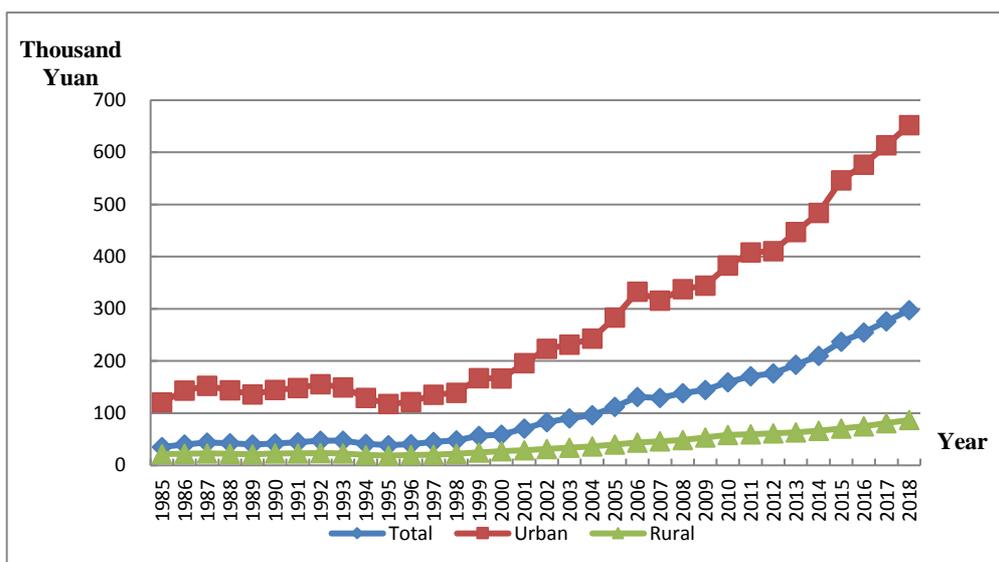
Figure XZ-2.2 Real Human Capital Per Capita by Region for Tibet，1985-2018

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 2018, the nominal labor force human capital increased from 0.02 trillion Yuan[41] to 2.0 trillion Yuan, an increase of more than 80 times; and the real labor force human capital increased from 0.02 trillion Yuan to 0.3 trillion Yuan, an increase of approximately 13 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	25	25
1986	29	27
1987	33	29
1988	38	29
1989	44	29
1990	51	32
1991	59	33
1992	68	36
1993	78	36
1994	91	33
1995	104	31
1996	120	33
1997	139	37
1998	161	42

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[41] In 1985, both the nominal and actual labor force human capital stocks of the Tibet were 0.02495 trillion yuan, which are 0.02 trillion yuan and 0.025 trillion yuan after rounding.

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
1999	183	48
2000	209	55
2001	232	61
2002	256	67
2003	288	74
2004	330	83
2005	380	94
2006	448	109
2007	509	119
2008	577	128
2009	641	140
2010	718	154
2011	845	172
2012	1005	197
2013	1153	218
2014	1271	233
2015	1430	257
2016	1606	281
2017	1823	314
2018	2033	344

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 2018, the nominal average labor force human capital increased from 23.9 thousand Yuan to 989.5 thousand Yuan, an increase of more than 40 times; and the real average labor force human capital increased from 23.9 thousand Yuan to 167.6 thousand Yuan, an increase of approximately 6 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	23.91	71.03	17.27	23.91	71.03	17.27
1986	26.74	81.58	18.75	25.10	76.24	17.65
1987	30.24	116.19	20.50	26.71	100.22	18.40
1988	34.19	107.96	22.59	26.12	79.05	17.80
1989	38.70	122.44	24.95	25.21	77.35	16.65
1990	44.09	139.17	27.71	27.34	83.58	17.65
1991	49.07	155.06	30.35	27.87	85.12	17.75
1992	54.81	173.61	33.30	28.61	87.43	17.95
1993	60.65	191.80	36.70	27.94	83.85	17.73
1994	67.41	212.41	40.79	24.23	73.99	15.09
1995	74.08	232.56	45.16	22.33	66.79	14.22
1996	85.03	253.01	49.80	23.72	66.36	14.78
1997	97.77	276.83	55.41	25.84	69.28	15.57
1998	111.53	300.76	61.96	29.25	75.41	17.15
1999	125.18	321.68	69.51	32.83	81.15	19.15
2000	139.94	344.10	78.15	36.65	86.46	21.57
2001	155.64	381.58	84.09	40.71	96.65	23.00
2002	172.24	422.52	90.19	44.76	105.96	24.70
2003	192.22	466.72	98.67	49.49	116.11	26.78
2004	213.68	514.34	110.31	53.63	125.45	28.95
2005	238.16	569.58	123.10	59.05	136.87	32.02
2006	271.88	647.22	138.01	65.96	152.63	35.06
2007	301.69	712.10	153.65	70.78	163.20	37.46
2008	335.10	785.04	170.57	74.38	170.21	39.34
2009	367.10	854.13	189.44	80.39	182.49	43.15

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	404.20	932.56	209.56	86.62	194.96	46.71
2011	464.69	1069.40	221.71	94.59	212.52	47.20
2012	539.90	1233.71	233.75	105.84	236.65	48.12
2013	610.87	1382.37	245.63	115.45	256.20	48.81
2014	662.38	1497.17	263.41	121.41	268.61	51.07
2015	729.56	1640.34	283.87	131.01	288.24	54.06
2016	805.93	1788.18	308.43	141.01	306.26	57.31
2017	899.82	1963.98	335.42	154.78	331.07	61.28
2018	989.48	2127.30	366.30	167.58	354.00	65.48

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. Column 1 is nominal human capital in six-education categories. Column 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	872	872	33
1986	1031	973	39
1987	1202	1054	44
1988	1411	1044	49
1989	1620	1004	54
1990	1862	1128	57
1991	2214	1259	61
1992	2618	1358	65
1993	3031	1383	69
1994	3468	1245	74
1995	3919	1183	79
1996	4623	1264	85
1997	5437	1413	91
1998	6012	1589	99
1999	6932	1873	108

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2000	8054	2174	120
2001	9337	2493	132
2002	9988	2698	146
2003	10854	2887	163
2004	11763	3037	184
2005	13130	3352	211
2006	15120	3798	245
2007	17453	4167	292
2008	20134	4519	349
2009	23250	5192	420
2010	26203	5628	507
2011	29463	5986	600
2012	33699	6664	707
2013	38258	7347	819
2014	42678	8066	939
2015	46467	8701	1049
2016	51750	9567	1168
2017	57290	10412	1288
2018	62819	11189	—

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 2018, the nominal human capital per capita increased from 31.1 thousand Yuan to 2.1 million Yuan, an increase of more than 65 times; and the real human capital per capita increased from 31.1

thousand Yuan to 0.4 million Yuan, an increase of approximately 11 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 2018, 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.
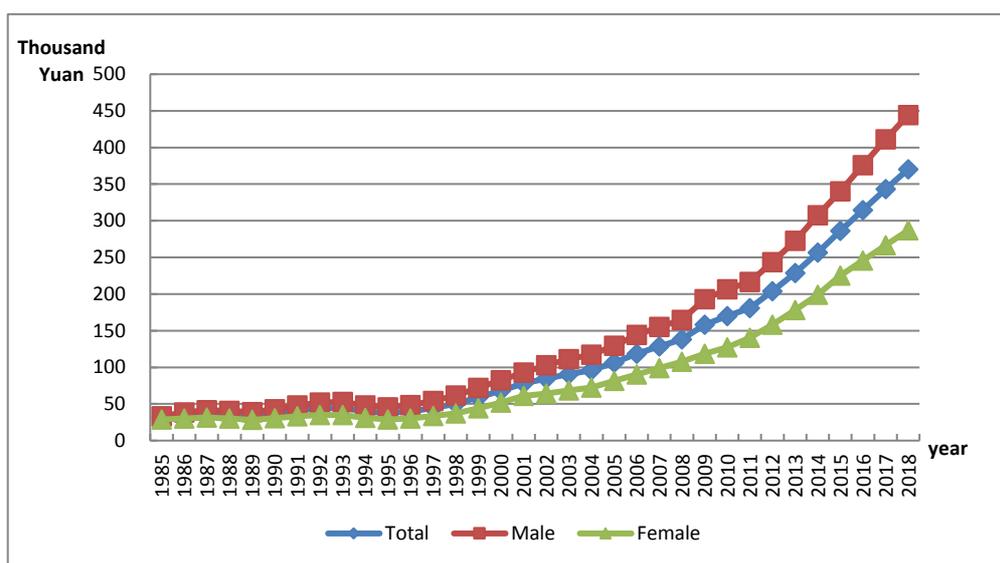

Figure SaX-2.1 Human Capital Per Capita by Gender for Shaanxi，1985-2018

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	31.14	66.20	21.75	31.14	66.20	21.75
1986	36.52	81.85	24.42	34.49	76.78	23.19
1987	41.95	95.39	27.43	36.78	81.94	24.50
1988	48.09	107.00	31.06	35.59	76.54	23.75
1989	54.57	118.75	35.10	33.83	72.23	22.19
1990	61.47	131.57	39.51	37.23	78.00	24.46

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	72.34	153.76	44.44	41.14	84.95	26.13
1992	84.70	177.95	49.97	43.94	88.41	27.38
1993	97.54	202.41	56.17	44.49	88.21	27.24
1994	111.08	226.94	62.89	39.87	77.15	24.36
1995	124.71	250.28	70.12	37.63	72.10	22.65
1996	146.06	291.48	77.51	39.92	76.13	22.85
1997	171.19	340.06	85.69	44.50	84.43	24.29
1998	189.51	366.60	95.00	50.10	93.17	27.11
1999	217.88	418.02	104.63	58.88	109.29	30.35
2000	252.52	482.64	115.54	68.17	125.81	33.85
2001	292.28	556.13	127.76	78.03	144.82	36.38
2002	313.37	580.08	138.92	84.65	153.83	39.40
2003	341.53	617.73	154.44	90.85	162.51	42.32
2004	371.98	663.68	170.65	96.03	169.52	45.31
2005	416.94	726.56	198.57	106.44	183.92	51.79
2006	472.09	810.63	226.47	118.60	200.98	58.83
2007	538.04	907.00	254.28	128.45	213.76	62.85
2008	615.21	1022.54	285.93	138.08	226.92	66.23
2009	708.48	1167.14	320.89	158.21	259.01	73.02
2010	790.02	1271.01	356.97	169.68	271.99	77.58
2011	890.86	1393.33	380.47	181.00	282.09	78.30
2012	1030.55	1575.88	404.38	203.80	310.97	80.72
2013	1189.66	1780.99	430.64	228.48	341.87	82.97
2014	1358.54	2003.69	464.47	256.75	378.56	87.94
2015	1527.66	2219.44	504.46	286.05	415.58	94.47
2016	1700.37	2440.67	541.53	314.35	451.14	100.21
2017	1887.41	2677.16	588.64	343.04	486.10	107.74
2018	2079.07	2914.97	642.53	370.33	518.91	114.96

Figure SaX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
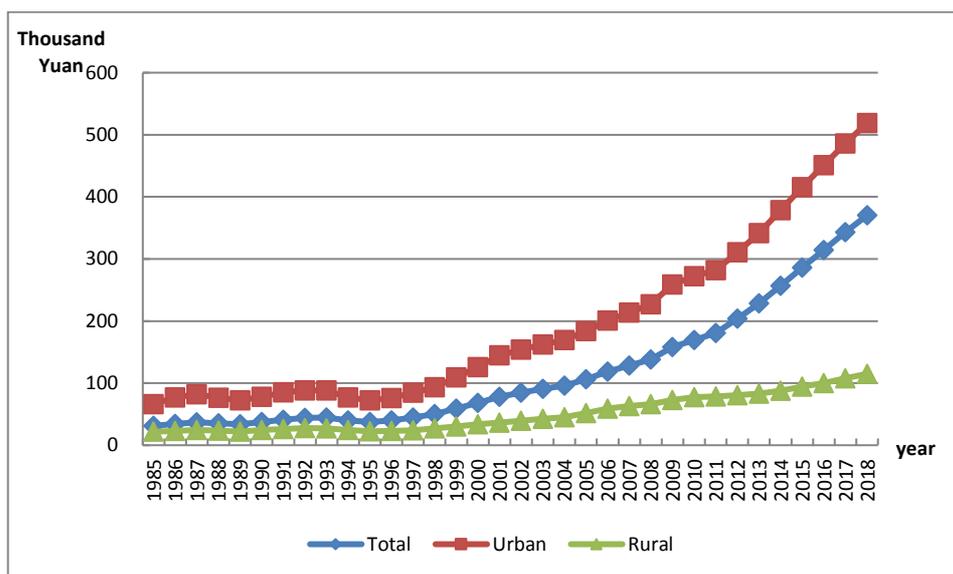

Figure SaX-2.2 Real Human Capital Per Capita by Region for Shaanxi，1985-2018

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 2018, the nominal labor force human capital increased from

0.4 trillion Yuan to 23.4 trillion Yuan, an increase of more than 64 times; and the real labor force human capital increased from 0.4 trillion Yuan to 4.2 trillion Yuan, an increase of approximately 12 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	360	360
1986	408	385
1987	473	416
1988	575	428
1989	690	429
1990	818	496
1991	944	539
1992	1073	561
1993	1202	553
1994	1353	491
1995	1516	462
1996	1736	480
1997	1983	523
1998	2203	590
1999	2503	685
2000	2866	786
2001	3144	850
2002	3431	934
2003	3752	1003
2004	4066	1054
2005	4521	1158
2006	5581	1408
2007	6699	1606
2008	7780	1752

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2009	8832	1977
2010	10433	2244
2011	11714	2383
2012	12968	2567
2013	14240	2736
2014	15679	2964
2015	16994	3182
2016	19253	3560
2017	21331	3880
2018	23431	4175

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 2018, the nominal average labor force human capital increased from 21.8 thousand Yuan to 1.1 million Yuan, an increase of more than 49 times; and the real average labor force human capital increased from 21.8 thousand Yuan to 0.2 million Yuan, an increase of approximately 8 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	21.81	43.88	16.17	21.81	43.88	16.17
1986	24.29	49.06	18.10	22.95	46.02	17.19
1987	27.43	56.05	20.40	24.13	48.15	18.23
1988	32.09	65.05	23.20	23.86	46.53	17.74
1989	37.02	73.78	26.32	23.00	44.88	16.64

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
1990	42.21	82.36	29.79	25.62	48.83	18.45
1991	48.03	92.11	33.38	27.42	50.89	19.63
1992	54.31	102.56	37.11	28.38	50.95	20.33
1993	60.57	112.00	41.35	27.88	48.81	20.05
1994	67.64	122.84	46.11	24.57	41.76	17.86
1995	75.24	134.63	51.03	22.94	38.79	16.48
1996	85.63	153.80	56.28	23.68	40.17	16.59
1997	97.21	174.58	62.19	25.64	43.35	17.63
1998	107.81	191.80	68.94	28.87	48.74	19.68
1999	120.88	212.97	76.49	33.08	55.68	22.19
2000	136.05	237.24	85.24	37.30	61.84	24.97
2001	149.20	255.53	92.24	40.31	66.54	26.26
2002	162.92	275.48	98.89	44.36	73.05	28.04
2003	177.81	294.35	107.69	47.51	77.44	29.51
2004	192.40	311.67	117.81	49.88	79.61	31.28
2005	212.59	327.45	137.38	54.45	82.89	35.83
2006	255.18	395.03	157.95	64.37	97.94	41.03
2007	299.03	460.73	181.37	71.68	108.58	44.83
2008	341.74	521.42	205.91	76.97	115.71	47.70
2009	384.64	579.03	233.52	86.10	128.50	53.14
2010	443.73	662.30	262.73	95.44	141.73	57.10
2011	499.98	743.54	285.74	101.74	150.54	58.81
2012	560.82	828.46	310.82	111.03	163.48	62.04
2013	626.31	918.16	337.11	120.34	176.25	64.95
2014	705.50	1027.71	362.93	133.36	194.17	68.71
2015	787.67	1133.14	391.32	147.49	212.17	73.28
2016	887.11	1274.78	421.34	164.02	235.63	77.97
2017	987.83	1412.14	457.36	179.66	256.41	83.71

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
2018	1094.27	1554.28	496.50	194.99	276.68	88.83

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. Column 1 is nominal human capital in six-education categories. Column 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	561	561	27
1986	655	616	30
1987	752	658	34
1988	865	640	40
1989	996	625	46
1990	1156	701	54
1991	1309	755	65
1992	1484	801	81
1993	1673	781	105
1994	1876	706	123
1995	2119	667	139
1996	2407	688	156
1997	2738	760	172
1998	3074	862	186
1999	3501	1005	204
2000	3899	1124	236

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2001	4452	1233	272
2002	5015	1390	308
2003	5706	1565	355
2004	6349	1701	426
2005	7031	1852	493
2006	8161	2124	581
2007	9257	2284	681
2008	10394	2371	847
2009	11480	2586	973
2010	12804	2770	1161
2011	14439	2960	1406
2012	16013	3187	1650
2013	17635	3416	1909
2014	19165	3635	2193
2015	20402	3813	2440
2016	22400	4136	2738
2017	24567	4476	3075
2018	26840	4797	—

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 2018, the nominal human capital per capita increased from 28.7 thousand Yuan to 1.2 million Yuan, an increase of more than 40 times; and the real human capital per capita increased from 28.7 thousand Yuan to

214.6 thousand Yuan, an increase of approximately 6 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 2018, 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.
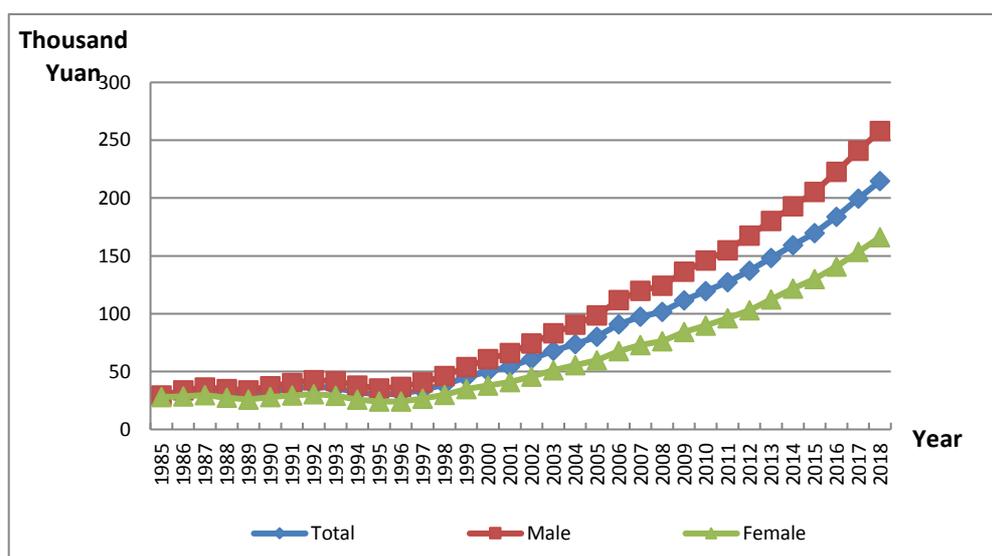
Figure GS-2.1 Human Capital Per Capita by Gender for Gansu，1985-2018

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	28.68	65.95	20.38	28.68	65.95	20.38
1986	33.28	78.81	22.49	31.26	73.65	21.22
1987	37.82	89.84	24.83	33.08	77.46	21.99
1988	42.54	98.56	27.64	31.47	70.46	21.11
1989	47.99	109.27	30.86	30.10	66.09	20.04
1990	54.32	122.30	34.52	32.95	72.59	21.41

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	61.06	137.90	38.22	35.23	77.44	22.68
1992	68.64	155.42	42.35	37.04	81.34	23.62
1993	76.74	173.20	47.00	35.85	78.68	22.64
1994	85.51	192.27	52.07	32.18	70.10	20.31
1995	95.66	215.47	57.63	30.10	66.07	18.68
1996	108.15	246.01	63.71	30.91	68.39	18.83
1997	123.00	284.41	70.53	34.15	76.91	20.26
1998	137.74	319.46	78.04	38.64	87.26	22.66
1999	156.66	368.44	86.09	44.97	103.54	25.46
2000	174.04	404.81	95.71	50.17	114.68	28.28
2001	195.96	440.62	105.79	54.28	121.19	29.63
2002	219.07	477.44	115.50	60.72	132.24	32.06
2003	247.75	522.95	128.43	67.93	143.55	35.15
2004	275.82	568.57	141.82	73.92	154.08	37.22
2005	303.86	604.10	155.60	80.02	161.76	39.64
2006	349.17	676.32	175.38	90.86	178.96	44.07
2007	395.67	746.04	196.13	97.63	187.65	46.36
2008	445.39	819.04	219.07	101.62	190.75	47.64
2009	495.78	894.34	246.10	111.71	206.43	52.36
2010	552.32	971.46	275.61	119.51	214.78	56.60
2011	620.56	1067.88	298.44	127.22	223.36	57.99
2012	689.81	1161.74	323.60	137.31	235.69	60.99
2013	765.28	1268.71	350.72	148.25	250.64	63.92
2014	839.26	1372.13	381.86	159.19	265.24	68.17
2015	907.85	1462.38	417.62	169.69	278.78	73.23
2016	995.32	1577.34	457.94	183.78	297.13	79.12
2017	1094.75	1705.85	505.83	199.45	316.90	86.27
2018	1201.09	1839.77	557.95	214.64	335.41	93.02

Figure GS-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
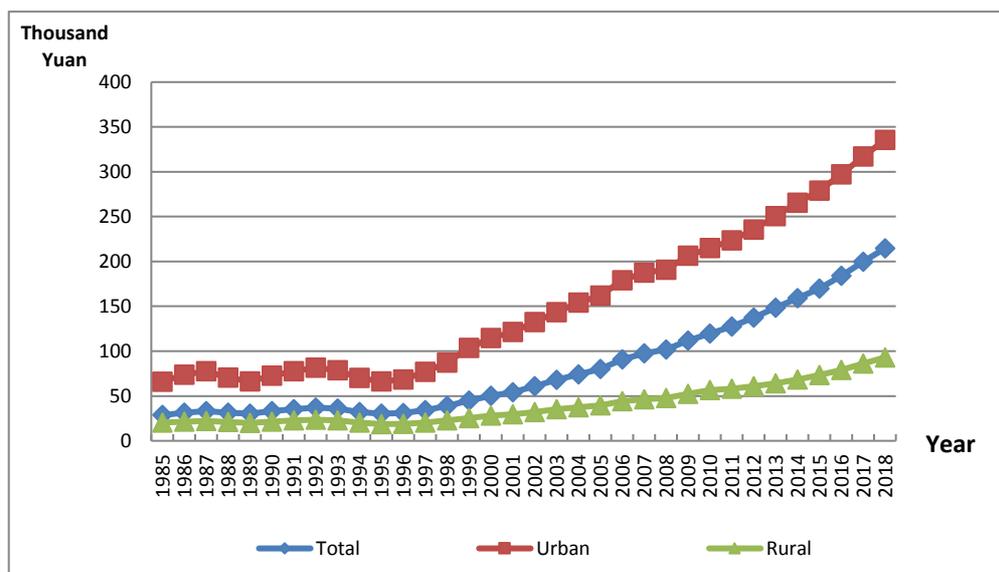

Figure GS-2.2 Real Human Capital Per Capita by Region for Gansu，1985-2018

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 2018, the nominal labor force human capital increased from 0.2 trillion Yuan to 11.9 trillion Yuan, an increase of more than 48 times; and the

real labor force human capital increased from 0.2 trillion Yuan to 2.1 trillion Yuan, an increase of approximately 8 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	242	242
1986	288	270
1987	343	300
1988	401	297
1989	473	297
1990	555	337
1991	631	365
1992	708	383
1993	788	369
1994	877	331
1995	973	307
1996	1089	312
1997	1205	336
1998	1337	376
1999	1477	426
2000	1642	475
2001	1809	502
2002	1977	548
2003	2173	596
2004	2331	623
2005	2615	685
2006	3079	797
2007	3555	872
2008	4049	918
2009	4505	1006
2010	5232	1124

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2011	5959	1213
2012	6698	1325
2013	7411	1425
2014	8105	1526
2015	8682	1610
2016	9735	1783
2017	10812	1955
2018	11921	2113

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 2018, the nominal average labor force human capital increased from 21.4 thousand Yuan to 735.9 thousand Yuan, an increase of more than 33 times; and the real average labor force human capital increased from 21.4 thousand Yuan to 130.4 thousand Yuan, an increase of approximately 5 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	21.44	47.83	15.37	21.44	47.83	15.37
1986	24.51	54.62	17.13	23.03	51.05	16.16
1987	27.99	62.06	19.12	24.49	53.50	16.93
1988	31.62	68.29	21.46	23.42	48.82	16.39
1989	35.78	75.31	24.15	22.47	45.55	15.68

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**
1990	40.39	82.85	27.20	24.53	49.18	16.87
1991	45.09	92.47	29.97	26.05	51.93	17.79
1992	50.00	102.29	32.95	27.02	53.53	18.38
1993	55.22	112.63	36.18	25.83	51.17	17.43
1994	60.89	123.63	39.83	22.96	45.07	15.54
1995	67.15	135.98	43.64	21.16	41.70	14.15
1996	74.70	152.04	48.20	21.39	42.27	14.25
1997	82.59	168.17	53.29	23.00	45.48	15.31
1998	91.21	184.99	58.98	25.68	50.53	17.13
1999	100.20	201.87	65.17	28.88	56.73	19.27
2000	110.46	220.84	72.31	31.95	62.56	21.36
2001	121.35	236.93	78.48	33.66	65.17	21.98
2002	132.42	253.39	84.71	36.71	70.18	23.51
2003	144.78	269.09	92.89	39.69	73.87	25.43
2004	155.38	280.21	101.93	41.50	75.93	26.75
2005	171.96	302.97	112.18	45.06	81.13	28.58
2006	200.62	352.87	126.93	51.94	93.37	31.89
2007	230.19	401.23	143.25	56.45	100.92	33.86
2008	260.77	447.69	161.36	59.10	104.26	35.09
2009	289.97	487.75	183.39	64.77	112.58	39.02
2010	332.43	551.90	206.73	71.44	122.02	42.46
2011	374.04	615.27	224.87	76.16	128.69	43.69
2012	417.62	679.62	245.44	82.60	137.88	46.26
2013	460.41	739.77	267.61	88.53	146.15	48.78
2014	502.47	795.29	292.89	94.60	153.73	52.28
2015	541.90	840.70	320.54	100.49	160.27	56.21
2016	601.00	924.65	352.84	110.10	174.18	60.96

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
2017	666.64	1014.76	391.23	120.53	188.52	66.72
2018	735.85	1107.89	433.15	130.43	201.98	72.21

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. Column 1 is nominal human capital in six-education categories. Column 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	120	120	11
1986	140	132	12
1987	160	141	13
1988	183	138	14
1989	208	133	15
1990	237	143	16
1991	274	154	17
1992	316	165	18
1993	363	168	19
1994	420	159	20
1995	479	154	21
1996	541	157	24
1997	617	171	27
1998	696	191	30
1999	787	217	34
2000	884	245	39
2001	1010	272	46

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	1126	296	53
2003	1252	322	62
2004	1386	345	71
2005	1533	378	81
2006	1741	422	92
2007	1955	445	104
2008	2181	451	118
2009	2479	498	137
2010	2795	533	163
2011	3182	570	195
2012	3561	618	239
2013	3966	661	299
2014	4378	709	367
2015	4783	753	442
2016	5223	808	519
2017	5670	862	597
2018	6122	908	—

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 2018, the nominal human capital per capita increased from 29.9 thousand Yuan to 1.2 million Yuan, an increase of approximately 39 times; and the real human capital per capita increased from 29.9 thousand Yuan to 175.2 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 2018, 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.
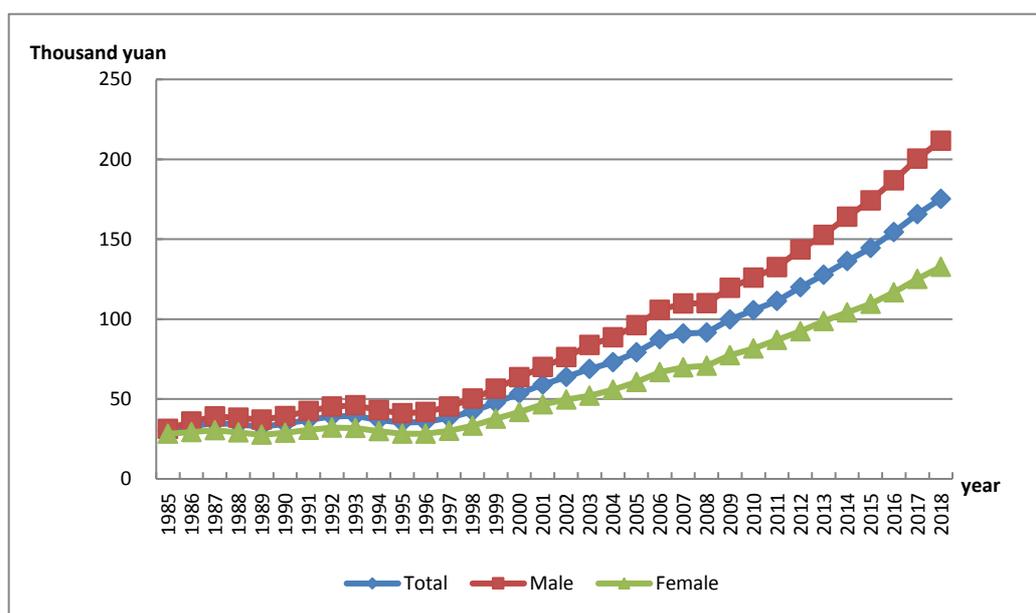
Figure QH-2.1 Human Capital Per Capita by Gender for Qinghai，1985-2018

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	29.86	56.86	20.76	29.86	56.86	20.76
1986	34.84	68.13	23.20	32.85	64.03	21.95
1987	39.57	76.55	25.94	35.02	66.74	23.33
1988	45.15	85.77	28.99	34.00	63.05	22.43
1989	51.02	95.89	32.47	32.65	60.09	21.29
1990	57.11	106.28	36.51	34.47	63.61	22.26

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	65.66	121.25	40.71	36.96	66.77	23.59
1992	74.96	137.23	45.42	39.13	69.58	24.69
1993	85.16	154.48	50.75	39.48	68.71	24.96
1994	97.31	176.75	56.86	36.88	63.81	23.17
1995	109.52	198.05	63.44	35.15	59.73	22.34
1996	122.39	220.08	70.45	35.57	59.58	22.81
1997	137.80	247.45	78.38	38.20	63.74	24.35
1998	153.89	274.82	86.92	42.29	70.37	26.74
1999	173.08	308.32	96.06	47.69	79.35	29.67
2000	193.16	340.45	107.29	53.46	87.97	33.34
2001	219.03	384.65	117.90	59.05	96.49	36.20
2002	242.45	421.96	127.99	63.70	103.68	38.19
2003	267.36	457.96	141.57	68.76	110.53	41.21
2004	293.30	496.12	155.51	72.98	117.28	42.91
2005	321.09	538.35	171.07	79.22	127.65	45.78
2006	359.60	588.81	191.65	87.27	137.14	50.73
2007	399.58	640.08	213.69	90.88	140.25	52.72
2008	443.00	697.47	236.17	91.54	140.33	51.88
2009	496.69	769.93	263.33	99.82	150.11	56.88
2010	552.92	843.87	291.75	105.45	156.54	59.57
2011	621.56	939.27	309.31	111.40	164.37	59.35
2012	690.34	1030.01	327.89	119.84	174.95	61.02
2013	766.42	1133.26	347.84	127.74	184.96	62.43
2014	842.27	1237.05	369.97	136.35	196.21	64.72
2015	916.47	1334.64	396.25	144.38	205.93	67.83
2016	998.69	1445.50	422.41	154.42	219.09	71.02
2017	1088.68	1566.11	451.48	165.59	233.40	75.09
2018	1181.60	1690.52	482.67	175.24	245.80	78.32

Figure QH-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
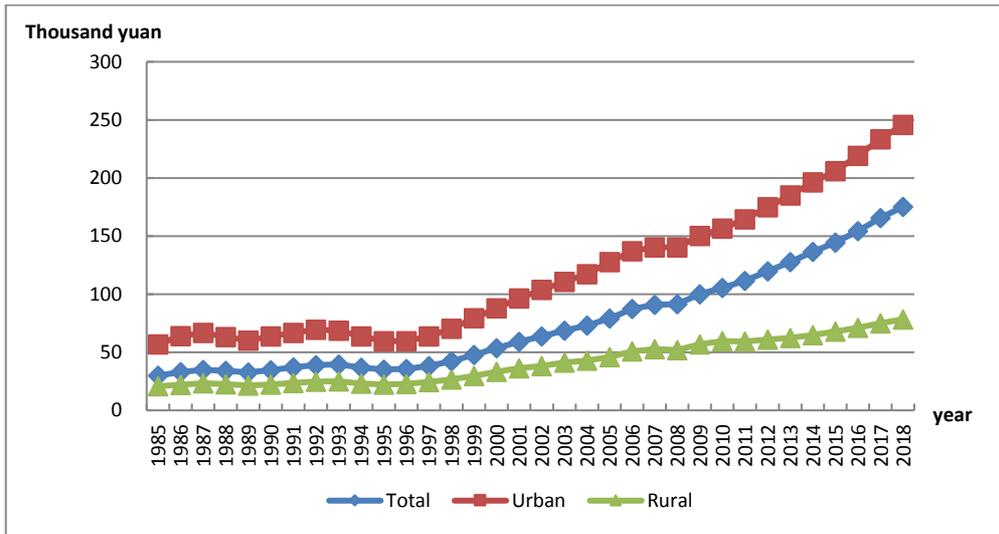
Figure QH-2.2 Real Human Capital Per Capita by Region for Qinghai，1985-2018

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 2018, the nominal labor force human capital increased from 51.0 billion Yuan to 2.8 trillion Yuan, an increase of more than 54 times; and the real labor force human capital increased from 51.0 billion Yuan to 424.0

billion Yuan, an increase of approximately 7 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	51	51
1986	58	55
1987	69	61
1988	82	62
1989	97	62
1990	114	69
1991	134	76
1992	156	82
1993	181	84
1994	207	79
1995	236	76
1996	266	78
1997	300	84
1998	338	94
1999	376	105
2000	419	117
2001	461	126
2002	505	135
2003	556	145
2004	613	154
2005	672	167
2006	772	189
2007	879	201
2008	990	205
2009	1133	229
2010	1310	251
2011	1472	265
2012	1644	287

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2013	1801	302
2014	1965	320
2015	2146	340
2016	2368	368
2017	2597	397
2018	2846	424

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 2018, the nominal average labor force human capital increased from 22.9 thousand Yuan to 764.8 thousand Yuan, an increase of more than 32 times; and the real average labor force human capital increased from 22.9 thousand Yuan to 114.0 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	22.91	42.61	16.51	22.91	42.61	16.51
1986	25.75	47.32	18.46	24.29	44.47	17.46
1987	29.61	54.19	20.69	26.24	47.25	18.60
1988	33.89	61.41	23.32	25.57	45.14	18.05
1989	38.67	69.30	26.34	24.78	43.43	17.27
1990	43.71	77.25	29.89	26.40	46.24	18.22
1991	49.96	87.94	33.35	28.18	48.42	19.33
1992	56.66	99.12	37.21	29.66	50.26	20.23
1993	64.14	111.40	41.57	29.85	49.55	20.45

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
1994	72.08	124.08	46.57	27.47	44.80	18.98
1995	80.63	137.86	51.86	26.07	41.58	18.27
1996	89.66	151.60	57.53	26.28	41.04	18.62
1997	99.62	166.58	63.90	27.88	42.91	19.85
1998	110.15	181.69	70.99	30.57	46.53	21.84
1999	120.89	196.82	78.32	33.70	50.65	24.19
2000	132.97	213.85	86.38	37.23	55.26	26.84
2001	146.05	234.23	93.71	39.94	58.76	28.77
2002	159.73	256.04	101.08	42.56	62.91	30.16
2003	174.78	277.47	110.77	45.58	66.97	32.25
2004	191.00	300.75	121.19	48.08	71.10	33.44
2005	207.36	323.50	132.10	51.61	76.70	35.35
2006	235.86	364.03	146.68	57.69	84.79	38.83
2007	265.95	405.50	162.33	60.84	88.85	40.05
2008	296.21	445.36	180.33	61.47	89.61	39.62
2009	332.78	493.76	202.19	67.23	96.27	43.68
2010	375.77	552.02	224.95	71.97	102.40	45.93
2011	415.75	608.46	236.89	74.84	106.48	45.46
2012	458.86	668.83	250.96	79.99	113.60	46.70
2013	498.78	722.89	266.63	83.54	117.99	47.85
2014	539.38	777.41	285.14	87.80	123.31	49.88
2015	582.68	831.72	304.87	92.34	128.33	52.18
2016	637.34	910.82	324.29	99.11	138.05	54.53
2017	697.99	997.61	346.30	106.78	148.68	57.59
2018	764.79	1093.85	369.00	114.03	159.04	59.87

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. Column 1 is nominal human capital in six-education categories. Column 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	158	158	11
1986	186	176	12
1987	213	188	13
1988	247	186	14
1989	284	183	14
1990	322	193	15
1991	375	212	16
1992	435	228	17
1993	500	229	17
1994	572	212	18
1995	648	205	19
1996	745	221	20
1997	870	248	21
1998	995	283	23
1999	1141	329	25
2000	1296	375	27
2001	1527	433	31

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	1738	495	34
2003	1967	550	40
2004	2204	594	46
2005	2497	662	54
2006	2950	766	64
2007	3402	837	75
2008	3876	879	90
2009	4438	999	110
2010	4910	1063	133
2011	5695	1159	155
2012	6462	1288	181
2013	7247	1396	211
2014	8058	1523	252
2015	8681	1621	302
2016	9570	1761	356
2017	10520	1905	401
2018	11486	2033	—

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 2018, the nominal human capital per capita increased from 38.7 thousand Yuan to 1.89 million Yuan, an increase of more than 47 times; and the real human capital per capita increased from 38.7 thousand Yuan to 333.6 thousand Yuan, an increase of approximately 8 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 2018, 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.
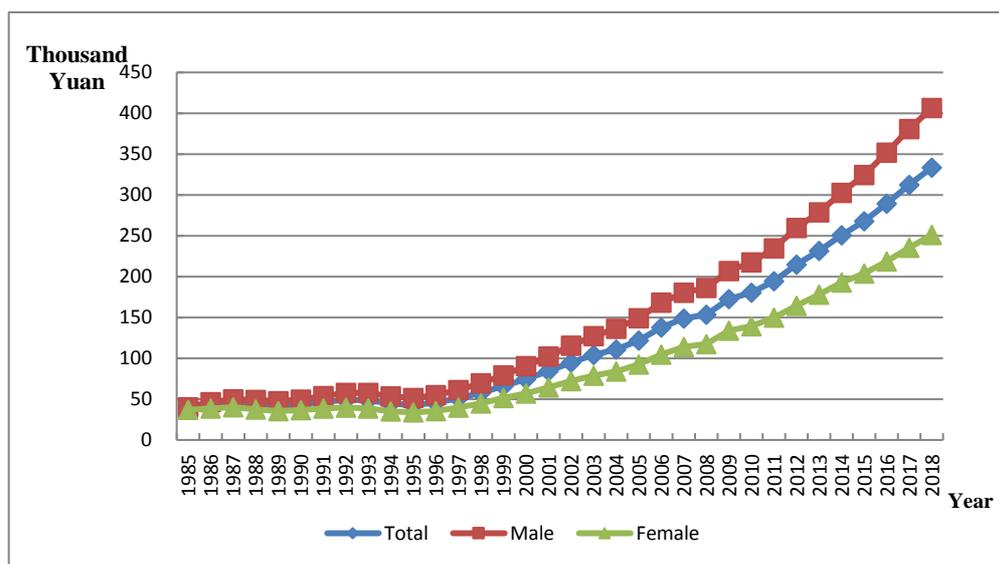
Figure NX-2.1 Human Capital Per Capita by Gender for Ningxia，1985-2018

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	38.73	72.22	28.08	38.73	72.22	28.08
1986	45.07	88.15	31.19	42.71	83.16	29.68
1987	51.32	101.57	34.49	45.23	87.19	31.17
1988	57.76	111.85	39.03	43.62	81.57	30.48
1989	65.10	124.45	44.10	41.88	78.11	29.06
1990	72.50	135.31	49.92	43.49	80.50	30.18
1991	82.70	154.48	55.84	46.74	85.97	32.06

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	94.03	174.36	62.42	49.23	88.78	33.65
1993	106.61	198.05	69.86	48.71	87.54	33.10
1994	120.48	223.81	77.79	44.62	79.26	30.31
1995	135.24	252.42	86.29	42.83	76.21	28.88
1996	154.11	287.32	96.01	45.65	81.38	30.06
1997	178.79	336.70	106.88	50.95	91.78	32.33
1998	201.99	376.69	119.09	57.52	102.69	36.10
1999	229.11	424.16	132.58	66.03	116.68	40.97
2000	257.69	466.59	149.35	74.51	128.73	46.38
2001	296.99	530.99	165.96	84.23	144.62	50.43
2002	332.91	581.60	183.24	94.78	159.20	56.02
2003	372.56	635.20	202.99	104.19	171.30	60.84
2004	412.03	680.63	224.28	110.96	177.69	64.33
2005	459.52	741.87	246.57	121.79	190.63	69.88
2006	531.32	843.33	275.34	137.92	213.09	76.26
2007	603.94	940.24	304.54	148.59	226.05	79.64
2008	677.73	1035.73	335.25	153.61	230.78	79.79
2009	766.51	1156.64	373.83	172.51	256.84	87.64
2010	834.14	1228.41	414.10	180.55	262.92	92.79
2011	955.91	1388.14	442.09	194.61	280.82	92.14
2012	1077.50	1543.01	473.38	214.73	305.44	97.02
2013	1200.85	1698.74	508.17	231.36	325.52	100.33
2014	1327.40	1860.89	550.32	250.82	349.60	106.95
2015	1433.64	1987.95	597.99	267.75	369.04	115.06
2016	1571.20	2162.25	643.42	289.18	395.47	122.33
2017	1725.82	2350.09	705.18	312.48	422.64	132.35
2018	1885.14	2549.81	763.32	333.64	448.68	139.50

Figure NX-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
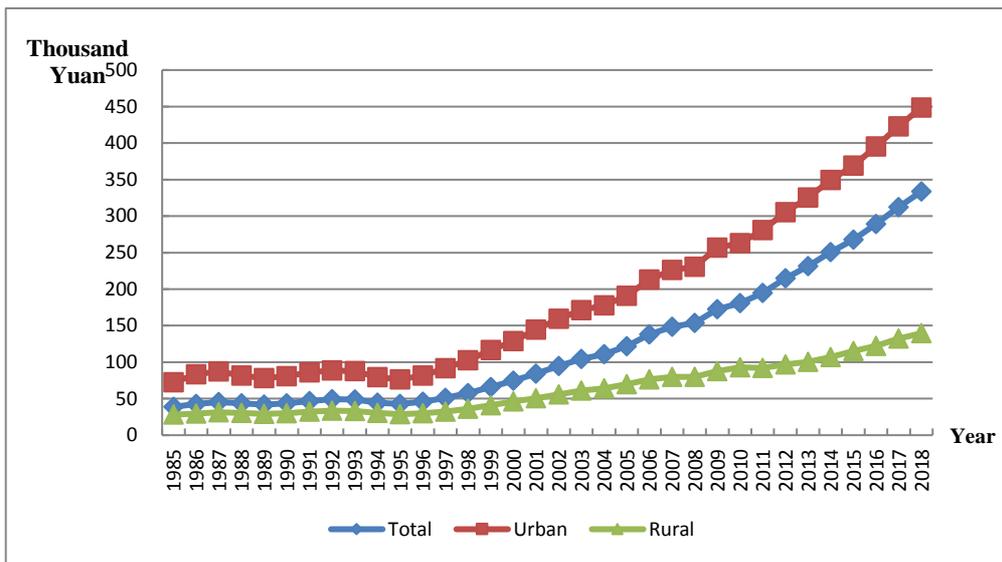
Figure NX-2.2 Real Human Capital Per Capita by Region for Ningxia，1985-2018

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 2018, the nominal labor force human capital increased from 59.0 billion Yuan to 4.5 trillion Yuan, an increase of more than 75 times; and

the real labor force human capital increased from 53.0 billion Yuan to 0.8 trillion Yuan, an increase of approximately 13 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	59	59
1986	67	64
1987	80	71
1988	95	72
1989	111	72
1990	129	77
1991	152	86
1992	180	94
1993	204	93
1994	234	87
1995	267	85
1996	310	92
1997	357	102
1998	408	117
1999	462	134
2000	523	152
2001	588	168
2002	652	187
2003	721	203
2004	805	218
2005	904	241
2006	1066	279
2007	1243	308
2008	1430	326
2009	1622	367
2010	1862	405
2011	2134	435

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2012	2393	478
2013	2667	515
2014	2988	566
2015	3266	612
2016	3644	673
2017	4063	738
2018	4500	799

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 2018, the nominal average labor force human capital increased from 27.2 thousand Yuan to 1068.8 thousand Yuan, an increase of more than 38 times; and the real average labor force human capital increased from 27.2 thousand Yuan to 189.7 thousand Yuan, an increase of approximately 6 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	27.23	46.50	20.69	27.23	46.50	20.69
1986	30.08	51.11	23.25	28.52	48.21	22.12
1987	34.04	58.38	26.11	30.11	50.11	23.59
1988	38.96	66.84	29.07	29.52	48.75	22.70
1989	44.49	75.94	32.45	28.66	47.66	21.38
1990	50.09	83.56	36.43	30.05	49.71	22.03
1991	56.97	95.52	40.74	32.21	53.16	23.39
1992	64.71	108.79	45.52	33.90	55.39	24.54

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**
1993	71.93	120.28	50.75	32.91	53.16	24.04
1994	80.40	133.99	56.55	29.86	47.46	22.03
1995	89.42	148.54	62.63	28.41	44.85	20.96
1996	101.61	168.37	70.07	30.20	47.69	21.94
1997	115.17	189.71	78.46	32.97	51.71	23.74
1998	129.27	210.41	87.94	37.02	57.36	26.66
1999	144.06	230.86	98.17	41.80	63.50	30.33
2000	160.70	253.87	109.46	46.78	70.04	34.00
2001	178.37	277.79	119.26	50.94	75.66	36.24
2002	196.14	301.31	129.45	56.23	82.48	39.57
2003	214.48	323.10	141.68	60.39	87.14	42.46
2004	235.83	348.60	155.87	63.92	91.01	44.71
2005	259.74	376.88	171.44	69.32	96.84	48.59
2006	299.03	432.24	192.37	78.15	109.22	53.28
2007	340.61	488.91	214.79	84.34	117.54	56.17
2008	382.94	543.90	240.29	87.26	121.19	57.19
2009	426.53	597.71	271.36	96.48	132.72	63.62
2010	476.54	657.47	303.12	103.54	140.72	67.92
2011	538.44	744.65	323.53	109.89	150.64	67.43
2012	598.68	823.82	347.44	119.66	163.07	71.21
2013	660.94	903.58	374.06	127.66	173.15	73.86
2014	728.72	988.78	410.67	138.09	185.76	79.81
2015	790.94	1060.12	448.17	148.16	196.80	86.23
2016	872.11	1169.98	480.50	161.00	213.98	91.36
2017	967.70	1293.28	525.68	175.78	232.58	98.66
2018	1068.75	1428.74	565.93	189.67	251.41	103.43

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. Column 1 is nominal human capital in six-education categories. Column 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	500	189	78
1986	601	226	91
1987	703	274	107
1988	809	322	159
1989	922	380	182
1990	1062	448	213
1991	1223	526	239
1992	1431	616	330
1993	1641	701	485
1994	1912	808	632
1995	2190	928	846
1996	2548	1063	1022
1997	2969	1209	1169
1998	3369	1370	1321
1999	3852	1542	1482
2000	4400	1734	1721
2001	5006	1915	1947

Year	Nominal Human Capital (Billions of Yuan)	Real Human Capital (Billions of 1985 Yuan)	Real Physical Capital (Billions of 1985 Yuan)
2002	5421	2075	2210
2003	5950	2288	2602
2004	6523	2516	3182
2005	7053	2765	3745
2006	8309	3372	4348
2007	9572	3990	5135
2008	10999	4669	6368
2009	12448	5314	7103
2010	14134	6174	8458
2011	15803	6850	10278
2012	17671	7578	11918
2013	19780	8366	13747
2014	22028	9248	15783
2015	24524	10215	17447
2016	27147	11259	19603
2017	29965	12393	23106
2018	32939	13582	—

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 2018, the nominal human capital per capita increased from 36.8 thousand Yuan to 1.5 million Yuan, an increase of about 39 times; and the real human capital per capita increased from 36.8 thousand Yuan to 0.3 million Yuan, an increase of approximately 6 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 2018, 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.
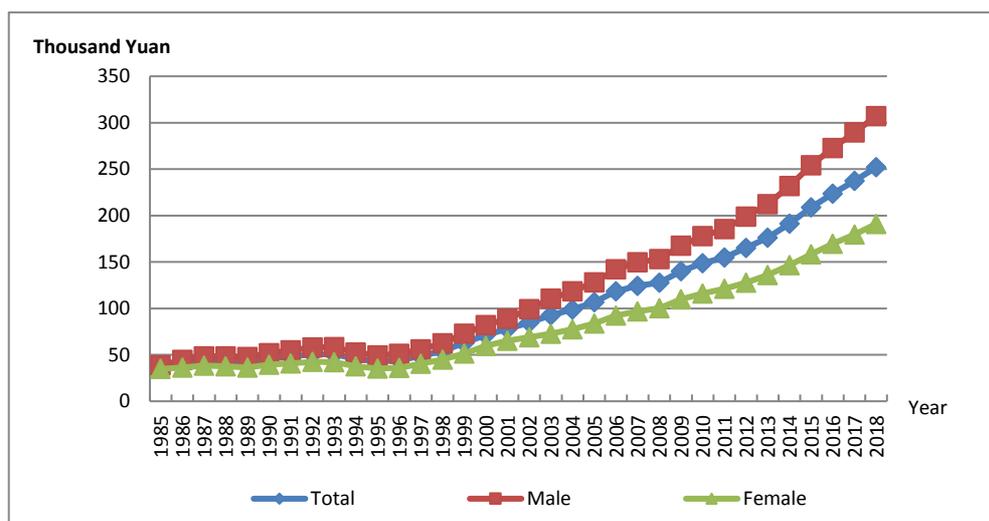
Figure XJ-2.1 Human Capital Per Capita by Gender for Xinjiang，1985-2018

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	36.84	64.95	24.92	36.84	64.95	24.92
1986	43.57	79.72	27.69	40.63	74.09	25.93
1987	49.98	92.05	30.90	43.55	78.56	27.68
1988	56.84	104.92	34.50	43.19	76.53	27.70
1989	64.59	119.18	38.52	42.24	75.92	26.14
1990	73.93	136.28	43.41	45.98	83.08	27.82
1991	84.19	156.08	48.24	48.12	87.05	28.65
1992	96.59	180.55	53.85	50.77	92.13	29.72

Year	Nominal Human Capital Per Capita (Thousands of Yuan)			Real Human Capital Per Capita (Thousands of 1985 Yuan)		
	Total	Urban	Rural	Total	Urban	Rural
1993	108.81	204.39	60.20	50.84	91.81	29.99
1994	123.82	236.11	67.37	45.57	83.05	26.72
1995	139.19	265.60	75.32	42.69	78.91	24.39
1996	158.86	307.95	83.19	44.05	82.87	24.35
1997	181.99	357.91	91.87	48.64	93.06	25.89
1998	203.30	401.25	101.41	54.19	104.43	28.35
1999	229.30	454.50	111.84	62.73	121.08	32.30
2000	259.41	513.89	124.19	71.46	136.76	36.74
2001	293.82	576.11	137.38	77.76	147.42	39.16
2002	318.70	613.68	150.31	84.73	158.78	42.46
2003	349.27	656.74	167.85	92.51	169.08	47.32
2004	383.52	708.06	185.46	98.74	178.54	50.04
2005	417.28	754.18	204.31	106.59	189.04	54.47
2006	469.27	830.26	228.26	118.26	206.04	59.66
2007	519.80	899.82	253.68	124.31	213.49	61.85
2008	576.92	980.58	281.15	127.82	216.82	62.60
2009	637.05	1068.00	312.36	140.20	235.77	68.19
2010	703.66	1159.98	344.75	148.64	247.18	71.14
2011	775.61	1273.41	369.45	154.88	257.21	71.38
2012	857.45	1406.04	396.57	165.20	274.72	73.19
2013	949.55	1554.97	426.76	176.10	292.42	75.65
2014	1042.17	1708.06	461.68	191.29	320.15	78.96
2015	1142.18	1868.14	500.60	208.64	348.41	85.11
2016	1241.17	2017.23	548.75	223.64	371.02	92.10
2017	1347.00	2176.56	604.52	237.24	390.94	99.66
2018	1458.97	2341.07	667.39	251.97	413.05	107.45

Figure XJ-2.2 shows the trend of real human capital per capita by region. From 1985 to 2018, the real human capital per capita in the urban area remains larger than that in the rural area. Since 1997, the growths 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.
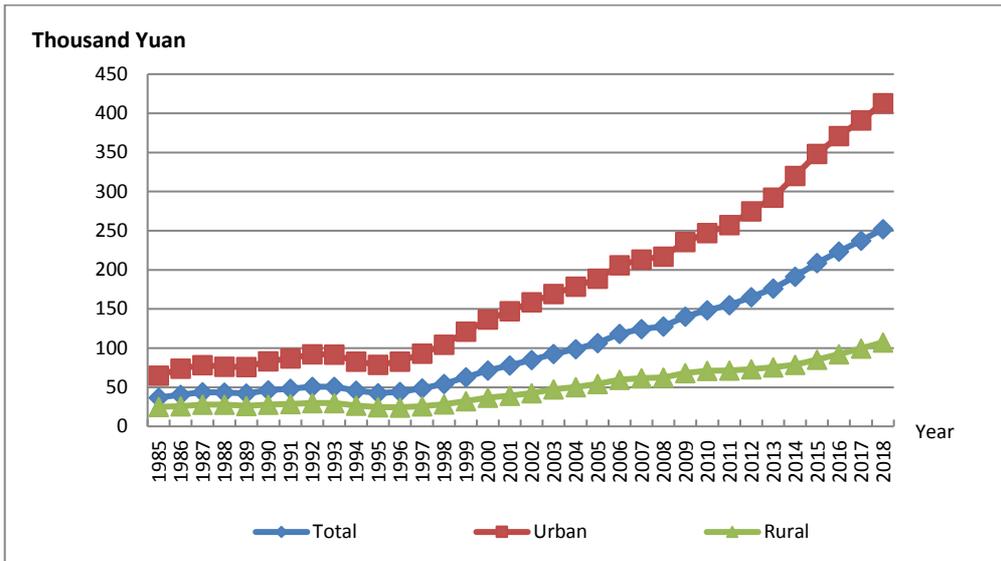
Figure XJ-2.2 Real Human Capital Per Capita by Region for Xinjiang 1985-2018

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 2018, the nominal labor force human capital increased from 0.2 trillion Yuan to 13.6 trillion Yuan, an increase of more than 70 times; and

the real labor force human capital increased from 0.2 trillion Yuan to 2.3 trillion Yuan, an increase of approximately 11 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	189	189
1986	226	210
1987	274	238
1988	322	245
1989	380	249
1990	448	278
1991	526	301
1992	616	324
1993	701	328
1994	808	299
1995	928	285
1996	1063	296
1997	1209	325
1998	1370	367
1999	1542	425
2000	1734	482
2001	1915	512
2002	2075	556
2003	2288	612
2004	2516	652
2005	2765	711
2006	3372	854
2007	3990	957
2008	4669	1035
2009	5314	1168

Year	Nominal Labor Force Human Capital (Billions of Yuan)	Real Labor Force Human Capital (Billions of 1985 Yuan)
2010	6174	1301
2011	6850	1363
2012	7578	1453
2013	8366	1543
2014	9248	1684
2015	10215	1851
2016	11259	2012
2017	12393	2167
2018	13582	2329

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 2018, the nominal average labor force human capital increased from 26.8 thousand Yuan to 877.9 thousand Yuan, an increase of more than 31 times; and the real average labor force human capital increased from 26.8 thousand Yuan to 150.6 thousand Yuan, an increase of approximately 5 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	26.78	42.71	19.03	26.78	42.71	19.03
1986	30.77	49.72	21.08	28.70	46.21	19.74
1987	35.84	58.22	23.62	31.24	49.69	21.17
1988	40.83	66.30	26.60	31.04	48.36	21.35
1989	46.70	75.76	29.94	30.54	48.26	20.32

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
1990	53.57	86.21	34.07	33.32	52.55	21.83
1991	60.71	98.52	38.01	34.72	54.95	22.58
1992	68.91	112.97	42.31	36.26	57.65	23.35
1993	76.54	126.14	47.29	35.84	56.66	23.56
1994	85.39	141.81	53.20	31.56	49.88	21.10
1995	95.71	159.45	59.70	29.45	47.37	19.33
1996	106.42	178.38	66.20	29.64	48.00	19.38
1997	118.26	198.86	73.35	31.78	51.71	20.67
1998	130.56	219.36	81.25	34.98	57.09	22.71
1999	143.64	240.58	89.58	39.55	64.09	25.87
2000	158.55	263.70	99.40	44.09	70.18	29.41
2001	174.64	288.31	109.22	46.71	73.78	31.13
2002	189.92	311.96	119.46	50.93	80.72	33.75
2003	208.60	338.26	132.85	55.76	87.08	37.45
2004	228.50	366.22	146.97	59.24	92.34	39.65
2005	250.62	394.96	162.82	64.43	99.00	43.41
2006	288.01	451.47	182.71	72.93	112.04	47.76
2007	324.01	502.67	203.62	77.68	119.26	49.65
2008	361.49	553.78	226.14	80.14	122.45	50.35
2009	397.47	599.98	251.15	87.38	132.45	54.83
2010	443.43	662.36	276.61	93.43	141.14	57.08
2011	483.00	723.88	296.71	96.09	146.21	57.33
2012	526.93	794.11	318.49	101.01	155.16	58.78
2013	574.99	870.95	342.00	106.07	163.79	60.63
2014	626.23	952.47	367.94	114.01	178.52	62.93
2015	682.71	1040.91	396.73	123.69	194.13	67.45
2016	741.39	1127.40	430.65	132.52	207.36	72.28

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
2017	807.20	1223.89	469.02	141.16	219.83	77.32
2018	877.92	1326.32	511.33	150.56	234.01	82.32

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. Column 1 is nominal human capital in five-education category[42]. Column 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)
1997	10273	4048
1998	10974	4204
1999	11633	4644
2000	12854	5328
2001	13857	5841
2002	14586	6342
2003	15369	6854
2004	16554	7415
2005	17687	7852
2006	18857	8199
2007	20478	8733
2008	22705	9286
2009	24051	9777
2010	25839	10264
2011	27982	10559
2012	30666	11121

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[42] Hong Kong's census data does not have population data with undergraduate education, so only five types of education can be calculated for human capital. The actual value is obtained by dividing the nominal value by the CPI calculated based on 1985.

Year	Nominal Human Capital (Billions of HKD)	Real Human Capital (Billions of 1985 HKD)
2013	33836	11759
2014	36397	12112
2015	40037	12940
2016	42804	13511
2017	46837	14569
2018	50375	15303

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 1997 to 2018, the nominal human capital per capita increased from 1887.6 thousand HKD to 9.1 million HKD, an increase of more than 4 times; and the real human capital per capita increased from 743.9 thousand HKD to 2748.4 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 1997 to 2018, and the growths of human capital for male and female both accelerated, with female's growth rate higher than male's in recent years.
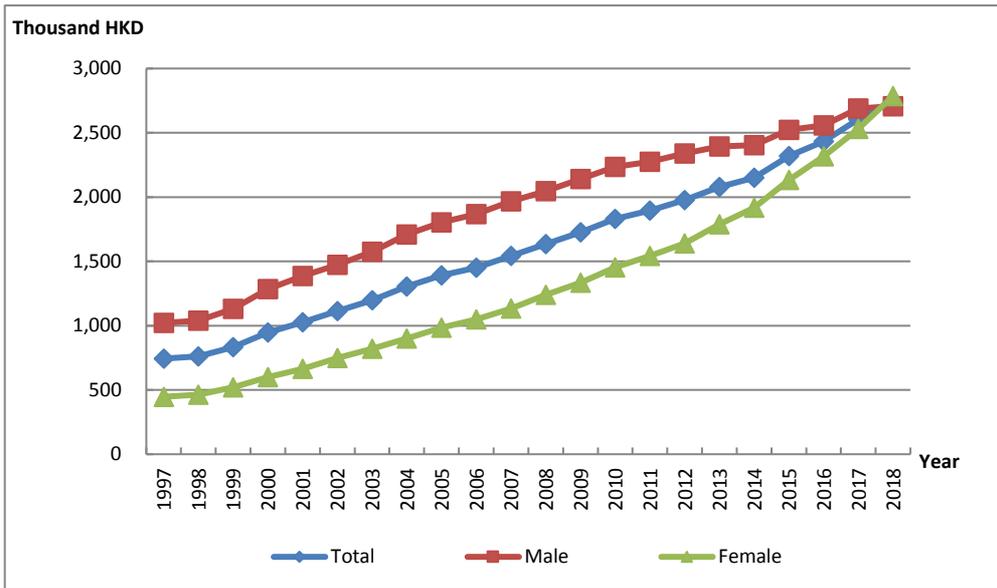
Figure HK-2.1 Human Capital Per Capita by Gender for Hong Kong, 1997-2018

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 1997 to 2018, the nominal labor force human capital increased from 7.4 trillion HKD to 39.6 trillion HKD, an increase of more than 4 times; and the real labor force human capital increased from 2.9 trillion HKD to 12.0 trillion HKD, an increase of approximately 3 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)
1997	7365	2903
1998	7867	3014
1999	8420	3361
2000	9250	3834
2001	10013	4221
2002	10590	4604
2003	11238	5011
2004	12179	5455
2005	13137	5832
2006	14185	6167
2007	15585	6646
2008	17226	7045
2009	18416	7486
2010	19955	7927
2011	21797	8225
2012	23965	8691
2013	26423	9183
2014	28424	9459
2015	31003	10020
2016	33616	10611
2017	36633	11395
2018	39557	12017

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 1997 to 2018, the nominal

average labor force human capital increased from 1.6 million HKD to 7.0 million HKD, an increase of more than 3 times; and the real average labor force human capital increased from 614.5 thousand HKD to 2.1 million HKD, an increase of approximately 2 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. Column 1 is nominal human capital in five-education categories. Column 2 is real human capital in five-education categories.

<p align="center">Table TW-1.1   Nominal and Real Human Capital for Taiwan</p>

Year	Nominal Human Capital (Billions of HKD)	Real Human Capital (Billions of 1985 HKD)
1997	166396	119349
1998	168575	118916
1999	174293	122733
2000	174182	121136
2001	167387	116419
2002	161175	112325
2003	166408	116296
2004	166565	114564
2005	170320	114493
2006	167963	112237
2007	170351	111823
2008	169969	107773
2009	167332	107038
2010	166386	105414
2011	165655	103482
2012	164889	101053
2013	164700	100140
2014	165787	99608

Year	Nominal Human Capital (Billions of HKD)	Real Human Capital (Billions of 1985 HKD)
2015	166717	100474
2016	164678	97883
2017	159775	94385
2018	158918	92626

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 1997 to 2018, the nominal human capital per capita increased from 8.2 million NTD to 8.5 million NTD, an increase of 0.04 times; and the real human capital per capita increased from 5.9 million NTD to 5.0 million NTD, a decrease of 0.15 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 1997 to 2000, and the growths of human capital for male and female both accelerated. But from 2000 to 2018, the real human capital per capita of male and female tend to be flat or even declining.
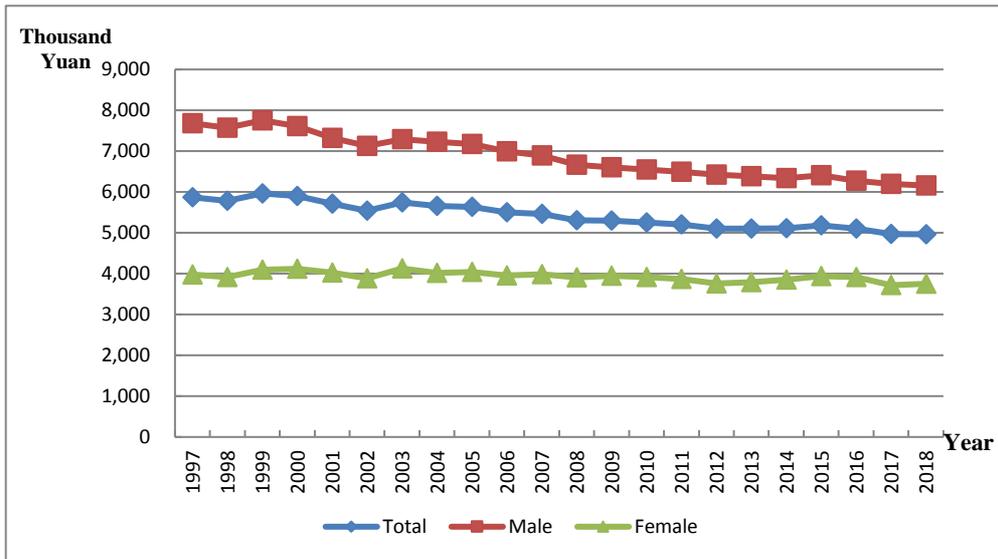
Figure TW-2.1 Human Capital Per Capita by Gender for Taiwan, 1997-2018

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 1997 to 2018, the nominal labor force human capital increased from 90.1 trillion NTD to 104.2 trillion NTD, an increase of 0.16 times; and the real labor force human capital increased from 64.6 trillion NTD to 60.7 trillion NTD, an decrease of 0.06 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)
1997	90089	64617
1998	92450	65216
1999	96080	67657
2000	96367	67019
2001	92170	64105
2002	89922	62668
2003	95601	66812
2004	97271	66904
2005	100170	67337
2006	99422	66437
2007	100979	66285
2008	102328	64884
2009	101354	64833
2010	102241	64775
2011	102621	64106
2012	103147	63214
2013	103525	62944
2014	104762	62943
2015	105431	63539
2016	105164	62508
2017	104182	61544
2018	104179	60721

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 1997 to 2018, the nominal average labor force human capital increased from 6.9 million NTD to 7.6 million NTD, an increase of 0.10 times; and the real average labor force human

capital increased from 5.0 million NTD to 4.4 million NTD, a decrease of 0.11 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/renkoupu cha /2000pucha/pucha.htm • 2005, http://www.stats.gov.cn/tjsj/ndsj/renkou/2	

Data	Sources	Notes
	005 /renkou.htm • 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/2 005 /renkou.htm • 2010, *China 2010 Census and China Demographic Statistics Yearbook* 2012 • 2015, *China 2015 1% Demographic*	We assume that the population aged 0-6years receive no schooling

Data	Sources	Notes
	Sampling Survey edited by Department of 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, 1994-2018	• *China Demographic Statistics Yearbook：1988-2019*	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:	• *Educational Statistics yearbook of China.1987* edited by the Plan and Finance Bureau of National Educational	*Part of Educational Statistics Yearbook of China.* are

Data	Sources	Notes
1980-2018	Committee • *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. 1998-2018*edited by the Plan and Development Department of National Educational Ministry	downloaded fromhttp://www.cnki.net/.
National, urban and rural population and birth rate for each year	• *China Statistics Yearbook 2019.* • *Statistics Summary for 56 years in China.* China Statistics Press	
Students by age, grade of primary and junior school: 2003-2018	• *Educational Statistics yearbook of China.2003-2018,* 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 • 1985-2018Census and Statistics Department of Hong Kong	
Total population	• 1980-2018, Hong Kong *Statistics Yearbook*	It is the resident population.
Enrollment by education level	• 1985-2018, Hong Kong Education Bureau	
Mortality rate by age and sex	• Hong Kong Mortality Table	
Birth by sex	• 1985-2018, Hong Kong *Statistics Yearbook*	
Employment rate by age, sex and education level	• 1985-2018, Hong Kong Census and Statistics Department	
Consumer Price Index (CPI)	• 1981-2018, 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)"; In 1999-2000, based on "standard industrial classification (the seventh edition)"; In 2001-2011, based

Data	Sources	Notes
		on "Standard industrial Classification (the eighth edition)"; In 2012-2019, 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.[44] 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 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

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[44] See Zhang, Weimin and Hongyan Cui (2003),"The estimation accuracy of China Census 2000", *Population Research*, Vol.27, No.4 (July), pp.25-35.

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 2018, the female enrollment data for university and college is available in the statistic yearbooks. The enrollment of 2018 is obtained by using method of line fitting from 2012 to 2017.

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 2018, 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

A simplified method was used to estimate the age distribution ratio λ. We assume that the enrollment age of primary school, junior high school, senior high school, junior college and above are 7, 13, 16 and 19 respectively:

Table A1.3.2 Enrollment age distribution ratio λ

Age	Primary school	Junior middle school	senior middle school	university
5				
6				
7	1			
8				
9				
10				
11				
12				
13		1		
14				
15				
16			1	

3.3 Method of imputing population data: 1985-2018

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: 1985-2018

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 2018, birth rate for each year from 1983 to 2018, national, rural and urban population by age and gender from the population sampling surveys for 1987 and each year from 1989 to 2018.

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 region.

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

$Exp = \text{Age}–16$, if $Sch <10$

$Exp = \text{Age}–Sch–6$, 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, 2007 and 2013, and urban parameters for 1999.

(4) [45]We use CHNS to obtain urban parameters for 2000, 2004, 2006, 2009, 2011 and 2015, and rural parameters for 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009, 2011 and 2015.

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[45] 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.

(5) We use CHFS to obtain urban and rural parameters for 2010, 2012, 2014 and 2016.

(6) We use CFPS to obtain urban and rural parameters for 2010, 2012, 2014, 2016 and 2018.

(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-agricultural income and agricultural 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 are students, unemployed persons, persons with disabilities, scholars to be promoted, or housewives;

(3) Discard individuals whose value of year of schooling, age and sex is missing;

(4) Drop individual whose wage is negative or zero;

(5) First Occupation: We delete samples who's nature of the work is

self-employed, paid family workers, and in the urban sample, we discard individuals, who are private business owner;

(6) Income range: Keep individuals who's income are between 1/20 and 15 times the average income.

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

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) Family agricultural production and management: Urban sample households engaged in agricultural production were deleted samples.

(8) 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, and 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 $\alpha, \beta, \gamma, \delta$ 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 2018.

Tables and figures of appendix B

Table B.1 Micro Datasets

Year	UHS	CHIP	CHNS	CHFS	CFPS	CLDS
1985	U					
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			

Year	UHS	CHIP	CHNS	CHFS	CFPS	CLDS
2012				U/R	U/R	
2013		U/R				
2014				U/R	U/R	U/R
2015			U/R			
2016				U/R	U/R	
2017						
2018					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.
	inc	1486.532	548.3841	1243.416	446.7642
1986	Sch	10.47865	2.919399	9.764368	2.788257
	Exp	20.47541	11.05743	17.80029	9.503479
1987	inc	1543.903	611.6541	1293.861	495.0336
	Sch	10.60941	2.911555	9.841867	2.710019
	Exp	21.04009	10.88748	18.42951	9.460324
1988	inc	1978.878	850.5979	1641.855	714.4136
	Sch	10.77356	2.931209	9.940273	2.766294
	Exp	20.67055	10.90293	17.99023	9.373456
1989	inc	2265.281	1012.228	1896.05	867.0767
	Sch	10.92746	2.965865	10.11012	2.690659
	Exp	20.8418	10.94331	18.31607	9.332533

1990	inc	2492.834	1087.999	2095.215	926.8817
	Sch	11.09685	2.925453	10.2875	2.701699
	Exp	21.2045	10.79883	18.541	9.304266
1991	inc	2739.452	1165.517	2329.817	1008.187
	Sch	11.26714	2.945501	10.50215	2.65431
	Exp	20.72	10.51704	18.24979	9.01576
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
1995	inc	7187.35	4701.14	6033.56	4018.84
	Sch	11.61	2.72	10.97	2.48
	Exp	21.49	10.26	19.23	8.94
1996	inc	7969.58	5466.77	6683.32	4888.78
	Sch	11.64	2.69	11.07	2.43
	Exp	21.80	10.28	19.58	8.96
1997	inc	8554.39	6037.77	7107.18	5311.87
	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 | Varia bles | Urban | | | | Rural | | | |
| | | Male | | Female | | Male | | Female | |
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1989	inc					1398.24	1259.78	1199.39	1074.94
	Sch					6.30	4.04	4.64	4.34
	Exp					17.88	11.47	16.19	10.32
1991	inc					1468.11	1306.13	1260.93	1139.13
	Sch					6.72	3.92	4.86	4.32
	Exp					18.41	11.51	17.09	10.45
1993	inc					2104.87	1911.41	1752.71	1491.15
	Sch					7.11	3.71	5.26	4.29
	Exp					19.28	11.55	17.99	10.32
1997	inc					4517.69	3818.30	3588.66	2958.12
	Sch					7.37	3.51	5.51	4.20
	Exp					20.60	11.57	19.33	10.58
2000	inc	10112.61	10832.57	8216.76	8367.89	5332.65	4511.72	4166.85	3346.32
	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
2004	inc	14440.98	11543.27	13080.04	10584.54	7254.25	6479.61	5722.63	4963.01
	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
2006	inc	19009.48	21177.45	15916.35	16025.81	10173.17	8371.42	7480.72	6806.45
	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
2009	inc	26775.71	27500.44	21608.55	20930.16	14634.10	11684.12	12023.12	9507.12
	Sch	11.69	2.88	12.00	2.76	8.32	3.33	7.31	4.11
	Exp	25.64	9.96	21.36	9.43	26.31	10.93	23.91	9.71
2011	inc	39813.88	38432.37	36982.66	36946.27	21927.65	17409.49	16949.41	13000.58
	Sch	12.74	3.16	13.26	3.10	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	24164.65	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.
1988	inc	1933.25	947.00	1632.07	834.47	953.01	880.75	852.15	761.52
	Sch	10.70	2.92	10.00	2.75	7.16	3.28	5.02	3.88
	Exp	20.96	10.97	18.25	9.43	18.33	12.39	15.41	10.88
1995	inc	6661.15	3771.24	5440.83	3059.29	4536.05	3533.31	4293.76	3115.17
	Sch	11.58	2.85	10.85	2.72	7.95	2.82	6.27	3.41
	Exp	22.46	10.80	20.59	9.65	21.26	11.92	20.05	11.17
1999	inc	9431.35	5666.40	7757.61	5112.18				
	Sch	12.05	2.74	11.74	2.57				
	Exp	22.72	10.09	20.74	9.18				
2002	inc	12428.98	7905.79	10016.43	7252.22	5250.24	5049.25	3694.44	3794.98
	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
2007	inc	31521.57	29229.78	23380.43	17992.01	13677.31	9934.99	10136.26	7731.68
	Sch	12.78	3.03	12.86	2.87	10.54	2.38	7.55	2.52
	Exp	21.49	11.07	17.62	9.74	22.37	12.81	19.39	11.36
2013	inc	46024.87	33002.89	35958.59	25805.72	21041.66	16491.36	19709.65	15149.22
	Sch	12.65	3.06	12.84	3.05	9.16	2.60	8.66	3.11
	Exp	21.96	10.89	18.75	9.61	22.70	12.34	20.95	11.02

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	11807.60	12406.63	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	39021.10	30071.84	29781.15	32905.47	21970.64	20413.34	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	45882.20	43892.81	34634.79	36429.07	26768.87	23875.00	18950.96	18700.14
	Sch	9.31	4.23	9.58	4.48	6.43	3.97	6.33	4.76
	Exp	19.27	12.37	16.89	11.09	24.86	12.20	21.78	12.07
2018	Inc	55012.92	42880.99	41629.23	33770.06	26697.59	21397.82	16266.97	16007.60
	Sch	11.00	3.36	11.43	3.53	8.22	2.75	7.27	3.31
	Exp	21.19	11.66	18.98	10.35	26.74	11.63	25.50	10.46

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	38350.09	50580.68	30434.63	31834.97	9876.40	12050.69	6545.16	9460.94
	Sch	11.85	3.50	11.96	3.57	8.02	3.02	6.67	3.54
	Exp	21.70	10.26	18.50	8.91	28.05	10.30	25.07	9.44
2012	inc	46309.61	50884.25	37000.66	38612.57	17501.20	16639.32	12178.25	12480.30
	Sch	12.44	3.38	12.72	3.48	8.59	3.09	7.57	3.71
	Exp	19.52	11.24	16.07	9.97	22.72	12.40	20.85	11.27

Year	Variables	Urban				Rural			
		Male		**Female**		**Male**		**Female**	
		Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
	inc	53131.18	35959.70	45585.92	31525.14	25846.90	19064.36	21018.34	15456.64
2014	Sch	12.36	3.43	12.82	3.47	9.18	2.99	8.58	3.61
	Exp	20.25	11.19	16.67	9.84	21.99	12.46	19.85	11.64
	inc	62335.44	57570.01	52939.53	46608.30	27777.48	21441.46	21866.89	18427.60
2016	Sch	12.19	3.45	12.68	3.60	8.89	2.99	8.14	3.77
	Exp	21.47	11.45	18.08	10.09	23.90	12.26	22.48	11.42

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.**
	inc	49140.28	46818.38	39476.19	41543.86	26174.77	33250.29	18752.97	31854.3
2014	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

$y = 0.0004x^2 - 1.3331x + 1226.7$

urban male intercept

$y = -0.0001x^2 + 0.5451x - 547.01$

urban male return to education

$y = 0.0006x^2 - 2.4213x + 2312.3$

urban female intercept

$y = -0.0002x^2 + 0.6452x - 646.74$

urban female return to education
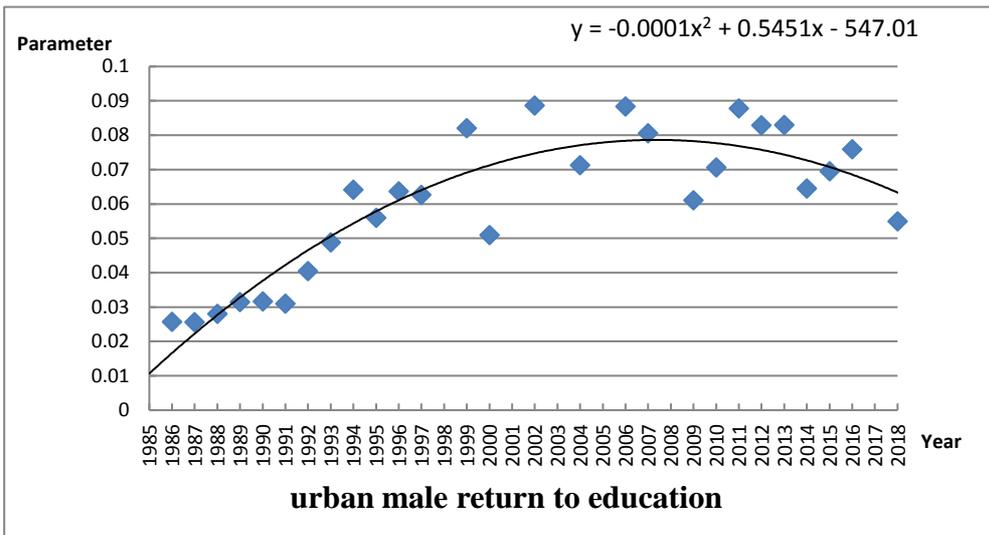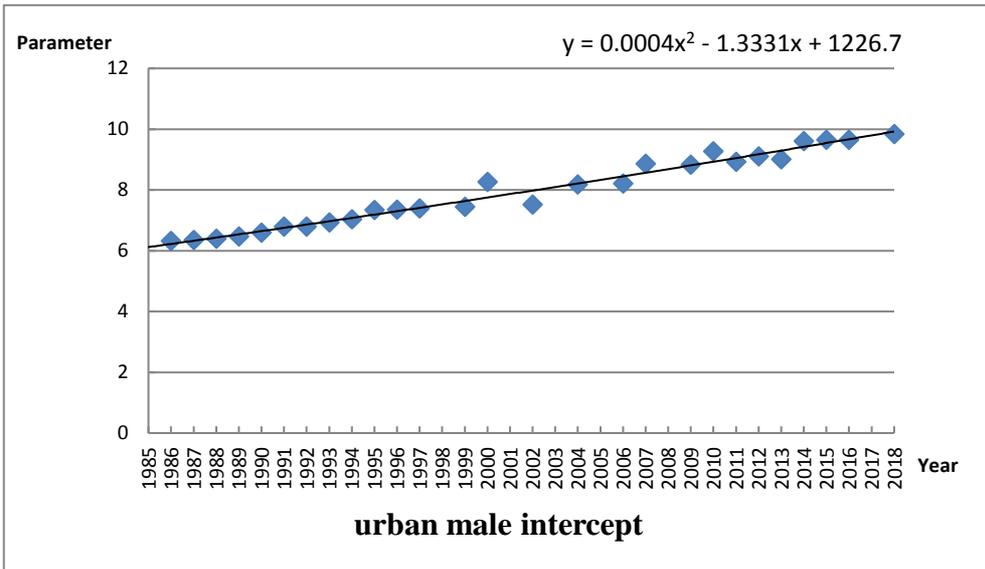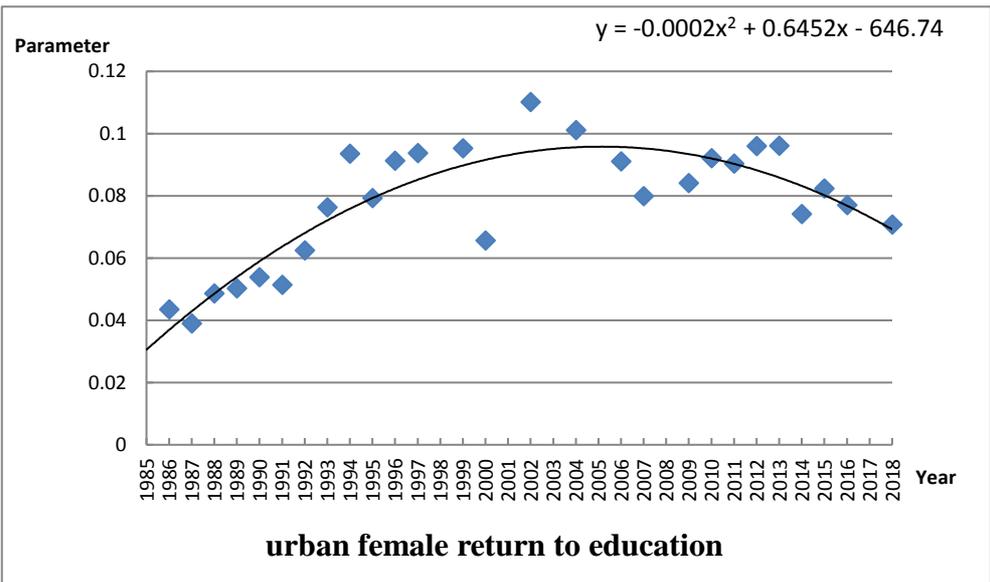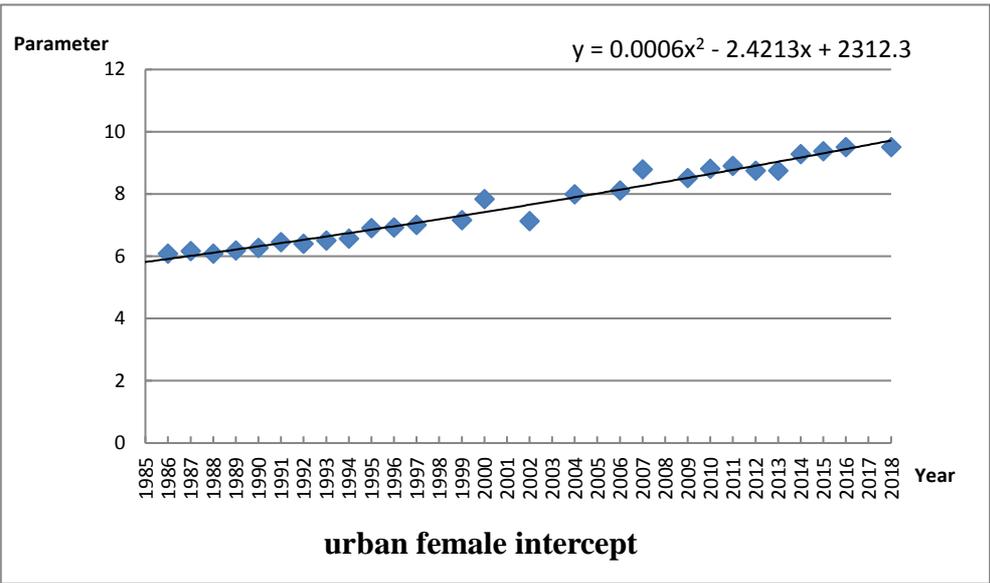
Figures B.5-B.8 Parameter Estimates Against Time: Rural Samples

$y = 0.0004x^2 - 1.6265x + 1512.5$

rural male intercept

$y = -7E-05x^2 + 0.2612x - 262.33$

rural male return to education

y = -0.0002x² + 1.0805x - 1192.1

rural female intercept

y = -2E-05x² + 0.0785x - 79.743

rural female return to education
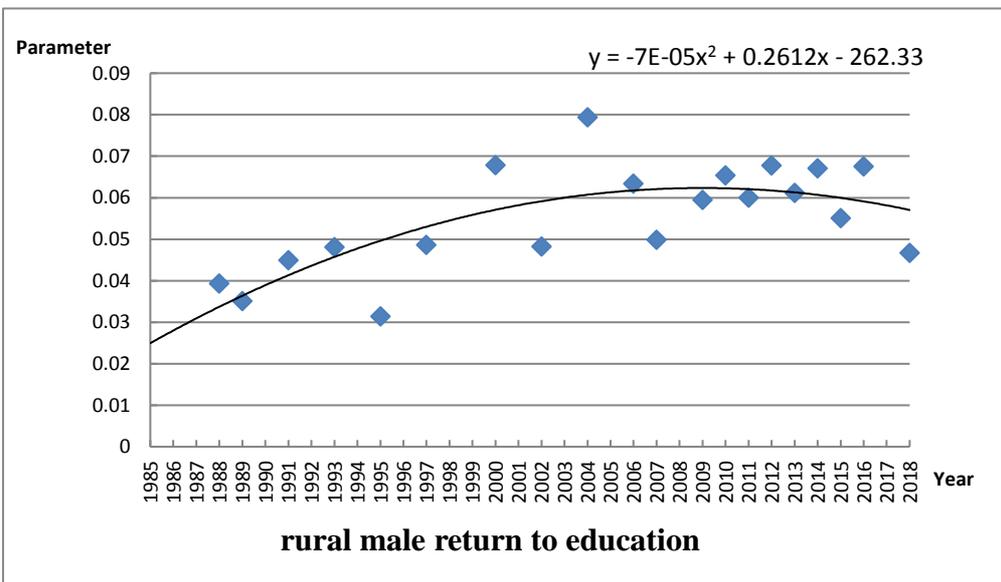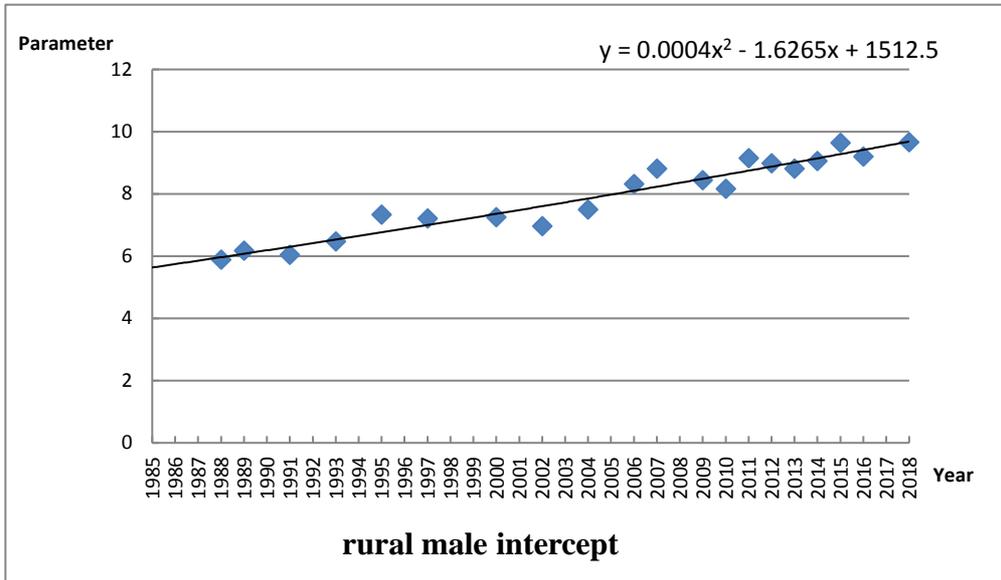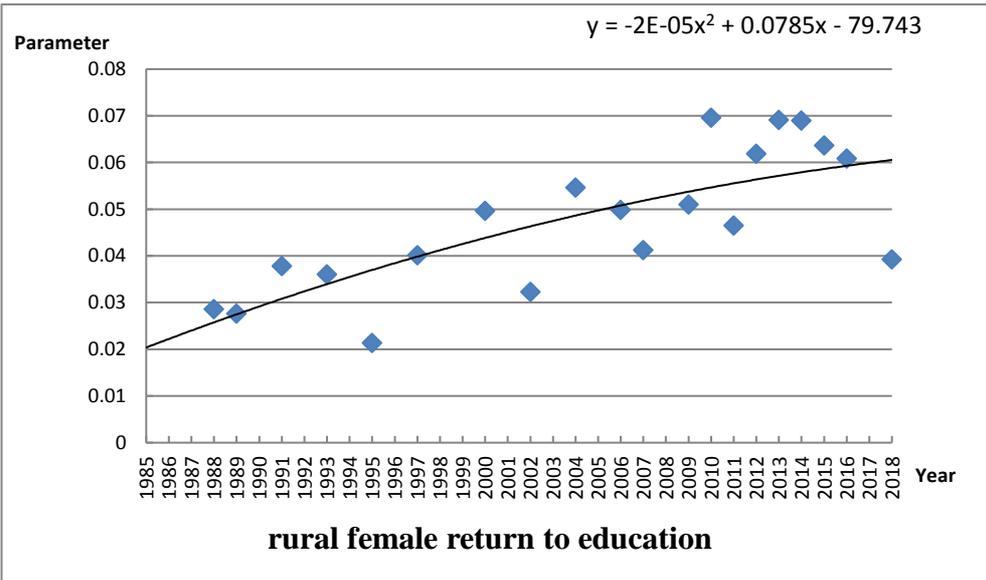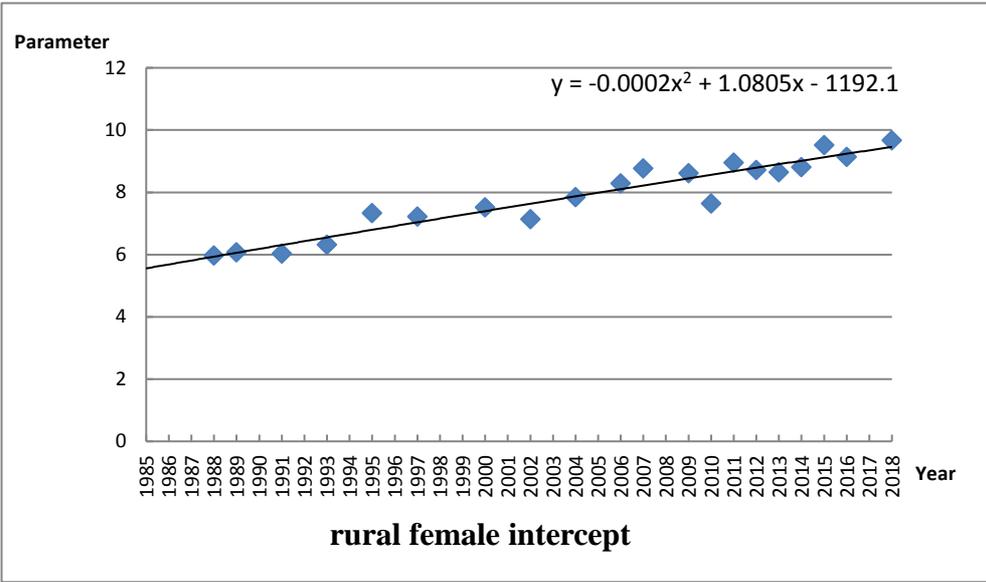
Appendix C Human Capital Stock Calculation

This section summarizes the basic methods and procedures for estimating China's human capital stock from 1985 to 2018 based on the J-F approach. In particular, it explains estimations on some of the variables necessary for the J-F approach based on China's data. We use the following notations:

y indicates calendar years from 1980 to 2018. 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 as five categories for the years 1985-2000 including no schooling (ns), primary school (pri), junior middle school (jm), senior middle school (sm), and college (col). For the years 2000-2018, the levels of education (e) are classified as 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	0-6
school only	7-15
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, or harmful conditions, the legal retirement age is 55 for males and 45 for females. For people who become disabled due to illnesses approved by the Labor Ability

Appraisal Committee, 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 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 *exp²* 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 $m_i = e^{\ln yinc}$. We regress the annual income observed in the survey data on m_i using the OLS (without the intercept) to obtain the coefficient on m_i, α.[46] Finally, we estimate the annual income of the employed as yinc=$\alpha \times e^{\ln yinc}$.

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[46] Jeffrey M. Wooldridge (2005), Introductory Econometrics: A Modern Approach, 3rd edition.

Note that the annual income used for estimating the Mincer equation is in real terms with 1985 as the base 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	-
2000-2018	0	6	9	12	15	16

(2) Coding of work experience:

For people younger than age 16, work experience is *exp*=0;

For people older than age 16, if s<10, work experience is *exp=age*-6;

For people older than age 16, if s≥10, work experience is *exp=age-sch*-6

2.2 Estimation of annual market income

After estimating the annual income of the employed using the Mincer equation, we obtain $yinc_{y,s,a,e} = whrs_{y,s,a,e} \times com_{y,s,a,e}$.

Given that

$$mhrs_{y,s,a,e} = whrs_{y,s,a,e} \times empr_{y,s,a,e} , \quad ymi_{y,s,a,e} = whrs_{y,s,a,e} \times empr_{y,s,a,e} \times com_{y,s,a,e}$$

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 the 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, sex and group in 2005	"China Population Census 2005"
The employed by age, sex and education level in 2005	"China Population Census 2005"
Population by age, sex and education level in 2005	"China Population Census 2005"
The employed by age group, sex and education in 2005	"China Population and Employment Statistics Yearbook 2006"
The employed by age group, sex in 2010	"China Population and Employment Statistics Yearbook 2010"
The employed by age group, sex and education in 2010	"China Population and Employment Statistics Yearbook 2010"
Population by age, sex and education in 2010	"China Population Census 2010"
The employed by age group, sex and education in 2010	"China Population and Employment Statistics Yearbook 2011"
The employed by age group, sex in 2015	"China Population and Employment Statistics Yearbook 2015"
The employed by age group, sex and education in 2015	"China Population and Employment Statistics Yearbook 2015"

| Population by age, sex and education in 2015 | "China Population Census 2015" |
| The employed by age group, sex and education in 2015 | "China Population and Employment Statistics Yearbook 2016" |

Note: The 1% sample population in 1995 is converted to the total population by the actual sampling percentage of 1.03%.

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 in each year by sex, age and education level is given by:

$$NewEnroll (y,s,a,e) = NewEnroll (y,s,e)*\lambda(y,s,a,e)$$
$$\sum_a \lambda(y,s,a,e) = 1$$

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 assigned 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 as 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 of the enrollment rate 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.

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 are worth noting:

(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 suspends 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 periods 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 the 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 periods divided by urban real wage in T-1 period. Results show that, for the 32-year period, 1985-2018, annual growth rates on average are 6.19% and 8.17% 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 final 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-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-pri-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 final 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-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-jm-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 observe 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-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-sm-1)*mi(y,s,a+2,col)*R^2

and

senr(y,s,a,col-sm-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-sm)*mi(y,s,a+3,col)*R^3+senr(y,s,a,uni-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-sm-1)*mi(y,s, a+2,col)*R^2+senr(y,s,a,uni-sm-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:

$$\text{pop\_noschool(y,s,a,e)} = \text{pop(y, s, a,e)} - \text{pop\_inschool(y,s,a,e)}$$

Note that following adjustment is made for negative values in the out-of-school population.

(1) Rewrite the negative numbers of the out-of-school population for certain gender, age and education level as 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 only consists of people who are working. For people below the age of 60, the formula for human capital is:

$$\text{mi(y,s,a,e)} = \text{ymi(y,s,a,e)} + \text{sr(y,s)}*\text{mi((y,s,a+1,e)}*\text{R}$$

For those who are over 60, human capital is zero, i.e. ymi = 0.

7．Human capital stock in China: 1985-2018

The income estimated by the Mincer equation is the real yearly income (using 1985 as the base). We use CPI and real income to obtain the nominal yearly income.

Tables C.1- C.2 report 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 1985-2018. Due to data limits, initially 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 record 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.
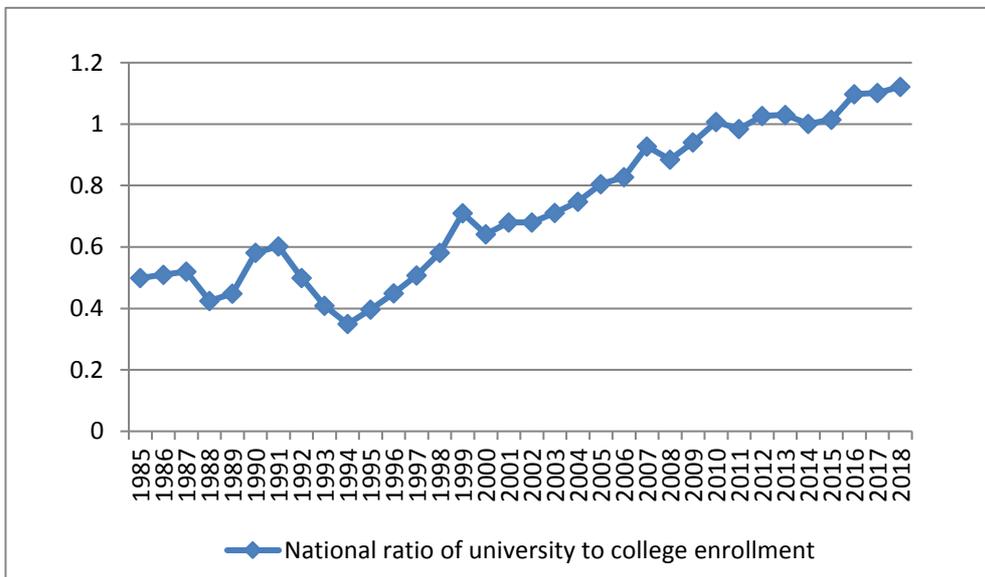
Figure C.7.1 National ratio of university to college enrollment, 1985-2018

Tables and figures of appendix C

Table C.1 Real Human Capital by Region and Gender, 1985-2018

Unit: Billion Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	11226	5775	11810	13310
1986	13711	6459	13090	13350
1987	14729	7159	14410	13480
1988	14329	6960	14280	12430
1989	14411	6988	13850	11280
1990	16644	8301	15410	11800
1991	18741	9737	17520	12480
1992	20248	10902	19280	12890
1993	20248	10902	19280	12890
1994	20392	11252	19420	12260
1995	18823	10683	17870	10780
1996	18417	10676	17110	10010
1997	20692	11935	17460	9732
1998	29141	16954	20920	10680
1999	34996	20847	23300	11440
2000	40379	24506	25840	12030
2001	46205	28578	27680	12670
2002	53670	32529	29200	13340
2003	60309	36085	30970	13830
2004	65694	39703	31530	14070
2005	71925	43643	32560	14650
2006	83716	49732	35760	16070
2007	93361	55166	37020	16930
2008	101521	59632	37730	17770
2009	117762	68552	41480	19980
2010	131600	75107	43140	21440
2011	146140	83632	41190	20940

Year	Urban Male	Urban Female	Rural Male	Rural Female
2012	165051	93423	40630	21110
2013	190104	105680	39850	21240
2014	210043	113503	40070	21940
2015	228232	119506	40570	22930
2016	250427	128779	40160	24100
2017	275152	138081	40060	25670
2018	299427	146845	39450	27150

Note: The results are based on six education categories.

Table C.2 Per Capita Real Human Capital by Region and Gender, 1985-2018

Unit: Thousand Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	94.09	57.18	29.92	37.38
1986	109.47	61.66	33.16	37.68
1987	112.57	65.98	36.57	38.05
1988	103.66	60.68	35.98	35.22
1989	99.42	57.83	34.74	32.05
1990	110.16	65.34	38.35	33.28
1991	120.44	73.62	43.57	35.20
1992	126.52	79.12	48.12	36.41
1993	124.23	78.55	48.77	34.75
1994	112.54	72.08	45.22	30.61
1995	108.05	69.56	43.57	28.40
1996	113.51	73.20	45.38	28.29
1997	125.27	81.38	49.78	29.74
1998	142.08	92.72	56.47	32.45
1999	162.12	108.42	63.96	35.52

Year	Urban Male	Urban Female	Rural Male	Rural Female
2000	178.84	121.84	72.46	38.27
2001	195.80	134.90	79.64	41.14
2002	217.74	145.97	86.78	44.54
2003	235.21	154.54	95.20	47.58
2004	247.37	163.13	99.92	49.72
2005	261.70	172.19	106.53	53.21
2006	291.61	189.92	117.54	59.10
2007	313.62	205.17	123.01	63.49
2008	331.31	217.09	126.71	67.90
2009	371.26	242.46	140.45	77.53
2010	401.37	258.27	147.72	84.72
2011	425.40	275.16	146.61	86.30
2012	462.74	296.58	150.77	90.94
2013	522.87	327.03	154.39	95.50
2014	567.54	347.00	160.81	101.74
2015	611.01	360.97	168.45	109.70
2016	660.60	381.50	171.86	117.92
2017	716.96	404.84	176.49	129.33
2018	771.01	428.48	178.52	141.84

Note: The results are based on six education categories.

Table C.3 Real Labor Force Human Capital by Region and Gender, 1985-2018

Unit: Billion Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	4929	2156	4960	5825
1986	5608	2447	5622	6027
1987	6249	2746	6348	6253
1988	6020	2636	6405	5816
1989	6023	2647	6368	5386

Year	Urban Male	Urban Female	Rural Male	Rural Female
1990	6902	3031	7257	5759
1991	7565	3426	8284	6070
1992	7902	3721	9137	6252
1993	7637	3748	9206	5933
1994	6807	3485	8546	5230
1995	6569	3493	8230	4840
1996	7367	3816	8541	4725
1997	8682	4431	9297	4881
1998	10467	5284	10480	5246
1999	12441	6267	11830	5677
2000	14453	7241	13070	6078
2001	16095	8133	13860	6360
2002	18346	9267	14630	6686
2003	20405	10372	15330	6961
2004	22332	11383	15430	7057
2005	24925	12781	15850	7356
2006	29804	14976	17650	8143
2007	33369	16611	18660	8719
2008	36258	17911	19330	9224
2009	42979	20952	21510	10480
2010	49411	23507	22580	11350
2011	54152	25840	21830	11260
2012	60806	28468	21870	11520
2013	67596	31639	21750	11800
2014	74371	33022	22090	12360
2015	81085	34942	22420	12950
2016	88518	37708	22510	13810
2017	96630	40409	22650	14810
2018	104412	42922	22440	15720

Note: The results are based on six education categories.

Table C.4 Per Capita Real Labor Force Human Capital by Region and Gender, 1985-2018

Unit: Thousand Yuan

Year	Urban Male	Urban Female	Rural Male	Rural Female
1985	65.58	33.49	21.44	27.68
1986	70.01	35.99	23.93	27.98
1987	73.01	38.08	26.59	28.32
1988	66.52	34.54	26.35	26.32
1989	62.88	32.61	25.67	24.18
1990	68.18	35.13	28.57	25.47
1991	72.70	38.21	32.31	26.60
1992	74.51	40.04	35.46	27.18
1993	71.18	39.09	35.70	25.62
1994	62.93	35.29	33.03	22.34
1995	59.85	34.19	31.80	20.50
1996	62.34	35.22	33.28	20.35
1997	68.29	38.38	36.61	21.37
1998	76.74	42.79	41.66	23.29
1999	85.49	47.70	47.28	25.55
2000	93.46	51.87	52.80	27.76
2001	100.34	55.55	57.31	29.51
2002	110.36	60.48	62.12	31.62
2003	118.25	64.65	66.93	33.59
2004	124.55	67.88	69.37	34.80
2005	133.42	72.79	73.41	37.10
2006	152.03	82.82	81.60	41.46
2007	164.11	90.25	86.29	44.95
2008	172.84	95.79	89.57	48.18
2009	196.55	108.76	99.79	55.34
2010	216.40	117.88	105.29	60.76

Year	Urban Male	Urban Female	Rural Male	Rural Female
2011	228.65	125.37	104.47	62.16
2012	249.40	134.73	107.73	65.72
2013	273.81	146.85	110.45	69.37
2014	295.45	151.86	115.24	74.24
2015	317.81	158.04	120.60	79.92
2016	343.78	168.06	123.12	85.91
2017	372.94	179.71	126.37	94.26
2018	400.34	192.14	127.42	103.33

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 for the purpose of comparing the value of physical capital with that of 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 modified version 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 the 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 the 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 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 all "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

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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:

$$T_t = \prod_{i=1}^{3} Z_{it}^{(Share_{it}+Share_{it-1})/2} \tag{5}$$

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:

$$Share_{it} = U_{it}/\sum_{i=1}^{3} U_{it} \tag{6}$$

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:

$$U_{it} = \left(\delta_{it} + r_t - \frac{q_{it}-q_{it-1}}{q_{it}}\right) * q_{it}K_{it}^{P} \tag{7}$$

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, 1985-2018（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
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

Province	1985	1990	1995	2000	2005	2017
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, 1985-2018（geometric）

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

Province	1985	1990	1995	2000	2005	2017
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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