Minghai Zhou

Labor's Share of Income

Another Key to Understand China's Income Inequality

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Preface

China's high economic growth after reform and opening up has been claimed as a miracle in human history by many economists. After the culture revolution, China suffered from serious poverty and backwardness due to which the national economy was on the edge of collapse. Today, China is the second largest economy in the world with per capita GDP reaching $8000 and ranks among the middle-income countries. Since reform and opening up, 0.5 trillion people have got rid of poverty and the living condition and lifestyle of ordinary Chinese people have experienced dramatic changes. As one of the many witnesses who experienced the whole process of China's reform, all kinds of past memories and present thoughts mingle together, making me feel lucky to be living at the right time.

However, China's recent history of high growth is not an idyllic picture of beauty but a striving picture of magnificence. Different times have different contradictions and conflicts. Great success comes with various pains and costs. As economists, the important thing is not to sing praise for the obtained success but to confront the real problems with calm and deep academic analysis in order to seek solutions and provide references to policy makers at various levels. This book about China's labor's share of income by Dr. Minghai Zhou is such a research outcome that has very focused and realistic meanings.

The decrease of the labor and household share of income is a phenomenon that has attracted wide attention in China. It is one of the stylized facts for being criticized as the evidence for unreasonable income distribution. The Chinese government has paid a lot of attention to this issue. In recent decades, almost all five-year plans and annual government working reports emphasize the importance of improving the income distribution by increasing these two shares. Although the government has taken some measures to deal with this issue, the situation has not been improved fundamentally. In the composition of household income of urban and rural citizens, the share of labor compensation takes more than 60 %. In order to increase the household share of income continuously, we need to make sure the

steady increase of the labor compensation. Therefore, understanding the mechanism of change in the labor share of income in China and grasping the key factors for increasing the labor share of income have important policy implications for the current 13th Five-Year Plan and for building a well-off society in an all-round way for future China.

There are several features of this book worth mentioning. First, the book has a broad view, a reasonable framework, and strong logic. This book puts the labor's income distribution into the whole process of economic reform and development. It systematically analyzes the reason behind the decreasing labor share of income in China from four levels, which are macro economy, regional difference, industrial feature, and firm heterogeneity. By doing so, it provides some new views and obtains some new conclusions. Second, the book has a clear focus on empirical analysis. The book uses a large sample of micro household data, provincial panel data, and industrial and regional survey data which increase the credibility by making the research conclusions lying on the solid empirical basis. Third, the book embeds the spirit of theoretical innovation and dares to make new theoretical generalization. For example, it distinguishes human capital from raw labor to reveal the unmatched contribution and return of rural migrants for promoting China's economic growth. It demonstrates that the change of trade mode is one of the main reasons for decreasing the labor share of income by separate regressions. It supports "Kuznets effects" rather than "Kaldor effects" by analyzing the correlation between industry structure and labor share of income. All the above results provide illuminations for theoretical research in related areas. Some ideas may be controversial. For example, we may question whether it is necessary to distinguish human capital from raw labor in a new economic era where the education level has been raised significantly from that in the past. Even so, it is helpful for promoting theoretical deepening and innovation.

The author of this book, Dr. Minghai Zhou, is a diligent and talented young scholar who also has a strong will. He completed his master's and Ph.D. program at Zhejiang University. After that, he did postdoctoral research at Zhejiang University for two years. During his Ph.D. study, he suffered from difficulties but faced them with a clam attitude. He conquered the difficulties with amazing perseverance, by studying hard and thinking diligently while in recuperation. This book is a revised and enriched version of his doctoral thesis. During his doctoral study, he conducted research projects independently at the provincial and national level. He published several academic papers in top Chinese journals and won the nomination prize of National Excellent 100 Doctoral Dissertations for his doctoral thesis. As an "earth turtle" scholar, who had no experience in study abroad and who was cultivated entirely by the domestic higher education system, he stood out in the fierce competition in the job market and received an offer from a world renowned international university as Assistant Professor in Economics, showing fully his academic attainments, research ability, and English level. As his supervisor, I am happy to see

that his research outcomes will be published in English as a book. I hope that his book will benefit scholars at home and abroad and enhance their understanding about the situation of China's income distribution, trigger more research on China's income distribution issues, and provide precious references for China's modernization process. At the same time, I hope Minghai would move a step forward for publishing more and better research outcomes and become a promising economist in the future.

Prof. Xianguo Yao
Dean, Faculty of Social Science
Zhejiang University

Acknowledgment I

Life is never so magnificent, abundant and happy until in adversity.

Romain Rolland

Dear readers, you can imagine my excitement after this last gentle strike on the keyboard for stopping off the whole doctoral thesis and writing down my sincere thanks now. In his autobiographical novel, Charles Dickens compared *David Copperfield* as his most beloved child. At this moment, I feel that no one has loved this child, an academic work which lasted for two years' and demanded a lot of energy and effort, so deeply like me.

I cherish him, not because it may have high academic value (such judgment is entirely dependent on my readers and specialists), but because he makes me feel the joy and pain as if a mother having a baby, and because he is the one who will accompany me in the cheer and hardness of my doctoral life. Even now, those frames of images are still floating in front of me. When I was able to understand and was illuminated by the top international journals of economics, my heart was filled with sweetness like eating honey. However, when I found that similar ideas have already been published in top Chinese journals, feelings of regret and frustration could not be calmed down for a while. In order to get more detailed data materials, I traveled alone to Shanghai Library to search for data twice. On the way back home, I was excited and planning how to use these materials fully. However, while manually typing tedious data for several months, I had no choice but to endure an aching back and a suffering soul all by myself. I cannot count how many nights I was excited by flash of ideas, climbed down from my bed, and hid in the washroom of the dorm for the purpose of calculation and deduction. I cannot count how many nights I tossed over because of the unsatisfactory progress of my thesis, when my brain was filled with anxieties and worries and my body was very tired at the same time. It was at the time of the 2010 Lunar New Year that I wrote my thesis in the most intense stage. Seeing the happiness and joy of passersby on my travel between the library and home, I could not stop myself from doubting the value of such suffering efforts. However, when I received the thick piece of my own from the printing lady, all questions and doubts were solved and all worries and anxieties were gone.

Although academic research is the core of my doctoral life, the harvests of five years' experience are far more than I can imagine. After the normal and dull bachelor and master's life, my doctoral life moved up and down as in a drama. Life and death, love and hate, sorrow and joy, and separation and reunion flooded me unexpectedly like tidewater, hurting me physically and psychologically. Luckily for me, the rainbow showed after the storm and I learned "endurance," "tolerance," "understanding," and "letting go." More fortunately, the altruistic love and warmth accompanied me when I went out in the chilly winter and welcomed the new spring of life. Such invaluable experience has now become the greatest treasure for my future life.

Of the many loves, I rely most on the mother-like care of my doctoral supervisor Prof. Wen Xiao. Professor Xiao's rigorous academic attitude helped me to get rid of the bad habit of carelessness and let me know how the key to academic research is not only bold innovation, but also careful thought. Every piece of my article was completed with the guidance of Prof. Xiao's careful conceiving and wording. Her ways of "training me to fish rather than giving me fish" promoted my ability of writing greatly. In addition, her generous encouragement and praise have been always the inexhaustible source of my learning momentum, increasing my confidence in the academic road ahead. Her love and help reflected in small drips and bits of our daily life, building home feelings in us due to her meticulous care. For example, as her students, we would go to her home to eat for improving our life and return with a satisfactory stomach full of the delicious food cooked by Prof. Zhang, her husband. Therefore, we had a nickname for our team of Prof. Xiao's students as the "Xiao Family." When I was confused, Prof. Xiao would always find a way to comfort me. When I faced important choices, she always provided help on my standpoint. The most unforgettable memory is that she sent me emails, asking about my situation when she was in Japan. Whenever I see these emails, my tears cannot stop flowing. Recalling the above small things, my heart is always warm and my eyes are always wet.

I was inspired most by the father-like care of my master's supervisor Prof. Xianguo Yao. He was not only my academic teacher but also my spiritual mentor. In terms of academic study, Prof. Yao's indomitable spirit for academic research and humanistic care for people's benefits has become my motto for academic research. Therefore, the topic of this Ph.D. thesis is one of my efforts for approaching the above two aspects. In terms of daily life, Prof. Yao's optimistic life attitudes and humorous working manners became powerful weapons with which I faced difficulties. I remember clearly that he comforted me by using his own example and encouraged me to do in-depth thinking about academic problems by using the recuperation time. Under his guidance, I found my own understandings for Chinese economy during the recuperation and contemplation, cultivating more and more interests on academic research. Using this opportunity, I thank Prof. Yao for bringing me into the door of exciting labor economics research, for cultivating me with a broad mind and deep thoughts, and for teaching me like a son with patience and tolerance.

Besides the above two teachers, I would also like to deliver my sincere thanks to those teachers that "preach, teach, and answer" me for my master and doctoral life. They are Prof. Xianhai Huang, Prof. Jiqiang Guo, Prof. Xueya Qian, Prof. Guoda Gu, Prof. Shuzhong Ma, Prof. Xukun Zhang, Prof. Zhenghan Cao, Prof. Yuexiang Jiang, Prof. Xiaodi Zhang, Prof. Xuejun Jin, Prof. Hang Ye, Prof. Jinchuan Shi, Prof. Miaojun Wang, Prof. Shiyuan Pan and Associate Prof. Zhangyong He at Zhejiang University; Prof. Min Lu, Prof. Zhao Chen, and Associate Prof. Yuan Zhang at Fudan University; Prof. Shunli Yao and Prof. Xiaopeng Yin at University of International Business and Economics; Prof. Fenglian Du at Inner Mongolia University; Assistant Prof. Zhigang Li at Hong Kong University; Assistant Prof. Hongliang Zhang at the Chinese University of Hong Kong; Dr. Alex Bryson at National Institute of Economic and Social Research; Prof. Chris Tilly at University of California, Los Angles; Albert Park at Oxford University; and Gerhard Illing at Munich University.

One takes on the colors of one's company. I would like to thank my academic brothers and sisters and classmates in the same grade. I can always find inexhaustible sources by learning from such excellent groups. Using a fancy economic terminology, I am the benefiter of the positive spillover of the "peer effects." Special thanks to Dr. Gaobang Lin who took away a lot of tedious administrative works, making me ashamed as the "big brother." Special thanks to Dr. Puqing Lai, whose thoughts and spirits I admire the most. Limited by space, I cannot tell the details of my thanks to everyone, but I promise that these thanks are genuine. They are Junjie Le, Jun Lai, Yuemei Wang, Luna Wang, Li Jiang, Qiushi Wang, Jie Weng, Weixiang Wen, Yi Gao, Xiaohua Li, Zheng Wang, Liangcong Fan, Zhiling Huang, Liqiu Zhao, Mingrui Qiao, Sisi Pan, Guoxiang Wang, Guohua Zeng, Jing Qu, Haifeng Zhang, Li Li, Ruixiang Chen, Ping Wang, Zhaoxi Tang, Lina Zhou, Junzhi Zhou, Yefeng Chen, Yanxiang Sun, Weiqing Li, Wenjing Fan, Baoqing Yin, Ying Wang, Jingsong He, Tian Hou, Juan Yang, Dun Ai, Xiaofeng Wu, Yijun Chen, Chao Chen, Shaochao Wu, Mingjian Shu, Dongcheng Zhang, Nan Tang, Sha Deng, Xiaoyu Jiao, Xin Fang, Tongyi Wang, Lili Lu, Lina Qiao, Bing Liu, Xiaohong Gu, Zhaoshi Zhang, Xiaohua Chen, Yao Yao, Gaoju Yang, and Jinliang Zhao.

I would also like to deliver my sincere thanks to the members of the English Club at Zhejiang University who made my doctoral life a colorful one and let me know the value of sincere friendship. These friends are now living across regions in China as the pillars of society. They are Yu Zhao, Jiandong Zhang, Jing Wang, Yuanyuan Guo, Qian Guo, Zhenyu Zou, Qianlan Ma, Yao Li, Yao Xu, Ling Li, Zheng Cao, Lili Xu, Rong Wang, Wei Si, Minyi Wang, Zhixiang Yang, Jianwei Ye, Xianliang Ge, Linjie Zhang, Yan Zhao, and Chang Zhou. I would like to thank my friends who encouraged and helped me for so long. They are Yijun Liu, Wei Shi, Liang Zhang, and Liya Zhang. I would like to give my special thanks to my beloved one, Chris Fu, who plays the role of a shining lamp, illuminating my road ahead. I will never feel alone with you accompany along the life road.

Finally, I am in serious debt to my parents who fed me, raised me, and educated me. They have always been my most trustworthy backings and most solid fortress. I owe them too much but give them too few returns; I bring them too many troubles and give them too few comforts; I spend too little time to care about them but am cared by them all the time. My dear father and mother, I devote this thesis to you and I believe you can read the true heart of a son.

January 2011

Minghai Zhou
At Yuquan Campus, Zhejiang University

Acknowledgment II

The previous acknowledgement was the one I wrote when finishing writing the whole doctoral thesis which is the core part of this book. Another main part of this book was done during my postdoctoral working time during 2011 and 2013. This was the acknowledgment I wrote after I finished the postdoctoral work and got a new position as Assistant Professor at University of Nottingham Ningbo China.

Two years has already passed after my Ph.D. graduation, while the moment of joy still lingers in front of my eyes. Two years ago, I was separated from my lover Chris by distance. Two years later, I plan to spend my whole life with my beloved wife. Changes in life brought too many challenges but also obtained too many blessings. Starting from the new life journey, I try my best to balance between life and career and between family and work. I cannot say I do a great job, but I do enjoy the new experiences.

Two years' postdoctoral working experience was comfortable because of a familiar environment, nice teachers, and lovely friends. However, the change of role from a student to a researcher was profound. Such change needed more wisdom, courage, and ability, demanding more requirements from me. Looking back at my two years of work, I cooperated with my supervisor for writing a series of Chinese and English academic papers and I collaborated with two UK scholars for an academic project. I attended many international conferences to present my work and I successfully organized two international conferences. Although these works were not perfect enough even for my own standard, I can comfort myself for not being a loafer. Because of such work, I successfully got the job of Assistant Professor in Economics at the School of Economics, University of Nottingham Ningbo China. Facing another new starting point, it is necessary for me to deliver my thanks to those who helped me during the past two years.

First, I would like to thank my cooperative supervisor Prof. Xianguo Yao, who let me return to the big family as a postdoctor, further proving his powerful magnetic charm. From my own perspective, his calling power is multidimensional, which can be summarized as the four "most". The greatest impression comes from his broad mind and frank spirit. The most enjoyable moment was his informal

teaching during the box lunches. The most admiration comes from his indomitable spirit for academic research. The most touching moment is the deep friendship between us and warm expectation from his students. Because of these impressions and admiration, I truly feel he is a teacher who teaches and answers and a father who cares and helps.

I would like to deliver my special thanks to my wife Chris for moving from Chengdu to Hangzhou, living in a strange city and fighting for a new life with tremendous courage and confidence. As all couples, we have joy, we have fights, we have quarrels, and we have fun. Along the road, the power of love has accumulated from my perseverance and her braveness, which make us ready for the storm and happy for the rainbow.

Lastly, I thank many teachers, colleagues, friends, academic brothers, and sisters. I carve your names in my deep heart. I thank you for the company, help, and care during the two years. I have to say farewell, but I believe that the physical distance will never pull away the closeness between hearts.

June 2013

Minghai Zhou
Hangzhou Library

Contents

Chapter 1
Introduction

> The produce of the earth - all that is derived from its surface by the united application of labour, machinery, and capital, is divided among three classes of the community, namely, the proprietor of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated.
>
> Original Preface, p. 1 by David Ricardo.

1.1 Background

After more than thirty years' experience of reform and opening up, Chinese economy has achieved a high growth miracle with an average annual economic growth rate around 10 % from 1978 to 2008. Meanwhile, the distribution of national income in China has experienced several important changes. At the beginning of reform and opening up, the share of labor compensation in national income has steadily increased by about 20 %, from 52.2 % in 1978 to 72.2 % in 1990, appearing the phenomenon that national income distribution has inclined to individuals. Some scholars name this change as "wage erodes profits" phenomenon (Dai and Li 1988). Regarding to this, other scholars propose that the increase of the labor's share of income is the natural result of the over-oppression to the price of primary goods and production factors. In another word, this can be explained as the results of interaction between income distribution system and commodity economy (Li 1992)

However, there are some new changes in the layout of the national income distribution of China. Using the income approach of GDP, the share of labor compensation in GDP decreased from 51.9 % in 1995 to 39.7 % in 2007, as many

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as 12 percentage points.[1] The decline of the labor's share of income has been an indisputable fact and aroused attention in the academia (Cai 2005; Li 2007).[2] Accordingly, the profit of the enterprises is increasing and the proportion of capital return in national income has increased from 34.9 % in 1997 to 46.1 % in 2007. The decrease of labor's share of income and the increase of capital's share of income manifest that national income distribution has transformed from "wage erodes profits" at the beginning reform and open up to the current "strong capital, weak labor" (Yao 2005). The decrease of the labor's share of income also attracted the attention of the Chinese party and government. In the 17th National Congress of Communist Party of China (NCCPC), it has been clearly pointed out that the main task is to improve the labor's share of income in GDP gradually, and especially improve the proportion in the primary distribution. Meanwhile, increasing the bargaining power of labor force, regarded as an effective way to increase the labor's share of income, gains most support in the National People's Congress and the National Party Congress.

The earliest theoretical studies about labor's share of income can be traced back to classical economist Ricardo (1981). He argues that the main research theme for political economy is the distribution law of owners of land, labor and capital in the production of commodities. Marx (1894) succeeds Ricardo's class analysis and argues that capitalists exploit laborers by occupying the surplus value created by the laborers, forming hostile relations between labor and capital in the economic distribution. Unlike Marx's production relations' perspective, neoclassical economists explain ways of income distribution from technology conditions of production. They argue that the distribution pattern of wage and profits in the market institution is determined by marginal productivity of labor and capital. Therefore, neoclassical economists not only succeed the classical tradition of discussing distribution law through production factors, but also consider the contribution of factors as their basis for distribution, forming the so called "functional" income distribution. Therefore, when exploring the change of the labor's share of income of China, it is not only important to succeed the Marxist prospective of relationship between production factors, but also it is necessary to absorb the discussion about income distribution in neoclassical economy.. These views will help explain the changes in the structure of income distribution in China.

In reality, the new changes of income distribution will directly affect every aspect of the economic operation. First, the decreasing labor's share of income will

[1]The data is from Li (1992).

[2]The data before 2004 is from *China's GDP Accounting: Historical Data 1952–2004* and data after 2004 is from various issues of *China Statistical Yearbook*. The national level data is aggregated by using provincial panel data. Here we haven't done any statistical modification on the labor's share of income which now is simply defined as the ratio between the labor compensation and GDP. Bai and Qian's (2009) recent research shows that the change of statistical caliber has overestimated the deceasing extent of the labor's share of income. However, after adjusting statistical caliber, the labor's share of income has dropped about 5 % from 1995 to 2004

put a strain on consuming power of citizens, making China trapped in a development mode of 'low consumption, high investment and export', which will inevitably result in over-capacity of production and latent risk of insufficient effective demand. During the global financial crisis in 2008–2009, the drawback of this kind of development mode has been more severe (Kuijis 2006; Economist 2007). Second, the decreasing labor's share of income and increasing capital's share of income will enlarge the income gap between labor and capital owner, inclining to an unequal income distribution of individuals. This enlarging gap will cause challenges to social security and stability (Subramanian 2008). Third, the decreasing trend reflects some features of microeconomic behavior in China's economy. As the result of lacking an effective bargaining scheme in China, capital is the determinist factor in production therefore capital owner has more bargaining power and stronger power in revenue seizing. In macro scope, it manifests that capital owners gain more share of national income in the primary distribution. In an economy with more bargaining power on the capital side, labor income will definitely face a decreasing share in GDP and remain at a low level. This is why discussion about the changes of labor's share of income and its determining factors has not only theoretical meanings but also strong practical meanings.

1.2 Research Method and Data

1.2.1 Research Method

Generally speaking, this book combines qualitative and quantitative, theoretical and empirical research method. One of the important features is that the book discusses the decreasing labor's share of income from three different aspect, i.e., macro, meso and micro and three different perspectives, i.e., growth, transition and opening up. Because of these different aspects and perspectives, this book does not construct a single and general theory for the labor's share of income. We combine theories and empirics together and illustrate them in each chapter.

Theoretical models are chosen and constructed based on the needs of analysis. When discussing the movement of the labor's share of income at both macro and meso level, we distinguish the real and nominal labor's share of income using a simple neoclassical model and looks at the effects of price factors on the measurement and movement of the labor's share of income. Furthermore, we discuss whether the turning point of the U-shape movement of the real labor's share fits with the Lewis turning point or not. When discussing factor growth and distribution at macro level, we modify neoclassical economic growth models and construct a framework for discussing growth and distribution of three main factors, i.e., raw labor, human capital and physical capital. Then we link the unbalanced economic growth with uneven national income distribution. When discussing the determinist factors of the labor's share of income at the meso level, we apply the determinist

theory of the labor's share of income under the neoclassical framework. We try to link the labor's share of income with the factors such as capital output ratio, technological progress, opening and industrial structure. When discussing the determinist factors at the industrial level, we use trans-log model of cost function and consider trade factors as structure variables. We propose that the change of trade mode in China is the main reason to explain the decreasing labor's share of income of industrial sector. When discussing the determinist factors of the labor's share of income at the macro firm's level, we construct a factor distribution theory model based on firm heterogeneity. By discussing the matching problems between firms and laborers, the model analyzes the differences of the labor's share of income in firms with different ownership type because of productivity effect and wage competition effect. By linking the model to China's reality, we examine the effect of ownership structure change, i.e., SOE reform, privation and entry of foreign firms on the movement of the labor's share of income.

Decomposition and regression analyses are the main empirical methods used in this book. We use several strategies to decompose the labor's share of income in China. We decompose the labor's share of income by industry to discuss the effect of industry structure on the labor's share of income. Different from previous studies, our industrial decomposition is confined to the subindustries within industrial sector. We decompose the labor's share of income by different sectors, i.e., governments sector, firms sector and households sector so that we can discuss the importance of structural effects and within-sector effects. We decompose the labor's share of income into raw labor's share and human capital's share so that we can discuss income shares of different types of workers and their impacts. In addition, we also decompose the labor's share of income into employment, compensation and output effects. Similarly, several empirical methods are chosen based on the features of data and needs of analysis. For example, when we further divide labor into raw labor and human capital, we use OLS and robust OLS methods to estimate Mincerian equation. When discussing determinist factors of regional and industrial labor's share of income, we use fixed effect, random effect and difference GMM estimation method. When discussing the labor's share of income at the firm level, we adopt system GMM to deal with the endogenous issues of regression model.

1.2.2 Research Data

Another feature of this book is to use various sources and levels of data to discuss the movement of the labor's share of income. When discussing the national labor's share of income at the macro level, we try to compare data series from different sources, e.g., income approach of GDP, flow of funds account, and input-output table in order to get an accurate and plausible measurement. Another innovation is that we combine the micro individual data with macro data to get unique analytical angle. More specifically, we use the three main micro individual data for discussing income distribution in China. They are Urban Household Survey (UHS) database,

China Health and Nutrition Survey (CHNS) database and China Household Income Project (CHIP) database respectively. UHS is the random sample survey of urban household conducted by General Unit of Social and Economic Investigation of National Bureau of Statistics. The survey data is from and 1986 to 2007. The survey provides various types of information of urban households, e.g., income, consumption, social security, poverty and etc. which are crucial data sources for studying the national income distribution, income level of urban citizens, income inequality and etc. CHNS is an international collaborative project between the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health (NINH, former National Institute of Nutrition and Food Safety) at the Chinese Center for Disease Control and Prevention (CCDC). The survey uses a multistage, random cluster process to draw a sample of about 7,200 households with over 30,000 individuals in 15 provinces and municipal cities that vary substantially in geography, economic development, public resources, and health indicators. The survey data used in this book is from 1989 to 2006. It is designed to examine the effects of the health, nutrition, and family planning policies and programs implemented by national and local governments and to see how the social and economic transformation of Chinese society is affecting the health and nutritional status of its population. Although the main focus of this survey is about nutrition and health, it also provides very detail income information for individuals and households, which is helpful to study topics related to income distribution. The CHIP project is carried out as part of a collaborative research project on incomes and inequality in China organized by Chinese and international researchers, with assistance from the National Bureau of Statistics (NBS). The survey provides information including income, consumption, employment, production and etc. The survey used in this book is three waves which are 1988, 1995 and 2002 respectively. The survey covers all provinces, including urban and rural citizens. By using these survey data, we use information about labor's compensation, education and working experiences for adults aged from 16 to 60 to estimate Mincerian equation, which can help us to further divide labor into raw labor and human capital.

We collect comprehensive regional and industrial panel data at meso level. By using *China's GDP Accounting: Historical Data* and *China Statistical Yearbook*, we collect the provincial panel data of the labor's share of income from 1978 to 2007. By using *China Statistical Yearbook*, C*hina Industrial Statistics Yearbook* and *China Labor Statistical Yearbook*, we collect panel data of the labor's share of income in industrial sector. In order to analyze the determinist factors of the labor's share of income, we also collect related variables from *China Statistical Yearbook* and *China Compendium of Statistics: 1949–2008*. It shall be also noted that we use HS and SITC trade data categorized by product in UN Comtrade database and aggregate and transfer the data to get a panel data within industrial sector from 1993 to 2007 which are useful for analyzing the effects of trade mode in Chap. 7.

At the micro level, we use the second wave of World Bank Investment Climate Survey for China in 2003. This survey covers 2400 firms in 14 manufacturing and

service industries located in 18 urban cities. This book is going to use information provided by this survey such as financial statement, technology innovation, foreign trade and government-firm relations to construct a firm panel data for discussing the determination of firm's labor's share of income.

1.3 Research Ideas and Contents

During the process of reform and opening up, "economic transition" and "opening up" are two most important features for understanding the decreasing labor's share of income in national income.

From the perspective of "economic transition", industrial structure changes from agriculture sector with higher labor's share of income into non-agriculture sector with lower labor's share of income, making national income distribution incline to capital so that the labor's share of income decreases continuously. Furthermore, fast development of industrialization and slow development of post-modernization will hinder the momentum for rising labor's share of income. Ownership structure changes, featured by SOE reform, privatization and entry of foreign firms will pose a downward pressure on the labor's share of income by lowering factor distortion and improving economic efficiency. From the perspective of "opening up", the effect of Chinese trade on the labor's share of income has deviated from the prediction of neoclassical trade theory due to the feature of "foreign investment led". In addition, the change of processing trade mode is also an important reason of decreasing labor's share of income within industrial sector. In the time of import-export related processing and compensation trade in Pearl River delta, import penetration rate promote labor demand thus raise the labor's share of income. While, in the time of export-led processing trade in Yangtze River delta, the simultaneous decline of import penetration rate and labor's share of income is the result of lowering and localizing raw material and labor cost from profit maximizing enterprises.

This study will mainly answer the following questions:

(1) How to deal with the net taxes on production and proprietors' economy for getting accurate and proper measurement of the labor's share of income? How to explain the movement of the labor's share of income in thirty years after reform and opening up?
(2) Shall we consider the impacts of price factors on measuring the labor's share of income? Can we get different results if we examine the real labor's share of income instead of nominal share? How to explain the difference between nominal and real labor's share of income? How to explain the movement of the real labor's share of income in China?
(3) How to discuss the interaction between growth and distribution of production factors such as labor and capital? What is the dynamic relationship between the change of the labor's share of income and economic growth?

(4) What is the effect of industrial structure changes from agriculture to non-agriculture on the labor's share of income? What is the influencing extent? What is the mechanism for explaining the decrease of the labor's share of income in China?
(5) What are the effects of ownership structure changes, e.g., SOE reform, privatization and entry of foreign firms, on the labor's share of income? What are specific mechanisms?
(6) Why the neoclassical trade theory cannot explain well about the change of the labor's share of income in China? What are the effects of processing trade mode changes on the decreasing labor's share of income? What are specific mechanisms?

This book has put the "labor's share of income" as main research focus so as to response to the recent phenomenon of decreasing labor's share of income in China. The book will discuss the movement of the labor's share of income since the reform and opening up in 1978. It will discuss determinist factors of the movement of the labor's share of income from macro, meso and micro aspects and from growth, opening and transition perspectives. Therefore, this book will expand the research into five aspects:

(1) First, we deal with the issues of measurement of the labor's share of income from macro perspective. For example, we compare the movement of the labor's share of income by looking at different data sources, e.g., national income approach of GDP data, input-output table, flows of funds account data. The book also re-measures the labor's share of income of income since the reform and opening up by amending and supplementing the corresponding data during 2004–2007. In addition, the book provides new estimation of the labor's share of income, distinguishes the nominal and real labor's share of income, and discusses the impacts of such distinction on the movement trends of China's labor's share of income.
(2) Second, we analyze the reason of uneven national income distribution pattern from macro perspective. By using individual micro data with large sample, e.g., UHS, CHNS and CHIP, we divide labor into raw labor and human capital and examine the structure changes within the labor and the effects of such changes. We use neoclassical growth model to explore the dynamic relationship between the labor's share of income and economic growth.
(3) Third, we analyze the reason of movement of the labor's share of income from meso perspective. By using decomposition equations for the labor's share of income, we decompose the movement of the labor's share of income into employment, compensation and output effects. Based on the decomposition equations, we not only distinguish the three effects between the nominal and real labor's share of income but also examine the movements of three effects of labor's share of income for the whole China and across provinces since reform and opening up. Then we use the provincial panel data to analyze the movement of the labor's share of income and its determinants in China from

1978 to 2007. By using neoclassical framework, we not only discuss the traditional variables such as factor input ratio and technological progress, but also opening factors such as export and FDI and transition factors such as industry and ownership structure. We use both level and difference equations to discuss the determinants of the movement of the labor's share of income.

(4) Fourth, we discuss the reason of the movement of the labor's income share from industrial perspective. We decompose the change of labor's share of income within industrial sector so that we can discuss within industry effect and industry structure effect within industrial sector. By using econometric regressions, we discuss the impacts of deterministic factors such as employment numbers, capital stock, trade factors, technological progress and SOE monopoly power. More importantly, we focus on the impacts of trade variables such as export dependence rate, import penetration rate and import share of processing trade in order to fill the gap of lacking discussions of trade mode in the literature.

(5) We investigate the determinants of the labor's share of income from micro firm's perspective. Utilizing the World Bank Investment Climate Survey for China in 2003, we discuss the influencing factors of the labor's share of income such as factor input ratio, trade dependency rate, technological progress and labor heterogeneity. We focus on the impacts of ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on labor's share of income during the economic transition and opening process.

1.4 Contributions

The contribution of this study can be illustrated as followings:

(1) Although current studies have discussed the phenomenon of the decreasing labor's share of income in China, many of them don't provide clear definition and don't give accurate measurement of the labor's share of income. When conducting empirical analysis, these studies don't deal with problems such as net taxes on production and proprietors' economy income so that the empirical results will not be reliable. By using employment data, this research adjusts the labor's share of income from 2004 to 2007 because of statistical caliber change so as to get consistent and robust measurement.

(2) Previous studies ignore the effect of price on estimating the labor's share of income and regard the labor's share of income as firm's profitability index rather than a distributional index of national income distribution. We use different price indexes to deflate the labor compensation and gross, getting the real labor's share of income after excluding the price factors. We argue that the real labor's share of income after considering price factors is more suitable to

describe the real situation of national income distribution in China since it better matches with the direct feeling of income distribution by ordinary workers.

(3) In order to discuss the distribution relations among factors for the national income, this research further divide labor into raw labor and human capital by using different sources of micro survey data. By using these data, we get the dynamic relationships between raw labor and human capital and are able to discuss the distribution structure within labor. By using aggregate labor's share of income, we obtain the raw labor's share of income and human capital's share of income which is not only helpful for understanding the inner structure of labor's share of income but also helpful for analyzing structure reasons of decreasing labor's share of income.

(4) There are very few studies regarding the total labor's share of income as macroeconomic variable and relating it to other macroeconomic variables. This research will combine macroeconomic growth with national income distribution in order to dynamically discuss the enlarging and distributing the economic "cake". Therefore, we discuss the interactions of growth and distribution of three factors, i.e., physical capital, human capital and raw labor. By extending MRW economic growth model, we get the new conclusion that the uneven national income distribution in China is closely related to unbalanced growth of three factors which are physical capital, human capital and raw labor.

(5) The determinist factors explaining labor's share of income in neoclassical model usually includes input and output ratio, technological progress and the competitiveness of the market. This research will consider the features of China and emphasize the effect of trade factors. By examining the industrial sector, we argue that the transformation of trade mode from import-export related processing trade to export-led processing trade related is the one of the main reasons of decreasing labor's share of income. Meanwhile, we argue that the "foreign investment led" feature of China's trade will make Chinese products deviate from labor intensive, making neoclassical trade theory unable to explain the phenomenon of decreasing labor's share of income in China.

(6) Current discussion about determinist factors of labor's share of income at firm level only consider the effects of state-owned monopoly power and SOE reform from a closed perspective. This research will use Investment Climate Survey data conducted by World Bank for China in 2003. This data can not only help us to introduce opening factors for discussing the impacts of trade and investment on the labor's share of income, but also help us to control impacts of economic environment such as firm performance and others. By introducing the distribution theory based on firm heterogeneity, we will discuss the impacts of ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on labor's share of income during the economic transition and opening process.

References

Bai C, Qian Z (2009) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41

Cai F (2005) Explore fair distribution mechanism with economic development [N]. People Forum, 17th October

Dai Y, Li H (1988) Wage erodes profits: the potential risks in China's reform of economic institution [J]. Econ Res J 6:3–11

Economists, a workers' manifesto for China: how workers are losing out in China, and why it matters to the rest of the world [EB/OL], economists (2007)

Kuijis L (2006) How will China's saving-investment balance evolve? World bank China office [EB/OL], research Working paper, no.5, 2006

Li Y (1992) Adjustment of functional income distribution: thinking of the phenomenon of national income inclining to individual [J]. Econ Res J 7:34–44

Li D (2007) Pay Attention to the decreasing labor income share of GDP [N], new fortune, 21 Sept 2007

Marx C (1972) (translated by Guo, D. and Wang, Y.) Das kapital [M], vol 1–3. People's Publishing House, Beijing

Ricardo D (1981) (translated by Guo, D. and Wang, Y.) On the principles of political economy and taxation [M]. Commercial Press, Beijing

Subramanian A (2008) What is China doing to its workers? [EB/OL]. Business Standard, New Delhi

Yao X (2005) Economic development of private economy and adjustment of labor capital relations [J]. Zhejiang Soc Sci 2:78–86

Chapter 2
Research Development of Theories and Empirics of Factor Income Distribution

This chapter discusses the research development of factor income distribution. In the following, we are going to review related research about labor's share of income, which is a commonly used proxy for factor income distribution. We will not only discuss the research development based on the decline of labor's share of income mainly in European countries from 1980s, but also examine the development of literature on the recent decline of labor's share of income in China, starting from mid-1990s. By reviewing past research outcomes both at home and abroad, it is found that the decline of labor's share of income is closely related to "two transitions" of world economy after the middle of 20th century. The first transition is globalization. It is well known that the global economy has transformed from a closed and self-sufficient system to an interactive and open one after the Second World War. One prominent feature that accelerated the process of economic globalization was the join of competition system of the global market by emerging countries such as China and other Asian countries. Trade and investment activities become increasingly important among rich countries, but between developed and developing countries as well, weaving a complicated global market networks. The transition in the goods market has strong impact on the internal labor market in almost every country. Recent studies suggested that the decline of labor's share of income in industrialized countries is closely related to the new round of globalization. The second transition is marketization. In the 1980s, countries which adopted planning economic system have transformed to the market economy either by implementing radical economic reform in Russia and Eastern European countries or by gradual economic reform in China. Despite different extent and impacts of these economic reforms, such drastic changes in economic and institutional structure have created prominent impacts on their labor markets without doubt.

In the recent history of economic development, China has not only experienced the process of embracing globalization, but also went through fast changes in its economic and institutional structure. Therefore, the key to understand the movement of factor shares in China is to capture two important features, i.e., opening up and transition. In the condition of openness, trade and investment promoted economic efficiency thus decreased labor's share of income. Meanwhile, in the process of economic transition, the decrease of labor's share of income was mainly caused by the industry structure change from agriculture industry to non-agriculture

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industry and the ownership structure change from state-owned economy to private-owned economy. Current studies mainly focused on impacts of industrial and economic structure on the decrease of labor's share of income. However, there are further research potentials not only about the measurement but also in the theoretical explanation about the labor's share. Especially, this chapter suggests that globalization and opening up is one of the major sources for explaining decreasing labor's share of income in China which is largely neglected by the current literature.

2.1 Measurement Issues of the Labor's Share of Income

From the perspective of macroeconomic operation, various factors' income which acts as the cost for final products for the whole society composes the national income account. These factors' income contains: labor compensation in the forms of wages and bonuses to the owner of labor, rent to the owner of land, interest and profits to the owner of capital. Just as its name implies, labor's share of income shows how much of national income accrues to the labor. It reflects the extent of the share in the final distribution of labor which is one of key factors during the production process. It is normally calculated as the ratio of total compensation of employees (wages and salaries before taxes, as well as employers' social contributions) over a product or income aggregate, such as gross domestic product (GDP) or gross national income (GNI) (Lübker 2007).

More commonly, labor's share of income can be calculated through the income approach of GDP or GNI. The micro foundation for income approach is the financial reports about sales and costs recorded by firms.[1] In order to discuss the definition of labor's share of income more precisely, Gomme and Rupert (2004) divide total value-added by factor entities into four parts (see Table 2.1). The first part is compensation of employees which contains wages, bonuses and welfare is unambiguously labor income; the second part is the source of income which can be unambiguously attributed to capital income, such as corporate profits, rental income, net interest income, and depreciation; the third part is the difference between taxes collected by the government and subsidies provided by government, which are neither labor income nor capital and can be regarded as a wedge between labor income and capital income; the last part is the proprietors' income which is ambiguous in accruing to labor or capital.[2] One part of the income earned by self-employed individual businessmen is the labor income as a laborer, and the rest

[1]The firm here has a wide meaning. It not only includes registered corporations in the general sense, but also includes unregistered firms such as self-employed farmers, individual merchants and etc.

[2]Proprietors' income means the income earned by self-employed individual businessmen or the owners of unincorporated businesses.

Table 2.1 Composition of national income accounts based on firm's financial reports

Total value added:			
Compensation of employees	Corporate profits, rental income, net interest income and depreciation	Indirect taxes less subsidies	Proprietors' income
Labor income	Capital income	Government income	Hard to define

part is the economic return as investor. It is very difficult to distinguish between labor income and capital income in practice since the owner of labor and capital is one entity.

At first glance, computing labor's share of income appears straightforward. We can just divide compensation of employees by GDP and we're done. However, such calculation conceals some potential issues hard to deal with. The first issue is about the treatment of the net indirect taxes. If our main concern is on the distribution relations between labor and capital, shall we exclude the impacts of net taxes on production on the firms collected by the government? The second issue concerns the apportionment of proprietors' income. If proprietors' income is hard to define, what rules shall we apply for proprietors' income to be divided between labor and capital?

In addition, Gomme and Rupert (2004) point out that the different composition of value-added in each economic sector would affect accurate measurement of labor's share of income. In the government sector, value added by the government is simply wage and salary income plus consumption of fixed capital and there is no capital income. Including the government sector biases the measured share of labor compensation up, because government capital income is missing. Therefore, we shall consider whether we should include or exclude the government sector when calculating labor's share of income. Also in the resident sector, the national income account imputes rental income as capital income but does not impute any labor income. Including the resident sector biases the measured share of labor compensation down because it neglects labor service to lodger provided by the house owner. Again, we need to consider whether we shall exclude the resident sector or impute labor income for this sector? Even in the narrowly defined firm sector, there are many occasions that are hard to distinguish labor income and capital income in a clear way. Krueger (1999) argues that in modern firms, Chief Executive Officers (CEOs), especially those working in the Wall Street, can not only get abundant labor income but also various forms of equity incentives such as stock options and stock grants. Therefore, it is debatable for imputing high salaries of CEOs as labor income or capital income. Krueger (1999) also finds that a large part of labor compensation can be explained by the return to human capital, which is again difficult to attribute to labor income or capital income.

2.2 Methods for Measuring the Labor's Share of Income

2.2.1 Treatment on the Net Taxes on Production

In order to solve issues of measurement of labor's share of income, researchers have provided several adjustment methods. Let's deal with the treatment of net taxes on production first. As we know from Gomme and Rupert (2004) that net taxes on production are a wedge out of labor income and capital income. When net taxes on production increase faster than the national income, the labor's share of income will fall if taxes are included as the denominator. Such fall of labor's share of income is not caused by the increasing power of capital thus leads to an overestimate of extent of decreasing labor's share of income. This is the case in China when taxes' share of income experienced an evident increase from 1993 to 2004. Therefore, one way of measuring labor's share of income accurately is to exclude the net taxes on production out of GDP. More specifically, if Y_L is labor income, Y_K is capital income, Y_T is the net taxes on production and Y is the aggregate national income, labor's share of income, α_L, can be expressed as:

$$\alpha_L = \frac{Y_L}{Y - Y_T} \tag{2.1}$$

Zhou et al. (2010a) find that the decrease of Chinese labor's share of income postpones from 1995 to 1998 if the impact of wedge is eliminated. Bai and Qian (2009a, b) and Luo and Zhang (2009b) also exclude the impact of net taxes on production on measuring labor's share.

Some studies argue that the impact of taxes on factor income distribution is not neutral (Bai and Qian 2010; Guo and Lv 2011; Lv and Guo 2012). More explicitly, Lv and Guo (2012) argue that different types of taxes have different effects on the distribution of factor income, leading noticeable difference between before and after tax labor's share of income. Therefore, the after-tax labor's share can be expressed as α_L^{AT}:

$$\alpha_L^{AT} = \frac{Y_L - Y_{TL}}{Y - Y_{TL} - Y_{TK}} \tag{2.2}$$

Here, Y_{TL} is taxes on labor income and Y_{TK} is taxes on capital income. Lv and Guo (2012) find that after-tax labor's share of income is consistently lower compared with before-tax labor's share of income from 1978 to 2008 in China.

2.2.2 Distribution of Labor and Capital in Proprietors' Income

Another difficulty in measuring labor's share of income is the imputation of proprietors' income (Krueger 1999). As mentioned earlier, one part of proprietors' income can be considered as labor income, while the other part is the economic return of capital investment. However, it is very difficult to distinguish between labor income and capital income in practice since the owner of labor and capital is one entity. By using US historical data from 1850 to 1952, Johnson (1954) and Kravis (1959) find that labor's share of income stabilizes around 65 %. After that, the standard treatment on the imputation of proprietor's income by the literature is that two thirds impute to labor while the rest one third imputes to capital. Such simple rule of thumb is confirmed by later studies using more recent data. Solow (1958), Krueger (1999) and Young (2006) find that US labor's share of income stabilizes between 65 and 70 % from 1929 to 1998. However, this rule of thumb cannot be simply applied to developing countries such as China. Compared with developed countries, Chinese labor's share of income is relatively lower and it moves downwards instead of stabilization. Luo and Zhang (2009b) find that labor's share of income in China has decreased below 40 % in recent years, which is only higher than those Latin American countries with extreme high income inequality such as Brazil. The preliminary estimation by the author also shows that Chinese labor's share of income is around 40 to 50 % from 1978 to 2007.

Gomme and Rupert (2004) further argue that the convenient rule of thumb can be applied to both proprietors' income and non-proprietors' income. In other words, labor's shares of income are assumed to be the same in both sectors. With this assumption, we can obtain a more general way of calculating labor's share of income. For the purpose of illustration, we redefine various incomes as follows: let Y_{UL} denote unambiguous labor income (compensation of employees), Y_{UK} be unambiguous capital income (corporate profits, rental income, interest income, and depreciation), Y_A be ambiguous income (proprietors' income) and Y_T be indirect taxes less subsidies (net taxes on production). Then total labor income, Y_L, would be:

$$Y_L = Y_{UL} + \alpha_A Y_A \tag{2.3}$$

Here, α_A is the share of labor income in proprietors' income. We also know that total labor income can be expressed as a part of national income net taxes:

$$Y_L = \alpha_L(Y - Y_T) = \alpha_L(Y_{UL} + Y_{UK} + Y_A) \tag{2.4}$$

Here, α_L is the share of labor income in total national income. According to the assumption, labor's shares of income are assumed to be the same in both sectors,

i.e., $\alpha_A = \alpha_L = \alpha$. From both Eqs. (2.3) and (2.4), we know that total labor's share of income, α, can be shown as:

$$\alpha = \frac{Y_{UL}}{Y_{UL} + Y_{UK}} = \frac{Y_{UL}}{Y - Y_T - Y_A} \tag{2.5}$$

Therefore, in practice, labor's share of income can be expressed as unambiguous labor income, Y_{UL}, divided by net national income excluding proprietors' income, $Y–Y_T – Y_A$ (Gollin 2002). The obvious advantage of this method is clear and easy to calculate. Because labor's share of income exhibits remarkable stability over longer periods of time in US, the rule of thumb is equivalent as Gomme and Rupert's method. However, the implicit assumption of this method relies on the homogeneity among different economic sectors which contradicts to the real world. Economic sectors differ from size and structure, leading to different labor's share of income in each sector. The assumption has at least two problems. First, proprietors' economy is concentrated in resident sector rather than in government and firm sector. Second, self-employed individual businessmen engage in labor intensive industries, e.g., a barber's shop, which have higher labor's share of income. Therefore, this method may underestimate the total labor's share of income in the economy.

Considering the labor intensive feature of self-employed individual business, we can directly merge proprietors' income, Y_A, together with unambiguous labor income, Y_{UL}, as the denominator, and then divided by total value-added net taxes:

$$\alpha_L = \frac{Y_{UL} + Y_A}{Y - Y_T} \tag{2.6}$$

This method is also clear and easy to calculate. Gollin (2002) argues that, in many developing countries, proprietors' economy mainly includes pure labor service industry, e.g., housekeeping, so that such method is reasonable. However, even in many developing countries, a large part in the proprietors' economy belongs to the return obtained by investment. For example, even a barber's shop needs to pay rents and buy equipment for haircutting and hairdressing. Therefore, Eq. (2.6) may overestimate the total labor's share of income in the economy. This is the case for China. Before 2004, *China's National System of Accounts 2002* states that "the net income received by self-employed individual laborers through production and operation shall be regarded as compensation of laborers, including both compensation of employees and profits through operating business" (National Bureau of Statistics 2003). This indicates that China's National Bureau of Statistics (NBS) adopts the third method for calculating the labor's share of income before 2004. It implies that although labor's share of income is relatively low in China, there are still chances for overestimation.

2.2.3 Adjustment of the Labor's Share Through Employment Numbers

We can adjust labor's share, especially labor's share of proprietors' income, by using information such as employment structure. One way of adjustment is to use related data of employment structure to adjust the part of labor compensation accruing to proprietors' economy (Gollin 2002; Ruiz 2005). First, we divide unambiguous labor income by the number employees in non-proprietors' economy to get average labor compensation. Then we multiply average labor compensation by total employment to get total labor compensation which includes labor compensation in proprietors' economy. In particular, let L_A denote the number of employees in proprietors' economy and L be the total employment, then labor's share of income can be adjusted as:

$$\alpha_L = \frac{Y_{UL} \times L/(L - L_A)}{Y - Y_T} \tag{2.7}$$

In this way, we succeed in adjusting the labor's share of income and avoiding direct discussion about the distribution of labor and capital in proprietors' income. However, the implicit assumption underlie this method is that labor compensation of proprietors' economy and other economies is set to be equal. If there are significant differences in earnings between self-employed individual businessmen and employees in the firm, such method will bias the number heavily.

Another way of adjustment is to use related data of employment structure to adjust the part of labor compensation accruing to overall operational surplus (Bernanke and Gurkaynak 2001). First, we divide total operational surplus by the total employment to get average operational surplus. Then we multiply average operational surplus by number of employees in proprietors' economy to estimate operational surplus in proprietors' economy. Finally, we can obtain total labor compensation by adding unambiguous labor income and operational surplus in proprietors' economy together. In particular, let Y_O denote the total operational surplus, L_A be the number of employees in proprietors' economy and L be the total employment, then labor's share of income can be adjusted as:

$$\alpha_L = \frac{Y_{UL} + Y_O \times L_A/L}{Y - Y_T} \tag{2.8}$$

In this way, we can calculate labor's share of income when total operational surplus is available instead of operational surplus in proprietors' economy. However, if we use the ratio of number of employees in proprietors' economy to total employment as a proxy for share of proprietor's economy, it implicitly assumes that unit capital income is the same in both proprietors' economy and

non-proprietors' economy. Again, if there are significant differences in the return to capital between self-employed individual businessmen and physical capital in the firm, such method will bias the number heavily.

As mentioned earlier, before 2004, "proprietors' income is all regarded as labor compensation" thus labor's share of income can be calculated as Eq. (2.6). However, NBS announces that, after 2004, "In terms of proprietors' economy, the labor compensation and operational profits of the proprietors' cannot be distinguished easily, the two components will all be considered as operational profits. Labor compensation only includes compensation of employees in proprietors' economy" (NBS 2007b; 2008). Therefore, the statistical caliber for imputing proprietors' income has experienced significant change before and after 2004. Above two ways of adjusting labor's share of income are proposed to solve the inconsistent problems due to the changes of statistical caliber in China before and after 2004. Although two methods differ in the ways that the former directly adjust to the labor compensation in proprietors' economy while the latter indirectly adjust to the operational surplus in proprietors' economy, they help to make the data comparable and consistent before and after 2004. Still above adjustments are not perfect: first, they don't essentially deal with the problem of real distribution of labor and capital in proprietors' economy; second, the assumptions of the two methods may not be established and the adjustment results may be heavily biased when there are significant differences between proprietors' economy and other economic sectors.

2.2.4 *Methods for Distinguishing Raw Labor and Human Capital*

We know that labor compensation is closely related to the human capital owned by the laborers. Another issue about measuring labor's share of income is whether return to human capital shall be considered as labor income or capital income and whether labor compensation can be further divided into small components. Krueger (1999) divide labor compensation into two parts. One part is the return to human capital and the other part is return to physical labor expenditure, which we call it raw labor compensation. By using Mincerian earnings regression (Mincer 1974; Krueger 1999) distinguishes raw labor and human capital within labor compensation:

$$\ln W_{\mathrm{i}} = b_0 + b_1 S_i + b_2 X_i + b_3 X_i^2 + e_i \tag{2.9}$$

Here, $\ln W_i$ represents the log wage of worker i, S_i is the year of education, X_i represents working experience, X_i^2 is the square term of experience, e_i is the error term,

b_0 is the intercept and b_1, b_2, b_3 are coefficients of regressors. Thus unit raw labor compensation can be expressed as a function of intercept, $W_0 = \exp(b_0 + 0.5\sigma^2)$, where σ^2 is the variance of the regression. Therefore, raw labor can be also called the intercept labor. Then we can obtain the ratio of raw labor in the total labor compensation which can be considered as $S_R = \sum W_0 / \sum W_i$. Finally, we can get raw labor's share of income by multiplying the ratio with total labor's share of income:

$$\alpha_R = \frac{Y_L}{Y - Y_T} \frac{\sum W_0}{\sum W_i} = \alpha_L S_R \tag{2.10}$$

We shall be aware of the impact of institutional arrangement on the size of raw labor's share of income. First, minimum wage policy might help to overestimate the raw labor's share of income; second, union organization helps union workers to obtain some rents which tend to overestimate the share of human capital; third, linear regression may not be the best way to distinguish raw labor and human capital returns, especially underestimating the raw labor's share of income of workers with high education.

In order to overcome the above drawbacks, Young and Zuleta (2008) propose another way aiming to directly measure the raw labor's share of income. They suggest that we can pick up those workers who have very little education and no working experience at first, and then we can calculate their wages to obtain the wage rate of raw labor W_0, finally we can divide the sum of wage rate and total employment by national income to get raw labor's share of income. More specifically, let the real wage rate of low educated and no experienced workers be W_0 and total employment number be L, then the raw labor's share of income can be expressed as:

$$\alpha_R = \frac{W_0 L}{Y - Y_T} \tag{2.11}$$

In order to get robust results, they use three groups of estimation. First, they use those workers whose age are between 16 and 17, and whose education below 8 years as benchmark group; second, they also include high school dropouts into the benchmark group; third, they further expand the age range, including workers whose age are between 18 and 24. Young and Zuleta (2008) compare the raw labor's share of income measured by Krueger (1999) and find that his estimation is higher than theirs. At the same time, they find that the trend before 1979 is the same for both measurements. After 1979, the former shows an increasing trend, while the latter shows the decreasing trend.

2.3 Theories of Determination of the Labor's Share of Income in Autarky

2.3.1 Early Theoretical Studies About Determination of the Labor's Share of Income

The earliest theoretical studies about labor's share of income can be traced back to classical economist David Ricardo (1981). He argues that the main research theme for political economy is the distribution law of owners of land, labor and capital in the production of commodities. Karl Marx (1972) succeeds Ricardo's class analysis and argues that capitalists exploit laborers by occupying the surplus value created by the laborers, forming hostile relations between labor and capital in the economic distribution. Unlike Marx's production relations' perspective, neoclassical economists explain ways of income distribution from technology conditions of production. They argue that the distribution pattern of wage and profits in the market institution is determined by marginal productivity of labor and capital. Therefore, neoclassical economists not only succeed the classical tradition of discussing distribution law through production factors, but also consider the contribution of factors as their basis for distribution, forming the so called "functional" income distribution.

2.3.1.1 Ricardo's Theory of Distribution

Ricardo (1981) argues that economic production is distributed through production factors such as land, capital and labor. His theory of distribution is mainly relied on "marginal" and "residual" principles. The "marginal" principle is used to explain the share of rents while the "residual" principle is to explain the distribution of wage and profits excluding the rents. In Ricardo's model, the economy of one country is divided into agriculture and industrial sector. The economic operation of the former sector determines the distribution of the latter sector. The distribution relations in the agriculture sector can be illustrated by Fig. 2.1, where axis Y stands for agriculture products and axis X represents the labor input in the agriculture production. Curve PAp and PMp stand for unit average labor products and marginal labor products respectively. The diminishing return to land indicates that average and marginal labor products decrease when labor input increases. Thus the production of agriculture products is determined by the labor input which can be illustrated by the area of rectangle OMDC. Accordingly, the rents can be calculated by multiplying the number of laborers with the difference between average and marginal labor, i.e., the area of rectangle BADC.

However, the marginal labor production in agriculture sector is not directly equal to wage, but the sum of wage and profits. Ricardo argues that, given any prices, the supply of labor is infinite and the supply curve of labor is OW. Therefore, the demand for labor is not determined by curve PMp, but rather by the accumulated

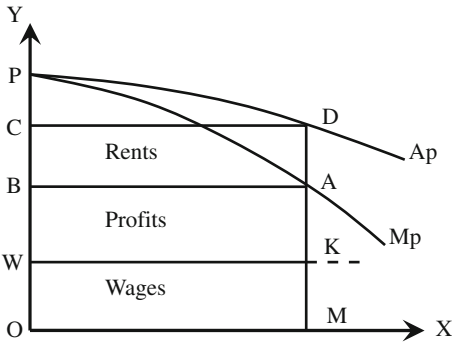

Fig. 2.1 Factor production and distribution in agriculture sector

capital in the economy. If the number of laborers is determined as OM by the capital, given wage W, the total wage of laborers is the area of rectangle OMKW, leaving the rest area of rectangle WKBA as the capital profits.

In equilibrium, capital stops moving between agriculture and industrial sectors, keeping the rate of profits same in both sectors. Because both input and output in the agriculture sector are agriculture products, profit rate is determined by profit size of agriculture products. In the industrial sector, the input is labor paid by the agriculture products while the output is industrial products. Therefore, the price of industrial products is adjusted by the profit rate in the agriculture sector. And the profit rate in the agriculture sector is determined by the condition of cultivation and extent of capital deepening.

Another key assumption by Ricardo is that the wage is only measured by the agriculture products and all wages are used to consume agriculture products. He further assumes that agriculture products are the wage commodities and industrial products are the non-wage products. This means that all the wages earned by workers are used to consume agriculture products and all the profits earned by capitalists are used to consume industrial products. Therefore, the output in the agriculture sector can be considered as the wage funds for the whole society, where the area of rectangle OMKW is the wages for workers in the agriculture sector and WKCD is the wages for workers in the industrial sector.

Ricardo has mentioned two cases of influencing the distribution ratio between wage and profits. One case is the agriculture protection policy by the government which increases the area OMKW and lowers the profitability and thus the economic growth. Another case is when the government collects taxes other than land taxes, such taxes will be bear by profits which lower the profit rate and lead to economic stagnation.

2.3.1.2 Distribution Theory of Marx

The distribution theory of Marx (1972) has adopted the "residual" principle and abandoned the "marginal" principle of Ricardo and applied the "residual" principle

into the whole economic operation instead of the industrial sector. The main differences between Marx and Ricardo are the followings: (1) Marx doesn't acknowledge the diminishing return law so that there is no need for using this law to determine the distribution of wage and profits; (2) Marx argues that the supply price of labor is not determined by non-agriculture products but by all commodities so that the share of profits in total output is determined by the difference between average labor production and labor supply price.

Marx argues that the industrial revolution has made a large number of handicraft mills go bankrupt in face of fierce competition from mass production by capitalist. However, the new production mode doesn't have sufficient ability to absorb the "reserve army" formed by unemployed workers in the handicraft industry. Therefore, when the labor supply surpasses the labor demand, wage is only sufficient to maintain the minimum level of workers' daily life and working necessities. Profit maximization is the main drive for capital accumulation in Ricardo's view. Unlike Ricardo, Marx argues that capital accumulation is not only a choice but also is a must because of competition among capitalists. Therefore, capitalist firms will use expanded reproduction to avoid competition. Because of such motive, the production will be concentrated into a small number of capitalists, turning the economy into the stage of monopolistic capitalism. In this stage, the organic composition of the capital increases, i.e., the ratio of constant capital formed by machines and equipment increases and the ratio of variable capital containing wages to the workers decreases. Therefore, the share of wage in total output decreases and workers fall into relative poverty or even absolute poverty.

In Marx's model, the share of wage in total output will fall along with the economic development. In Marx's view, the only way to increase wage of workers and its share is to increase the collective bargaining power of the working class by lowering the extent of exploitation from capitalists and returning a part of "surplus value" back to laborers. Therefore, the distribution theory of Marx implies that the collective organization of workers and its bargaining power should coincide with the level of economic development in order to maintain a stable distributional relation between wage and profits.

2.3.1.3 Distribution Theory of Neoclassical Economics

The value and distribution theory of neoclassical economics adopts "marginal" principle of Ricardo which is the opposite of Marx's theory. However, the distribution theory of neoclassical economics also differs from that of Ricardo's: (1) neoclassical economics extends Ricardo's substitutive principle between land and labor factors and argues that land, capital and labor all substitute with each other pairwise; (2) neoclassical economics argues that the share of factor returns in the total output is not related to the supply price of the factors but related to the marginal substitution between factors. We can illustrate this point by looking at Fig. 2.1. Assume that OX is the labor input in the production. Given other factors, curve PMp is the marginal production function of the labor factor, then AM

represents the unit demand price and area OMBA is the share of labor returns in the total output. Since the "marginal" principle can be extended to other factors, therefore, area BADC is the return to land or capital which is determined by their marginal productivity. From production perspective, Marshall (1890) further argues that the division of total production by labor and capital is the result of short term profit maximization of firms.

In the neoclassical framework, the relation between the input of factors and output of products is determined by first order homogenous production function. The most famous production function is proposed by Cobb and Douglas in (1928), where the functional form is $Y = AK^{\alpha}L^{1-\alpha}$. The function implies that the contribution of labor in total output, i.e., the labor's share of income, is the parameter $(1-\alpha)$ on the labor in the Cobb-Douglas (CD) production function. This also means that labor's share of income is a constant parameter which doesn't change over time. Therefore, we can get three main conclusions from the analytical framework of neoclassical theory of distribution: (1) the return to each factor is determined by the contribution or the function of this factor in the production process, therefore, the neoclassical theory of distribution is also called the functional distribution theory; (2) Although the neoclassical framework attempts to build relations between all types of technological progress and labor's share of income, this endeavor contradicts with the constant labor's share of income embedded in the CD production function; (3) As Ricardo's theory of distribution, neoclassical theory also believes that factor distribution is governed by a general "natural law". Therefore, the neoclassical theory of factor distribution doesn't have any real and practical value, leading other theories to find meaningful explanation of distribution beyond neoclassical framework.

2.3.1.4 Keynesian Theory of Distribution

In the book *The General Theory* (short for *The General Theory of Employment, Interest, and Money*), Keynes mainly discusses about how investment can have a determinist effect on employment number and national income level, assuming price and wage are exogenously given. Although Keynes himself is indifferent to issues of income distribution, the economists of New Cambridge School[3] have inherited his theoretical system and extend it into the area of income distribution, forming a distribution theory with Keynesian feature, named as "Keynesian Distribution Theory". The New Cambridge School economists think that the analytical framework of "investment-saving" of Keynes can be used to analyze the distributional relationship between wage and profit, assuming employment and output are exogenously given. Kaldor (1955) proposes that when economy satisfies

[3]New Cambridge School is one of the main branches of Keynesian economics, including representatives such as Joan Robbinson, Nicholas Kaldor, Piero Sraffa, Luigi Pasinetti, John Eatwell and so on.

the condition of full employment, total output can be divided into two parts, wage and profit. These two parts are separately distributed to two groups, workers and capitalists, who save their money with different saving rates. When the total investment in the society equals the total saving, the economy is in an equilibrium status, which determines the ratio between wage and profit at the same time:

$$\frac{P}{Y} = \frac{1}{s_p - s_w}\frac{I}{Y} - \frac{s_w}{s_p - s_w} \tag{2.12}$$

Equation (2.12) suggests that profit share (P/Y) is determined by investment rate (I/Y) and the saving rates of workers and capitalists (S_w and S_p). When saving rate of workers S_w equals to zero, i.e., workers have consumed all his income, the share of profit can be simplified as:

$$\frac{P}{Y} = \frac{1}{s_p}\frac{I}{Y} \tag{2.13}$$

Equation (2.13) means, when entrepreneurs (capitalists) increase their consumption level, their profits will be increased. This is as what Kalecki's profit theory suggests: "The capitalists earn what they spend, and the workers spend what they earn". On the contrary to Ricardo's (or Marx's) model, Keynesian distribution model argues that profit is determined by the propensity to invest and the propensity to consume of capitalist. Therefore, profit is the "priority payment" in national output and wage becomes the "residual" part. Ricardo argues that all taxes (except for the taxes on land rents) should be undertaken by profit, however, Keynesian model proposes all taxes, like income tax, profit tax and commodity tax, eventually will be borne by wage. Assume that investment rate (I/Y) and the saving rate of capitalist (S_p) doesn't change over time, thus the share of wage will be constant. This means that every year, when real wage increases at the natural rate, output per capita will also increase in the same rate so that the share of wage remains constant over time.

In the Keynesian model, wage and profit correspond to the income of two groups of people who are workers and capitalists. Pasinetti (1962) argues that the assumption of no savings for workers is not realistic. He suggests that workers will also save their income and lend it to the capitalists, in order to gain interest and occupy a part of profit of the capitalists. Under this circumstance, the distribution of profit consists two parts: one belongs to the capitalists, and the other belongs to the workers. Pasinetti's (1962) research shows that in this case, without making any assumptions to the saving behavior of workers and capitalists, Eq. (2.12) can still be realized.

Different from Pasinetti (1962), Goodwin (1967) has extended the Keynesian distribution model from another perspective so as to discuss the relationship between labor's share of income and cyclical economic fluctuations. In this model, labor's share of income and unemployment rate will have a predator-prey relationship: when labor's share of income is too high, labor forces are faced with the

risk of unemployment, the unemployment rate will increase in turn (in this case, labor's share of income is the predator); when unemployment rate increases, the labor cost will decrease, labor's share of income will return back to a lower level and start to increase again (in this case, the unemployment rate is the predator), bringing the chasing circle into another time. Goodwin (1967) argues that in the long run, the unemployment rate is not allowed to persist so that labor's share of income will be stable in the long run.

It is observed that although Keynesian theory has discussed the determinist factors of labor's share of income from the demand side, it reaches a similar conclusion with the neoclassical theory that labor's share of income will be stable in the long run. Therefore, the "marginalist" distribution theory of neoclassic seems to dominate the discussions about distribution issues in western economics. The newly discussion about labor's share of income is still based on neoclassical framework. Economists extend the framework by adding the factors such as technological progress, imperfect market competition so as to supplement the thoughts of "marginalism".

2.3.2 *The Relationship Between the Labor's Share of Income and the Capital Output Ratio*

When we apply the theory of neoclassical economics to the estimation of Cobb-Douglas (CD) production function, labor's share of income will not change over time since it can be considered as the constant parameter in CD production function. Meanwhile, the series of research in the beginning of 20th century show that labor's share of income remains stable in the long run (Hicks 1932; Keynes 1939; Solow 1958). Kaldor (1961) further argues that constant labor's share of income is one of several features for the macroeconomic growth, named as "Kaldor stylized facts".[4]

When the production function is not the typical CD production function, there is a clear functional relationship between labor's share of income and capital output ratio (Bentolila and Saint-Paul 2003). Assume that production function is a homogeneous linear function with constant return of scale (CRS):

$$Y = F(K, L) = Kf(1, L/K) = Kf(l) \tag{2.14}$$

[4]"Kaldor stylized facts" means that in the long run, the increase of economy has the following features: the increase rate of ouuput per person, the ratio of capital output, the return rate of capital and the share of labor and capital in national income are almost constant.

K and L are capital and labor respectively, $F(\cdot)$ and $f(\cdot)$ represent the form of production function, and l stands the labor capital ratio (L/K). Assume that firm maximizes profits as its objectives:

$$\max \pi = pY - wL - rK \Leftrightarrow \max \pi = Kpf(l) - Kwl - rK \tag{2.15}$$

Then the condition of goods market equilibrium is:

$$\partial \pi / \partial l = Kpf'(l) - Kw = 0 \Rightarrow w/p = f'(l) \tag{2.16}$$

Using the above function, labor's share of income can be expressed as:

$$\alpha_L = wL/pY = pf'(l)L/pKf(l) = lf'(l)/f(l) \tag{2.17}$$

Define $k = K/Y$ as capital output ratio, then $k = 1/f(l)$. From Eq. (2.17), the labor's share of income α_L has an one-to-one relationship with capital output ratio k, representing as $\alpha_L = g(k)$.

Assume that production function is as CD functional form, then $Y = AK^{\alpha}L^{1-\alpha}$. From Eq. (2.17), we know that the labor's share of income is equal to the output elasticity, i.e., the parameter on the labor in CD production function (1 – α). In this case, labor's share of income is constant and irrelevant to the capital output ratio, which is consistent with "Kaldor stylized facts".

When production function follows the constant elasticity of substitution (CES) functional form:

$$Y = \left[\alpha K^{(\sigma-1)/\sigma} + (1-\alpha)L^{(\sigma-1)/\sigma}\right]^{\sigma/(\sigma-1)} \tag{2.18}$$

Assume that the technological progress is Hicks neutral, σ is the substitution elasticity between labor and capital, and α is the output elasticity of capital. Using Eq. (2.17), capital output ratio k and labor's share of income α_L can be expressed as the following two equations respectively.

$$k = \left[\frac{K^{(\sigma-1)/\sigma}}{\alpha K^{(\sigma-1)/\sigma} + (1-\alpha)L^{(\sigma-1)/\sigma}}\right]^{\sigma/(\sigma-1)} \tag{2.19}$$

$$\alpha_L = \frac{(1-\alpha)L^{(\sigma-1)/\sigma}}{\alpha K^{(\sigma-1)/\sigma} + (1-\alpha)L^{(\sigma-1)/\sigma}} \tag{2.20}$$

Then the relationship between labor's share of income and capital output ratio can be expressed as:

$$\alpha_L = 1 - \alpha k^{(\sigma-1)/\sigma} \tag{2.21}$$

From the above equation, we know that labor's share of income is a monotonic function of capital output ratio. However, whether labor's share of income increases or decreases along with capital output ratio, depends on the substitution elasticity (σ) between labor and capital. When the substitution elasticity (σ) is equal to one, the labor's share of income is a constant; when substitution elasticity (σ) is higher than one, the labor's share of income will decrease when capital output increase; when substitution elasticity (σ) is less than one, which means capital and labor substitute with each other, the labor's share of income will increase when capital output increase. For illustrative purpose, we use a figure to show the relationship between these two variables (see Fig. 2.2). The horizontal axis is the capital output ratio k and vertical axis is the labor's share of income α_L. Bentolila and Saint-Paul (2003) call such relationship as *SK* curve. The research results concerning China show more supporting evidences that the substitution elasticity is less than one (Bai and Qian 2009b; Luo and Zhang 2009b).[5] According to these results, *SK* curve is shown as a monotonic increasing curve, the increase of capital output ratio will move labor's share of income from point A to point A_1.

2.3.3 *The Impact of Technological Progress on the Labor's Share of Income*

When production function is CD functional form, we know that the labor's share of income is a constant. Therefore, the technological progress will not affect the labor's share of income. When the production function is CES functional form, technological progress plays its role. First, we assume that technological progress is Hicks neutral, and then the production function can be expressed as:

$$Y = A\left[\alpha K^{(\sigma-1)/\sigma} + (1-\alpha)L^{(\sigma-1)/\sigma}\right]^{\sigma/(\sigma-1)} \tag{2.22}$$

Here, A is the level of technology. Using the equation of (2.16) and (2.17), we can get the relationship between labor's share of income and capital output ratio with consideration of technological progress.

$$S_L = 1 - \alpha(Ak)^{(\sigma-1)/\sigma} \tag{2.23}$$

From the equation above, we know that labor's share of income will be affected by the technological progress. This can be illustrated by Fig. 2.2, when there is no technological progress, labor's share of income will be fixed at point A. When there

[5]If state specifically elsewhere, when discussing the impacts of other factors on the labor's share of income, it is assumed that substitution elasticity between labor and capital is less than one in order to get a better understanding about the situation in China.

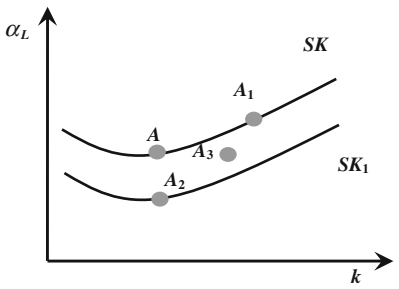

Fig. 2.2 Labor's share of income and capital output ratio

is technological progress, SK curve will shift down to SK_1 and the labor's share of income will decrease from point A to point A_2.

However, recent research proposes that technological progress is not usually Hicks neutral but biased. If we categorize the type of technological progress in terms of production factors, we can divide it into capital-biased technological progress and labor-biased technological progress. According to Acemoglu's (2003) definition, the so-called labor-augmenting technological progress means that technological progress will cause an outward shift of isoquant curve in the direction paralleling to the labor axis; while capital-augmenting technological progress means that technological progress will cause an outward shift of isoquant curve in the direction of paralleling to the capital axis. If we assume CES functional form, the production function can be expressed as:

$$Y = \left[\alpha(A_1K)^{(\sigma-1)/\sigma} + (1-\alpha)(A_2L)^{(\sigma-1)/\sigma}\right]^{\sigma/(\sigma-1)} \tag{2.24}$$

A_1, A_2 and σ are parameters of capital-augmenting technology, labor-augmenting technology and the substitution elasticity between labor's share of income and capital output ratio respectively. Using Eq. (2.17), capital output ratio k and labor's share of income α_L can be expressed as the following two equations respectively.

$$k = \left[\frac{K^{(\sigma-1)/\sigma}}{\alpha(A_1K)^{(\sigma-1)/\sigma} + (1-\alpha)(A_2L)^{(\sigma-1)/\sigma}}\right]^{\sigma/(\sigma-1)} \tag{2.25}$$

$$\alpha_L = \frac{(1-\alpha)(A_2L)^{(\sigma-1)/\sigma}}{\alpha(A_1K)^{(\sigma-1)/\sigma} + (1-\alpha)(A_2L)^{(\sigma-1)/\sigma}} \tag{2.26}$$

Then the relationship between labor's share of income and capital output ratio can be expressed as:

$$\alpha_L = 1 - \alpha(A_1k)^{(\sigma-1)/\sigma} \tag{2.27}$$

From Eq. (2.27), we can find an interesting conclusion that capital-augmenting technological progress will affect the labor's share of income while labor-augmenting technological progress has no relationship with the labor's share of income. Acemoglu (2003) argues that, in the long run, the economy operates on a balanced growth path together with only labor-augmenting technological progress. Since labor-augmenting technological progress has no effects on the labor's share of income, therefore the labor's share of income will be constant along the balanced growth path; in the short run, when the economy operates on a transition path, the technological progress is capital-augmenting. Under this circumstance, the labor's share of income will change along with the technological progress, such changes are the same as the case with a Hicks neutral technological progress. This can be illustrated by Fig. 2.2, capital-augmenting technological progress will shift SK curve to SK_1 and the labor's share of income will decrease from A to A_2.

Zeira (1998) and Zuleta (2008) explore the effects of biased technological progress on the labor's share of income from different angles. By constructing model, they argue that factor scarcity will create strong incentives for people to conduct factor saving innovation investment. In another word, the aim of people conducting factor saving innovation investment is to decrease demand of scarce factors and increase the utilization of abundant factors respectively. If the price of factors is determined by the marginal production of such factor, then capital-saving technological progress will increase the labor's share of income and labor-saving technological progress will decrease the labor's share of income. Huang and Xu (2009) have decomposed the change of labor's share of income into multiplier effect, capital deepening effect and the effect of labor-saving (or capital-saving) technological progress by introducing Hicks' factor biased technological progress. Their research also confirms that labor and capital saving technological progress will impose opposite effects on the labor's share of income and the final effect of technological progress is determined by the difference between the two offsetting effects. However, these studies exit some differences with the models above, which suggest that only capital-augmenting technological progress[6] can result in the decrease of labor's share of income.

China's economy operates on the transition path, meaning that labor's share of income will be affected by the technological progress, especially capital biased technological progress. However, technological progress is normally endogenous, which cannot explain fully about the dynamic changing process of labor's share of income.

[6]In fact, labor-saving is equal to capital-augmenting and capital-saving is equal to labor-augmenting.

2.3.4 The Impacts of Imperfect Competition on the Labor's Share of Income

2.3.4.1 Imperfect Competition in Goods Market

So far, all discussions are conducted under the assumption of perfect competition. In the condition of perfect market competition, wage equals the marginal products of labor, interest equals to the marginal production of capital and the price of good equals to its marginal cost. However, under the imperfect market competition, the price of firm products can be different from marginal cost. Instead, the price contains a mark-up over marginal cost.

Kalecki (1938, 1954) first analyzes the determinist theory of labor income distribution in imperfect market competition. He argues that, in the short run, labor and capital are not "substitutional" but "limitational" factors. The marginal cost of each factor equals its average cost and labor's share of income (capital's share of income) is entirely determined by the elasticity of demand faced by firms.

We can express his idea in mathematical equation. Considering the price mark-up of firms, the first order condition for maximizing firm's profit in Eq. (2.16) has changed to:

$$\mu w/p = f'(l) \tag{2.28}$$

Here, μ stands for the ratio of mark-up,[7] then, the labor's share of income can be expressed as:

$$\alpha_L = \mu^{-1} l f'(l)/f(l) = \mu^{-1} g(k) \tag{2.29}$$

The above equation means that with a constant mark-up, the labor's share of income will still have a one-to-one corresponding relationship with capital output ratio. Usually, the mark-up will change with economic fluctuation. If the mark-up (μ) is pro-cyclical, then labor's share of income will exhibit a counter-cyclical feature. This provides a perspective for exploring the relationship between labor's share of income and economic cycle. This can be illustrated by Fig. 2.2, the change of mark-up will not change the labor's share of income by shifting *SK* curve, but directly deviates the equilibrium point of labor's share of income away from the *SK* curve. The labor's share of income will decrease from point *A* to point A_3.

[7]Ratio of mark-up = (price of goods –marginal cost)/price of goods.

2.3.4.2 Imperfect Competition in Labor Market

Besides the imperfect competition feature in goods market, trade union plays a significant role in forming the imperfect competition feature of labor market in the western countries. More specifically, trade union has strong bargaining power on wage setting issues, which makes the labor market have features of imperfect market competition. Therefore, the power of trade union and the form of wage contract will have an impact on the labor's share of income. Let's take the "effective bargaining" model as an illustrative example. Firm and trade union negotiate on the wage and the number of employment. Such negotiation determines the number of employment at the level when marginal production of labor equals the reservation wage. At the same time, it determines the real wage as a weighted average of the real reservation wage and average labor between the average product of labor and real reservation wage, where the weight is determined by the bargaining power of workers, representing as θ (Blanchard 1997; Bentolila and Saint-Paul 2003). To be more specific, we can change the first order condition of maximizing profit in Eq. (2.16) to:

$$\frac{w}{p} = \theta \frac{f(l)}{l} + (1-\theta)\frac{\bar{w}}{p} \tag{2.30}$$

According to the above equation, the deterministic function of labor's share of income can be expressed as:

$$\alpha_L = \frac{wL}{pY} = \frac{wl}{pf(l)} = \theta + (1-\theta)\frac{lf'(l)}{f(l)} = \theta + (1-\theta)g(k) \tag{2.31}$$

When the functional form is CES and technological progress is Hicks neutral, i.e., Eq. (2.21), then the relationship between the labor's share of income and capital output ratio can be expressed as:

$$\alpha_L = 1 - \alpha(1-\theta)(Ak)^{(\sigma-1)/\sigma} \tag{2.32}$$

Equations (2.31) and (2.32) show that decreasing bargaining power of trade union will shift down the SK curve to SK_1 and move the equilibrium point from point A to point A_2, meaning that the decreasing bargaining power of trade union will also lead to the decrease of labor's share of income. Meanwhile, it can be shown from the above equations that the addition of bargaining power of trade union weakens the sensitivity of labor's share of income from the change of capital output ratio. When discussing the effects of bargaining power of trade union, results are sensitive for different model specifications. For example, Bentolila and Saint-Paul (2003) adopt a "right to manage" model and argue that the labor's share of income is still determined by Eq. (2.16) in such model. In this case, the labor's share of income is not related to the change of the bargaining power of trade union.

2.3.5 The Impacts of Labor Heterogeneity on the Labor's Share of Income

Up till now, we assume that the workers are homogeneous. However, there are significant skill differences among workers. Meanwhile, large amounts of literature have discussed the reasons why there are significant differences in skill premium among different types of workers.[7] In the literature, workers are normally categorized as skilled workers and unskilled workers based on their skills types. Then, in the world of heterogeneous workers, the question now is whether the difference in skill premium will affect labor's share of income. Therefore, we can extend the above model to discuss the deterministic factors of labor's share of income when considering "labor heterogeneity". Bentolila and Saint-Paul's (2003) research shows that when we make some constraints on the production function, there is still a definite functional relationship between labor's share of income and capital output ratio. Such function can be expressed as:

$$Y = H[K, G(B_1L_1 + B_2L_2)] \tag{2.33}$$

Here, B_1 and B_2 are parameters of technological progress for unskilled workers (L_1) and Skilled workers (L_2) respectively,[8] $H(\cdot)$ and $G(\cdot)$ are homogeneous linear function.

Then the first order condition for maximizing profit is as the following:

$$\frac{\partial Y}{\partial L_i} = \frac{w_i}{p} = B_i \frac{\partial H}{\partial G} \frac{\partial G}{\partial (B_i L_i)}, (i = 1, 2) \tag{2.34}$$

Therefore, the labor's share of income can be expressed as:

$$\alpha_L = \frac{w_1L_1 + w_2L_2}{pY} = \frac{\sum_{i=1}^{2} B_iL_i \frac{\partial H}{\partial G} \frac{\partial G}{\partial (B_iL_i)}}{H(K, G(B_1L_1, B_2L_2))} = \frac{G \frac{\partial H}{\partial G}}{H(K, G)} = \phi\left(\frac{G}{K}\right) \tag{2.35}$$

Here, capital output ratio is $k = K/H$, which is directly related to G/K. Therefore, there is still a one-to-one corresponding relationship between labor's share of income and capital output ratio even if we consider the further divisions of labor.

To further analyze the relationship between labor's share of income and differences in skill premium, we still use CES function to explore such relationship. According to Krusell et al. (2000), the production function can be written as a nested CES function.

[8]Studies about differences of skill premium in US support for the existence of skill biased technological progress, implying $B_2 > B_1$.

$$Y = \left[(AK + B_1L_1)^{\varepsilon} + (B_2L_2)^{\varepsilon}\right]^{1/\varepsilon}, \varepsilon = (\sigma - 1)/\sigma \tag{2.36}$$

We know that σ is the substitution elasticity between labor and capital. The CES function above means that capital and unskilled workers can substitute with each other, while skilled workers supplement capital, having managing and monitoring effects on unskilled workers and capital. Therefore, the first order condition of maximizing profit can be expressed as:

$$w_1 = \left((AK + B_1L_1)^{\varepsilon} + (B_2L_2)^{\varepsilon}\right)^{1/\varepsilon - 1}(AK + B_1L_1)^{\varepsilon - 1}B_1 \tag{2.37}$$

$$w_2 = \left((AK + B_1L_1)^{\varepsilon} + (B_2L_2)^{\varepsilon}\right)^{1/\varepsilon - 1}B_2^{\varepsilon}L_2^{\varepsilon - 1} \tag{2.38}$$

Then, the labor's share of income can be expressed as:

$$S_L = \frac{B_1L_1(AK + B_1L_1)^{\varepsilon - 1} + (B_2L_2)^{\varepsilon}}{(AK + B_1L_1)^{\varepsilon} + (B_2L_2)^{\varepsilon}} \tag{2.39}$$

Therefore, skill premium and capital output ratio of two types of can be expressed as the following two equations.

$$\omega \equiv w_2/w_1 = \frac{B_2(B_2L_2)^{\varepsilon - 1}}{B_1(AK + B_1L_1)^{\varepsilon - 1}} \tag{2.40}$$

$$(Ak)^{\varepsilon} = \frac{(AK)^{\varepsilon}}{(B_2L_2)^{\varepsilon}\left(1 + (B_1\omega/B_2)^{1/\varepsilon - 1}\right)^{\varepsilon}} \tag{2.41}$$

Replace Eqs. (2.40) and (2.41) into Eq. (2.39), the functional relationship between labor's share of income and capital output can be expressed as:

$$S_L = 1 - Ak(B_1\omega/B_2)\left(1 + (B_1\omega/B_2)^{\frac{\varepsilon}{\varepsilon - 1}}\right)^{1/\varepsilon - 1} \tag{2.42}$$

Therefore, labor's share of income is not only related to capital output ratio but also related to the differences in skill premium for two types of workers. Meanwhile, skill biased technological progress will also affect labor's share of income. This can also be illustrated by Fig. 2.2. It will shift SK curve up to SK_1, and the equilibrium point will change from point A to point A_1. Therefore skill biased technological progress poses the same effect as capital biased technological progress which all produce a downward pressure to labor's share of income.

Song (2010) investigates the existence of skill biased technological progress in China and finds that capital biased technological progress and skill biased technological progress have a complementary relationship in China. He argues that technological progress exhibits both capital and skill biased features in China.

Wang and Sheng (2010) construct a model including skilled labor, unskilled labor and physical capital. In that model, they also introduce the supplementary relationship between capital and skilled labor. They suggest that there are three channels through which skill biased technological progress will have impacts on labor's share of income. First, skill biased technological progress will increase labor's share of income through increasing demand of skilled labor; Second, since physical capital is normally matched with skilled labor, skill biased technological progress will increase the returns of physical capital and decrease labor's share of income; Third, skill biased technological progress will further decrease labor's share of income by decreasing demand of unskilled labor. Among those three channels, they argue that the second channel is more important to explain why labor' share of income is decreasing in China in recent years.

2.4 The Deterministic Theory of Labor's Share of Income Under Economic Globalization

The 1994 edition of *Dictionary of World Economics* defines economic globalization as "all economic relations based on production forces which are in the developing process and status of extending and interconnecting globally". The economic globalization can be shown the globalization of market economy, financial globalization and drastic development of multinational corporations and information technologies (Li 1994). United Nations Economic and Social Commission for Western Asia (UN-ESCWA 2002) provides another similar definition that "from the perspective of economy, globalization is related to reducing tariff caused by national boundary, facilitating the flow of commodity, capital, service, technology and labor among countries." Therefore, the impacts of globalization on labor's share of income are mainly through channels which are international trade and foreign direct investment.

2.4.1 The Labor's Share of Income in the Neoclassical Trade Model

Discussions about effects of trade on the factor's share of income are mainly based on neoclassical trade theory. Hecksher (1919) and Ohlin (1933) argue that countries with different endowments have different comparative advantages which are the reasons for international trade. Hecksher–Ohlin (HO) model predicts that a country will specialize to product and export the goods which it can effectively use its abundant factors. Meanwhile, it will import the goods which it can effectively use its scarce factors. This means that a country will specialize in production by using of the factors with high production elasticity. Therefore, international trade and

specialization increase the production elasticity of the factors which are relatively abundant domestically and decrease the production elasticity of relatively scarce factors. At last, if the factor's share of income equals production elasticity of each factor, then international trade and specialization will increase the income share of abundant factors and decrease the income share of scarce factors. In developed countries, capital factor is relatively abundant while labor factor is relatively scarce so that developed countries will export capital intensive goods and import labor-intensive goods. This will increase the capital's (abundant factor) share of income and decrease the labor's (scarce factor) share of income. Finally, Stolper and Samuelson's (1941) theory proposes that the situation will be the opposite in developing countries. They argue that the final result of trade will equalize factor prices among all countries, leading a stable labor's share of income in each country. Therefore, neoclassical trade theory provides a reasonable theoretical explanation to the recent decrease of labor's share of income in industrialized countries and receives wide supports from various studies (Harrison 2002; Guscina 2006; Jaumotte and Tytell 2007). However, in China, the labor factor is relatively abundant while the capital factor is relatively scarce. Based on the neoclassical trade theory, the labor's share of income shall decrease and the capital's share of income shall decrease. Contrary to the prediction, the labor's share of income has experienced a declining trend in recent years in China. In the composition of income approach of GDP, the ratio of labor compensation in GDP has decreased from 52.9 % in 1985 to 39.7 % in 2007, decreasing as many as 13 percentage points.[9] Therefore, the prediction by neoclassical trade theory cannot be supported easily, contradicting the empirical evidences, at least in China.

2.4.2 *Trade in Intermediate Inputs and the Labor's Share of Income*

Feenstra and Hanson (2001) argue that trade are more shown as trade in intermediate inputs as the form of outsourcing around the 21st century. They call such trade as "global product sharing". They think that outsourcing is not only transferring the low-skilled production in developed countries but also involving developing countries in more complicated manufacturing and processing. This can help developing countries to effectively use the relatively scarce factor such as capital and skilled workers. Therefore, after considering trade in intermediate inputs, the developing countries may experience a decrease in labor's share of income and an increase in capital's share of income. Feenstra and Hanson (2001) have added the trade in intermediate inputs into the production function and explore the influence

[9]Bai and Qian's (2009a, b) study shows that part of the reason for decreasing labor's share of income is the changing statistic calibers in China. However, there is still a clear declining trend of labor's share of income, decreasing 4.3 % since 1995, even if we eliminate the statistical factors.

of trade in intermediate inputs on the differences in skill premium. This chapter makes some modification to this model and makes this model adaptable to the discussion of the relationship between trade in intermediate inputs and labor's share of income.

Assume that the country will produce one good and needs two inputs. The production of two inputs need two factors, capital K and labor L, so that the homogeneous linear production function of two inputs can be expressed as:

$$y_i = f_i(L_i, K_i),\ (i = 1, 2) \tag{2.43}$$

Assume that input factor y_1 is a labor-intensive product like manufacturing products while input factor y_2 is capital-intensive goods like research and development (R&D), marketing and after-sale service. Two input factors are the input factors for producing final goods. Further assume that the country is relatively abundant in capital and technology, according to HO theory, this country can engage more high skilled production like R&D and outsource the low skilled production such as manufacturing. This means that import input y_1 and export input y_2. The production function of final goods can be expressed by inputs and their trade volumes:

$$y_m = f_m(y_1 - x_1, y_2 - x_2) \tag{2.44}$$

Here, x_1 and x_2 are the trade volumes for input y_1 and input y_2 respectively. We further assume that x_1 is negative, meaning that firm import input y_1 from other countries. Meanwhile, we assume that the price of exports of input 2 is standardized by one and price of imports of input 1 is p, and the price of final goods is p_m. Maximizing production requires:

$$\begin{aligned} &\max_{x_i, L_i, K_i} F(L_m, K_m, p_m, p) = p_m y_m + p x_1 + x_2 \\ &s.t. L_m = L_1 + L_2; K_m = K_1 + K_2 \end{aligned} \tag{2.45}$$

To firm, it is equivalent for maximizing output as for minimizing the cost. Therefore, the optimization requires:

$$\begin{aligned} &\min_{L_m, H_m, K_m} C(w, r, Y_m, p/p_m) = wL_m + rK_m \\ &s.t. L_m = L_1 + L_2; K_m = K_1 + K_2 \end{aligned} \tag{2.46}$$

Here, w and r are the price of labor and capital respectively; Meanwhile, let's assume that the capital can be adjusted in the long run and the cost function is also homogeneous linear.

To specify the effect of trade factors on labor's share of income, we need to confirm the specific form of cost function. Therefore, we define the cost function as $C(L_m, K_m, Z)$ where Z is a vector of exogenous and structural variables which will

shift the entire cost function. Following Kohli (1991), let's assume that the cost function is homogeneous linear with trans-logarithmic form:

$$\begin{aligned}\ln C = {} & \theta_0 + \beta_1 \ln L_m + \beta_2 \ln K_m + \frac{1}{2}\beta_3 (\ln L_m)^2 + \frac{1}{2}\beta_4 (\ln K_m)^2 \\ & + \beta_5 \ln L_m \times \ln K_m + \sum \delta_j Z_j + \sum \varphi_j Z_j \ln L_m + \sum \phi_j Z_j \ln K_m\end{aligned} \tag{2.47}$$

Here, j is the subscript for the structure variables. We take the derivative to capital and labor respectively and then we can get:

$$\frac{\partial \ln C}{\partial \ln L_m} = \frac{L_m \cdot \partial C / \partial L_m}{C} = \beta_1 + \beta_3 \ln L_m + \beta_5 \ln K_m + \sum \varphi_j Z_j = \alpha_L \tag{2.48}$$

$$\frac{\partial \ln C}{\partial \ln K_m} = \frac{K_m \cdot \partial C / \partial K_m}{C} = \beta_2 + \beta_4 \ln K_m + \beta_5 \ln L_m + \sum \phi_j Z_j = \alpha_K \tag{2.49}$$

If we take derivative to labor with regard to cost function, we can get labor's share of income. Similarly, we can get capital's share of income by taking derivative to capital with regard to cost function. In this model, trade acts as a structure variable influencing labor's and capital's share of income.

2.4.3 *Foreign Direct Investment and the Labor's Share of Income*

Dunning's (1988) specific location advantage theory argues that the natural and factor endowment of a specific location will determine whether this place will have the advantage of attracting foreign investment. Therefore, firms producing labor-intensive goods will choose to invest in the countries which are relatively abundant in labor and firms producing capital-intensive goods will choose to invest in the countries which are relatively abundant in capital. This means that foreign direct investment will further expand the factor abundant sectors in the host countries. Therefore, FDI should be able to increase the output elasticity and income share of the abundant factor. Location advantage theory also provides a relatively reasonable explanation to decrease labor's share of income and increase capital's share of income in developed countries. However, this still cannot be used to explain the fact that labor's share of income is decreasing in China.

Decreuse and Maarek (2008) have constructed a theoretical model to discuss the effect of FDI on labor's share of income. First, they assume that there is product heterogeneity between foreign-invest firms and domestic firms. In addition, labor market is a frictional market that aims to match labor force with two types of firms,

i.e., foreign and domestic firms. Therefore, using "searching and matching" model, they argue that FDI has two opposite effects on labor's share of income. On the one hand, foreign firms have stronger ability of financing and more advanced technology, which can quickly increase the labor while maintaining low level of increase in workers' wage. This will lead to the decrease of labor's share of income in the foreign firms; on the other hand, because of the competition between foreign and domestic firms, this will increase the wage level and increase labor's share of income. Therefore, FDI's impact on labor's share of income is a U-shape curve.

From the perspective of China, studies also find both positive and negative effects of FDI on labor's share of income. The positive effect of FDI can be summarized into four aspects. First, at the beginning of reform and opening up, China is facing "two gaps" in saving and foreign currency which make the capital a strong position apparently. The introduction of foreign investments alleviates the shortage of capital. According to the "bargaining power" model, utilizing foreign investments ought to increase status of laborers and improve their income (Luo and Zhang 2009b). Second, foreign investments in China are mainly in the form of Greenfield investment so that the introduction of them means new projects and employment opportunities (Luo and Zhang 2008). Third, the introduction of foreign investments will also have 'wage spillover' effect (Fosfuri et al. 2001). Compared to local firms, foreign-invested firms tend to pay higher wage (Zhao 2001, 2002; Liu et al. 2004), which will have an increasing effect on the labor compensation in the whole economy. Fourth, foreign-invested firms, especially western countries' firms, will normally import the norms and standards of employing workers from the parent country (e.g., labor protection, overtime payment, dismissal payment and holiday arrangement), which will improve the living conditions of the labor force (Liu et al. 2004).

However, other studies show that the foreign direct investment will also pose a negative influence on labor's share of income because of unique feature of China. Luo and Zhang (2009a, b) argue that the competition of attracting foreign investments in different regions in China can be the main factor to strengthen the bargaining power of capital. The local governments have put the low labor cost and low labor protection as the main strategy to attract foreign investment which increase the bargaining power of capital and weaken the bargaining status of labor force. Foreign capital can move across different provinces easily by the way of "vote by foot" but labor force has various hindrances for mobility because of the constraints such as House Registration System (Hukou System). Second, the funds of Chinese FDI mainly come from countries and regions nearby and 40 % of foreign investment appears as round-tripping investment (Xiao 2004). The motive of these round-tripping flows is mainly for the preferential policy and cheap labor force, which puts a limit on the increase labor compensation.

2.5 The Deterministic Theory of Labor's Share of Income During Economic Transition

However, both neoclassical framework and the perspective of open economy still cannot explain fully about the factors that change the labor's share of income. The transition of economic structure is very important for understanding the operation of economy. Especially, developed countries have entered a post-contemporary period where service industry has become the pillar of national economy. Therefore, the change of labor's share of income will also be influenced by such structure change. Developing countries like China are still in the accelerating stage of industrialization. Meanwhile, the urban-rural dualistic economic structure has made the exploration of reasons for movements of the labor's share of income in some developing countries like China more complicated.

2.5.1 The Evolution of Labor's Share of Income in the Post Modernization

Young (2006) and Zuleta (2009) construct economic model of two sectors to analyze the impacts of changes of industry structure in developed countries. Let's assume that one sector produces tradable manufacturing products whose input factors are labor and capital. The other sector is non-tradable service sector whose input factor is only labor. The production functions of two types of products (X and Y) are:

$$Y = K^{\alpha} L_y^{1-\alpha}; X = BL_x \tag{2.50}$$

Here, K is capital, L is labor, B is the labor productivity for producing product X. Subscript x and y are the input of labor factors for producing product X and Y respectively. By making some proper assumptions on the consumption of two goods, Zuleta (2007) shows that the labor's share of income can be expressed as:

$$\alpha_L = \frac{1-\alpha}{1-\alpha L_x} \tag{2.51}$$

The equation above means that labor's share of income is related to output elasticity and the numbers of laborers in service industry. Zuleta (2009) argues that, in developed countries, the share of service industry will grow steadily along with the economic development, which means the labor's share of income will also increase at the same time.

2.5.2 The Movement of the Labor's Share of Income in Dual Economy

In order to provide a more reasonable explanation for the reality of the labor's share of income in China, Li et al. (2009) use the theory of dual economy of Lewis to construct a mathematical model about the transfer of labor force. They argue that although the dual economic structure in China has hoarded a large amount of labor force in the countryside, the economic development with the feature of urbanization and industrialization has transferred labor force from agriculture sector to industrial sector. Their research argues that in the process of labor transferring, the movements of labor's share of income can be divided into three phases. At the beginning of labor transferring, the increase in the industrial output will compensate more than the decrease in the agriculture output of agriculture. Meanwhile, the growth of industrial output is higher than the growth of workers' wage, resulting in a declining trend of labor's share of income; in the middle stage of labor transferring, the increase of marginal product in agriculture and the increasing growth of wage has made labor's share of income move to the bottom; in the last stage of labor transferring, the marginal product in the industrial sector will increase which makes the growth of industrial output lower than the growth of wage resulting in an increasing trend of labor's share of income. Therefore, labor's share of income will decrease first and increase after in this process, appearing a U-shape curve. However, the model of Li et al. (2009) has several drawbacks. First, labor is assumed only to transfer between agriculture and industrial sector which ignores the impacts of labor-intensive service industry on labor's share of income. Second, this model still assumes that labor and capital are fully utilized from the perspective of production, meaning that the analytical framework is still neoclassical. However, this cannot fully manifest the assumption of Lewis (1954) about the infinite labor force in dual economy.

Gong and Yang (2010a, b) suggest that the economy society contemplated by Keynes is more suitable to describe the reality in China. Therefore, they construct an unbalanced dynamic model with Keynesian feature. By constructing the model, they propose that under the condition of dual economy in China, infinite labor supply is the main reason of decreasing labor's share of income. Also, under the dual economy, the infinite labor supply not only hinder the wage increase despite the increasing demand of labor force, but also makes the labor productivity and the change of price less sensitive with to the change of wages. This means that when the labor productivity or the price of goods increases, the increase of wage is not remarkable, which transfers the benefit from economic growth and labor productivity increase into profits rather than wages, meaning that the fruits of economic growth cannot be shared by laborers. Therefore, their demand perspective has provided a different mechanism from Li et al. (2009) in explaining the decreasing labor's share of income. Meanwhile, Gong and Yang (2010a, b) also argue that the increasing demand of labor will exhaust the surplus labor with further economic development, so that wage will gradually play the role of reflecting the demand-supply relationship in labor market again.

This means that when the economy develops to a certain stage, wage will increase faster as economy develops, which will turn over the decreasing trend of labor's share of income. Therefore, labor's share of income will also appear as a U-shape curve which is consistent with the conclusion of Li et al. (2009).

2.6 The Empirical Analysis of the Determination of the Labor's Share of Income

Whether labor's share of income is stable or not, the academia of economy still exist clear dispute. The main focus is whether labor's share of income is consistent with "Kaldor fact" or "Kuznets fact".[10] If "Kuznets fact" is more convincing, then we should connect the change of labor's share of income with the change of economic structure. Therefore, current studies decompose labor's share of income to discuss the impacts of intra-industry and inter-industry movements on the total labor's share of income.

2.6.1 The Dispute About Stability of Labor's Share of Income

At the beginning of 20th century, studies show that labor's share of income keeps stable in the long run which is described as "Bowley's law" in Hicks' (1932) Wage *Theory*. Keynes (1939) calls the stability of labor's share of income as "one of the most surprising, yet best-established facts in the whole range of economic statistics". Kaldor (1961) further considers this as one of the "stylized facts" of Macroeconomic growth. Solow (1958) argues that when the fluctuation of total labor's share of income is less than that of individual industry's labor's share of income, we can conclude that labor's share of income is relatively stable. Although he argues that labor's share of income fluctuates with the change of the industrial structure in the short run, such skeptical note cannot exclude the fact that labor's share of income is stable in a long run in US. Recent studies show that "Kaldor fact" still holds in US, as labor's share of income keeps stable around 75 to 80 % (Kruger 1999; Young 2006). The stability of labor's share of income in US is confusing and surprising since economic structure and production technology has experienced drastic changes. Meanwhile, the situations in UK are also consistent with "Kaldor fact". Labor's share of income keeps a random walk status around

[10]From the perspective of labor's share of income, the so-called "Kuznets fact" means that, with economic development, the change of the industry structure and the difference of labor's share of income in each industry lead to the unstable distribution between labor and capital.

70 % between 1960 and 1995 (Bentolila and Saint-Paul 2003). For the time dimension, labor's share of income keeps a relatively stable trend. Then, what will be the situation for the cross-section dimension? After considering attribution issues of labor compensation in proprietors' economy, Gollin (2002) has pointed out that the labor's share of income are not statistically different across multinational samples, which keeps stable between 65 and 80 %.

However, many economists argue that the stability of labor's share of income doesn't hold. First, labor's share of income has decreased in many industrialized countries in middle and later 20th century, especially for Germany and France, two countries in the European mainland, which experience largest decreases (Guscina 2006); Second, although the cross-county differences of labor's share of income become smaller after considering the proprietors' economy, such modification dramatically decreases the number of multinational sample which makes the result less representative (Harrison 2002). Meanwhile, Harrison extends the cross section data into panel data and finds that changes in the labor's share of income are still unstable within each country even if attribution issues in proprietors' economy are considered. Last, among the emerging market economies, China's labor's share of income appears a downward trend, decreasing from 51.9 % in 1995 to 39.7 % in 2007. Luo and Zhang (2009a) argue that the fluctuation in labor's share of income in China is more consistent with "Kuznets fact" rather than "Kaldor fact".

If the labor's share of income is stable, according with "Kaldor fact", it won't affect growth, consumption or other macroeconomic variables. However, when the movement of labor's share of income is consistent with 'Kuznets fact', it will pose important effects on various variables in the economy. The decrease of labor's share of income will result in the decrease of income share in the residents' sector in national income distribution (Li and Yin 2007; Bai and Qian 2009c; Liu and Cai 2010). The decrease of residents' income will directly cause insufficient consumption which will further constrain the sustainable development of China's economy and its momentum to grow (Kuijis 2006; Economists 2007; Huang and Wei 2010). On the other hand, the decrease of labor's share of income means that capital's share of income will increase. This will increase the income share of capital owners and enlarge the income disparity within the residents' sector, which will challenge the social and political stability (Subramanian 2008).

2.6.2 *The Structural Factors of the Labor's Share of Income*

If we want to infer from the micro conclusion of "constant factor share" by neoclassical equilibrium model to the "stability of factor share" at the macro level, we need to identify many intermediate variables, e.g., the elasticity of substitution, the demand of goods, the demand condition of factors, markets with different extent of competition and monopoly and non-neutral taxes. Therefore, Solow (1958)

suggests that labor's share of income will respond to the changes of these. Solow suggests using the method of decomposing industries to study the within-industry changes of labor's share of income, avoiding contradictions between microeconomic and macroeconomic theories.

If labor's share of income in each industry is different and the total labor's share of income doesn't change over time, then the stability of labor's share of income comes from the macro level. However, the total labor's share of income is not the simple addition of each industry's labor's share of income, but a weighted average based on the share of value-added of each industry. Such relations can be expressed as:

$$S = \sum_{i=1}^{k} w_i S_i \tag{2.52}$$

Here, S_i is industry i's labor's share of income and w_i is the share of value-added of this industry in the total value-added. Therefore, the change of total labor's share of income is caused by two changes: the changes of labor's share of income in each industry and the changes of value-added weights of each industry. We can use the variance to evaluate the degree of changes of labor's share of income. Assume that σ_i is the variance of the change of labor's share of income in one industry, the theoretical value of variance of the total labor's share of income is:

$$\sigma^2 = \sum_{i=1}^{k} w_i^2 \sigma_i^2 + 2 \sum_{i=1}^{k} \sum_{j=1, j<i}^{k} w_i w_j \mathrm{cov}\left(\sigma_i, \sigma_j\right) \tag{2.53}$$

When industrial variance of labor's share of income is independent to each other, the covariance between two industries, $\mathrm{cov}(\sigma_i, \sigma_j)$, is zero. Therefore, the variance of total labor's share of income is the weighted average of variances in each industry. Therefore, Solow proposes two ways of evaluating the stability of labor's share of income. The first way is to measure the absolute stability, which means observing the extent of changes (express by serial variance) of total labor's share of income in a period of time. However, such measuring method does not have a clear standard to decide whether labor's share of income is stable or not. The other way is called the relative stability. Only when the total variance is less than the within-industry variances, labor's share of income is relatively stable. Although Solow doubts the existence of relative stability of labor's share of income in US, the result of research shows that it satisfies the requirement of relative stability regardless of industry classification, whether it is a more broad classification across the whole industries or a more narrow classification within the industry sector.

Besides this, Solow also use the fixed weights of total labor's share of income and compared with weighted average labor's share of income in weighted mean, exploring the effects of the adjustment of industry structure. The research shows that the change of industry structure has no influence on the labor's share of income from 1929 to 1954 in US. However, Solow finds that the movements of the labor's

share of income in different industries correlate with each other, which may influence the stability of total labor's share of income.

To examine the time trend of movements of the labor's share of income, Gujarati (1969) has provided testing regressions when exploring the labor's share of income in US manufacture from 1949 to 1964.

$$S_{it} = a + bt; S_{it} = a + bt + ct^2 \tag{2.54}$$

Here, S_{it} is the labor's share of income of industry i in year t. He records the year 1949 as $t = 1$, then t is the ascending series from 1 to 16. a, b and c are the regression coefficients and c is the coefficient for the quadratic form of time, testing the asymptotic effect of time. Gujarati's (1969) research shows that no matter from the whole manufacture industry or from within manufacture industry, the result of the test all suggests that the labor's share of income has a clear downward trend. Meanwhile, the quadratic form of time is not significant, meaning that the change of the labor's share of income is a linear function related to time. Close and Shulenburger (1971) modify the regression model and add the factor of economic cycle. Then the regressions become:

$$S_{it} = a + bt + cU; S_{it} = a + bt + ct^2 + dU \tag{2.55}$$

Here, U is the unemployment rate, the higher the employment rate, the more sluggish of the economy. They find that the movement of labor's share of income is counter-cyclical in all industries and sectors in US from 1948 to 1965. Besides this, different from Gujarati, their research result suggests that no matter from industries or sectors, the increases of the labor's share of income are the main trend. Only some industries exhibit no obvious trends and only a few industries have downward trends. However, both studies attempt to prove the assumption of constant labor's share of income.

Young (2006) expands the time range of industrial labor's share of income in US from 1959 to 1996. He adopts the method of volatility decomposition to decompose the movements of the labor's share of income into three effects: within-industry effect, structural effect and covariance effect. If we take the difference to total labor's share of income in Eq. (2.52) with regard to time, we can then get the decomposition equation as the following.

$$\Delta S_t = \sum_{i=1}^{k} w_{i,t-1}\Delta S_{i,t} + \sum_{i=1}^{k} \Delta w_{i,t} S_{i,t} + \sum_{i=1}^{k} \Delta w_{i,t}\Delta S_{i,t} \tag{2.56}$$

Here, Δ is the difference operator so that $\Delta S_t = S_t - S_{t-1}$. Therefore, the change of labor's share of income can be decomposed into three effects. The first effect is within-industry effect, which means the effect from the within-industry or within-sector changes of labor's share of income when the structure of industry or sector keeps constant at time period $t - 1$. The second effect is structural effect,

which means the effect of the changes of industry structure on the labor's share of income when the labor's share of income within-industry or within-sector keeps constant at time period $t - 1$. The third effect is covariance effect, which means the co-movement of structural effect and within-industry effect. Making use of this technology of decomposition, Young (2006) finds that the changes of the industry structure don't have a significant effect on the volatility of labor's share of income, although US has experienced decreasing shares of agriculture and manufacture industry and increasing shares of the service industry in this period. In addition, he also finds that the movements of labor's share of income in different industries correlate with each other. These results are consistent with those of Solow's.

However, compared with discussion of stability of the labor's share of income, such technology of decomposition is very useful for analyzing the reason behind the movements of labor's share of income. Bai and Qian (2009a) explore the moving trend of the labor's share of income in three main industries[11] in China during 1978 to 2004. After decomposing the three main industries, they find that the change of industry structure has a significant impact on the movements of total labor's share of income. The result shows that the decrease of the labor's share of income is partly caused by the transformation of industry structure, which means that the decrease of labor's share of income is caused by the transformation of industry from agriculture to non-agriculture industries, and partly caused by the decrease of the labor's share of income within the manufacture industries. Similarly, Luo and Zhang (2009a) also conduct empirical research about the movements of the labor's share of income in China from the perspective of industries. They find that the change of industry structure positively correlates and co-moves with the labor's share of income in different industries, intensifying the volatility of total labor's share of income. They argue that movements of the labor's share of income in China are neither "absolute stable" nor "relative stable" in the standards proposed by Solow (1958). The volatility of labor's share of income in China is more consistent with the "Kuznets fact" but not supports the "Kaldor fact". Using the industry level data, they decompose movements of the labor's share of income and find that before 1996, the labor's share of income in China is increasing, which is related to the increase of the labor's share of income within three main industries and the increasing share of the primary and tertiary industry. However, the main reason is the increase of labor's share of income in the secondary industry; after 1996, the share of the primary industry falls down continuously but the share of the tertiary industry does not have a remarkable increase, leading to the decrease of total labor's share of income. Besides this, the decrease of the labor's share of income in all three main industries is also the main reason for the downward trend of total labor's share of income in the whole economy.

Meanwhile, Luo and Zhang (2009a) also find that there are enormous regional differences of the labor's share of income in China. Most provinces in the eastern

[11]The classifications of the three main industries are: the primary industry (agriculture), the secondary industry (industry and construction) and the tertiary industry (service).

regions have a lower labor's share of income than the nation average while the provinces in the central and western regions are the opposite. Fortunately, they find that such regional differences narrow down over time. They argue that, these are caused by the increasing share of the tertiary industry in eastern regions and the decreasing share of primary industry in the central and western regions. Besides the role of industry structure, the development of labor-intensive industries and non-state-owned economies in the eastern coastal regions and the remaining features of capital-intensive industries and state-owned economies in the central and western regions are also reasons for the narrowing regional differences of the labor's share of income within-industries.

2.6.3 The Determinist Factors of the Labor's Share of Income

Another way to explore the determinist factors of the labor's share of income is to use econometric regression analysis. Current studies mainly use variables such as ratio of input factors, technological progress, international trade, FDI, economic development, institutional factors and political factors to explain the change of labor's share of income, analyzing their impacting magnitudes and directions.

2.6.3.1 Ratio of Input Factors and Technological Progress

Bentolila and Saint-Paul (2003) conduct research about OECD countries between 1972 and 1993 and find that the capital output ratio has significant negative effect on labor's share of income, indicating a substitutive relationship between labor and capital. Through calculation, they find that the substitution elasticity is 1.06 ($\sigma > 1$). Diwan (2000) uses the data from 135 countries during 1975 to 1995 to analyze the effect of capital accumulation on labor's share of income. He finds that capital accumulation will pose different effects in rich and poor countries. In rich countries, the labor's share of income will increase along with increase of capital accumulation; while in poor countries, the labor's share of income will decrease when capital accumulation increases. Diwan argues that high level of capital stock will increase the bargaining power of labor relative to capital. When the level of capital stock is low, the increasing rate of the labor's share of income has to slow down in order to attract the influx of capital. Harrison (2002) discusses the impacts of labor capital ratio on the labor's share of income by using data for more than 100 countries in the world from 1996 to 1997. She finds that the higher the labor capital ratio, the lower the labor's share of income will be. This result implies that when the substitution elasticity of labor and capital is relatively low, the increase of labor force (or the decrease of capital stock) will decrease the labor's share of income counter-intuitively. Poterba (1998) has obtained similar conclusions when

analyzing US data. By using Chinese provincial data from 1987 to 2004, Luo and Zhang (2009b) find that the capital output ratio has a significant and positive correlation with the labor's share of income. They argue that because China is abundant in labor force, capital accumulation can increase the capital stock per labor and the marginal product of labor, forming a supplementary rather than a substitutive relationship between capital and labor. Through estimation, they find that the substitution elasticity between labor and capital in China is 0.94. Bai and Qian (2009b), Shao and Huang (2010) and Weng and Zhou (2010) further confirm that the substitution elasticity between capital and labor is less than 1 by using the provincial panel data in China. However, by using panel data of Chinese industrial firms from 1998 to 2005, Bai and Qian (2009a) find that capital output ratio has an insignificant on the labor's share of income and propose that the substitution elasticity between labor and capital is 1 accordingly. By using firm level survey data in China from 2000 to 2004, Li et al. (2009) find that capital output ratio is negatively correlated with labor's share of income, meaning a strong substitutive relationship between labor and capital. In all, there are still significant differences in estimating substitution elasticities between labor and capital whether using multi-national data or Chinese data.

Bentolila and Saint-Paul (2003) use total factor productivity (TFP) to proxy technological progress and find that TFP has a negative effect on the labor's share of income in countries belong to Organization for Economic Co-operation and Development (OECD). Therefore, they argue that capital biased technological progress causes the decrease of the labor's share of income in OECD countries. By using GDP per unit of labor time (labor productivity) as the proxy for technological progress, Guscina (2006) analyzes the impacts of technological progress on the labor's share of income for 18 industrialized countries between 1960 to 2000 and obtain similar results. By using the capital stock share in telecommunications as the proxy for technological progress, Jaumotte and Tytell (2007) show that technological progress poses a negative effect on the labor's share of income, outweighing the effects of globalization factors such as international trade in OECD countries. The regression analyses of Chinese provincial panel data by Luo and Zhang (2009a, b) show that technological progress, measured by labor productivity, doesn't significantly increase the labor's share of income. They argue that this is because the growth of labor productivity is higher than workers' wage in China. By using panel data of Chinese industrial firms, Bai and Qian (2009a) also find that technological progress has little effect on the factor distribution share in Chinese industry sector. In addition, other studies in China also use capital per capita and capital output ratio to measure technology and discuss its impact (Bai et al. 2008; Li et al. 2009).

2.6.3.2 Factors of Economic Globalization

From the perspective of empirical studies, factors of economic globalization are usually measured by foreign trade dependence (such as import penetration rate, export sales ratio, rate of duties on imports and etc.), the share of FDI in GDP and

the existence of capital control. Harrison's (2002) study shows that the above three measurements of evaluating economic globalization are all negatively correlated with the labor's share of income which she explains by using neoclassical trade model and the "bargaining" model between capital and labor. Lee and Jayadev (2005), Jayadev (2007) and Guscina (2006) have obtained similar conclusions by conducting empirical researches about developed countries. Jaumotte and Tytell's (2007) empirical research about OECD countries show that the economic globalization (measured by trade, immigration, outsourcing and offshoring) is the main reason for the decline of labor's share of income in these countries after 1980s. Diwan (2000, 2001) notes that globalization poses difference effects on the labor's share of income in different countries and these effects are highly sensitive to different functional form. He points out that loosening capital control may pose a negative influence on the labor's share of income through financial crisis and bring a long-term trauma to the laborers.

By using Chinese provincial data from 1987 to 2004, Luo and Zhang (2009b) firstly examine the effect of globalization factors on the labor's share of income in China. Their research shows that FDI has a negative impact on the labor's share of income while export has a positive but insignificant effect on the labor's share of income. They argue that the competition of attracting foreign investments by local governments in China has weakened the bargaining power of laborers and the influx motive of foreign investments has due to the China's cheap labor and preferential policy lead to the decrease of the labor's share of income. Meanwhile, the increasing share of export by foreign firms and the increasing complexity of export goods have made the effect of export on the labor's share of income inconsistent with Stolper-Samuelson theorem (Stolper and Samuelson 1941). By using provincial panel data in the industrial sector, Shao and Huang (2010) analyze the effect of FDI on the declining labor's share of income. They argue that FDI has both increasing effects on the labor compensation and labor productivity. However, the effect of FDI on increasing labor productivity is stronger than the effect on increasing the labor compensation, resulting in the decrease of the labor's share of income.

By using the provincial data in China from 1996 to 2006, Jiang and Zhang (2008) focus on exploring the effect of international trade on the labor's share of income. Their research shows that export has a positive effect on labor's share of income and import has a negative effect on labor's share of income. Therefore, international trade has a positive effect on labor's share of income overall, which shows that the employment effect of foreign trade is larger than the effect of labor productivity. By using provincial data in China from 1997 to 2003, Bai and Qian (2009b) examine the effect of FDI, import and export on the labor's share of income. In that paper, they argue that regions with heavy foreign investment have stronger economy dynamics and more sufficient competition. In addition, the dependence on foreign trade which is used to measure the degree of market opening can also measure the degree of market competition in that region. Therefore, the degree of market competition represented by these two measurements (FDI and dependence on trade) can help to increase labor's share of income and decrease

capital's share of income. However, their empirical research shows that the both coefficients are not significant. Regarding to such results, they argue that this is because the degree of market competition has no big changes in China after middle of 1990s.

2.6.3.3 Economic Development and Economic Cycle

"Kuznets curve" indicates that at the beginning of economic development of a country, income inequality will be enlarged continuously and after reaching a certain level of economic development, the income inequality will then decrease gradually. Cross-country study by Daudey and Garcia-Penalosa's (2007) shows that the higher the labor's share of income of a country, the smaller the income inequality (measured by Gini coefficient) will be. According to this logic, labor's share of income tends to be in the downward trend at the beginning of economic development and increase after a certain period which is consistent with "Kuznets curve". By using cross-country data, Li et al. (2009) find that labor's share of income will change along with the GDP per capita in a U-shape rule. Their research shows that the lowest point of the U-shape curve is around $6000 GDP per capita (purchasing power parity in 2000). Therefore they argue that labor's share of income in China may enter into an upward trend in two years after 2009. Diwan's (2000) has added GDP per capita and its quadratic term into determinist function of the labor's share of income and finds that coefficient of GDP per capita is positive and the coefficient of quadratic term of GDP per capita is negative. This means an inverse U-shape relationship between labor's share of income and the level of economic development which is the opposite comparing with the prediction of "Kuznets curve". Studies by Lee and Jayadev (2005) and Jayadev (2007) show that the labor's share of income is positively correlated with economic development (measured by GDP per capita). Harrison (2002) introduces the average income level in domestic country relative to the foreign country into the determinist function of the labor's share of income and finds that it is negatively correlated with labor's share of income. She argues that when a country has higher average income level, the incentive for labor force to immigrate will be less and labor force will place in disadvantageous bargaining position, resulting in the lower labor's share of income.

As for the researches with regard to China, Luo and Zhang (2009b) uses the provincial panel data to conduct empirical research and show that the labor's share of income in China will decrease with the economic development. Specifically, when real GDP per capita (price in 1987) increases by 1 %, the labor's share of income will decrease by 0.13 %. Meanwhile, after adding the quadratic form of real GDP per capita, they also find that there is a U-shape relationship between economic development and the labor's share of income. Bai and Qian's (2009b) empirical research shows that capital's share of income will increase when GDP per capita increases, which indirectly proves a negative correlation between economic development and the labor's share of income. Meanwhile, GDP per capita contributes the biggest explaining power for the model. They argue that the main

reason is that the level of economic development (measured by GDP per capita) can reflect the change of China's industry structure. Because of short time span of the data, they haven't tested the U-shape relationship in the paper of Luo and Zhang (2009b).

In addition, many studies argue that the change of labor's share of income is related to the economic cycle. Most studies regress the labor's share of income with the unemployment rate, economic growth and inflation rate. Some studies find that the labor's share of income is cyclical (Beck 1958) while others claim that it has a counter-cyclical attribute (Close and Shulenburger 1971; Kalleberg and Wallace 1984; Krueger 1999; Jiang 2008, 2009).

2.6.3.4 Factors of Labor Market Institution and the Role of Government

Since the power of trade union has significant influences on the determination of labor's wage and employment, the studies about labor's share of income will normally consider the relationship between the power of trade union and labor's share of income. Kalleberg and Wallace (1984) analyze the determinist factors of labor's share of income in the printing industry in US. They argue that the bargaining power of labor and capital, measured by the coverage of union and frequency of strike, will remarkably increase labor's share of income. Meanwhile, when the power of trade union weakens, the ability for the union to increase labor's share of income will also be weakened. Guscina (2006) uses the ratio of workers participating into trade union and the dummy variable to measure the degree of protection for labor force. He points out that, after mid-1980s, the weakening power of trade union and the decreasing degree of protection for employment is one of the reasons for decreasing labor's share of income. Bentolila and Saint-Paul (2003) examine the effect of the number of labor conflict on labor's share of income and finds that the effect is negative but not significant.

Human capital accumulation may influence labor's share of income in two aspects: first, the improvement of education will increase the marginal product of labor so that labor's share of income will be increased; the other possibility is when level of education becomes higher, the physical capital needed to match with such educational level will be more. Therefore, the increasing bargaining power of capital is not helpful for increasing labor's share of income. Diwan's (2000) research shows that in rich countries, labor's share of income will be higher when human capital accumulates more while in poor countries, labor's share of income will be lower when human capital accumulates more. Luo and Zhang (2009b) argue that when government is excluded from the primary distribution, human capital accumulation will lead the income incline to the laborers.

In addition, government influences the labor's share of income through fiscal spending. Diwan's (2000) study shows that the increase of fiscal spending is helpful to increase labor's share of income in poor countries but not in rich countries. He argues that the reason of such difference is because fiscal spending in poor countries

is mainly used to compensate the income of labor while fiscal spending in rich countries are mainly transfer payment to specific groups (such as interest group). Harrison (2002) also supports the view that increasing government spending is helpful to increase the labor income and its share. Le and Jayadev (2005) and Jayadev (2007) use the ratio of government in national income to proxy the interference of government to economy and find that when this ratio is higher, the labor's share of income will also be higher. Moreover, they even find that government deficit also has positive effect on the labor's share of income. Luo and Zhang (2009b) introduce explanatory variables such as the ratio of government spending and government consumption to GDP and find that expansion of fiscal spending can help to increase the labor's share of income. More specifically, 1 % increase in fiscal spending will cause 0.14 % increase in the labor's share of income.

2.6.3.5 The Institutional Factors in Economic Transition

Since China is a typical country in economic transition, we need to pay more attention on the institutional factors in the economic transition path, when discussing about the determinist factors of labor's share of income. Li et al. (2009) use the share of state-owned enterprises (SOEs) as an explanatory variable for economic transition to analyze its effect. Their result shows that labor's share of income is negatively correlated with the share of SOEs. They argue that SOEs are mainly capital-intensive firms with lower labor's share of income, so that the increasing share of SOEs will cause the decrease of the labor's share of income. Bai and Qian (2009a) use the shares of state-owned, collective, corporation, foreign, and Hong Kong, Macau, and Taiwan (HMT) in the total capital as proxy for difference of firm targets. They find that the labor's share of income in the industrial sector has dropped 4.7 % because of the restructuring reform in SOEs. Regarding to this, they provide an opposite explanation compared with Li et al. (2009) that the average labor's share of income in SOEs is significant higher than non-SOEs and the decrease of labor's share of income is the result of decreasing distortion in the factor market. In addition, they find that the restructuring reform of SOEs is the main reason of the decrease of labor's share of income in the industrial sector, contributing 51 % of the explanatory power in the total predicted value. Luo and Zhang (2009b), however, analyze the same question from a different angle. They use the employment share of non-state-owned sector to represent privatization (i.e., one of the result of restructuring reform of SOEs). Their result shows that privatization has a significant and negative influence on the labor's share of income. They argue that the firm compensation system can better reflect the supply and demand relationship of the market after privatization which is the short-run result of the positive shock from the market (Luo 2008). Meanwhile, after the restructuring reform of SOEs, the abundant labor force has imposed supply shocks to the labor market, which poses a downward pressure to wages (Lu 2008; Weng and Zhou 2010).

2.7 Inspiration of Current Studies and Future Direction

From the perspective of the definition and measurement of the labor's share of income, this chapter first discusses the ratio of labor compensation in national income account and firms' account (i.e., the measurement issues of labor's share of income). We have discussed issues about the net taxes on production, attribution issues of capital and labor in proprietors' economy and distinguish between human capital and raw labor which are related to the measurement of the labor's share of income in details. We propose various modification methods which make the data more suitable for the needs of the research. Aiming at the current macroeconomic data of the labor's share of income in China, we discuss the effect from the change of statistical caliber and propose plans to modify the impacts from the change of statistical caliber.

Second, we retrospect and analyze the deterministic theories of labor's share of income of Ricardo, Marx, Neoclassic and Keynesianism and point out their common features and differences. Although the vale and distribution theory of Marx has gained a huge success in socialist countries, the "marginalist" distribution theory of Neoclassic seems to dominate the direction of western economic research. Therefore, economists share common knowledge that the division between wage and profit is no longer determined by the bargaining and game between laborers and capitalists but determined by the marginal productivity of labor and capital factors.

Third, the current discussion of the labor's share of income is still Neoclassic (Bentolila and Saint-Paul 2003). Economists have made some extensions to the neoclassic theory by adding factors such as technological progress and imperfect market competition, further supplementing the "marginalist" thoughts. After considering the economic globalization, this chapter discusses how international trade and foreign direct investment affect the labor's share of income under open economy. In addition, this chapter also discusses the dynamic evolution of the labor's share of income in the process of economic transition and different features for developed and developing countries.

Finally, this chapter summarizes empirical researches about the labor's share of income both at home and abroad in two aspects. One is to follow Solow's (1958) idea to discuss the impacts changes of industry structure and changes within-industry labor's share of income on the total labor's share of income by decomposing weighted sum of labor's share of income based on the industry classification. This idea of decomposition is consistent with the theoretical part when discussing how labor's share of income evolves in the process of economic transition. The other is to use regression analyses to discuss the factors influencing labor's share of income, such as, input factors, technological progress, globalization, level of economic development, labor market institution, government and institutional factors in economic transition. We find that the cross-country studies (mainly aiming at developed countries) consider globalization and technological progress as the main reasons for decreasing labor's share of income in the

developed countries in the past two decades. Studies about China emphasize the role of institutional factors, such as restructuring reform of SOEs.

The phenomenon of decreasing labor's share of income in China during the reform and opening up has become a prominent issue in the development of China's economy and society. It not only means that there is an unbalanced distribution ratio between labor and capital but also reflects the trend of enlarging income inequality in China. Therefore, the issue of income distribution, especially in terms of factor distribution, has attracted wide attention in academia. Current research analyzes the moving trend and determinist factors of labor's share of income. To draw on the results of national and international studies, this paper thinks that we need to further explore the determinist factors and the mechanism of the labor's share of income in China.

Firstly, current studies about the labor's share of income in China use the statistical data directly to make trend and regression analyses. However, labor's share of income needs to be redefined and reevaluated, so that we could tailor the specific needs of different studies. For example, we need to further analyze and discuss the issues about handling indirect tax, attributing proprietors' income, differentiating price indexes to different factors and so on. More specifically, the attribution of proprietors' income is one of the most difficult issues for proper measuring labor's share of income. Current methods just use simple rules by either attributing proprietors' income to labor compensation or capital surplus, which inevitably overestimate or underestimate the labor's share of income. Meanwhile, a large number of proprietors' income in the economy hasn't been included in China's National System of Accounts (NSA). These issues will make us harder to judge the real situation of the evolution of income distribution structure. We know that most of the income of proprietors' income will be finally owned by the laborers so that the labor's share of income will increase with the development of proprietors' economy. It can be predicted that proprietors' economy is going to play bigger roles in China. The development of service economy and internet economy will cultivate the prosperity of proprietors' economy which can help to improve the national income distribution pattern in China. Therefore, estimating the impacts of proprietors' economy on the labor's share of income is one research direction can be studied further.

Secondly, economic globalization is the major trend of economic development in the past two decades. Although the factor income distribution is more depended on the demand and supply of domestic labor market, the factors of globalization (international trade and investment) undoubtedly have increasing influence on the income distribution among factors. The phenomenon of decreasing labor's share of income and increasing capital's share of income appears in the industrialized countries. And scholars use Hechscher–Ohlin model to explain the change of factors' share of income caused by economic globalization. However, when applying this theory into emerging economies (e.g., China), the model predicts that trade will increase the labor's share of income and improve the income distribution condition between capital and labor. This contradicts with the indisputable fact that labor's share of income is decreasing and the income inequality is enlarging in China

during the reform and opening up. Meanwhile, the empirical evidences about China show that there is only a week correlation between trade and the labor's share of income. Therefore, the prediction of neoclassical trade theory contradicts with the reality in China. It is necessary to explore further about the adaptability for current trade theory in China. Or we can construct some theoretical models more consistent with China's reality to understand the impacts of economic globalization on the change of labor's share of income in China.

Thirdly, with regard to the decreasing labor's share of income in China, studies which use firm-level microeconomic data argue that the restructuring reform of SOEs (or simply privatization), capital's bargaining power and technological progress are the main reasons for explaining the decrease of the labor's share of income. However, international studies which mainly aim at developed countries incline to consider the factors of globalization like trade and FDI as the main reasons of decreasing labor's share of income. The economic transition in China is accompanied with opening up, for example, a great number of new-born private firms engage in international trade and the introduction of many foreign-invest firms significantly change the ownership structure in China. Therefore, we shall combine the opening up and economic transition together to explain the determinist factors of the labor's share of income in China in a more integrated framework.

Fourthly, current studies mainly focus on explaining the reasons and mechanisms of decreasing labor's share of income. However, as a microeconomic variable, the size of the labor's share of income directly means labor cost of the firm which is an import indicator for firm's micro-behaviors and decisions. As a macroeconomic variable, the labor's share of income is not only the constraints of the consumption ability of society but also a justice measurement for the social distribution. The increase of labor's share of income represents as the improvement of relationship between distributional factors and boost economy by increasing consumption in society. However, the increase of labor's share of income represents the increase of the firm's labor cost from micro perspective, which will lower the firm productivity and hinder economic growth. However, no matter from which perspective, the change of labor's share of income will pose an important influence on economic growth.[12] Therefore, it is worthwhile to further explore how labor's share of income influences firm's microeconomic efficiency and macroeconomic growth.

Fifthly, the decrease of labor's share of income means the income gap between the owners of the labor and owners of the capital will enlarge, which will cause both imbalances in function income distribution and size income distribution. Previous studies always discuss personal income inequality and labor's share of income separately and ignore the inter-connection between them. To increase the labor income can not only increase labor's share of income but also improve the

[12]Some studies have already begun to analyze the macro effect of the change of labor's share of income (Huang and Wei, 2010). The study shows that the increase of labor's share of income is not only good for the expansion of residential consumption, but also for promoting economic growth.

worsening income inequality in current situation in China. Therefore, exploring the connections between functional income distribution and size income distribution will have important policy implications.

References

Acemoglu D (2003) Labor- and capital-augmenting technical change [J]. J Eur Econ Assoc 1(1): 1–37
Bai C (2010) Industry monopoly is the key for decreasing labor income share [N], People's Daily, 1st June 2010
Bai C, Qian Z (2009a) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41
Bai C, Qian Z (2009b) On the increase in the Chinese aggregate capital income share: an investigation from provincial perspective [J]. J Tsinghua Univ (Philos Soc Sci) 24(4):137–147
Bai C, Qian Z (2009c) Who has eroded residents' incomes? An analysis of China's national income distribution patterns [J]. Soc Sci China 5:99–115
Bai C, Qian Z, Wu K (2008) Determinants of factor shares in China's industrial sector [J]. Econ Res J 8:16–28
Beck JW (1958) An Interindustry analysis of labor's Share. Ind Labor Relat Rev 11(2):231–246
Bentolila S, Saint-Paul G (2003) Explaining movements in labor income share [J]. Contrib Macroecon 3(1):1103–1136
Bernanke BS, Gurkaynak RS (2001) Is growth exogenous? Taking Mankiw, Romer, and Weil seriously [J]. NBER Macroecon Annu 16:11–57
Blanchard O, Nordhaus WD, Phelps ES (1997) The medium run [J]. Brook Pap Econ Act 2:89–158
Close FA, Shulenburger DE (1971) Labor's share by sector and industry, 1948–1965 [J]. Ind Lab Relat Rev 24(4):588–602
Cobb CW, Douglas PH (1928) A theory of production [J]. Am Econ Rev 18(Supplement):139–165
Daudey E, Garcia-Penalosa C (2007) The personal and the factor distributions of income in a cross-section of countries [J]. J Dev Stud 43(5):812–829
Decreuse B, Maarek P (2008) FDI and the labor share in developing countries: a theory and some evidence [EB/OL], Working Paper, GREQAM, University of Aix-Marseilles, 2008
Diwan I (2000) Labor income shares and globalization [EB/OL]. World Bank Working Paper, Washington, 2000
Diwan I (2001) Debt as sweat: labor, financial crises, and the globalization of capital [EB/OL]. World Bank Working Paper, Washington, 2001
Economists, A Workers' Manifesto for China: How Workers Are Losing Out in China, and Why It Matters to the Rest of the World [EB/OL], Economists (2007)
Feenstra RC, Hanson GH (2001) Global production sharing and rising inequality: a survey of trade and wages [EB/OL], NBER Working Papers No. 8372, Cambridge, 2001
Fosfuri A, Motta M, Ronde T (2001) FDI and spillovers through workers' mobility [J]. J Int Econ 53(1):205–222
Gollin D (2002) Getting income shares right [J]. J Polit Econ 110(2):458–475
Gomme P, Rupert P (2004) Measuring labor's share of income [EB/OL], policy discussion papers, Federal Reserve Bank of Cleveland, 2004
Gong G, Yang G (2010a) Analysis of China's unequal distribution of income from the perspective of functional income distribution [J]. Soc Sci China 2:54–68
Gong G, Yang G (2010b) The evolution of the share of wage income in national income [J]. Manag World 5:45–55

Goodwin R (1967) A growth cycle. In Feistein CH (eds) Socialism, Capitalism and Economic Growth. Cambridge University Press, Cambridge
Gujarati D (1969) Labor's share in manufacturing industries: 1949–1964 [J]. Ind Lab Relat Rev 23 (1):65–77
Guo Q, Lv B (2011) The influence of tax on factor income distribution [J]. Econ Res J 6:16–30
Guscina A (2006) Effects of globalization on labor's share in national income [EB/OL], IMF Working Paper, 6 (294), Washington, 2006
Harrison AE (2002) Has globalization eroded labor's share? Some Cross-country evidence [EB/OL], mimeo, University of California at Berkeley and NBER, 2002
Heckscher EF (1991) The effect of foreign trade on the distribution of income [A]. 1919, Economisk Tidskrzft. In: Heckscher EF, Ohlin B Heckscher-Ohlin trade theory [M]. The MIT Press, Cambridge (translated, edited and introduced by Harry Flam and M. June Flanders)
Hicks J (1932) The theory of wages [M]. McMillan, London
Huang Q, Wei X (2010) Macroeconomic effects of decreasing share of labor incomes in China: empirical analysis based on provencal panel data [J]. Financ Trade Econ 4:121–127
Huang X, Xu S (2009) Reasons for the decline of labor share: from the angle of labor-saving technical progress [J]. Econ Res J 7:34–44
Jaumotte F, Tytell I (2007) Globalization of labor [EB/OL], IMF World Economic Outlook 2007, Chapter 5, 2007
Jayadev A (2007) Capital account openness and the labor share of income [J]. Camb J Econ 31 (3):423–443
Jiang L (2008) Trend and influential factors of labor share in China: an analysis based on China's Provincial Panel Data [J]. Mod Econ Sci 30(4):7–12
Johnson DG (1954) The functional distribution of income in the United States, 1850–1952 [J]. Rev Econ Stat 36(2):175–182
Kaldor N (1961) Capital accumulation and economic growth [A]. In: Lutz FA, Hague DC (eds) The theory of capital [C]. St. Martin Press, New York
Kaldor N (1955) Alternative theories of distribution [J]. Rev Econ Stud 23(2):83–100
Kalecki M (1938) The determinants of distribution of the national income [J]. Econometrica 6 (2):97–112
Kalecki M (1954) Theory of economic dynamics [M]. George Allen, London
Kalleberg AL, Wallace M, Raffalovich LE (1984) Accounting for labor's share: class and income distribution in the printing industry [J]. Ind Lab Relat Rev 37(3):386–402
Keynes JM (1939) Relative movements of real wages and output [J]. Econ J 49:34–49
Kohli U (1991) Technology, duality, and foreign trade: the GNP function approach to modeling imports and exports [M]. University of Michigan Press, Ann Arbor
Kravis IB (1959) Relative income shares in fact and theory [J]. Am Econ Rev 49(5):917–949
Krueger AB (1999) Measuring labor's share. Am Econ Rev [J] 89(2):45–51
Krusell P, Ohanian LE, Rios-Rull JV, Giovanni LV (2000) Capital-skill complementarity and inequality: a macroeconomic analysis [J]. Econometrica 68(5):1029–1053
Kuijis L (2006) How will China's saving-investment balance evolve? World bank china office [EB/OL]. Research Working Paper, No. 5, 2006
Lee K, Jayadev A (2005) The effects of capital account liberalization on growth and the labor share of income: reviewing and extending the cross-country evidence [A]. In: Epstein G (ed) Capital flight and capital controls in developing countries [C]. Edward Elgar, Cheltenham
Lewis WA (1954) Economic development with unlimited supplies of labour [J]. Manch Sch Econ Soc Stud 22(2):139–191
Li Z (eds) (1994) Dictionary of world economics [M]. Economic Science Press, Beijing
Li Y, Yin J (2007) Anatomy of high saving rate of china: analysis based upon flow of funds account of china from 1992 to 2003 [J], Econ Res J 6:14–26
Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: a u-shaped curve [J]. Econ Res J 1:70–82
Lu M (2008) Decreasing labor's share of income: why and how to do? [N]. Shanghai Securities News, 9 September 2008

Liu W, Cai Z (2010) Structure problems in domestic aggregate demand and uneven national income distribution [J]. Xinhua Dig 19:44–48
Liu M, Xu L, Liu L (2004) Wage-related labor standards and FDI in China: some survey findings from Guangdong Province [J]. Pac Econ Rev 9(3):225–243
Lüker M (2007) Labor shares [EB/OL], technical brief No.01, International Labor Office, Geneva, 2007
Luo C (2008) Rethinking the Kardo "Stylized Facts": the share of labor income revisited [J]. J World Econ 1:86–96
Luo C, Zhang J (2009a) The economic explanation of decrease of labor income share: empirical evidence from China's provincial data [J]. Manag World 5:25–35
Luo C, Zhang J (2009b) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79
Lv B, Guo Q (2012) Calculation on china's functional income distribution and redistribution [J]. Econ Res J 10: 27–40
Marx C (1972) (translated by Guo, D. and Wang, Y.) Das kapital [M], vol 1–3. People's Publishing House, Beijing
Mincer JA (1974) Schooling, experience, and earnings [M]. Columbia University Press, New York
National Bureau of Statistics of China (2003) China's national accounting system 2002 [M]. China Statistics Press, Beijing
Ohlin B (1933) Interregional and international trade [M]. Harvard University Press, Cambridge
Pasinetti LL (1962) Rate of Profit and Income Distribution in Relation to the Rate of Economic Growth Source [J]. The Review of Economic Studies 29(4):267–279
Poterba JM (1998) The rate of return to corporate capital and factor shares: new estimates using revisited national income accounts and capital stock data [J]. Carnegie-Rochester conference series on public policy, vol 48. pp. 211–246
Ricardo D (1981) (translated by Guo, D. and Wang, Y.) On the principles of political economy and taxation [M]. Commercial Press, Beijing
Ruiz CG (2005) Are factor shares constant: an empirical assessment from a new perspective, Working Paper, Carlos III Macroeconomics Workshop, 2005
Shao M, Huang J (2010) FDI and China's regional labor share: empirical evidence from industry [J]. China Economic Quarterly 9(4):1189–1210
Solow RM (1958) A skeptical note on the constancy of relative shares [J]. Am Econ Rev 48 (4):618–631
Song D, Wang L, Dong Z (2010) Does skill-biased technological progress exist: evidences from China's empirical evidences [J]. Econ Res J 5:68–81
Stolper W, Samuelson P (1941) Protection and real wages [J]. Rev Econ Stud 9(1):58–73
Subramanian A (2008) What is China doing to its workers? [EB/OL]. Business Standard, New Delhi
United Nations Economic and Social Commission for Western Asia, Annual Review of Developments in Globalization and Regional Integration in the Countries of the ESCWA Region [EB/OL], 2002
Wang Y, Sheng D (2010) Factor accumulation, skill-biased technological progress and labor's share of income [J]. World Economic Papers 4:33–50
Wen J, Zhou L (2010) Variations in the labor income share in China's Industry during 1997–2008 [J]. Chin J Popul Sci 4:31–45
Xiao G (2004) People's Republic of China's Round Tripping FDI: Scale, Causes and Implications [EB/OL], Asia Development Bank Institute Discussion Paper No. 24, 2004
Young AT (2006) One of the things we know that ain't so: why US labor's share is not relatively stable [EB/OL], Mimeo, University of Mississippi
Young AT, Zuleta H (2008) Re-measuring labor's share [EB/OL], Working Paper of University of De Rosario, 2008
Zeira J (1998) Workers, machines and economic growth. Q J Econ 113(4):1091–1118
Zhao Y (2001) Foreign direct investment and relative wages: the cases of China. China Econ Rev [J] 12(1):40–57

Zhao Y (2002) Earnings differentials between state and non-state enterprises in Urban China [J]. Pac Econ Rev 7(1):181–197

Zhou M, Xiao W, Yao X (2010) Decreasing China's labor's share: research development of measurement and explanation [J]. World Econ Pap 6:92–105

Zuleta H (2008) Factor saving innovations and factor income shares [J]. Rev Econ Dyn 11(4):8 36–851

Zuleta H (2009) If factor shares are not constant then we have a measurement problem. Can we solve it? Universidad del Rosario, Serie de Documentos de Trabajo, 2009

Zuleta H, Young AT (2007) Labor's shares aggregate and industry: accounting for both in a model of unbalanced growth with induced innovation. Working Paper, Universidad del Rosario and University of Mississippi, 2007

Chapter 3
Structure Factors in the Movements of Labor Income Share: Comparison Analysis of Income Approach of GDP and Flow of Funds Account of China

This chapter compares the trend of movement of labor's share of income in the income approach of GDP and in the flow of funds account, where the former has a declining trend while the latter shows a mild increasing trend. Structure analysis of the flow of funds account indicates that the weighted average labor's share of income of the enterprises sector is moving opposite with that of housing and government sector, thus the aggregate labor's share of income shows a mild increasing trend. The volatility decomposition of labor's share of income indicates that the within industry effects positively correlated with between industry effects that causes the instability of the income approach of GDP, while the negative correlation between within and between industry effects causes relative stability of the flow of funds account. Therefore, the government can adjust its industry policies to coordinate industrial structure change with the movements of labor's share of within industry, in order to maintain the stability of labor's share of income.

3.1 Introduction

From the reform and opening up, China's economy has maintained the miracle of rapid. During 1978–2008, the average annual economic growth rate in China is 9.89 %. The economic development has changed the distributional relationship between labor and capital factors in the national income. In recent years, the change of labor's share of income becomes a focus of the whole society. Li (2007) points out that the decrease of labor's share of income has been an indisputable fact. The *Blue Book of Chinese Societies* published by Chinese Academy of Social Sciences points out that "the ratio of labor compensation in GDP in China has been decreasing continuously: before 2003, it is above 50 % and it decreases to 40.6 % in 2006." Regarding to the decreasing labor's share of income, economists have expressed their concerns. Kuijis (2006) argues that the decrease of labor's share of income is the reason of slump consumption in China. He argues that the economic

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growth driven by investment and export may not be sustained because of insufficient demand of consumption. In addition, the decrease of labor's share of income may expand the income inequality between labor and capital owners, which will challenge the long-term stability of society.

However, most judgments and concerns about decreasing labor's share of income are based on provincial income approach of GDP. As the *Blue Book* says that the rapid decrease of labor's share of income starts from 2004. However, in 2004, the accounting method of GDP in China has experienced a significant change. After 2004, National Bureau of Statistics (NBS) has re-categorizes proprietors' labor compensation and operating surplus of proprietors' economy from labor compensation to operation profits. Bai and Qian's (2009) research shows that the change of accounting method of GDP overestimates the decreasing extent of labor's share of income. After adjusting to the consistent statistical caliber, the labor's share of income will be increased by 6.29 %. Similarly, Li (2007) has adjusted the labor's share of income to in 2005 from 41.4 to 48 %, returning back for 6.6 %. These studies show that, the change of statistical method is the main reason of dramatic decrease of the labor's share of income in recent years. Therefore, after eliminating the statistical factors, although this doesn't change the downward trend of labor's share of income, the decreasing extent has been largely reduced. Then, what we would like to ask in this chapter is that, after eliminating statistical factors, whether the decrease of labor's share of income is just a short-term fluctuation or not. If the decrease of the labor's share of income is just a short-term fluctuation, then we don't have to be so worried about this phenomenon.

In order to explore the moving trend of the labor's share of income in a comprehensive way, we are going to conduct comparison research by using different channels of national income accounting data. Besides the labor's share of income calculated by income approach of GDP, we are going to calculate the comparable labor's share of income data from flow of funds account. Through comparison, we find that two data sources don't exhibit consistent moving trend. Unlike income approach of GDP, the labor's share of income calculated by the flow of funds account has shown an increasing trend from 1993 to 2003. We analyze the reason from the perspective of sector structure and propose that the weighted average labor's share of income of the enterprises sector is moving opposite with that of housing and government sector which stabilize the total labor's share of income. Meanwhile, we compare the stability of change of two data series and find that the labor's share of income calculated by flow of funds account has a higher stability than income approach of GDP. By using volatility decomposition technique, we argue that the within industry effects positively correlated with between industry effects that causes the instability of the income approach of GDP, while the negative correlation between within and between industry effects causes relative stability of the flow of funds account. Therefore, the government can adjust its industry policies to coordinate industrial structure change with the movements of labor's share of within industry, in order to maintain the stability of labor's share of income.

3.2 The Movements of Total Labor's Share of Income and Its Modifications

The current NSA in China provides the data of GDP from the perspective of labor's wage, net taxes on production, depreciation of fixed assets and operating surplus. Therefore, if we divide the GDP by labor compensation, we can estimate the labor's share of income in GDP. One way to calculate labor's share of income is to use provincial income approach of GDP. From 1995, various issues of *China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004* provide provincial and industrial factor distribution data where the time span covers from 1978 to 2007. Li (2007), Bai and Qian (2009), Jiang (2008) and Luo and Zhang (2009a) all use different angels to analyze the movements of the labor's share of income of and its deterministic factors by the income approach of GDP. The other way is to calculate the labor's share of income by using the physical part in flow of funds account. By using such accounting table, Li and Yin (2007) discuss the issue of high savings in China. In this chapter, we are going to discuss the labor's share of income by using such accounting table. Flow of funds account provides the factor distribution data categorized by government sector, non-financial firms sector, financial institution sector and household sector where the time span covers from 1992 to 2007 (Xu 2002). To conduct consistent comparison analysis of labor's share of income both by income approach of GDP and flow of funds account, we constraint the time span from 1992 to 2007. Figure 3.1 has described the change of the labor's share of income calculated by using these two methods.

First, we find that two data series have both show a significant drop from 2003 to 2004 where the labor's share of income calculated by flow of fund accounts has

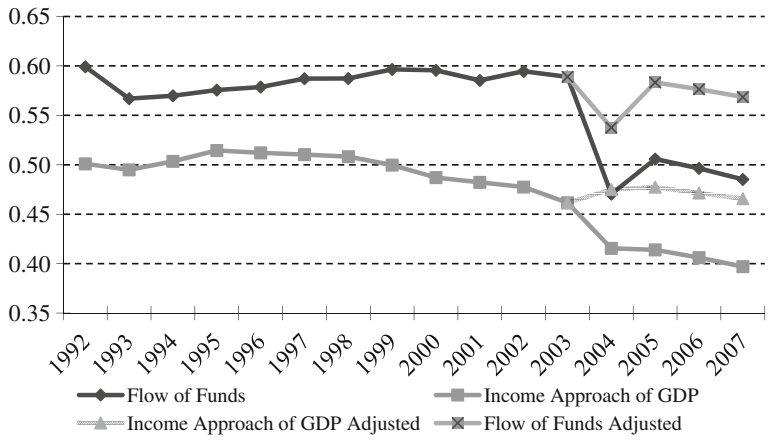

Fig. 3.1 The moving trend of labor's share of income by flow of funds account and income approach of GDP 1992–2007. *Data Sources China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004*

experienced larger decreasing extent, dropping from 58.9 % in 2003 to 47 % in 2004, as much as 12 %. This indicates that the change of statistical caliber has consistent effect on two data series. To compare the change of labor's share of income before and after adjusting statistical caliber consistently, we need to adjust back the data of labor's share of income from 2004 to 2007. Bai and Qian (2009) use the operating surplus of private unincorporated enterprises (OSPUE) to adjust labor's share of income by *China Economic Census Yearbook* in 2004. However, for un-census years, *China Statistical Yearbooks* only provide aggregate operating surplus and do not list OSPUE separately. Therefore, their adjustment cannot be used to adjust labor's share after 2004. However, *China Labor Statistical Yearbook* has provided the number of employment of proprietors' economy. By using the method of Gollin (2002) and Ruiz (2005), we can adjust labor compensation by using the ratio between total employment and employment in the non-proprietors' economy. Let Y be the aggregate national income, Y_{UL} be unambiguous income attributed to labors, L be the number of entire workforce, and L_A be the number of self-employed employees, then adjusted labor's share of income (α_L) can be noted as:

$$\alpha_L = \frac{Y_{UL} \times L/(L - L_A)}{Y - Y_T} \tag{3.1}$$

The modification in the above equation is based on the idea that if the change of statistical caliber has excluded the labor compensation of proprietors' economy and we readjust the labor compensation of proprietors' economy back to the total labor compensation, then we can get a consistent and comparable data before and after the change of statistical caliber. Therefore, we can divide the labor compensation which doesn't include proprietors' labor compensation by the non-proprietors' employment to get average labor compensation, then we multiply the average labor compensation with the total employment to get the labor compensation which include proprietors' labor compensation. It shall be noted that Eq. (3.1) has implicit assumption that there is no difference in labor compensation between proprietors' workers and other workers. However, the proprietors can get both labor compensation and operational surplus. Therefore, this modification may underestimate total labor compensation.

Employment in proprietors' economy in urban and rural area is recorded based on the registration type in China in normal years. However, based on *China Economic Census yearbook* and *China Statistical Yearbooks*, we find a large amount of unregistered self-employed employees. For instance, the number of self-employed employees in the statistical yearbook is 45.9 million, while the number in the census yearbook is 94.2 million. Therefore, the number of unregistered employees is 48.5 million. We refer to the growth rate of registered self-employed employees during 2004–2007, and get the number of self-employed employees of corresponding years (see Table 3.1).

The result shows that if we reconsider the proprietors' economy, labor compensation will increase around 14–17 %, which will increase labor's share of income for 6–7 % (see Fig. 3.1). This is almost the same as the adjustment of

Table 3.1 Total employment and proprietors' employment 2004–2007

Year	Total employment	Proprietors' employment	#Urban	#Rural	#Unregistered	Ratio
2004	752	94.2	25.21	20.66	48.35	1.14
2005	758	100.7	27.78	21.23	51.66	1.15
2006	764	106.0	30.12	21.47	54.39	1.16
2007	770	112.9	33.10	21.87	57.94	1.17

Note Data from China Statistical Yearbooks 2005–2008; unit of employment numbers is million

statistical caliber by Bai and Qian (2009) and Li (2007), indicating the robustness of our adjustment method. From Fig. 3.1, we find that labor's share of income of two data series has a notable increase after adjustment. Meanwhile, we also find that from 2005, labor's share of income of two data series has appeared a consistent and slowly decreasing trend. It shall be noted that although we use employment data to modify the data of labor's share of income after 2004, we still cannot exclude biases from such estimation. The effectiveness of data still needs longer time series data to support. However, at least we have proposed some practical modification method, which help us to analyze consistent change of the labor's share of income before and after the change of the statistical caliber.

In addition, we also find that before the change of the statistical caliber, two data series don't exhibit consistent moving trend of the labor's share of income. From the perspective of labor's share of income calculated by income approach of GDP, it increases a little from 49.5 % in 1993 to 51.2 % in 1995 and steadily decreases after that, reaching 46.2 % in 2003. It has decreased 5 % in 8 years. From the perspective of labor's share of income calculated by flow of funds account, it increases steadily from the lowest point 56.7 % in 1993 to 58.9 % in 2003 and only has a small decrease in 2001. We also find that labor's share of income calculated by flow of funds account is significantly higher than by income approach of GDP. Therefore, when overserving data calculated by income approach of GDP, we will easily gain a conclusion that the labor's share of income is decrease continuously after 1996; however, when observing the labor's share of income calculated by flow of funds account, we tend to conclude that labor's share of income is relatively stable with a slight upward moving trend. Since two data series have provided different moving trend of the labor's share of income, this requires us to explain the reasons behind different trends of two data series.

3.3 Structural Factors of Sectoral Change of the Labor's Share of Income

Structural decomposition is one way to explain the reason of change of labor's share of income. We know that total labor's share of income can be defined as weighted average of each industry's labor's share of income where the weight is the

share of one industry's value-added in the whole GDP. Therefore, the moving trend of total labor's share of income can be decomposed by the change of labor's share of income within each industry and the change of value-added share in each industry. Specifically, assume that $S_{i,t}$ is the labor's share of income of industry i in year t and $w_{i,t}$ is the share of value-added in this industry, then in year t, total labor's share of income (S_t) can be expressed as:

$$S_t = \sum_{i=1}^{k} w_{i,t} S_{i,t} \tag{3.2}$$

Solow (1958) first uses this method to explore the stability of total labor's share of income in US. After that, Gujarati (1969) and Close and Shulenburger (1971) separately explore within-sector and within-industry change of labor's share of income in US. Young (2006) uses the latest data to update Solow's method. By using income approach of GDP data, Bai and Qian (2009) and Luo and Zhang (2009a) discuss the structural factors of industrial change of total labor's share of income in China. Both studies show that the transformation of China's industry structure from agriculture industry to non-agriculture industry (especially to the tertiary industry) and the change of labor's share of income within three main industries are the main reasons for decreasing labor's share of income. They argue that because labor's share of income is relatively higher (about 0.85) in agriculture and relatively lower in the secondary and tertiary industry (about 0.40–0.45), the transformation of industry structure from high-share agriculture to low-share non-agriculture will pose a downward pressure to total labor's share of income. In addition, the labor's share of income within the three main industries has decreased after 1996, which further decreases the total labor's share of income. Therefore, they have explained the moving trend of the labor's share of income calculated by income approach of GDP in Fig. 3.1 from the perspective of three main industries.

Following the above ideas, we would like to use the decomposition method to explain the moving trend of the labor's share of income calculated by flow of funds account. Based on the attribute of economy activity units of flow of funds account, we find that the whole economy can be divided into four sectors, i.e., non-financial enterprises sector, financial institutions sector, governments sector and households sector. Meanwhile, the flow of funds account provides data of labor compensation and value-added value within each sector. Therefore, we can use Eq. (3.2) to analyze the reason behind the change of the labor's share of income calculated by flow of funds account from the perspective of sector. In order to focus on the real economic sectors, we merge non-financial enterprises and financial institutions together to get firms sector. Figure 3.2 describes the change of the labor's share of income within three sectors from 1992 to 2007. First, we find that the labor's share of income of governments and households sector is significantly higher than firm sector. We know that the value-added of governments sector is mainly used to pay wages and welfare to government officials in administrative institutions. In

governments sector, there is little capital income except for the depreciation of fixed asset (Gomme and Rupert 2004). The value-added of households sector is composed by the labor income and operational income of proprietors in urban and rural areas. Therefore, these two sectors have relatively higher labor's shares of income. The labor's share of income in households sector has kept around 90 % for the whole period while the labor's share of income in governments sector has a significant upward trend before 1999, which was caused by increasing remuneration and welfare of government officials. Therefore, after eliminating governments and households sectors, we can examine the labor's share of income in firms sector solely, which can better reflect the genuine distribution situation of labor and capital in the real economy. When observing the firms sector, we find that its labor's share of income keeps between 35 and 45 % and has a small increase and a notable decrease during 1993–1996. It has reached the bottom point 35.7 % in 2001 and appeared fluctuations after 2001. Such moving trend is consistent as the study by Luo and Zhang (2009a) about the change of the labor's share of income in the secondary industry. Therefore, if we explore only from the perspective of firms sector, we do find that there is a rapid decreasing trend of the labor's share of income after 1996. Different from the "wage erodes profits" phenomenon in the beginning of 1990s, there is an inclination to capital in factors' income distribution after 1996 (Li et al. 2009).

Like what we have mentioned before, the change of statistical caliber in 2004 mainly re-categorizes proprietors' labor compensation and operating surplus of proprietors' economy from labor compensation to operation profits. Such change will directly influence the labor's share of income in the households sector. In Fig. 3.2, the labor's share of income of household sector has a sudden drop in 2004,

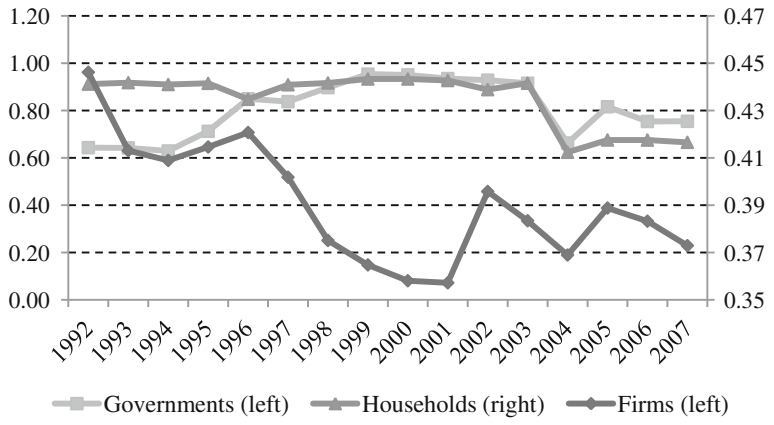

Fig. 3.2 The moving trend of the labor's share of income in governments, households and firms sectors 1992–2007. *Data Sources China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004*

which further proves the influence of changing statistical caliber on the proprietors in the households sector. However, we find that government sector has also experienced similar drop in 2004. This is mainly because the industrial activity units which execute the administrative accounting system have been included in the value-added of governments sector after 2004 (Zhao 2006).

However, total labor's share of income is not only determined by labor's share of income in each sector, but also closely related to the share of each sector in the national economy. The share of the each sector and its movement over time will all influence the size and the change of total labor's share of income. We find that governments sector has a lower and relatively steady share of value-added, and its average share is 9.3 %. Changes of shares of firms and households sector are relatively significant. From Fig. 3.3, we can find that the share of value-added in firm sector has decreased rapidly from 64.3 % in 1995 to 59 % in 2000. After that, it returns back quickly and reaches 64 % in 2007, appearing a U-shape curve. However, the share of value-added in household sector moves oppositely, appearing an inverse U-shape curve. Such pattern of movements in sectoral structure exactly reflects the wide range structure reform in SOEs and significant development of private firms after the middle of 1990s. In the middle of 1990s, the structure reform of SOEs has made many small and medium-sized SOEs bankrupt, or restructured to private-owned enterprises (POEs) through management buyout (MBO). The decreasing number of SOEs has caused the decreasing value-added share of firms sector. On the other hand, many laid-off workers from SOEs reemployed for being proprietors which increase the value-added share of households sector. At the beginning of the new century, rapid development of POEs has made the value-added share of firms sector rise again quickly. At the same time, POEs has

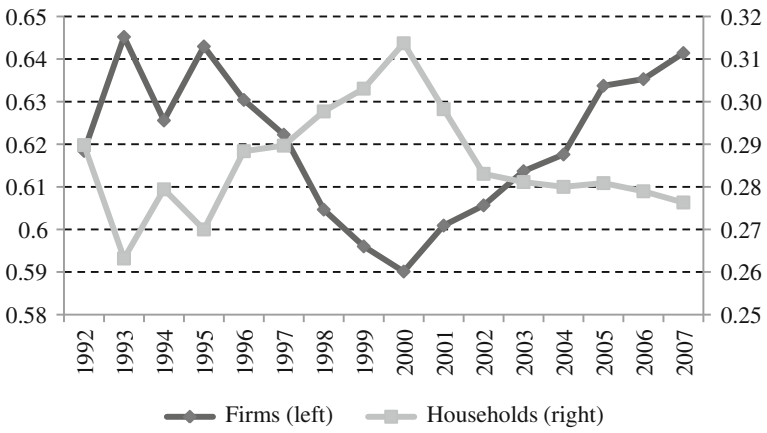

Fig. 3.3 The change trend of value-added share of firms and households sectors 1992–2007. *Data Sources China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004*

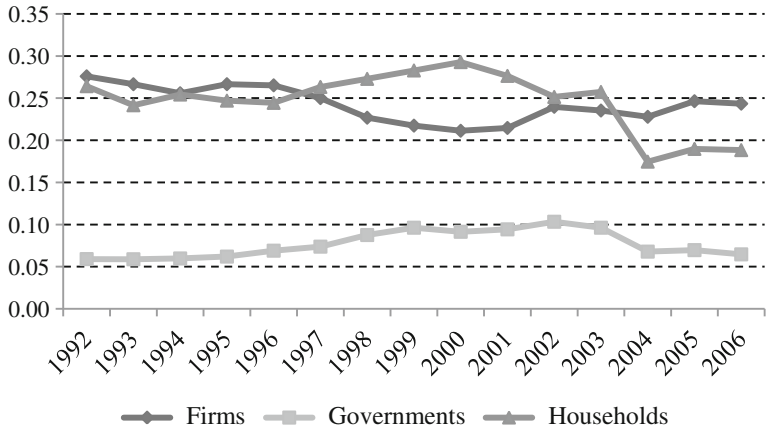

Fig. 3.4 Changes of weighted average of the labor's share of income in three sectors 1992–2007. *Data Sources China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004*

created a large number of employment opportunities, lowering the value-added share of proprietors' economy. This indicates that the U-shape moving trend of firms sector and the inverse U-shape moving trend of households sector reflect the change of economic structure in China after the middle of 1990s.

We have mentioned in the previous paragraph that the change of total labor's share of income is determined by both within-sector changes of the labor's share of income and structural change between sectors. Therefore, it is much clearer for us to understand the inner structure of the change of total labor's share of income by examine the weighted average series of the labor's share of income. From Fig. 3.4, we can see that, before 2004, the weighted average value of firms sector is consistent with the change of value-added share of firms sector, appearing a U-shape curve. Moreover, the weighted average value of households sector is also consistent with the change of value-added share of households sector, appearing an inverse U-shape curve. The reversal changes of two weighted average values in two sectors cancel with each other, making total labor's share of income stable. In addition, the weighted average value of governments sector is also consistent with the change of labor's share of income within this sector, which steadily increases from 1994. Therefore, before the change of statistical caliber, the change of total labor's share of income, the sum of the labor's share of income in those three sectors, appears to be relatively stable with a slight upward moving trend (see Fig. 3.1). This means that although the labor's share of income in each sector has a relatively larger change, the change of total labor's share of income can be relatively stable due to the sectoral structure change.

3.4 The Volatility of the Labor's Share of Income and Its Decomposition

3.4.1 The Comparison of Volatility of the Labor's Share of Income

We find that after eliminating statistical factors, the movements of the labor's share of income of two calculation methods have narrowed down. Therefore, the upward or downward trend of the movements of the labor's share of income is just a normal volatility. If this is the case, then we cannot deny Kaldor's (1956, 1961) judgement of making constant labor's share of income as one of the "stylized facts" in economic development. If labor's share of income is constant as what Kaldor has proposed, then judging the stability of labor's share of income is more important than studying the moving trend. Solow (1958) has proposed two ways to evaluate the stability of the labor's share of income. The first one is absolute stability, which means to examine the changing extent of total labor's share of income (expressed by serial variance) in a certain time span. However, this evaluation method does not have a definite criterion to determine whether the labor's share of income is stable or not. The other one is relative stability. If the variance of total labor's share of income is less than the variance in each sector or industry, then it satisfies the requirement of relative stability. Therefore, we can compare the volatility (i.e., absolute and relative stability) of the labor's share of income calculated by flow of funds account and income approach of GDP.

First, let's study the absolute stability of two data series. Considering the effects of statistical caliber on data, we divide time into two phases, i.e., time before the change of statistical caliber (from 1992 to 2003) and time after the change of statistical caliber (from 2004 to 2007). From Table 3.2, we can find that the volatility of the labor's share of income between 1992 and 2007 has been overestimated. After eliminating the influence of statistical caliber, the standard deviations of two data series both decrease sharply. The change of statistical caliber during 2003–2004 has made the labor's shares of income of two data series fluctuates significantly where the standard deviation of flow of funds account has reached at 0.084, much larger than changes degree in other periods. All these show that the change of statistical caliber is the main source of the volatility of the labor's

Table 3.2 Comparison of absolute stability of the labor's share of income 1992–2007

Statistics	Time range	Income approach of GDP	Flow of funds account
Standard deviation	1992–2007	0.042	0.044
	Before change: 1992–2003	0.017	0.010
	After change: 2004–2007	0.009	0.015
	Effect of statistical caliber	0.033	0.084

Note Data is calculated by author

Table 3.3 Comparison of relative stability of the labor's share of income 1992–2007

Income approach of GDP	Primary industry	Secondary industry	Tertiary industry	Total
Standard deviation: 1992–2003	0.010	0.012	0.006	0.017
Flow of funds account	Firms sector	Governments sector	Households sector	Total
Standard deviation: 1992–2003	0.024	0.123	0.024	0.010

Note Data is calculated by author

share of income. When we compare the volatility of the labor's share of income reflected by two data series, we find that before the change of the statistical caliber, the standard deviation of flow of funds account is significantly lower than the standard deviation of income approach of GDP. This means that the labor's share of income calculated by flow of fund account is relatively stable. However, due to the drawback mentioned above, this method only can judge which one is more stable through horizontal comparison and cannot judge the stability itself.

The measurement of relative stability can help us to explore the stability of two methods themselves. In order to eliminate the effect of statistical caliber, Table 3.3 shows standard deviations of total, within-industry and within-sector labor's share of income calculated by income approach of GDP and flow of funds account. We find that the method of income approach of GDP doesn't satisfy the requirement of relative stability. The standard deviation of total labor's share of income is higher than the standard deviation in each industry, which means the total volatility of the labor's share of income is larger than within-industry volatility. On the contrary, flow of funds account satisfies the requirement of relative stability. The standard deviation of total labor's share of income is significantly lower than the standard deviation in each sector, which means that the total volatility of the labor's share of income is lower than within-sector volatility. Therefore we can get such conclusion that the labor's share of income of two methods not only have different moving trend but also have different changing extent. The labor's share of income calculated by flow of funds account is relatively less volatile than calculated by income approach of GDP, and is relative stable by itself. However, the labor's share of income calculated by income approach of GDP not only does not satisfy the requirement of absolute stability, but also fails to satisfy the requirement of relative stability.

3.4.2 Decomposition of Volatility of the Labor's Share of Income

We would like to answer why total labor's share of income calculated by income approach of GDP has an unstable volatility and total labor's share of income

calculated by flow of funds account is relatively stable. To conformably analyze the reason of volatility of the labor's share of income, we follow the volatility decomposition technique of the labor's share of income proposed by Ruiz (2005) and Young (2006). This technique has decomposed the volatility of labor's share of income into three effects, i.e., within-sector effect, structural effect and covariance effect. Taking time difference on total labor's share of income in Eq. (3.1), we can get the decomposition equation as the following.

$$S_t - S_{t-1} = \sum_{i=1}^{k} w_{i,t}\left(S_{i,t} - S_{i,t-1}\right) + \sum_{i=1}^{k} \left(w_{i,t} - w_{i,t-1}\right) S_{i,t} + \sum_{i=1}^{k} \left(w_{i,t} - w_{i,t-1}\right)\left(S_{i,t} - S_{i,t-1}\right) \tag{3.3}$$

The first term on the right side of the equation is within-sector effect, which is when industry or sector structure keeps unchanged in period t − 1 the effect of the change of labor's share of income inside industries and sectors. The second term is structural effect, which means the effect from the within-industry or within-sector changes of labor's share of income when the structure of industry or sector keeps constant at time period $t - 1$. The third term is covariance effect, which means the co-movement of structural effect and within-industry effect.

We decompose the change of the labor's share of income calculated by income approach of GDP and flow of funds account respectively. From Fig. 3.5, we find that the volatility of the labor's share of income calculated by income approach of GDP is mainly influenced by within-industry effect and structural effect and the covariance effect is too small to be important. When industry structure keeps unchanged, the labor's share of income within each industry has led to the decrease of total labor's share of income, with the largest changing extent. When the

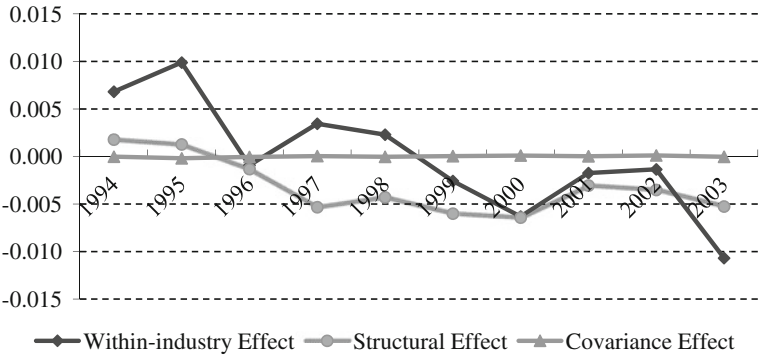

Fig. 3.5 Volatility decomposition of the labor's share of income: income approach of GDP 1994–2003. *Data Sources China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004*

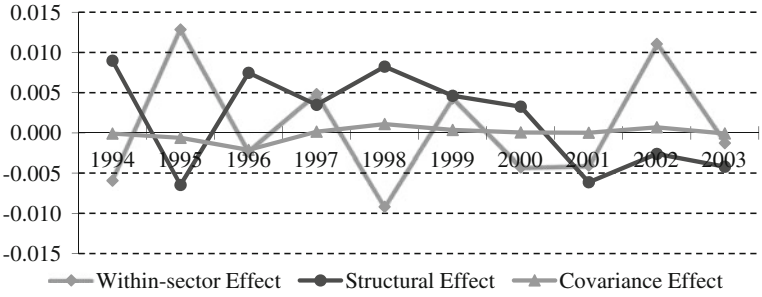

Fig. 3.6 Volatility decomposition of the labor's share of income: flow of funds account 1994–2003. *Data Sources China Statistical Yearbook* and the *China's GDP Accounting: Historical Data 1952–2004*

within-industry labor's share of income keeps unchanged, the change of industry structure also lead to the decrease of total labor's share of income. Therefore, total labor's share of income appears to be a downward trend. Meanwhile, the within-industry effect co-moves with structural effect, whose correlation is 0.87. Such co-movement will inevitably increase the extent of volatility of the labor's share of income. This can explain the reason why income approach of GDP fails to satisfy the requirements of relative stability. Therefore, the change of industry structure can further enhance the instability of the labor's share of income.

About the volatility decomposition of flow of funds account, three effects have appeared notable changes (see Fig. 3.6). Both within-sector effect and structural effect appear up-and-down fluctuations and don't exhibit a certain moving trend. We find that although the changing extent of three effects of flow of funds account is larger than income approach of GDP, the within-sector and structural effect in flow of funds account cancel with each other, forming a negative correlation (−0.54). Therefore, the opposite movements of within-sector effect and structural effect help to stabilize the labor's share of income. This also explains the reason why flow of funds account can satisfy the requirement of relative stability. Therefore, the change of sectoral structure has a significant influence on the stability of the labor's share of income.

To compare the above two volatility decompositions, we can conclude that the volatility of the labor's share of income is mainly decided by within-industry (or within-sector) effect and structural effect. The covariance effect can be ignored. Within-industry or within-sector effect reflects the change of the labor's share of income itself while the structural effect, on the other hand, reflects the effect of change of economic structure (e.g., sectoral structure and industrial structure) on the labor's share of income. When within-industry (or within-sector effect) is negatively related to structural effect, the volatility of total labor's share of income will decrease and make it satisfy the requirement of relative stability. When within-industry (or within-sector) effect is positively related to structural effect, the

volatility of total labor's share of income will increase and make it fail to satisfy the requirement of relative stability. The decomposition of the labor's share of income calculated by income approach of GDP and flow of funds account have reflected above two relations between within-industry (or within-sector) effect and structural effect so that two decompositions show different moving trend and volatility.

3.5 Conclusion and Policy Implications

This chapter analyzes the moving trend of the labor's share of income from 1992 to 2007 and compares difference of the income approach of GDP and flow of funds account. We find that the change of statistical caliber in 2004 leads to a sudden drop of the labor's share of income which is mainly caused by excluding proprietors' income out of the labor compensation. We attempt to use the employment data in proprietors' economy to re-adjust the statistical caliber and add total labor's share of income after 2004. After adjustment, the labor's share of income has increase form 6 to 7 % and two data series appear similar moving trend. However, before the change of statistical caliber, the moving trends of the labor's share of income by two calculation methods are not consistent with each other. The former has a downward trend after 1995 and the latter has a steady increase trend starting from 1993. Through decomposing the sectoral structure in flow of funds account, we find that the changing shares of firms sector and households sector reflect the change of economic structure and ownership structure. The opposite moving trend of governments sector and households sector indicate that a large number of laid-off workers in SOEs during mid-1990s are reemployed for being proprietors. After 2000, the share of firm sector has increased continuously due to the development of POEs. Combining the moving trend of the labor's share of income within firms and households sector, we find that the opposite moving trend of two sectors is helpful to stabilize total labor's share of income. However, the weighted average of the labor's share of income in governments sector has a steady increase, resulting in a steady increase of total labor's share of income. Therefore, the interaction of the labor's share of income within three main sectors and value-added share of each sector makes labor's share of income calculated by flow of funds account have a moving trend in Fig. 3.1.

Besides comparing the moving trend of the labor's share of income calculated by income approach of GDP and flow of funds account, we also explore the moving stability of two methods. After considering the statistical factors, the stability of two methods still exist notable difference. The labor's share of income calculated by flow of funds account is more stable (both in terms of absolute and relative stability) than income approach of GDP. Meanwhile, we use volatility decomposition technique to explain the differences in stability between two methods. The study shows that the co-movement of within-industry effect and industrial structure effect in income approach of GDP increases the volatility of total labor's share of income,

failing to satisfy the requirement of relative stability. The opposite movement of with-sector effect and sectoral structure effect in flow of funds account moving decreases the volatility of total labor's share of income, satisfying the requirements of relative stability.

Therefore, we find that the labor's shares of income from different data sources have notable differences, both from the perspective of the moving trend and extent. Such differences have made us difficult to get a consistent judgment about the moving trend of the labor's share of income. There are two possible reasons for such differences: the first reason is the statistical differences. After examining related materials, we find that both income approach of GDP and flow of funds account are constructed on the basis of SNA. However, we still cannot exclude the possibility of statistical differences; another reason may be related to the time period that we focus on. Our analysis only reflects the short-term volatility of the labor's share of income calculated by those two methods. The conclusion of instability by income approach of GDP may be changed to stability in the medium and long run. Therefore, we also need to examine the changing trend in medium and long run in order to get a robust judgment of the moving trend of the labor's share of income. This requires longer period and more detailed industrial and sectoral statistical data of the labor's share of income released by Chinese government in the future.

When analyzing the structural factors and volatility decomposition of the labor's share of income, we have discussed about the interaction between within-industry (or within-sector) labor's share of income and the value-added share in each industry (or sector). We find that the structure change of industry (or sector) reflects the change of economic structure. Such change of economic structure may increase or decrease the volatility of total labor's share of income. When the structure effect is positively correlated to within-industry (or within-sector) effect, the structure change of industry (or sector) leads to more fluctuation of total labor's share of income, failing to satisfy with the requirement of relative stability. On the contrary, when the structure effect is negatively correlated to within-industry (or within-sector) effect, the structure change of industry (or sector) leads to less fluctuation of total labor's share of income, satisfying with the requirement of relative stability. This indicates that the volatility of the labor's share of income depends on two-level factors: the first one is micro-level factor, i.e., within-firm change of the labor's share of income. This may be determined by the specific technology and features of input factors of micro firms. For example, textile firms need more labor, while petroleum processing firms more equipment and capital. Therefore, under the modern enterprise system, firm have their own rights of choosing technology and factors. Government shouldn't interfere such rights of choice; the second is macro-level factor, i.e., the change of the labor's share of income caused by industrial or sectoral structure change. In this aspect, government can influence total labor's share of income through adjusting macroeconomic policy, for the purpose of stabilizing the operation of macro economy and balancing the distributional relationship among factors.

References

Bai C, Qian Z (2009) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41

Close FA, Shulenburger DE (1971) Labor's share by sector and industry, 1948–1965 [J]. Ind Labor Relat Rev 24(4):588–602

Gollin D (2002) Getting income shares right [J]. J Polit Econ 110(2):458–475

Gomme P, Rupert P (2004) Measuring labor's share of income [EB/OL], policy discussion papers, Federal Reserve Bank of Cleveland

Gujarati D (1969) Labor's share in manufacturing industries: 1949–1964 [J]. Ind Labor Relat Rev 23(1):65–77

Jiang L (2008) Trend and influential factors of labor share in China: an analysis based on China's provincial panel data [J]. Mod Econ Sci 30(4):7–12

Kaldor N (1956) Alternative theories of distribution [J]. Rev Econ Stud 23(2):83–100

Kaldor N (1961) Capital Accumulation and Economic Growth [A]. In: Lutz FA, Hague DC (eds) The theory of capital [C]. St. Martin Press, New York

Kuijis L (2006) How will China's saving-investment balance evolve? World Bank China Office [EB/OL], Research Working Paper, No.5

Li D (2007) Pay attention to the decreasing labor income share of GDP [N], New Fortune

Li Y, Ying J (2007) Anatomy of high saving rate of China: analysis based upon flow of funds account of China from 1992–2003 [J]. Econ Res J 6:14–26

Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: A U-shaped curve [J]. Econ Res J 1:70–82

Luo C, Zhang J (2009) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79

Ruiz CG (2005) Are factor shares constant: an empirical assessment from a new perspective, Working Paper, Carlos III Macroeconomics Workshop

Solow RM (1958) A skeptical note on the constancy of relative shares [J]. Am Econ Rev 48 (4):618–631

Xu C (2002) Analysis of China's flow of funds [J]. J Financ Res 9:19–33

Young AT (2006) One of the things we know that ain't so: why US labor's share is not relatively stable [EB/OL]. University of Mississippi, Mimeo

Zhao C (2006) Governments sector account in Chinas system of national accounts [M]. China Statistics Press, Beijing

Chapter 4
Unbalanced Economic Growth and Uneven National Income Distribution

This chapter re-measures the labor's share of income of income since the reform and opening up by amending and supplementing the corresponding data during 2004–2007. We find that the labor's share of income decreases steadily after 1998. This chapter also further divides labor into raw labor and human capital. By using the individual level data of UHS, we find the human capital's share of income has increased rapidly while the raw labor's share of income decreases steadily during 1988–2007. By using extended MRW growth framework, we find that the movement of China's national income distribution pattern is closely related to the unbalanced growth of three factors which are physical capital, human capital and raw labor. The high growth rate of physical and human capital bring upward trend of their income share, while the stagnant state of raw labor will bring its share to decrease rapidly. By using various sources of factor growth data from 1995 to 2007, we confirm the inference of the extended model. And we find that the steady growth of physical capital, the slowing down of the growth rate of human capital, and the negative growth rate of raw labor are the causes of decreasing labor's share of income of GDP during 1998–2006. Relate raw labor with minimum wage, we suggest that the unmatched economic contribution and return of rural surplus labors is the key to understand the leaning of national income distribution towards capital. And we suggest that the main approach to achieve harmonious distribution relations is to raise the labors compensation of such people.

4.1 Introduction

Income distribution has been a long lasting central focus of economic study. Classical economists such as David Ricardo (1981) consider that the study of rules of distribution among owners of land, labor, and capital during the production process should be the main subject for political economics. Marxian theory adopts the class analysis of Ricardo, asserting that the capital exploit labor by retaining the surplus value created by the labors which will arise in rival relations in income distribution between labor and capital. Neoclassical theory, distinct from the Marxian production relation analysis, explains income distribution in terms of

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technical condition of production. Thus, the distribution pattern of wage and profits is considered as a result of marginal productivity of labor and capital.

The neoclassical theory predominates because of empirical results of the constancy of labor's share of income in the U.S. and U.K. at the begging of the 20th century (Hicks 1932; Keynes 1939; Solow 1958). However, labor's share of income in industrial countries, especially European countries, experiences a significant decline since last quarter of 20th century.[1] Many studies suggest that globalization is the main cause of declining labor's share of income in the industrial country (Diwan 2001; Harrison 2002; Jaumotte and Tytell 2007). Their main argument is based on the neoclassical trade theory that the imported labor-intensive products from emerging markets will lower the demand of domestic labors, causing decline of labor's share of income in those developed countries. Cross country analysis of OECD and industrial countries provide empirical supports for HO theory for explaining the decline of labor's share of income, in addition with other explanatory factors such as skilled biased technological progress (Bentolila and Saint-Paul 2003) and weakening power of labor union (Guscina 2006).

However, labor's share of income in the emerging markets such as China has also had a decline trend which contradicts the prediction of neoclassical trade theory. According to the income approach of GDP, labor's share of income in China decreases from 51.9 % in 1995 to 39.7 % in 2007. Correspondingly, profits of firms have increased, and the capital's share of GDP increases from 34.9 % in 1997 to 46.1 % in 2007. It is said that the pattern of national income distribution changes from "wage erodes profits" (Dai and Li 1988) at the begging of the reform and opening up to "strong capital and weak labor" relations (Yao 2005) in the most recent decade. Therefore, the report of 17th congress of China clearly emphasizes that "the share of labors compensation in the primary distribution should be raised". And "increase the bargaining power of labor towards capital" is the hottest suggestion in the NPC & CPPCC of China.

Economists will not satisfy with the "reflexible" suggestions so that they try to explain the underlying factors in the story behind the decreasing labor's share of income from two perspectives. Firstly, they combine the labor's share of income with industrial structural changes during the economic development process, indicating that the industrial structural change from the agricultural sector to non- agricultural sectors is the main reason for decreasing labor's share of income (Bai and Qian 2009; Luo and Zhang 2009a). Secondly, empirical studies mainly focus on the economic reasons that have impacts on the movement of labor's share of income. These studies show that ownership restructuring of SOEs, privatization, technical progress, raising monopoly power, international trade and entry of foreign direct investment are the main causes of decrease of labor's share of income (Bai et al. 2008; Bai and Qian 2009; Li et al. 2009; Luo and Zhang 2009b; Xiao and Zhou 2010).

[1]Average labor's share of income of OECD countries falls by more than 5 points after reaching its peak in the late 1970s. Among those OECD countries, France and Germany have sharpest drops in their labor's share of income (Bentolila and Saint-Paul 2003).

Although exploring the reason of decreasing labor's share of income is one of the main goals of this chapter, it distinguishes with previous studies from methods and perspectives. Firstly, we combine macroeconomic growth with national income distribution so that we can discuss the expansion and division of the economic cake dynamically. Secondly, we not only discuss the distribution pattern between capital and labor, but also divide labor into raw labor and human capital so that we can discuss the distribution pattern among physical capital, human capital and raw labor. Thirdly, we extend Mankiw et al. (1992) economic growth framework, and discuss the mutual relations of growth and distribution among above three factors during the economic growth process.

We obtain results different from previous studies. Firstly, after dividing labor into raw labor and human capital, we find that human capital's share of GDP increases significantly and raw labor's share of income of GDP decreases steadily during 1998–2007. Secondly, by constructing and testing the extended model, we find that high growth rate of physical and human capital increase their income share of GDP, while low growth rate of raw labor bring its share to decrease dramatically. Between 1998 and 2006, the steady growth rate of physical capital, the slowing growth rate of human capital and the negative growth rate of raw labor is the reason of decreasing aggregate labor's share of income. Thirdly, relating raw labor with minimum wage, we suggest that the unmatched economic contribution and return of rural surplus labors is the key to understand the leaning of national income distribution towards capital. And we suggest that the main approach to increase aggregate labors compensation and achieve harmonious distribution relations is to raise labors compensation of such people.

4.2 Labor's Share of Income in National Income Distribution

In the practice of national accounting, gross domestic product is calculated from three approaches, namely production approach, income approach and expenditure approach. The income approach of GDP reflects created income during the production process. It divides the final products based on the income shares of production factors and the share which pays to the government (Zhao 2003). The income approach of GDP in China divide the value added into four parts, namely labors compensation, net taxes on production, depreciation of fixed assets, and operating surplus. However, these national accounts based on the income approach are not divided rigorously based on attribution of factor's income. Therefore, Gomme and Rupert (2004) divide GDP into four parts based on attribution of factor's income: the first is unambiguous labor compensation, including wages, bonus, and welfare; the second is unambiguous capital's income, such as corporate profits, rental income, net interest income, and depreciation; the third is taxes less subsidies for the government sector. It can be attributed to neither capital income

nor labor income, which can be considered as a wedge beside capital and labor; the fourth is ambiguous income of proprietors (i.e., owners of unincorporated businesses) which cannot be clearly attributed to capital or labor. Because some of the income earned by self-employed workers clearly represents labor income, while some represents a return on investment or economic profit. Therefore, when we want to clearly identify the distributional relationship between labor and capital, we shall consider the impacts of government taxes and proprietors' income. And we shall not simply divide compensation of employees by gross value added where there are potential measurement problems. In addition, if the national income is divided into labor-capital dichotomy, measuring labor's share of income indicates the determination of capital's share, which is one minus labor's share of income. Thus, herein we just discuss the measurement problems of labor's share of income of GDP.

4.2.1 Dealing with Net Taxes on Production

Since the net taxes on production are the wedge attributed to neither capital income nor labor income, will the labor's share of income excluding this part reflect the true distributional relations between labor and capital? Table 4.1 lists the labor's share of income and taxes' share of GDP in China from 1993 to 2004. We find that the proportion of net taxes on production of GDP increases from 11.7 % in 1993 to 15.8 % in 2003. Therefore, the increase of the proportion of net taxes will over-

Table 4.1 Impacts of net taxes on labor's share of income 1993–2004

Year	Unadjusted labor's share of income	Taxes' share	Adjusted labor's share of income
1993	0.495	0.117	0.560
1994	0.503	0.120	0.572
1995	0.514	0.123	0.586
1996	0.512	0.129	0.588
1997	0.510	0.136	0.591
1998	0.508	0.143	0.593
1999	0.500	0.149	0.587
2000	0.487	0.153	0.575
2001	0.482	0.156	0.572
2002	0.478	0.156	0.566
2003	0.462	0.158	0.548
2004	0.416	0.141	0.484

Note The data is calculated by authors according to *China's GDP Accounting: Historical Data 1952–2004(G)*

estimate the extent of labor's share of income decreasing. And we deduct the net taxes on production from the GDP when estimating the labor's share of income. On concrete, let Y_L be labor income, Y_K be capital income, Y_T be net taxes on production collected by government, and Y be the aggregate income adding up the above three, then labor's share of income will be noted as:

$$\alpha_L = \frac{Y_L}{Y - Y_T} \tag{4.1}$$

According to above equation, we find that after deducting the impact of the wedge, the decrease of labor's share of income has postponed from 1995 to 1998. And it rises from 56 % in 1993 to the maximum 59.3 % in 1998, and then drops to 54.8 % in 2003 (see Table 4.1 Column 3).

4.2.2 *Division and Revision of Proprietors' Income*

However, we find the labor's share of income has a distinctive slump in 2004 as can be seen in the last row of Table 4.1. Bai and Qian (2009) consider that the statistical change of attribution of labors compensation overestimates the extent of labor's share of income decreasing. In order to discuss the impacts from changes of statistical caliber before and after 2004 in China clearly, we follow Gomme and Rupert (2004) to further distinguish proprietors' income with the non-proprietors' income. Let Y_{UL} be unambiguous income attributed to labors, Y_{UK} be unambiguous income attributed to capital, and Y_A be ambiguous income attributed to proprietors. Before 2004, the National Bureau of Statistics (NBS) says that "proprietors' income is considered as labors compensation" (NBS 2003), which means that all proprietors' income is attributed to labors income. Therefore, labor's share of income will be noted as:

$$\alpha_L = \frac{Y_{UL} + Y_A}{Y - Y_T} \tag{4.2}$$

After 2004, the NBS says that "labors compensation and operating profits of proprietors are considered as business profits while labors compensation only includes the compensations of employees in the proprietors' economy" (NBS 2007). Therefore, labor's share of income will be:

$$\alpha'_L = \frac{Y_{UL}}{Y - Y_T} \tag{4.3}$$

The change of statistical caliber results in a significant slump in 2004 compared in 2003, overestimating the decrease of labor's share of income after 2004. Bai and Qian (2009) use the operating surplus of private unincorporated enterprises

(OSPUE) to adjust labor's share of income by *China Economic Census Yearbook* in 2004. However, for un-census years, *China Statistical Yearbooks* only provide aggregate operating surplus and do not list OSPUE separately. Therefore, their adjustment cannot be used to adjust labor's share of income after 2004. However, we can adjust labor's share of income in two ways resorting to employment data of unincorporated business. The first approach focuses on labors compensation of self-employed workers by utilizing employment data (Gollin 2002; Ruiz 2005). It is possible to get average labors compensation by dividing unambiguous labors income of incorporated enterprises by the number of employees. We can scale this up for the entire workforce by multiplying average labors compensation by the number of people in the workforce. The advantage of this approach is that it attempts to take into account of the labors compensation of self-employed people. On concrete, let L_A be the number of self-employed employees, L be the number of entire workforce, and then adjusted labor's share of income will be noted as:

$$\alpha_L = \frac{Y_{UL} \times L/(L - L_A)}{Y - Y_T} \tag{4.4}$$

The second approach focuses on the adjustment of aggregate operating surplus by using employment data (Bernanke and Gurkaynak 2001). It is possible to get average operating surplus by dividing aggregate operating surplus by the number of employees. We can scale this up for the self-employed employees by multiplying average surplus. Finally, we add the operating surplus of unincorporated business with the unambiguous labors income to get aggregate labors compensation including unincorporated business. On concrete, let Y_O be the aggregate operating surplus, and we also define L_A as the number of self-employed employees, and L as the number of entire workforce, and then adjusted labor's share of income will be noted as:

$$\alpha_L = \frac{Y_{UL} + Y_O \times L_A/L}{Y - Y_T} \tag{4.5}$$

Both approaches have their implicit assumptions. The former assumes that average labors compensation of unincorporated and incorporated business are the same, while the latter assumes that unit capital income of unincorporated and incorporated business are the same. When there is substantial difference between unincorporated and incorporated business, both approaches will have biased results.

We adjust the labor's share of income after 2004 according to the above two approaches. Compared with *China Economic Census Yearbook* and *China Statistical Yearbooks*, we find a large amount of unregistered self-employed employees. For instance, the number of self-employed employees in the statistical yearbook is 45.9 million, while the number in the census yearbook is 94.2 million. Therefore, the number of unregistered employees is 48.5 million. We refer to the growth rate of

Table 4.2 Labor's share of income adjusted by the employment structure 2004–2007

Year	Total	Self-employed	#Unregistered	Unadjusted	Adjusted1	Adjusted2	Adjusted average
2004	752	94.2	48.4	0.484	0.553	0.528	0.540
2005	758	100.7	51.7	0.482	0.556	0.528	0.542
2006	764	106.0	54.4	0.475	0.552	0.525	0.538
2007	770	112.9	58.0	0.463	0.542	0.516	0.529

Note Data from *China Statistical Yearbooks* 2005–2008; unit of employment numbers is million

registered self-employed employees during 2004–2007, and get the number of self-employed employees of corresponding years (see Table 4.2 and Column 4).

After adjustment, the two approaches increase labor's share of income by 6–7 % and 4–5 % respectively (see Table 4.2 Column 5–6). The extent of adjustment is consistent with that of Bai and Qian (2009), indicating the robustness of the two revisions. Because of the difficulty in choosing between two approaches, we set the adjusted average as the final results (see Table 4.2 Column 8).

4.2.3 Movement of Labor's Share of Income Since Reform and Opening up

Up till now, we can get accurate measurement of labor's share of income of GDP after the above adjustments. Integrating data information of NBS, we get two sets of income approach of GDP. The first set is the pre-revised data, in which the time span is from 1978 to 2002; the second set is the revised data according the census yearbook in 2004, and the time span is from 1993 to 2004.[2] We combine the two data sets, revising and supplementing the data from 2004 to 2007. Therefore, we obtain comparable data series of labor's share of income from 1978 to 2007 (See Fig. 4.1).

Since the reforming and opening up, national income distribution undoubtedly experiences several significant changes. Labor's share of income increases from 57 to 60.9 % during 1978–1984, showing the national income distribution leaning towards individuals and being consistent with the observation of Li (1992). However, different from Li (1992), labor's share of income experiences a small down turn during 1986–1989, and a big slump during 1990–1993.[3] The recent decrease persists for the longest time span and the labor's share of income decreases

[2]The first set of data is from *China's GDP Accounting: Historical Data 1952–1995(G)*, and *China's GDP Accounting: Historical Data 1996–2002(G)*; the second set of data is from *China's GDP Accounting: Historical Data 1952–2004(G)*.

[3]This may be due to combining the two different sets of income approach data.

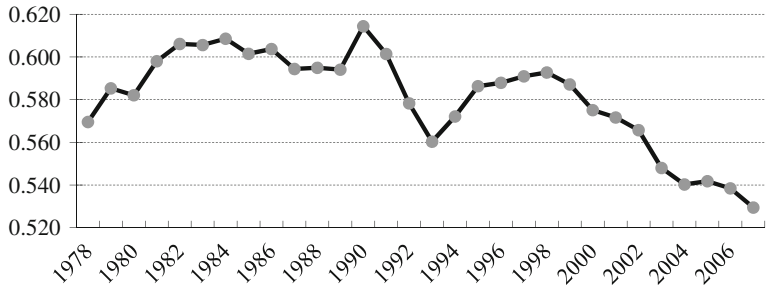

Fig. 4.1 Movement of labor's share of income 1978–2007

from 59.3 % in 1998 to 52.9 % in 2007, indicating the national income distribution leaning towards capital.

4.3 Dividing National Income into Raw Labor and Human Capital

Another important observation is that despite of the uneven distribution between labor and capital in China in recent years, the income inequality among labors experience a substantial expansion. According to World Bank (2007), the Gini coefficient reaches 0.47 in 2004. However, Gini coefficient only reflects income inequality among individuals. Our intension is to further divide the labors from the angle of functional income distribution. We know that labors compensation is closely related to the human capital possessed by particular labors. Therefore, one part of labors compensation can be considered as returns to human capital, and the rest part is the return from the physical expenditure of the labor, which we call it as "raw" labors compensation. Krueger (1999) resorts to Mincerian earning regressions (Mincer 1974) to distinguish raw labor and human capital:

$$\ln W_{\mathrm{i}} = b_0 + b_1 S_i + b_2 X_i + b_3 X_i^2 + e_i \tag{4.6}$$

Where, $\ln W_i$ is the natural log of labor i's annual labor compensation, S_i equals years of schooling, X_i is work experience, X_i^2 is experience squared, e_i is an equation error, b_0 is the constant, and b_1, b_2, and b_3 are the coefficients of regressors. The average value of each labor's earnings attributable to "raw" labor, denoted W_0, is approximated by $W_0 = exp(b_0 + 0.5\sigma^2)$, where σ^2 is the mean square error of the regression (Raw labor might more appropriately be called "intercept labor".). The share of labors compensation accruing to raw labor is approximated by $S_R = \Sigma W_0 / \Sigma W_i$. We can obtain raw labor's share of income of GDP by multiplying this share with the aggregate labor's share of income.

$$\alpha_R = \frac{Y_L}{Y - Y_T} \frac{\sum W_0}{\sum W_i} = \alpha_L S_R \tag{4.7}$$

We use data of Urban Household Survey (UHS) and estimate Mincerian equation by OLS regression. There are two reasons for using this survey data. Firstly, UHS is carried out by the Urban Survey Organization of China's National Bureau Statistics. It covers 146 cities, 80 towns and 25,000 households. The choice of cities and towns, as well as of households, is based on the principle of random and representative sampling. Therefore, the sample can reflect the wage and income status of China's urban population. By comparing the corresponding statistics in *China Statistic Yearbook*, Zhang et al. (2005, 2008) confirm the data representativeness of UHS. Secondly, UHS provides 20 consecutive annual data from 1988 to 2007. According to the 2002 *Handbook of the Chinese Urban Household Survey*, the sampling method is consistent overall years under study. Therefore, we can consecutively estimate the distribution between raw labor and human capital within labors by using Mincerian regression.

According to UHS, labors compensation W_i consists four major components, namely, basic wage, bonus, subsidy and other labor-related income; Years of education S_i is allocated by the index of education level[4]; potential experience X_i is age minus education minus 6, and UHS also provide variable as "work entry year" so that we have another measure of actual work experience as the "survey year" subtracting "work entry year"; Because the *Labor Law* sets 16 as the minimum working age, we limited our sample to workers aged 16 or over. Because most workers retire by age of 60 in accordance with China's mandatory retirement age, individuals older than 60 are also excluded. An alternative method is to set work experience below 45 years, and we can get consistent results. All regression results show expected signs of coefficients of education, experience and squared experience in Mincerian equations, all coefficients are significant at 1 % level, and the explanatory power is around 12–30 % (detailed results are listed in Tables 4.6, 4.7, 4.8, 4.9 and 4.10). Column 2–5 in Table 4.3 list results of distributional rate of raw labor in urban labors compensation, where column 2 and 4 are regression results for potential and actual work experience. Meanwhile, during the data processing, we find that there are outliers for wages,[5] and we amend them to get robust results (See Table 4.3 Column 3 and 5).

Before discussing the movement of distributional rate of raw labor S_R, we shall first examine the data quality. Firstly, we should make sure all the rates are

[4]For 2002, the education level is divided as illiteracy, half-illiteracy, primary school, junior school, senior school, high school, vocational school, college, university, graduate school, and the corresponding years are 0, 3, 6, 12, 12, 15, 16, 18. For other years, this is adjusted according to the minor difference of division.

[5]We find that some individuals have abnormal low wages. For example, annual wages are below 1000 RMB for some samples in 2006. This will obviously lower the intercept term and overestimate the returns to education and experience. Therefore, we use robust regression for revision, and we find substantial increase of S_R.

Table 4.3 Distributional rate of raw labor in aggregate labor 1988–2007

Year	UHS				CHNS		CHIP	
	Potential experience	Robust regression 1	Actual experience	Robust regression 2	Potential experience	Robust regression	Urban	Whole
1988	0.233	0.349	0.363	0.454			0.391	0.394
1989	0.233	0.342	0.363	0.435	0.571	0.325		
1990	0.236	0.338	0.359	0.422				
1991	0.255	0.369	0.383	0.450	0.684	0.535		
1992	0.229	0.339	0.359	0.414				
1993	0.259	0.337	0.362	0.396	0.628	0.616		
1994	0.189	0.244	0.278	0.305				
1995	0.205	0.284	0.297	0.352			0.313	0.337
1996	0.189	0.242	0.270	0.312				
1997	0.207	0.266	0.277	0.338	0.647	0.620		
1998	0.161	0.227	0.259	0.320				
1999	0.162	0.207	0.215	0.268				
2000	0.143	0.194	0.193	0.235	0.363	0.323		
2001	0.137	0.154	0.178	0.212				
2002	0.117	0.138	0.140	0.160			0.186	0.309
2003	0.138	0.147	0.152	0.166				
2004	0.105	0.121	0.119	0.143	0.222	0.182		
2005	0.096	0.113	0.110	0.134				
2006	0.102	0.117	0.116	0.141	0.191	0.183		
2007	0.094	0.125	0.125	0.152				

Note Column 2 and 4 are calculated from UHS; column 2 and 4 are OLS regression results for the potential and actual work experience respectively; column 3 and 5 are robust regression excluding the impacts of outliers; during 2002–2006, we use hourly wage as explained variables; in other years, we use annual wage as explained variables; numbers of samples are around 25,000–30,000 for 1988–1992, 5300–7000 for 1993–2001, and 16,000–24,000 for 2002–2007 respectively; column 6 and 7 are calculated from CHNS, and are OLS and robust results for the potential work experience respectively; numbers of samples for all years are around 2000–3000; column 6 and 7 are calculated from CHIP, and are results for urban and the whole country respectively, where, the data of 2002 including the rural migration workers; numbers of samples for urban are around 11,000–17,000; numbers of sample for the whole country are around 20,000–25,000

comparable and consistent all over the estimating years. One of the main drawbacks of UHS is that it does not provide information of working hours during 1988–2001. Hence, labor market participation may be distributed unevenly among workers of different educational levels (Zhang et al. 2005).[6] However, UHS provides employment months and working hours during 2002–2006 so that hourly wage can be estimated. Then we compared with the results of distributional rate of raw labor setting hourly and annual wage as explained variable, and results show that they are highly consist during this period. Therefore, we can infer boldly that Mincerian results by annual wage before 2001 are also robust and reliable. Secondly, we should make sure the representativeness of the data. We have already said something about random sample method for getting representative results. Meanwhile, UHS also provides weights[7] for the sample during 2002–2007. We find that there are little changes on the results after concerning the weights, indicating the good quality of the data. Thirdly, although the number of samples varies substantially across the survey years, the consistent trend of distributional rate of raw labor S_R shows further evidence for robustness of the empirical results.[8]

We choose Column 4 in Table 4.3 as the discussing series. We find that the distribution rate of raw labor in aggregate labor decreases steadily for the estimating years, especially after the early years of 1990s. It reaches the bottom 13 % in 2005 and increases back a little bit to 15.2 % in 2007. This means after the Southern Tour by Deng Xiaoping, the returns to human capital increase substantially, and the prophet of "let some people to get rich" has already come true. However, the UHS only reflects the living status of urban labors, and will it be different if we consider the non-agriculture employment for rural labors? Because data of China Health and Nutrition Survey (CHNS) includes non-agriculture employment population in the rural areas, therefore, we can re-estimate the results by using this survey data, which shows in Table 4.3, Column 6–7 (Mincerian regression results are listed in Table 4.11). We find that all variables have expected results except for 1993, and the distribution rate of raw labor in aggregate labor shows significant decreasing trend after 1997, indicating the returns to human capital experiencing substantial rise.[9] Although China Household Income Project (CHIP) only has data for three years, this data provide further evidence for the decreasing trend of distributional

[6]If less educated workers are more likely to be unemployed for parts of the year or work fewer hours in recent years, we may overestimate both the level and rate of increase of the returns to education.

[7]The weights are allocated for the weighted data to reflect the picture of the overall country.

[8]Still, we cannot exclude some potential problems. For instance, raw labor may be of less value to those with a level of education get high education, thus the linear skill formulation may be a poor approximation.

[9]The reason for the insignificance of coefficient of education before 1993 of CHNS may lies that the labor price may not be set by market price. Hence the significance of coefficient of education in the following years may indicate marketization for pricing the human capital, and not the rising of human capital return. However, this inference is contradicted with UHS data. CHNS cannot provide consecutive year data and its sample size is relatively small, we support the results of UHS that the increasing return to human capital is also due to the growth of its level.

rate of raw labor in aggregate labor (Mincerian regression results are listed in Table 4.12). The results of UHS and CHIP are quite close to each other for the urban population, indicating the robustness of the results.

According to the distributional rate of raw labor in aggregate labors compensation in Table 4.3, we combine the micro and macro data together, and get the estimation results of raw labor's share of income of GDP, and the value of raw labor and human capital compensation (see Table 4.4). We find that the human capital's share of GDP increases significantly after further dividing the national income system. It increases from 32.5 % in 1988 to 44.9 % in 2007. Correspondingly, raw labor's share of income of GDP decreases from 27 % in 1988 to 8 % in 2007. For the real value, it shows that drastic rise for the human capital compensation and relatively low increase for the raw labors compensation.

On one side, the evolution of national income pattern indicates the increasing economic returns to human capital of labors after reform and opening up. On the other side, the decrease of raw labor's share of income of GDP indicates that labors income of those who have little education and experience endure a stagnant growth. We suggest that the rapid decrease of raw labor's share of income will hinder the

Table 4.4 Divide national income into raw labor and human capital

Year	Labor's share in GDP	Human capital's share in GDP	Raw labor's share in GDP	Human capital compensation (Billion Yuan)	Raw labor compensation (Billion Yuan)
1988	0.595	0.325	0.270	406.5	337.7
1989	0.594	0.336	0.258	474.5	365.0
1990	0.614	0.355	0.259	566.7	413.9
1991	0.601	0.331	0.270	607.0	495.8
1992	0.578	0.339	0.240	759.8	537.3
1993	0.560	0.338	0.222	1022.5	670.9
1994	0.572	0.398	0.175	1586.6	696.3
1995	0.586	0.380	0.206	1917.4	1042.3
1996	0.588	0.405	0.183	2388.8	1081.6
1997	0.591	0.391	0.200	2579.1	1316.4
1998	0.593	0.403	0.190	2854.5	1341.6
1999	0.587	0.430	0.157	3227.9	1180.3
2000	0.575	0.440	0.135	3668.7	1129.1
2001	0.572	0.451	0.121	4126.7	1108.5
2002	0.566	0.475	0.091	4834.1	923.6
2003	0.548	0.457	0.091	5360.6	1066.5
2004	0.540	0.463	0.077	6666.8	1113.9
2005	0.542	0.469	0.072	7973.8	1229.8
2006	0.538	0.462	0.076	9125.8	1503.6
2007	0.529	0.449	0.080	10628.5	1898.4

Note Results are calculated by authors according to Eq. (4.7)

growth of aggregate labors compensation so that the aggregate labor's share of income of GDP will decrease from 1998. In the following section, we try to combine the economic growth with national income distribution to confirm such inference.

4.4 Extended MRW Growth Model

Mankiw et al. (1992) extend Solow's (1956) growth model into a widely cited theoretical and empirical framework (MRW framework) including human and physical capital. Hereon, we begin by briefly reviewing the MRW framework and pointing out its implications. Assuming a constant-returns-to-scale Cobb–Douglas production function:

$$Y(t) = K(t)^{\alpha} H(t)^{\beta} (A(t)L(t))^{1-\alpha-\beta} \tag{4.8}$$

Where, the output $Y(t)$ is obtained by the inputs of physical capital $K(t)$, human capital $H(t)$, labor $L(t)$ and technology $A(t)$. Meanwhile, L and A are assumed to grow exogenously at rates n and g:

$$L(t) = L(0)e^{nt} \tag{4.9a}$$

$$A(t) = A(0)e^{gt} \tag{4.9b}$$

Using lowercase letters to denote per-worker quantities, e.g., $y = Y/L$. Therefore, we can rewrite the production function (4.8) and the physical and human capital accumulation equations in a standard way as:

$$y(t) = A(t)^{1-\alpha-\beta} k(t)^{\alpha} h(t)^{\beta} \tag{4.10}$$

$$\dot{k}(t) = s_k y(t) - (n + g + \delta)k(t) \tag{4.11a}$$

$$\dot{h}(t) = s_h y(t) - (n + g + \delta)h(t) \tag{4.11b}$$

Let s_k be the fraction invested in physical capital and s_h be the fraction invested in human capital. In addition, we are assuming that human capital depreciates at the same rate δ as physical capital. Then the growth rate of output per worker can be expressed by the growth rate of all input factors from Eq. (4.10):

$$\frac{\dot{y}(t)}{y(t)} = (1 - \alpha - \beta)\frac{\dot{A}(t)}{A(t)} + \alpha\frac{\dot{k}(t)}{k(t)} + \beta\frac{\dot{h}(t)}{h(t)} \tag{4.12}$$

For simplicity, we can rewrite (4.12) as:

$$g_y = (1 - \alpha - \beta)g + \alpha g_k + \beta g_h \tag{4.13}$$

According to above model, MRW further consider that growth rate of output per worker is the same as the growth rate of all input factors, namely $g_y = g = g_k = g_h$, along the Balanced Growth Path (BGP). What's more, the physical and human capital's shares of GDP, which are α and β, are relatively constant over time when the economy are operating along the BGP. Therefore, the constancy of the factors' share is an alternative term for a BGP of this economy. However, the human capital's share β is relatively hard to obtain. Therefore, we normally discuss the constancy of physical capital's share α, and most studies discuss from the angle of labor's share of income $(1 - \alpha)$ alternatively. From Great Depression till now, labor's share of income of national income remain somewhere between 75 and 80 % in the U.S. (Solow 1958; Kruger 1999; Young 2006). Therefore, popular textbook on economics often expresses this as one of the well-known stylized facts of economic growth, most closely associated with the pioneering work of Nicholas Kaldor (1956, 1961). After considering the proprietors' income, Bernanke and Gurkaynak (2001) and Gollin (2002) also suggest that there is no systematic tendency for country labor's share of incomes to vary with real GDP per capita or the capital-labor ratio. Indeed, most estimated labor shares lie in range of 65 and 80 %.

Therefore, many economic growth literatures assume the economy operating along the BGP. Thus empirical test of economic growth model based on MRW framework will first calculate the growth of human and physical capital investment, and then estimate the size of each factor's share as parameters. However, China, as a developing country, shows a distinctive transitional feature, which may bring the fluctuation of factor's share. Thus to act in an opposite way, we first estimate the factor's share and then discuss the growth of each factor input. Before that, we should extend the MRW framework in need of discussing this problem.

After adding human capital accumulation into the Solow model, MRW still put the entire Labor L into production function, which may overlap human capital and labor conceptually and empirically. In fact, from the discussion in Sect. 4.3, we divide the aggregate labor L into raw labor R and human capital H. This division can potentially alter either the theoretical modeling or the empirical analysis of economic growth. At the theoretical level, properly distinguishing raw labor and human capital may change one's view of the nature of the growth process. Firstly, unlike to include human capital directly, this division avoids overlapping conceptually and empirically. Secondly, including raw labor helps us to discuss further about the mutual relations between economic growth and income distribution. We know that in MRW framework, the production function is Cobb–Douglas linear function so that the shares of factors are constant parameters. In order to make the factor shares change with time, we generalize the function form to homogenous linear function with constant return of scale:

$$Y(t) = A(t)F[K(t), H(t), R(t)] \tag{4.14}$$

We mainly alter the Eq. (4.8) into two aspects. Firstly, we consider technology $A(t)$ separately, and still assume its exogenous growth rate. Secondly, we break aggregate labor $L(t)$ into raw labor $R(t)$ and human capital $H(t)$, thus the extended MRW model is consistent with the Solow model. We can rewrite the production function (4.10) by denoting per-worker quantities.

$$y(t) = A(t)F[k(t), h(t), r(t)] \tag{4.15}$$

Where, $r(t)$ is raw labor per worker unit. As the MRW framework, labor L and technology A are still assumed to grow exogenously at rates n and g. The accumulations of physical and human capital are the same as Eqs. (4.11a) and (4.11b). The economic growth rate is as:

$$\frac{\dot{y}(t)}{y(t)} = \frac{\dot{A}(t)}{A(t)} + \frac{\partial F}{\partial k}\frac{k}{F}\frac{\dot{k}(t)}{k(t)} + \frac{\partial F}{\partial h}\frac{h}{F}\frac{\dot{h}(t)}{h(t)} + \frac{\partial F}{\partial r}\frac{r}{F}\frac{\dot{r}(t)}{r(t)} \tag{4.16}$$

For simplicity, we can rewrite (4.16) as:

$$\left(g_y - g\right) = \alpha g_k + \beta g_h + (1 - \alpha - \beta)g_r \tag{4.17}$$

According to MRW framework, we can get $(g_y - g) = g_k = g_h$, and relatively stable factor's share α and β along the BGP of the economy. Therefore, we can infer that the growth rate of raw labor per worker is the same as the growth rate of output and other factors per worker, namely $(g_y - g) = g_k = g_h = g_r$. However, the decrease of China's labor's share of income of GDP has obviously contradicted with the Kaldor stylized facts, which let us to relate unbalanced economic growth with the national income distribution. The overall economic growth has steadily increased from 1988, around 10 % per year. However, the contribution and distribution of each factor for maintaining the economic growth is not consistent with each other. From the perspectives of functional distribution, physical capital's share α increases steadily from 1998 (see Fig. 4.1). Human capital's share β presents an increasing trend from 1988, thus the raw labor's share of income $(1- \alpha - \beta)$ presents a decrease trend from 1988 (see Table 4.4). We know that when the accumulation of physical and human capital are accelerating (g_k and g_h increase quickly), their share of GDP will have an increasing trend (α and β increase steadily). And the decrease of raw labor's share of income of GDP $(1 - \alpha - \beta)$ means that the growth rate of raw labor per worker g_r is relatively low. In other words, the unbalanced feature of economic growth will lead to the uneven distribution among factors. Thus we dynamically relate economic growth with income distribution from theoretical point of view. For better testing the inference, we need to estimate the level and growth rate of physical capital, human capital and raw labor.

4.5 Distribution Pattern Along the Unbalanced Growth Path

Before estimating the growth rate of each factor, we need to estimate the level of each factor's stock first. The estimation of physical capital stock is based on the perpetual inventory system created by Goldsmith (1951). He (1992), Chow (1993), Huang et al. (2002), Zhang and Zhang (2003), Zhang et al. (2004), and Bai et al. (2007) use this approach to estimate China's aggregate, provincial and industrial physical capital stock. We use the newest estimation results by Shan (2008), and choose a sub-period series between 1995 and 2007.[10] We get the physical capital per worker k and its growth rate g_k by dividing employment number (see Table 4.5 Column 2–3). The estimation of human capital stock is rather difficult. Chen et al. (2004) and Yao and Zhang (2008) use regional average education level as the proxy for human capital. However, this approximation is criticized for several potential problems such as the narrow empirical range, the uncertainty of measuring index, and the inconsistent caliber (Qian 2005).[11] Qian et al. (2008) use perpetual inventory system to estimate the human capital stock which is comparable and consistent with the physical capital. We make use of their results and obtain the series of human capital stock between 1995 and 2005, and we also get human capital per worker h and its growth rate g_h (see Table 4.5 Column 3–4). In addition, we consider that raw labors compensation itself is a stock concept. Thus we divide this by employment number to get unit raw labor r and its growth rate g_r.[12] Where, all data are calculated by the constant price of 1995.

Table 4.5 clearly shows the unbalanced feature of China's economic growth. Firstly, the aggregate economy shows an increasing trend, and the economic growth rate is from 6.2 % in 1996 to 15.3 % in 2007. Secondly, unit physical capital shows a rapid growing trend, and the growth rate stabilizes between 10 and 13 %. Thirdly, although the growth rate of human capital fluctuates a little bit, it still has rapid growth rate, some years are as high as 30–50 %.[13] In contrast, the growth rate of unit raw labor between 1999 and 2002 is negative, and it only recovers during 2006–2007. Considering the fluctuation of the economy itself and instability of the data, we estimate the average growth rate of each factor. During 1996–1997, we find that the rapid growth rate of human capital offsets the low increase of raw labor

[10]The original paper only have data till 2006, the data of 2007 is calculated by authors according to the method of that paper.

[11]The authors also calculate the average education level between 2002 and 2007 by using the Population Census data according to *China Population Statics Yearbook*. We find that the annual growth rate of this variable is only around 1 %, which contradicts with the increasing return to human capital obtained in this paper.

[12]In fact, the unit raw labor calculated by employment number is consistent with what Kruger called Intercept Labor W_0. Therefore, we also use UHS data to estimate W_0 directly, and find the latter is higher than the former. However, two series are highly consistent with correlation reaching 0.97, indicating good matching of the micro and macro data together.

[13]This may cause by the biased calculation of human capital.

Table 4.5 Unit stock level of factors and their growth rate

Year	g_y	k	g_k	h	g_h	r	g_r
1996	0.062	15,845	0.123	1761	0.066	1442	−0.059
1997	0.063	17,548	0.107	2284	0.297	1681	0.166
1998	0.063	19,326	0.101	2386	0.045	1703	0.013
1999	0.065	21,168	0.095	2642	0.107	1502	−0.118
2000	0.087	23,159	0.094	3971	0.503	1412	−0.060
2001	0.083	25,277	0.091	4217	0.062	1359	−0.038
2002	0.098	27,898	0.104	4545	0.078	1133	−0.167
2003	0.108	31,282	0.121	5315	0.169	1284	0.134
2004	0.128	35,125	0.123	5709	0.074	1285	0.001
2005	0.119	39,757	0.132	4714	−0.174	1385	0.078
2006	0.131	45,062	0.133	5752	0.220	1656	0.195
2007	0.153	50,943	0.131			1985	0.199
1996–1997	0.063	0.1152		0.1813		0.0536	
1998–2006	0.0980	0.1106		0.1205		0.0043	

Note All unit factors' level are calculated by the constant price of 1995; unit of value of human capital and raw labor compensation: Yuan; the last two rows are the average growth rate of each factor during 1996–1997 and 1998–2006 respectively

thus the aggregate labor's share of income has an increasing trend. However, during 1998–2006, we find that the physical capital still keep steady growth rate, the human capital slows its growth rate, and the raw labor presents a negative growth rate. Therefore, it is no wonder that we find the rising physical capital's share α and dropping labor's share of income $(1 - \alpha)$. This is consistent with the prediction for the extended MRW model.

In the above analysis, we find the decrease of labor's share of income of GDP is closely related to the stagnant and negative growth rate of unit raw labor. But what is the story behind the movement of raw labor? Up till now, we don't fully discuss the economic meaning of the unit raw labor r. In Sect. 4.3, we divide labors compensation into human capital and raw labors compensation, where raw labors compensation means the residual part after explaining the human capital. If we examine raw labors compensation directly, this means the compensation for an uneducated and inexperienced worker entering the labor market (Mulligan and Martin 1997; Young and Zuleta 2008).[14] In real life, minimum wage is set for those uneducated and inexperienced workers by government, thus has the closest relations with raw labor.[15] The stagnant and negative growth of the unit raw labor

[14]It is noted that unit raw labor will increase with the development of the economy, not only because of the improvement of science and technology which raise the productivity of raw labor, but also because of the improvement of life quality of rock-bottom labors due to economic growth and welfare arrangements.

[15]In fact, minimum wage and raw labor differs with each other. The unit raw labor is the wage rate set by the demand and supply of market system, while the minimum wage is set by government's

means that life of those who get minimum wage don't have significant improvement of life under such rapid economic growth rate.

In China, a large amount of rural surplus labors migrate to the urban areas, forming the world renowned "migration tide". The number of migrant workers increases from 78.5 million in 2000 to 137 million in 2007, taking up of 46.7 % of urban employment population (Cai 2008). These migrant workers often get raw labors compensation for lacking of human capital investment. One undeniable fact is that the migration of these rural surplus labors is the main cause for rapid economic growth and urbanization.[16] However, these economic constructors get relatively low return from the economic growth, and the stagnant of these people will pull down the aggregate labor's share of income of GDP. Hence the unbalanced feature of economic growth will lead to uneven national income distribution.

4.6 Conclusions and Policy Implications

This chapter re-measures the labor's share of income of GDP since the reform and opening up by amending and supplementing the corresponding data during 2004–2007. We find that the labor's share of income decreases steadily after 1998. The chapter also further divides labor into raw labor and human capital. By using the individual level data of UHS, we find the human capital's share has increased rapidly while the raw labor's share of income decreases steadily during 1988–2007. By using extended Mankiw et al. (1992) growth model, we find that the movement of China's national income distribution pattern is closely related to the unbalanced growth of three factors which are physical capital, human capital and raw labor. The high growth rate of physical and human capital brings upward trend of their share of GDP, while the stagnant state of raw labor will bring its share to decrease rapidly. By using various sources of factor growth data from 1995 to 2007, we confirm the inference of the extended model. And we find that the steady growth of physical capital, the slowing down of the growth rate of human capital, and the

(Footnote 15 continued)

law for protecting the minimal labors right (Minster of Labor and Social Security PRC 2004). When legal minimum wage reflects the raw labor determined by the market power, two concepts are perfectly substitutive. When legal minimum wage is higher than the minimum wage set by market power, two concepts deviate with each other. Thus the wage of raw labor is affected by institutional arrangements in the economy. And the minimum wage raises the intercept of the earnings equation and overestimate raw labor's share of GDP (Kruger 1999).

[16]Cai and Wang (1999) suggest that 21 % of GDP growth rate between 1978 and 1998 is contributed by migrant workers moving from agriculture to non-agriculture sectors. The scale of migration is much larger since 1998, thus the contribution of migrant workers may be more significant.

negative growth rate of raw labor are the causes of decreasing labor's share of income of GDP during 1998–2006. Therefore, when examining the leaning trend of national income distribution towards capital, we combine macroeconomic growth with national income distribution so that we can discuss the expansion and division of the economic cake dynamically. We obtain the following views through above analyses.

Firstly, the unbalanced feature of economic growth is the key to understand China's economy. Since reform and opening up, our economy has maintained relatively stable economic growth rate. However, the stable growth does not mean balanced growth. The balanced growth means all factors grow harmoniously at the rate of their contribution, and U.S. can be considered as a preferable example for operating along the BGP. Our analysis indicates that the unbalanced feature of China's economy is distinctive, namely the high growth rate of physical and human capital and stagnant growth rate of raw labors. Since 1998, the slowing down of the growth rate of human capital and the negative growth rate of raw labor is the cause of decreasing labor's share of income of GDP. Therefore, the unbalanced feature of economic growth finally turns out to be uneven functional income distribution.

Secondly, the unbalanced feature of China's economic growth may have its own advantages. If we consider parameters of Cobb–Douglas production function as output elasticity, we find that the economic growth path of China has a relatively flexible elasticity. Therefore, the unbalanced feature of China's economic growth can be generalized as "low wage growth strategy". The "low wage growth strategy" means that although the economic growth benefits from the migration of rural surplus labors, the labors compensation of these people are lower than their contribution. However, for these migrant workers, the urban employment indeed brings higher income than the farming income, thus they are willing to work with low wages in urban areas. The "low wage growth strategy" utilizes the high performance-to-price of migrant workers to realized economic growth under the "Pareto Improvement". This might be a new annotation for explaining China's economic growth miracle.

Thirdly, the unbalanced growth will arouse potential problems in terms of fair distribution view. If we take parameters of Cobb–Douglas production function as factor's share of GDP, we can easily find enlarging income distribution with high economic growth rate. The enlargement of income distribution not only reflects between capital and labor, but also reflects between physical workers and other factors. The stagnant growth of raw labor indicates the stagnant income of rural migrant workers. This means that the economic contribution and return of those workers are unmatched. Therefore, the economic growth of China is realized at the expense of relative benefits of rural migrant workers. This contradicts the distribution principle of socialism either from perspectives of "distribution according to work" or "distribution according to contribution of factors".

Therefore, contrasting with "reflexible" suggestions as "the share of labor compensation in the primary distribution should be raised", our suggestion focuses on raising labors compensation for those who get minimum wages, especially for rural migrant workers. In recent years, the implementation of minimum wage policy and release of new *Law on Employment Contracts*, exert active effects on protecting labor's rights and interests and promoting income of low qualified employees. We see that the raw labor has picked up by 20 % during 2006–2007(see Table 4.5 Column 7). This will alleviate the leaning trend of national income distribution towards capital and maintain reasonable distribution relations during the economic growth process. However, whether the rapid increase of raw labor will lead to the slowing down of growth of other factors and finally hinder the aggregate economic growth is a suspending question for further study.

Appendix

See Tables 4.6, 4.7, 4.8, 4.9, 4.10, 4.11 and 4.12.

Table 4.6 OLS results of mincerian regression of potential experience of UHS data (corresponding to Table 4.3 Column 2)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0596***	0.0621***	0.0627***	0.0612***	0.0705***	0.0684***	0.0921***	0.0866***	0.0922***	0.0879***
	(0.00140)	(0.00134)	(0.00128)	(0.00134)	(0.00145)	(0.00325)	(0.00380)	(0.00376)	(0.00392)	(0.00398)
Experience	0.0928***	0.0844***	0.0811***	0.0778***	0.0856***	0.0741***	0.0761***	0.0728***	0.0726***	0.0646***
	(0.00118)	(0.00113)	(0.00110)	(0.00118)	(0.00122)	(0.00276)	(0.00316)	(0.00320)	(0.00336)	(0.00341)
Experience squared	−0.00169***	−0.00148***	−0.00142***	−0.00141***	−0.00170***	−0.00151***	−0.00153***	−0.00145***	−0.00145***	−0.00124***
	(2.64e−05)	(2.55e−05)	(2.49e−05)	(2.66e−05)	(2.74e−05)	(6.11e−05)	(7.02e−05)	(7.14e−05)	(7.42e−05)	(7.49e−05)
Constant	5.630***	5.788***	5.914***	6.086***	6.148***	6.650***	6.616***	6.893***	6.922***	7.088***
	(0.0198)	(0.0192)	(0.0187)	(0.0203)	(0.0218)	(0.0498)	(0.0582)	(0.0582)	(0.0612)	(0.0633)
No. of sample	27,916	26,053	27,034	26,804	32,972	7,521	7,336	7,398	7,244	7,283
R-squared	0.237	0.250	0.244	0.198	0.182	0.134	0.140	0.125	0.127	0.104
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.102***	0.108***	0.118***	0.123***	0.145***	0.144***	0.151***	0.153***	0.151***	0.152***
	(0.00419)	(0.00455)	(0.00449)	(0.00540)	(0.00429)	(0.00416)	(0.00429)	(0.00396)	(0.00397)	(0.00347)
Experience	0.0696***	0.0687***	0.0596***	0.0649***	0.0495***	0.0480***	0.0521***	0.0494***	0.0469***	0.0464***
	(0.00356)	(0.00382)	(0.00387)	(0.00453)	(0.00390)	(0.00437)	(0.00424)	(0.00348)	(0.00369)	(0.00314)
Experience squared	−0.00133***	−0.00140***	−0.00113***	−0.00134***	−0.00082***	−0.00082***	−0.00093***	−0.00088***	−0.00084***	−0.00086***
	(7.94e−05)	(8.57e−05)	(8.78e−05)	(0.000102)	(9.03e−05)	(9.85e−05)	(0.000103)	(7.87e−05)	(8.39e−05)	(7.28e−05)
Constant	6.890***	6.911***	6.904***	6.904***	6.755***	6.864***	6.850***	6.958***	7.094***	7.248***
	(0.0666)	(0.0721)	(0.0723)	(0.0867)	(0.0696)	(0.0731)	(0.0716)	(0.0675)	(0.0685)	(0.0611)
No. of sample	7,062	6,645	6,994	6,265	16,146	17,380	20,378	22,320	22,061	23,941
R-squared	0.122	0.127	0.122	0.119	0.148	0.137	0.147	0.167	0.156	0.172

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; to get comparable and consistent among coefficients, the explained variable is replaced by annual wage

Table 4.7 Robust results of mincerian regression of potential experience of UHS data (corresponding to Table 4.3 Column 3)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0467***	0.0485***	0.0499***	0.0475***	0.0547***	0.0577***	0.0823***	0.0730***	0.0832***	0.0774***
	(0.000795)	(0.000863)	(0.000843)	(0.000838)	(0.000826)	(0.00242)	(0.00302)	(0.00290)	(0.00319)	(0.00325)
Experience	0.0548***	0.0520***	0.0506***	0.0454***	0.0455***	0.0431***	0.0490***	0.0449***	0.0475***	0.0458***
	(0.000673)	(0.000728)	(0.000727)	(0.000740)	(0.000699)	(0.00205)	(0.00251)	(0.00247)	(0.00274)	(0.00278)
Experience squared	−0.00078***	−0.00072***	−0.00070***	−0.00062***	−0.00065***	−0.00066***	−0.00079***	−0.00072***	−0.00077***	−0.00075***
	(1.51e−05)	(1.64e−05)	(1.64e−05)	(1.67e−05)	(1.56e−05)	(4.55e−05)	(5.58e−05)	(5.52e−05)	(6.04e−05)	(6.12e−05)
Constant	6.173***	6.276***	6.370***	6.566***	6.685***	7.004***	6.956***	7.310***	7.248***	7.411***
	(0.0113)	(0.0124)	(0.0123)	(0.0127)	(0.0124)	(0.0371)	(0.0463)	(0.0450)	(0.0498)	(0.0517)
No. of sample	27,916	26,053	27,034	26,804	32,972	7,521	7,336	7,398	7,244	7,283
R-squared	0.343	0.316	0.307	0.261	0.247	0.128	0.134	0.117	0.120	0.101
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0869***	0.0986***	0.106***	0.117***	0.125***	0.125***	0.134***	0.137***	0.134***	0.138***
	(0.00358)	(0.00368)	(0.00374)	(0.00432)	(0.00252)	(0.00254)	(0.00235)	(0.00224)	(0.00223)	(0.00206)
Experience	0.0502***	0.0503***	0.0421***	0.0526***	0.0438***	0.0363***	0.0376***	0.0396***	0.0374***	0.0326***
	(0.00305)	(0.00309)	(0.00321)	(0.00363)	(0.00224)	(0.00227)	(0.00209)	(0.00201)	(0.00195)	(0.00177)
Experience squared	−0.00085***	−0.00090***	−0.00070***	−0.00092***	−0.00068***	−0.00051***	−0.00053***	−0.00062***	−0.00057***	−0.00048***
	(6.79e−05)	(6.93e−05)	(7.30e−05)	(8.13e−05)	(4.90e−05)	(4.95e−05)	(4.54e−05)	(4.33e−05)	(4.20e−05)	(3.84e−05)
Constant	7.289***	7.238***	7.281***	7.119***	7.084***	7.219***	7.201***	7.299***	7.438***	7.573***
	(0.0569)	(0.0584)	(0.0601)	(0.0694)	(0.0417)	(0.0424)	(0.0398)	(0.0382)	(0.0381)	(0.0354)
No. of sample	7,062	6,645	6,994	6,265	16,146	17,380	20,378	22,320	22,061	23,941
R-squared	0.107	0.131	0.124	0.135	0.153	0.135	0.153	0.166	0.164	0.182

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; to get comparable and consistent among coefficients, the explained variable is replaced by annual wage

Table 4.8 OLS results of mincerian regression of actual experience of UHS data (corresponding to Table 4.3 Column 4)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0324***	0.0319***	0.0334***	0.0325***	0.0410***	0.0467***	0.0684***	0.0650***	0.0726***	0.0742***
	(0.00105)	(0.00101)	(0.000956)	(0.000966)	(0.000949)	(0.00248)	(0.00292)	(0.00293)	(0.00305)	(0.00329)
Experience	0.0801***	0.0724***	0.0687***	0.0645***	0.0571***	0.0474***	0.0442***	0.0429***	0.0397***	0.0356***
	(0.00104)	(0.000992)	(0.000941)	(0.000989)	(0.000896)	(0.00235)	(0.00277)	(0.00282)	(0.00294)	(0.00323)
Experience squared	−0.00142***	−0.00118***	−0.00110***	−0.00105***	−0.00085***	−0.00067***	−0.00053***	−0.00054***	−0.00044***	−0.00036***
	(2.74e−05)	(2.56e−05)	(2.37e−05)	(2.49e−05)	(2.28e−05)	(5.90e−05)	(6.95e−05)	(7.11e−05)	(7.33e−05)	(8.11e−05)
Constant	6.157***	6.312***	6.416***	6.587***	6.738***	7.101***	7.135***	7.382***	7.406***	7.482***
	(0.0140)	(0.0140)	(0.0135)	(0.0142)	(0.0137)	(0.0365)	(0.0434)	(0.0442)	(0.0467)	(0.0512)
No. of sample	27,258	25,337	26,298	26,004	31,376	7,044	6,822	6,910	6,706	6,717
R-squared	0.310	0.329	0.325	0.275	0.272	0.170	0.168	0.148	0.152	0.125
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0787***	0.0935***	0.101***	0.109***	0.135***	0.139***	0.146***	0.151***	0.154***	0.140***
	(0.00344)	(0.00364)	(0.00359)	(0.00417)	(0.00379)	(0.00380)	(0.00401)	(0.00349)	(0.00398)	(0.00316)
Experience	0.0355***	0.0354***	0.0354***	0.0327***	0.0933***	0.0871***	0.0866***	0.0789***	0.0802***	0.0486***
	(0.00337)	(0.00356)	(0.00347)	(0.00388)	(0.00401)	(0.00388)	(0.00402)	(0.00354)	(0.00369)	(0.00265)
Experience squared	−0.00038***	−0.00034***	−0.00036***	−0.00032***	−0.00193***	−0.00177***	−0.00179***	−0.00163***	−0.00165***	−0.00106***
	(8.44e−05)	(8.97e−05)	(8.80e−05)	(9.60e−05)	(9.99e−05)	(9.48e−05)	(0.000103)	(9.05e−05)	(9.20e−05)	(6.96e−05)
Constant	7.485***	7.335***	7.339***	7.352***	6.593***	6.658***	6.679***	6.804***	6.824***	7.499***
	(0.0541)	(0.0579)	(0.0558)	(0.0653)	(0.0618)	(0.0613)	(0.0624)	(0.0574)	(0.0660)	(0.0474)
No. of sample	6,386	5,877	6,225	5,339	16,475	17,754	20,844	22,817	22,586	23,784
R-squared	0.121	0.144	0.154	0.144	0.223	0.200	0.203	0.217	0.207	0.170

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; to get comparable and consistent among coefficients, the explained variable is replaced by annual wage

Table 4.9 Robust results of mincerian regression of actual experience of UHS data (corresponding to Table 4.3 Column 5)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0266***	0.0279***	0.0298***	0.0282***	0.0369***	0.0406***	0.0636***	0.0562***	0.0655***	0.0626***
	(0.000702)	(0.000766)	(0.000754)	(0.000748)	(0.000743)	(0.00220)	(0.00271)	(0.00262)	(0.00287)	(0.00292)
Experience	0.0569***	0.0547***	0.0534***	0.0490***	0.0446***	0.0405***	0.0388***	0.0343***	0.0328***	0.0292***
	(0.000692)	(0.000750)	(0.000742)	(0.000765)	(0.000702)	(0.00209)	(0.00257)	(0.00252)	(0.00278)	(0.00287)
Experience squared	−0.00088***	−0.00081***	−0.00078***	−0.00070***	−0.00060***	−0.00052***	−0.00041***	−0.00037***	−0.00030***	−0.00024***
	(1.82e−05)	(1.94e−05)	(1.87e−05)	(1.93e−05)	(1.78e−05)	(5.24e−05)	(6.45e−05)	(6.35e−05)	(6.91e−05)	(7.20e−05)
Constant	6.467***	6.551***	6.626***	6.797***	6.931***	7.222***	7.249***	7.587***	7.568***	7.718***
	(0.00934)	(0.0106)	(0.0107)	(0.0110)	(0.0108)	(0.0325)	(0.0403)	(0.0395)	(0.0440)	(0.0454)
No. of sample	27,258	25,337	26,298	26,004	31,376	7,044	6,822	6,910	6,706	6,717
R-squared	0.407	0.376	0.363	0.321	0.309	0.180	0.173	0.144	0.145	0.122
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0678***	0.0818***	0.0900***	0.0971***	0.117***	0.115***	0.123***	0.127***	0.125***	0.125***
	(0.00314)	(0.00321)	(0.00325)	(0.00381)	(0.00219)	(0.00220)	(0.00201)	(0.00190)	(0.00188)	(0.00178)
Experience	0.0274***	0.0294***	0.0306***	0.0327***	0.0652***	0.0615***	0.0582***	0.0583***	0.0543***	0.0381***
	(0.00307)	(0.00313)	(0.00313)	(0.00354)	(0.00189)	(0.00189)	(0.00176)	(0.00169)	(0.00166)	(0.00166)
Experience squared	−0.00021***	−0.00025***	−0.00029***	−0.00034***	−0.00122***	−0.00114***	−0.00107***	−0.00111***	−0.00102***	−0.00068***
	(7.71e−05)	(7.90e−05)	(7.95e−05)	(8.76e−05)	(4.70e−05)	(4.67e−05)	(4.32e−05)	(4.14e−05)	(4.03e−05)	(3.86e−05)
Constant	7.725***	7.598***	7.574***	7.562***	7.055***	7.170***	7.227***	7.325***	7.480***	7.771***
	(0.0494)	(0.0510)	(0.0505)	(0.0596)	(0.0318)	(0.0321)	(0.0299)	(0.0282)	(0.0282)	(0.0290)
No. of sample	6,386	5,877	6,225	5,339	16,475	17,754	20,844	22,817	22,586	23,784
R-squared	0.115	0.144	0.152	0.143	0.211	0.189	0.198	0.209	0.204	0.185

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; to get comparable and consistent among coefficients, the explained variable is replaced by annual wage

Table 4.10 Results of mincerian regression of hour wage approach of UHS data (2002–2006)

Year	Potential work experience (OLS)					Potential work experience (Robust)				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Education	0.140***	0.136***	0.149***	0.152***	0.151***	0.124***	0.125***	0.137***	0.140***	0.139***
	(0.00381)	(0.00362)	(0.00362)	(0.00352)	(0.00383)	(0.00254)	(0.00254)	(0.00235)	(0.00224)	(0.00224)
Experience	0.0360***	0.0261***	0.0303***	0.0299***	0.0261***	0.0339***	0.0262***	0.0272***	0.0280***	0.0259***
	(0.00347)	(0.00338)	(0.00355)	(0.00318)	(0.00320)	(0.00229)	(0.00231)	(0.00213)	(0.00205)	(0.00200)
Experience squared	−0.00040***	−0.00024***	−0.00032***	−0.00034***	−0.00029***	−0.00039***	−0.00023***	−0.00025***	−0.00030***	−0.00026***
	(7.75e−05)	(7.56e−05)	(7.92e−05)	(7.06e−05)	(7.28e−05)	(5.05e−05)	(5.07e−05)	(4.64e−05)	(4.44e−05)	(4.32e−05)
Constant	−0.666***	−0.437***	−0.564***	−0.492***	−0.355***	−0.467***	−0.349***	−0.399***	−0.304***	−0.182***
	(0.0627)	(0.0605)	(0.0637)	(0.0597)	(0.0657)	(0.0424)	(0.0428)	(0.0402)	(0.0386)	(0.0386)
No. of sample	15,105	16,393	19,235	21,109	20,959	15,105	16,393	19,235	21,109	20,959
R-squared	0.154	0.138	0.163	0.169	0.161	0.148	0.134	0.157	0.167	0.167
Year	Actual work experience (OLS)					Actual work experience (Robust)				
	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006
Education	0.123***	0.122***	0.134***	0.139***	0.138***	0.110***	0.110***	0.121***	0.125***	0.123***
	(0.00335)	(0.00331)	(0.00336)	(0.00301)	(0.00349)	(0.00222)	(0.00223)	(0.00205)	(0.00194)	(0.00192)
Experience	0.0482***	0.0410***	0.0447***	0.0396***	0.0360***	0.0432***	0.0403***	0.0382***	0.0384***	0.0350***
	(0.00330)	(0.00288)	(0.00313)	(0.00269)	(0.00274)	(0.00207)	(0.00204)	(0.00190)	(0.00180)	(0.00179)
Experience squared	−0.00074***	−0.00061***	−0.00068***	−0.00060***	−0.00056***	−0.00065***	−0.00059***	−0.00055***	−0.00060***	−0.00054***
	(8.09e−05)	(7.06e−05)	(7.42e−05)	(6.47e−05)	(6.56e−05)	(5.09e−05)	(5.00e−05)	(4.59e−05)	(4.37e−05)	(4.28e−05)
Constant	−0.484***	−0.339***	−0.441***	−0.355***	−0.226***	−0.313***	−0.225***	−0.228***	−0.132***	0.00970
	(0.0527)	(0.0496)	(0.0527)	(0.0473)	(0.0554)	(0.0345)	(0.0344)	(0.0322)	(0.0303)	(0.0305)
No. of sample	15,257	16,554	19,429	21,350	21,190	15,257	16,554	19,429	21,350	21,190
R-squared	0.175	0.159	0.184	0.185	0.172	0.170	0.155	0.172	0.181	0.177

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 4.11 Results of mincerian regression of hour wage approach of CHNS data (corresponding to Table 4.3 Column 6–7)

Year	1989	1991	1993	1997	2000	2004	2006
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.000597	0.00955***	0.00708	0.0240***	0.0710***	0.102***	0.117***
	(0.00505)	(0.00328)	(0.00459)	(0.00449)	(0.00457)	(0.00570)	(0.00532)
Experience	0.0286***	0.0292***	0.0304***	0.0221***	0.0275***	0.0318***	0.0226***
	(0.00429)	(0.00319)	(0.00448)	(0.00400)	(0.00406)	(0.00571)	(0.00534)
Experience squared	−0.000395***	−0.000372***	−0.000434***	−0.000292***	−0.000402***	−0.000401***	−0.000197*
	(9.45e−05)	(7.49e−05)	(0.000103)	(9.08e−05)	(9.05e−05)	(0.000126)	(0.000116)
Constant	−1.146***	−1.054***	−0.687***	0.298***	0.206***	0.0351	0.101
	(0.0662)	(0.0449)	(0.0638)	(0.0606)	(0.0628)	(0.0918)	(0.0869)
No. of sample	3,515	3,155	2,686	2,488	2,704	1,842	1,979
R-squared	0.030	0.081	0.043	0.037	0.102	0.159	0.200
Year	1989	1991	1993	1997	2000	2004	2006
Explained variable	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage	lnwage
Education	0.0219***	0.0203***	0.00434	0.0227***	0.0748***	0.114***	0.117***
	(0.00283)	(0.00247)	(0.00381)	(0.00400)	(0.00397)	(0.00529)	(0.00489)
Experience	0.0282***	0.0270***	0.0223***	0.0233***	0.0268***	0.0311***	0.0211***
	(0.00240)	(0.00240)	(0.00371)	(0.00357)	(0.00353)	(0.00530)	(0.00492)
Experience squared	−0.000298***	−0.000256***	−0.000279***	−0.000310***	−0.000368***	−0.000356***	−0.000155
	(5.28e−05)	(5.64e−05)	(8.57e−05)	(8.09e−05)	(7.87e−05)	(0.000117)	(0.000107)
Constant	−1.534***	−1.234***	−0.630***	0.286***	0.134**	−0.122	0.0860
	(0.0370)	(0.0338)	(0.0529)	(0.0540)	(0.0546)	(0.0852)	(0.0800)
No. of sample	3,515	3,155	2,686	2,488	2,704	1,842	1,979
R-squared	0.120	0.167	0.045	0.048	0.140	0.211	0.227

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; all regressions are set hour wage as explained variables

Table 4.12 Results of mincerian regression of CHIP data: urban and overall China (corresponding to Table 4.3 Column 8–9)

Category	Urban					Overall China				
	Annual wage approach			Hour wage approach		Annual wage approach			Hour wage approach	
Year	1988	1995	2002	1995	2002	1988	1995	2002	1995	2002
Explained variable education	0.0376***	0.0511***	0.0969***	0.0564***	0.104***	0.0379***	0.0720***	0.0772***	0.0551***	0.0765***
	(0.000913)	(0.00160)	(0.00228)	(0.00181)	(0.00245)	(0.000947)	(0.00172)	(0.00171)	(0.00182)	(0.00150)
Experience	0.0445***	0.0428***	0.0321***	0.0427***	0.0317***	0.0440***	0.0809***	0.0721***	0.0428***	0.0445***
	(0.000836)	(0.00162)	(0.00230)	(0.00183)	(0.00247)	(0.000831)	(0.00159)	(0.00169)	(0.00170)	(0.00149)
Experience squared	−0.00058***	−0.00052***	−0.00032***	−0.00050***	−0.00029***	−0.00057***	−0.00127***	−0.00125***	−0.00048***	−0.00056***
	(1.93e−05)	(3.97e−05)	(5.63e−05)	(4.51e−05)	(6.06e−05)	(1.94e−05)	(4.29e−05)	(4.96e−05)	(4.60e−05)	(4.35e−05)
Constant	3.971***	7.416***	7.497***	−0.261***	−0.265***	3.963***	6.730***	7.360***	−0.269***	−0.0963***
	(0.0134)	(0.0251)	(0.0372)	(0.0282)	(0.0399)	(0.0135)	(0.0208)	(0.0178)	(0.0220)	(0.0157)
No. of sample	17,292	12,025	9,599	11,711	9,502	19,238	14,698	21,130	14,373	20,888
R-squared	0.331	0.218	0.199	0.202	0.196	0.305	0.405	0.313	0.234	0.308

Note Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; where, the overall China refers to rural and urban employment population for 1988 and 1995, and it includes rural migrant population for 2002

References

Bai C, Qian Z (2009) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41
Bai C, Qian Y, Xie C (2007) The return to capital in China. Comp Stud 28:1–22
Bai C, Qian Z, Wu K (2008) Determinants of factor shares in China's industrial sector [J]. Econ Res J 8:16–28
Bentolila S, Saint-Paul G (2003) Explaining movements in labor income share [J]. Contrib Macroecon 3(1):1103–1136
Bernanke BS, Gurkaynak RS (2001) Is growth exogenous? Taking Mankiw, Romer, and Weil seriously [J]. NBER Macroecon Annu 16:11–57
Cai F (2008) Lewis turning point: a coming new stage of China's economic development [M]. Social Science Academic Press, Beijing
Cai F, Wang D (1999) Sustainability of China's economic growth and labor contribution [J], Econ Res J 10:62–68
Chen Z, Lu M, Jin Y (2004) Regional differences of human capitals and education development in China: an estimation of the panel data [J]. J World Econ 12:25–31
Chow GC (1993) Capital formation and economic growth in China [J]. Q J Econ 108(3):809–842
Dai Y, Li H (1988) Wage erodes profits: the potential risks in China's reform of economic institution [J]. Econ Res J 6:3–11
Diwan I (2001) Debt as sweat: labor, financial crises, and the globalization of capital [EB/OL], World Bank Working Paper, Washington
Gollin D (2002) Getting income shares right [J]. J Polit Econ 110(2):458–475
Goldsmith RW (1951) A perpetual inventory of national wealth, studies in income and wealth, NBER [M], 14:5–74
Gomme P, Rupert P (2004) Measuring labor's share of income [EB/OL], Policy Discussion Papers, Federal Reserve Bank of Cleveland
Guscina A (2006) Effects of globalization on labor's share in national income [EB/OL], IMF working paper, 6 (294), Washington
Harrison AE (2002) Has globalization eroded labor's share? some cross-country evidence [EB/OL], mimeo, University of California at Berkeley and NBER
He J (1992) Estimation the capital stock of China [J], J Quant Econ, 10:24–27
Hicks J (1932) The theory of wages [M]. McMillan, London
Huang Y, Ren R, Liu X (2002) Capital stock estimates in Chinese manufacturing by perpetual inventory approach [J]. China Econ Q 1(2):377–396
Jaumotte F, Tytell I (2007) Globalization of labor [EB/OL], IMF World Economic Outlook 2007, Chapter 5
Kaldor N (1956) Alternative theories of distribution [J]. Rev Econ Stud 23(2):83–100
Kaldor N (1961) Capital accumulation and economic growth [A]. In: Lutz FA, Hague DC (eds) The theory of capital [C]. St. Martin Press, New York
Keynes JM (1939) Relative movements of real wages and output [J]. Econ J 49:34–49
Krueger AB (1999) Measuring labor's share [J], American Econ Rev J 89(2):45–51
Li Y (1992) Adjustment of functional income distribution: thinking of the phenomenon of national income inclining to individual [J]. Econ Res J 7:34–44
Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: A U-shaped curve [J]. Econ Res J 1:70–82
Luo C, Zhang J (2009a) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79
Luo C, Zhang J (2009b) The economic explanation of decrease of labor income share: empirical evidence from China's provincial data [J]. Manag World 5:25–35
Mankiw NG, Romer D, Weil DN (1992) A contribution to the empirics of economic growth [J]. Q J Econ 107(2):407–437
Mincer JA (1974) Schooling, experience, and earnings [M]. Columbia University Press, New York

Minster of Labor and Social Security PRC (2004) Minimum wage regulations [EB/OL], No.21 orders
Mulligan CB, Sala-i-Martin X (1997) A labor income-based measure of the value of human capital: an application to the states of the United States [J]. Jpn World Econ 9(2):159–191
National Bureau of Statistics of China (2003) China's national accounting system 2002 [M]. China Statistics Press, Beijing
National Bureau of Statistics of China (2007) Gross Domestic Production Approach in Year of China's Economic Census[M]. China Statistics Press, Beijing
Qian X (2005) The study on level of human capital in China [D], Doctor Thesis of Economics, Zhejiang University
Qian X, Wang Q, Liu H (2008) The new estimation on human capital in China from 1995–2005 [J]. Stat Res 25(12):3–10
Ricardo D (1981) (translated by Guo, D. and Wang, Y.) On the principles of political economy and taxation [M]. Commercial Press, Beijing
Ruiz CG (2005) Are factor shares constant: an empirical assessment from a new perspective, Working paper, Carlos III Macroeconomics Workshop
Shan H (2008) Re-estimating the capital stock of China: 1952–2006 [J]. J Quant Tech Econ 10:17–31
Solow RM (1956) A contribution to the theory of economic growth [J]. Q J Econ 70(1):65–94
Solow RM (1958) A skeptical note on the constancy of relative shares [J]. Am Econ Rev 48 (4):618–631
World Bank (2007) World development indicators [EB/OL]
Xiao W, Zhou M (2010) Change of trade mode and decrease of labor share: empirical evidence from China's industrial sector [J]. Journal of Zhejiang University (Humanities and Social Science), 5:154–163
Yao X (2005) Economic development of private economy and adjustment of labor capital relations [J]. Zhejiang Soc Sci 2:78–86
Yao X, Zhang H (2008) Education, human capital and regional economic differentials [J]. Econ Res J 5:47–57
Young AT (2006) One of the things we know that ain't so: why US labor's share is not relatively stable [EB/OL]. Univ Miss, Mimeo
Young AT, Zuleta H (2008) Re-measuring labor's share [EB/OL], Working paper of University of De Rosario
Zhang J, Zhang Y (2003) Recalculating the capital of China and a review of Li and Tang's article [J]. Econ Res J 7:35–43
Zhang J, Wu G, Zhang J (2004) The estimation of China's provincial capital stock: 1952–2000 [J]. Econ Res J 10:35–44
Zhang J, Zhao Y, Park A, Song X (2005) Economic returns to schooling in urban China, 1988–2001 [J]. J Comp Econ 33(4):730–752
Zhang J, Han J, Zhao Y (2008) Trends in the gender earnings differential in urban China [J]. Ind Labor Relat Rev 61(2):224–243
Zhao H (2003) GDP and GDP accounts [EB/OL], China statistics information net

Chapter 5
Estimation and Analysis of Movements of Real Labor's Share of Income

This chapter provides new estimation of the labor's share of income, distinguishes the nominal and real labor's share of income, and discusses the impacts of such distinction on the movement trends of China's labor's share of income. We find that the real labor's share of income by considering the price factors is lower than the estimated nominal value in the literature by 6–14 % with higher and longer decreasing trend, indicating the worsening situation of national income distribution and matching with the direct feeling of income distribution by ordinary workers. The U-shape turning point of real labor's share of income may indicate the short term trend of rising wage by the change of supply and demand relation of labor, and it may also be a long term effect by the increase of labor productivity. Therefore, we shall change the traditional development mode of capital substituting labor, promote the labor-augmented technical progress, develop modern service sector in favor of labor, increase human capital and labor productivity, let the factor of labor to better share the results of fast economic development and finally realize the win-win situation of both economic and social development and income distribution improvement.

5.1 Introduction

Since the reform and opening up, China's economy has achieved the miracle of rapid growth under the background of urban and rural integration and transition of economic development mode. However, in the recent years, national income distribution in China appears an unbalanced and even distorted trend. From the perspective of factor distribution structure, labor compensation is at a low share and continuously declines in the primary distribution, decreasing from 51.9 % in 1995 to 39.7 % in 2007, which is the lowest historical level.[1]

Currently, scholars have conducted a series of research about the structure of factor income distribution in China, especially the reason behind the change of labor's share of income. Most studies use firm-level and provincial panel data to

[1]In 2009 and 2010, the share of labor compensation in the primary distribution returns back to 46.6 and 45.0 % respectively, which approximately equals to the level in 2004.

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conduct empirical analysis about the economic factors which affect the labor's share of income in China. These studies focus on the role of economic transition factors (e.g., industrial structure and ownership structure change) (Bai and Qian 2009; Li et al. 2009; Luo and Zhang 2009b). Meanwhile, most studies use income approach of GDP data to estimate the labor's share of income, dealing with the neutral issues of taxes (Guo and Lv 2011) and attribution issues of proprietors' economy (Zhang and Zhang 2010).

However, previous studies ignore the effect of price on estimating the labor's share of income and regard the labor's share of income as firm's profitability index rather than a distributional index of national income distribution. In this chapter, we are going to re-estimate the labor's share of income. We use different price indexes to deflate the labor compensation and gross, getting the real labor's share of income after excluding the price factors. New estimation results show that real labor's share of income follow the law of the U-shape curve, passing the turning point of the U-shape curve and entering the increasing path in 2004. We think that the reason of labor's share of income changes from decrease to increase may be caused by the short-term effect of the change of demand and supply relationship of labor force and also possibly caused by the long-term effect of the improvement of distribution due to the increase of labor productivity. Therefore, we should change the traditional development mode, replace labor with capital, and boost the labor biased technological progress, develop the modern service industries which are advantageous to labor factor and increase human capital and labor productivity, make labor factor enjoy the fruit of rapid economic growth more and better and finally achieve the win-win situation of the development of economic society and improvement of income distribution. We argue that the U-shape turning point of real labor's share of income may indicate the short term trend of rising wage by the change of supply and demand relation of labor, and it may also be a long term effect by the increase of labor productivity. Therefore, we shall change the traditional development mode of capital substituting labor, promote the labor-augmented technical progress, develop modern service sector in favor of labor, increase human capital and labor productivity, let the factor of labor to better share the results of fast economic development and finally realize the win-win situation of both economic and social development and income distribution improvement.

5.2 Current Estimation of the Labor's Share of Income and Its Limitation

5.2.1 The Data Sources of Estimating the Labor's Share of Income

The labor's share of income in China is mainly estimated by income approach of GDP. The income approach of GDP includes four main income components, i.e., labor compensation, net taxes on production, depreciation of fixed assets and

operating surplus. More specifically, labor compensation is defined as the total compensation obtained by laborers engaging production activities. It not only includes wages, bonus and allowances in the form of money and in-kind, but also include welfare that the laborers enjoy, e.g., public health care fees, transportation subsidies, social insurance paid by the firm, housing fund and etc. Net taxes on production are defined as the production taxes less the production subsidies. Production taxes are taxes, additional charges and fees on production units which engage in production, sales and operation activities and use production factors (e.g., fixed assets, land and labor) while production subsidies are unilateral government transfers to production units, e.g., policy loss subsidy, price subsidy and etc. Depreciation of fixed assets refers to the fixed assets value extracted based on the provided appreciation rate to make up for the loss of fixed assets in a certain period of time. Operating surplus refers to the surplus left by subtracting the value-added by labor compensation, net taxes on production and depreciation on fixed assets. Currently, we can collect income approach of GDP data through three main channels, i.e., provincial income approach of GDP data, flow of funds account data and input–output table data.

Provincial income approach of GDP data mainly come from various issues of *China Statistical Yearbook* and several historical GDP data provided by NBS.[2] These historical GDP data not only provide consistently comparable provincial income approach of GDP data with each year of *China Statistical Yearbook*, and also provide income approach of GDP in three main industries.[3] Since the data set can not only discuss the effect of industry structure change on the labor's share of income (Bai and Qian 2009; Luo and Zhang 2009a), but also conduct provincial panel regression analysis for determinist factors of the labor's share of income (Bai and Qian 2009; Luo and Zhang 2009a). Therefore, this data set is the most wildly used.

The income approach of GDP data in flow of funds account contain data of four main income components of three main sectors, i.e., firms sector (including both financial and non-financial sector), governments sector and households sector.[4] This data set is mainly from the *China Statistical Yearbook* in each year and *China's Flow of Funds Account: Historical Data 1992–2004* provided by NBS based on 2004 economic census data and the change of accounting method. Current studies mainly use the sectoral information of flow of funds account, examining the factor distribution relations between firms sector, governments sector and households sector (Bai and Qian 2009; Zhou et al. 2010).

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[2]They are *China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*.

[3]The historical GDP data also provides income approach of GDP categorized by smaller industry classifications. Because adjustment of Industrial Classification of National Economy during the accounting period, *China's GDP Accounting: Historical Data 1952–2004* has merged several smaller industries within the tertiary industry in order to conduct consistent accounting.

[4]Flow of funds account also includes a foreign sector. Since this sector has a relatively small size, we ignore the sector in this chapter.

Income approach of GDP data in input–output table are mainly from the usage tables in various years. Because input–output table not only provides intermediate input and usage information, but also provides the demand structure information of final use in consumption, investment and export. Therefore, input–output table has an obvious advantage in exploring the effects of technological efficiency and demand structure on the evolution of the labor's share of income (Sun 2012). However, input–output table also suffers data balancing and revising issues. In addition, it cannot provide a continuous time series data which is the reason why studies of using this data are relative few.

5.2.2 *Current Estimation Method of the Labor's Share of Income*

Using income approach of GDP, the labor's share of income can be defined as the ratio between labor compensation and GDP. Studies about estimating the labor's share of income mainly focus two aspects. First is the treatment and attribution issue about taxes. Some studies argue that the net taxes on production is neutral and should be eliminated from the calculation of the labor's share of income (Gomme and Rupert 2004; Bai and Qian 2009; Luo and Zhang 2009b; Zhou et al. 2010). Other studies argue that the effect of taxes on factor's share of income is non-neutral and different kinds of taxes will have different affecting mechanisms on factor's share of income. Therefore, they propose that it is necessary to distinguish the factor's share of income before and after taxes (Bai and Qian 2010; Guo and Lv 2011).

Second is the attribution issue of proprietors' economy. Some studies use rules of thumb for attributing one quarter to capital and two quarters to labor in the proprietors' economy (Johnson 1954). Other studies assume the same attribution ratio of capital and labor in the proprietors' economy as non-proprietors' economy (Gomme and Rupert 2004). With regard to the changes of statistical caliber of proprietors' economy in China around 2004, many studies re-adjust proprietors' income back to labor compensation for getting consistent estimation of the labor's share of income but without dealing with the distribution relationship of capital and labor within the proprietors' economy (Bai and Qian 2009; Zhou et al. 2010). Recent studies use population census and rural and urban household survey to estimate the labor-capital distribution within the proprietors' economy. Then they use such estimation to re-adjust the total labor's share of income (Zhang and Zhang 2010; Lv 2011).

5.2.3 *Limitation of Estimating the Labor's Share of Income*

Current studies mainly use provincial income approach of GDP data to estimate the labor's share of income. Because of different research objectives and issues of data availability, there are some differences of estimating the labor's share of income.

However, current estimations all ignore an important issue, i.e., the issue of distinguishing the nominal and real labor's share of income. We argue that it is essential to distinguish the real and nominal labor's share of income both from theoretical and empirical aspects. Specific reasons are as followings:

5.2.3.1 The Labor's Share of Income as Firm's Profitability Index

Normally, most scholars directly use the nominal labor's share of income to study the issues in national income distribution. However, from the perspective of data sources, provincial income approach of GDP data in China are aggregated from firm's value-added accounting data. Such aggregation has made the labor's share of income reflect the micro scope of firms. From the perspective of micro-level firms, the labor's share of income can also be named "labor cost per unit output" (or simply, unit labor cost).[5] The unit labor cost mainly refers to the share of labor cost in per unit output, which is an important index for measuring the firm's profitability. For example, if unit labor cost is 0.6, this means that the share of labor cost in firm's per unit output is 60 %. The increase of unit labor cost means decrease of firm's profitability and vice versa. Because firms mainly care about the profitability in the short term, therefore there is no need to consider price factors when calculating unit labor cost. The nominal value is already sufficient. Therefore, although scholars have the right intention to use nominal labor's share of income to explore the national income distribution, it causes a mismatch between intension and perspective.

5.2.3.2 The Labor's Share of Income as a Distributional Index

When we regard the labor's share of income as a macro-index for measuring national income distribution, it is not reasonable for only looking at the nominal value without considering the price factors. From the micro-perspective of laborers, they care more about the real purchasing power of wage to buy "food, clothing, housing and transportation". For the entire national economy, GDP shall be deflated by the general price index considering consumption, investment and export. On the same token, it is reasonable to deflate the wage by the consumer price index (CPI) to get the real wage. Therefore, after considering price factors, labor's share of income can better reflect the real situation of national income distribution. The direct feeling of income distribution by ordinary workers is not only from nominal monetary income but also from the real purchasing power of the monetary income.

[5]Let labor compensation divided by number of employment to get average labor compensation. Let value-added divided by number of employment to get labor productivity. The unit labor cost is the ratio between average labor compensation and labor productivity. The value range of unit labor cost is 0–1.

5.2.3.3 The Necessity to Distinguish the Nominal and Real Labor's Share of Income

In fact, when level of consumer price equals the general price level, nominal labor's share of income is equal to real labor's share of income. In this case, there is no need to distinguish the nominal and real value empirically even they are theoretical different. However, the theoretical importance to distinguish the nominal and real labor's share of income is that they provide two different micro-perspectives for examining economic operation and income distribution. On the one hand, the nominal labor's share of income reflects micro-perspective of firms and focuses on the area of production. It examines firm's labor cost and competitiveness. On the other hand, the real labor's share of income reflects the micro-perspective of laborers and focuses on the area of consumption. It examines the real purchasing power of labor compensation and its income distribution effect. However, best to our knowledge, most recent studies have ignored such differences and implicitly assumed that two types of price index are equal to each other. They study national income distribution from the perspective of firms and production, but they ignore the fact that national income distribution shall be examined from the perspective of laborers, which obviously cause a mismatch of the research angle. Some researchers may argue that: "Although the above argument is right theoretically, it is trivial empirically. CPI may not be equal to the general price level but they might be very close." However, in the next part of this chapter, we would like to argue that the two price levels are far from equality and even fail to form an identical moving trend, at least in China.

5.3 Distinguish the Nominal and Real Labor's Share of Income

5.3.1 Theoretical Model

From the perspective of income flow, one country's output Y can be represented as sum of all factors' income, the price index for the whole economy will be $P_{y.}$[6] For simplicity, we assume that there are only two factors, i.e., labor and capital, in the economy, whose real income are labor compensation W and capital income

[6]From the definition, there is some difference between price index and price level. Price index reflects the change of commodity's price level in a period of time. In practice, if we examine the price index which the base year is 1978, this price index can not only reflect the change of price level but also represent the absolute price level of one specific year. Therefore, we compare the price index instead of price level here.

K respectively and whose price index are P_w and P_k respectively.[7] Then the nominal output can be expressed as:

$$P_y \cdot Y = P_w \cdot W + P_k \cdot K \tag{5.1}$$

The price index of output is the weighted average of two factors' price index[8] which we denote the weight as ω_i, then general price index is:

$$P_y = \omega_1 \cdot P_w + \omega_2 \cdot P_k \tag{5.2}$$

Therefore, we can distinguish the nominal and real labor's share of income theoretically. The nominal labor's share of income (*NLS*) is the ratio between nominal (or the current) labor compensation and output.

$$NLS = (P_w \cdot W)/(P_y \cdot Y) \tag{5.3}$$

The real labor's share of income (*RLS)* is the ratio between real (unchanged price) labor compensation and output after excluding the price.

$$RLS = W/Y \tag{5.4}$$

Summarizing Eqs. (5.2)–(5.4), we can compare the nominal and real labor's share of income in three scenarios. The first scenario is that the nominal and real labor's share of income are equal to each other which means that labor and capital are facing the same price; the second scenario is that the nominal labor's share of income is relatively smaller which means labor faces lower price than capital; the third scenario is that the nominal labor's share of income is relatively higher which means labor faces higher price than capital. We can express the above relations by the followings:

$$\begin{cases} NLS = RLS & P_w = P_y = P_k \\ NLS < RLS & P_w < P_y < P_k \\ NLS > RLS & P_w > P_y > P_k \end{cases} \tag{5.5}$$

Theoretically, all three scenarios can be true when the price of labor, capital and output satisfy specific relationships. In practice, the price of labor, capital and output refers to CPI, producer price index (PPI)[9] and GDP

[7]For simplicity, we not only ignore the effect of other factors (e.g., land) but also the effect of taxes.

[8]The real calculation of non-changed GDP and the process of compiling of main price index is much more complicated (Zhu and Xu 2012) but the basic idea is the same.

[9]Producer price index (PPI) is mainly used to reflect the price changes in the area of production, including commodity retail price index, industrial producer sale price index, industrial producer purchase price index and fixed asset investment price index.

deflator[10] respectively. In the first scenario, three price indexes are assumed to be equal to each other which is exactly the strict assumption implied by current literature. However, this scenario doesn't fit with the real situation. The other two scenarios have exactly the opposite price relationships to be satisfied. According to the reality of China's economy, the third scenario fits more with the real situation, i.e., PPI is significantly higher than GDP deflator and PPI. In the following estimation, we are going to testify the analysis here.

5.3.2 *Estimation of the Nominal and Real Labor's Share of Income in China*

We use the same estimation method as Zhou et al. (2010) to measure the nominal labor's share of income in China. First, we excluding the effect of net taxes on production; second, we use employment numbers to deal with labor compensation belonging to the part of proprietors' economy; finally, we get a consistently comparable series of the nominal labor's share of income from 1978 to 2007 which is illustrated as the black line NLS[11] in Fig. 5.1. The calculation of the real labor's share of income can be divided into three steps. First, we divide labor compensation by CPI to get real labor compensation; second, we divide nominal GDP by GDP deflator to get real GDP[12]; finally, we divide real labor compensation by real GDP to get the real labor's share of income after excluding the price factors, which is illustrated as the grey line RLS in Fig. 5.1.

Comparing the nominal and real labor's share of income, we can find that the real labor's share of income is under nominal labor's share of income which accords with the theoretical prediction of the third scenario. In 2007, for example,

[10]Because GDP deflator is the weighted average of CPI and PPI (see Eq. (4.2)), the value of GDP deflator must be in the middle of CPI and PPI. Therefore, once we know the relationship between CPI and GDP deflator, we automatically know the relationship between PPI and other two price indexes.

[11]The estimation result of the nominal labor's share of income in Fig. 5.1 is the same as Zhou et al. (2010), while the estimation of the real labor's share of income is based on the nominal one but with price adjustment which ensures the validity of later comparisons, i.e., comparing by the same estimation method and statistical caliber.

[12]In this paper, we use income approach of GDP data to conduct price deflation which make sure that numerator and denominator are consistent with each other. However, in China, GDP deflator is estimated through the expenditure approach of GDP data. When income approach of GDP data is not equal to the expenditure approach of GDP data, there is an issue of applying deflation index of GDP to excluding the price factor. We find that income approach of GDP numbers is equal to the expenditure approach of GDP numbers before 2000. After 2000, the expenditure approach of GDP numbers is significantly smaller than income approach of GDP numbers with an increasing gap each year. If we replace the income approach of GDP data by the expenditure approach of GDP as the denominator, both the nominal and real labor's share of income will have an even larger decrease. This will only reinforce but not change the moving trend of the real labor's share of income.

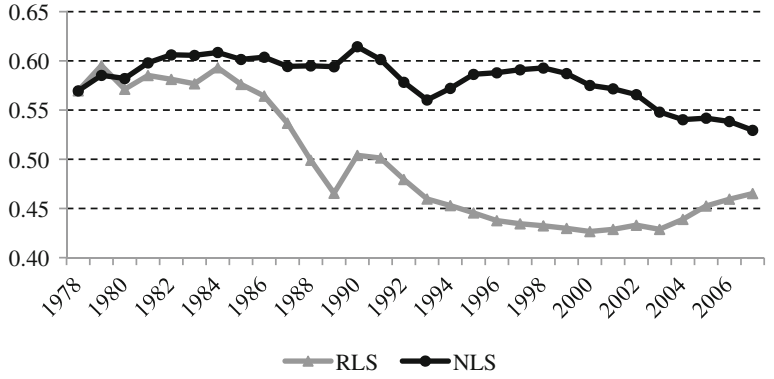

Fig. 5.1 China's nominal and real labor's share of income 1978–2007. Because we lack the provincial income approach of GDP data in 2008 and the number rebound back substantially in 2009 which may be caused by the re-adjustment of statistical caliber (Zhang 2012), we confine our analysis of the change of labor's share of income between 1978 and 2007. *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*

the real labor's share of income is 46.5 %, which is 6.4 % lower than the nominal value (52.9 %) estimated by Zhou et al. (2010). Because of the different estimation method and adjusting subject, current literature have some differences in estimation values of the nominal labor's share of income. But under relatively same statistical caliber, our estimation values of the real labor's share of income are significantly lower than the nominal value in the literature. For example, our real estimation value is 14.1 % lower than Lv's (2011) value (60.6 %). Lower real labor's share of income means that the situation of national income distribution is even worse than current perception.

Meanwhile, the real and nominal labor's share of income show different moving trends. In some years, they move in the opposite direction. First, the overall changing extent of the real labor's share of income is larger than the nominal labor's share of income. The former has a gap of 17 % between maximum and minimum value, which is 9 % higher than the latter. Compared with the nominal labor's share of income, the real labor's share of income has a larger decreasing extent and longer decreasing period. Second, the real labor's share of income has a moving trend of a U-shape, while the nominal labor's share of income has a feature of periodical change. Third, the real labor's share of income passes the turning point and enters the increasing path after while the nominal labor's share of income has a continuous downward trend after 1998.

The theoretical analysis of this chapter shows that the necessary condition of making the real labor's share of income lower than the nominal labor's share of income is that the CPI shall be significantly higher than GDP deflator and PPI. We can verify the above relationship by comparing real price indexes(see

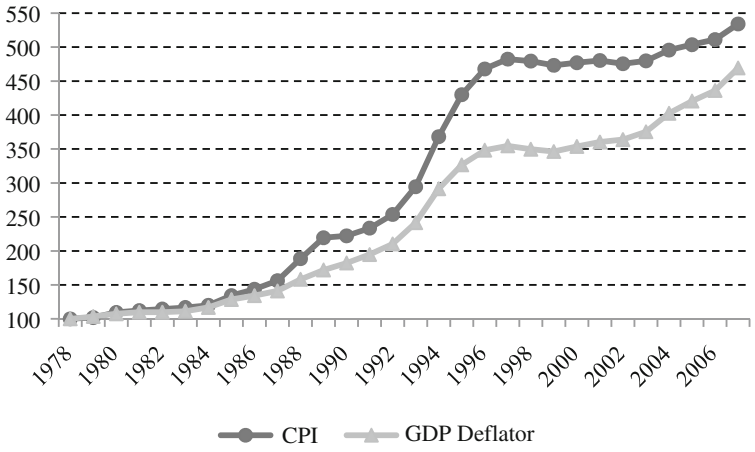

Fig. 5.2 Comparing CPI and GDP Deflator 1978–2007. *Data sources China Compendium of Statistics: 1949–2008*

Fig. 5.2).[13] This means that labor faces higher price than capital. In other words, firms can produce by using relatively cheap raw material and intermediate products while laborers have to pay higher price for the re-production activities such as food, clothing, housing and transportation. This phenomenon shows that, in the process of price policy making by the Chinese government, there is price discrimination of "paying attention to capital, looking down on labor", which will cause the situation of over-inclination of national income distribution to capital in China.

5.3.3 *Estimating Provincial Nominal and Real Labor's Share of Income*

The nominal and real labor's share of income have similar differences in each province as in the whole nation. Using price data of each province and following the same calculation method, we can compare the nominal and real labor's share of income in each province (see Fig. 5.3). First, most provincial real labor's share of income (RLS) is under the provincial nominal labor's share of income (NLS), which is the same as for the whole nation. Second, changes of the nominal labor's share of income are different among provinces. Some regions (e.g., Zhejiang, Fujian

[13]Due to the incomplete time series of industrial producer purchasing price index, in the figure, we only compare the moving trend of CPI and GDP deflator from 1978 to 2007. However, from Eq. (4.2), we can infer that CPI must be higher than industrial producer purchasing price index, i.e., the PPI.

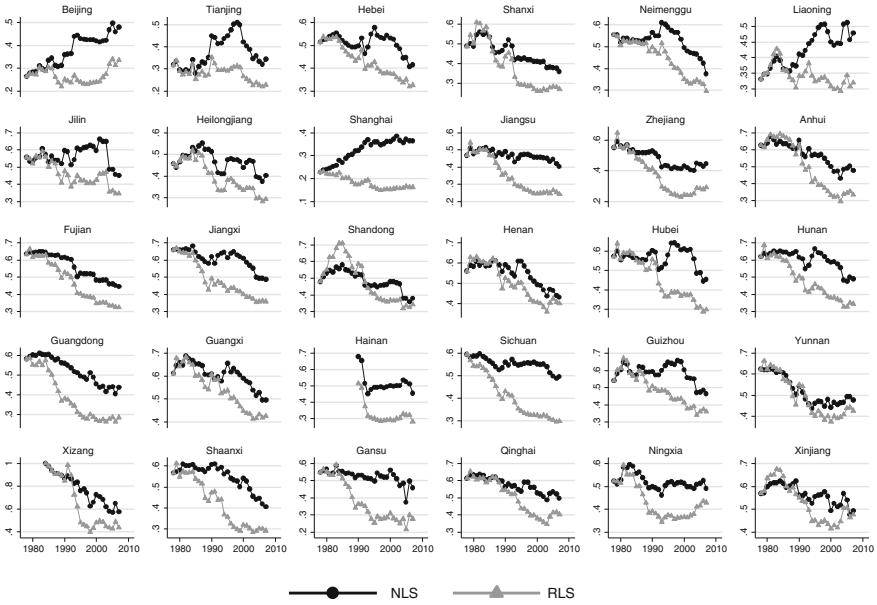

Fig. 5.3 Provincial nominal and real labor's share of income in China 1978–2007. *Data sources* *China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*. *Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

and Guangdong in eastern coastal region and Xizang, Xinjiang and Gansu in the western inland region) show decreasing trends earlier back from 1980s, other regions (e.g., Jilin and Heilongjiang in old industrial base in northeast China and Hunan, Hubei and Guizhou in central and western regions) have shown moving trends of inverse U-shape and even some regions (such as Beijing, Shanghai and Liaoning) show increasing trends. On the contrary, changes of real labor's share of income are more similar across provinces and are consistent with the change in the whole nation. Most provinces show decreasing trends and some provinces appear upward trends at the end of the examining period, indicating the turning point of U-shape curves. It implies that the price volatility is the main reason for different movements between the nominal and real labor's share of income. After excluding the price factors, the real labor's share of income converges across provinces.

The difference in the changes of the nominal and real labor's share of income also leads to different rankings of the labor's share of income across provinces. We choose the average labor's share of income from 1978 to 2007 as cross-sectional comparisons among provinces. Therefore, we get two figures for illustrating the

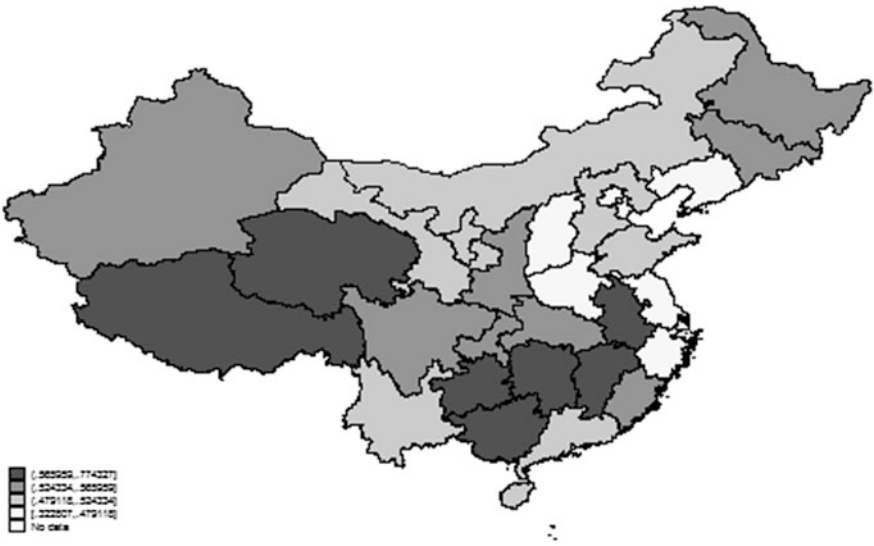

Fig. 5.4 Provincial rankings of the nominal labor's share of income. *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*. *Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

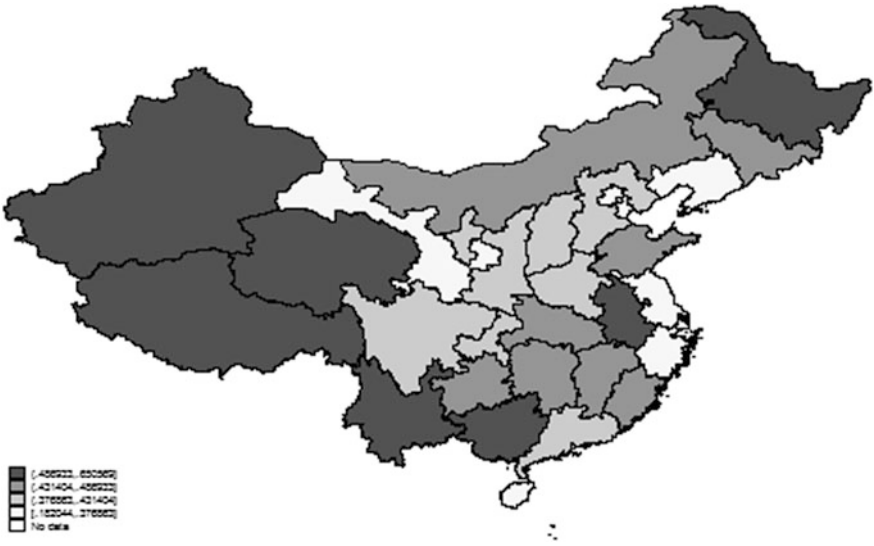

Fig. 5.5 Provincial rankings of the real labor's share of income. *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*. *Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

provincial rankings of the nominal and real labor's share of income (see Figs. 5.4 and 5.5). Darker color stands for higher labor's share of income and vice versa. We find that provincial differences are significant both for the nominal and real labor's share of income. For example, the labor's share of income is highest in Xizang while lowest in Shanghai. The shares are relative low in three municipalities directly under the central government, i.e., Beijing, Shanghai and Tianjin. What's more, the shares are lower in eastern regions than in the western and central regions. However, the provincial rankings are slightly different between the nominal and real labor's share of income. The provincial rankings of the real labor's share of income shows clearer picture of "higher west and lower east".

5.3.4 *Discussion About the Change of the Real Labor's Share of Income and U-Shape Turning Point*

From the above analysis, there are significant differences between the nominal and real labor's share of income both for the whole nation and across provinces. After considering the price factors, the average real labor's share of income is 49.4 % during 1978–2007, which is 8.7 % lower than the nominal labor's share of income. The real labor's share of income keeps stable from 1978 to 1984, indicating that rural reform at the beginning of reform and opening up has increased farmer's income at the same pace with economic growth so that the real labor's share of income can maintain at a relatively high level. During 1984–1989, the reform inclining to the urban citis incentivizes the power of capital, leading to a "profit eroding wage" phenomenon and causing significant downward trend of the real labor's share of income. During 1989–1991, the real labor's share of income appears short-term volatility with economic cycle. Further opening up policies after 1992 (especially those policies for attracting FDI), have resulted in a further downward trend to the real labor's share of income. Until 2004, the real labor's share of income shows an upward trend for recovery, passing the turning point of U-shape curve and entering the increasing path. Therefore, the periodical features of the real labor's share of income can reflect features of economic development in different phases in China.

Compared with the nominal labor's share of income, the real labor's share of income has a larger decreasing extent and longer decreasing period, which means that that the situation of national income distribution reflected by the new estimation is even worse than current perception. In addition, we argue that the real labor's share of income after price adjustment can better reflect the direct feeling of ordinary workers about the change of income distribution in China. In recent years, labor compensation of ordinary workers begins to increase significantly with average wage growth higher than economic growth. However, they don't fell the significant improvement for the living conditions. This may lie in the fact that although the monetary wage growth has surpassed the economic growth, the real

purchasing power of labor's wage hasn't increased sufficiently and may even decrease because of high inflation. In this case, the direct feeling of ordinary workers is that the income distribution hasn't been improved significantly. In Fig. 4.3, the change of the real labor's share of income across provinces reflects the above situation. In 2007, the real labor's shares of income in most provinces decrease to the lowest level while the shares in a few provinces show upward trends but remain at a low-order level. Therefore, after excluding the price factors, the change of the real labor's share of income is more consistent with the direct feeling of ordinary workers, which reflects the true situation of national income distribution.

From the above analysis, we can also find that another important difference between the change of the real and nominal labor's share of income is the U-shape moving trend of the real labor's share of income. In addition, the real labor's share of income has passed the turning point and entered the increasing trend after 2004. Current studies show that the change of labor's share of income follows the U-shape rule. Li et al. (2009) argue that under the dual economic structure in China, the infinite labor supply will not increase wage along with the increase of the labor demand. It also makes the labor productivity insensitive to the wage, which will cause a continuous decrease in the labor's share of income. When the economy develops into a certain stage, the wage growth will be faster along with the economic growth, which will reverse the downward trend of the labor's share of income. Therefore, the change of the real labor's share of income is consistent with the theoretical prediction of Lewis dual economic model. However, Li et al. (2009) and Luo and Zhang (2009b) argue that the U-shape turning point of the labor's share hasn't appeared yet in China and predict that the labor's share of income will enter the increasing path in the near future. But their analyses are based on the moving trend of the nominal labor's share of income. The conclusions they get are not consistent with the moving trend of the real labor's share of income. Therefore, although distinguishing the real and nominal labor's share of income will not challenge the U-shape rule, it poses dispute on the time of U-shape turning point of the labor's share of income in China.

However, the graphic turning point of the real labor's share of income does not necessary mean that the economic turning point, which needs further judgment and analysis. To decide whether the economic turning point has been formed or not, we need to further analyze whether the increase of the real labor's share of income is a long-term trend or a short-term phenomenon. At current, economists regards the U-shape turning point of the labor's share of income's as the turning point of wage growth surpassing output growth. Such definition has the same meaning as the Lewis turning point which means that the growth rate of labor demand is higher than labor supply and wage begin to increase (Cai 2010). Many studies have already found evidences that the wage and labor cost increases continuously and rapidly and outweigh the economic growth in China from the new century (Cai and

Du 2011; Li et al. 2012).[14] Therefore, the U-shape turning point of the labor's share of income may reflect the China's current economic development stage of Lewis turning point which the infinite labor supply transforms into insufficient labor force.

Although the turning point of the real labor's share of income matches better with the Lewis turning point, economists haven't further distinguished whether the U-shape change of the labor's share of income is caused by the increase of nominal wage driven by labor demand and supply or the increase of labor productivity driven by technological progress. We argue that the increase of nominal wage driven by labor demand and supply is short-term and unsustainable. In current China, the industry structure is mainly labor-intensive which makes capital harder to replace labor (the substitution elasticity between labor and capital is less than 1). The labor shortage is not easy to be replaced by capital. Therefore, the rapid wage growth compensates the impacts from the relative decrease of labor supply, making the labor's share of income change from decrease to increase. However, when the economy transforms to capital-intensive industry structure, capital can easily replace labor (the substitution elasticity between labor and capital is higher than 1). In this case, the relative decrease of labor supply will not lead to rapid growth of labor's wage, but exhibit as the rapid replacement of labor by large machines and equipment. This will in turn lead to the further decrease of the labor's share of income. Therefore, due to the transformation of industry structure, the substitutive relationship between capital and labor will also change so that the relative decrease of labor supply may decrease the real labor's share of income for the second time.

On the contrary, the increase of labor's share of income caused by the increase of labor productivity is long-term and sustainable. By developing labor-biased technology and industries, the increase of labor productivity will increase marginal productivity of labor and increase the unit labor output, which will increase the income of per unit labor and finally increase the share of labor compensation in total output. In addition, the increase of labor productivity is not only helpful to achieve fast and steady economic development, but also improve the national income distribution in favor of labor instead of capital. This will be helpful for achieving economic and social equality. Therefore, the U-shape turning point of the labor's share of income caused by the increase of labor productivity also indicates the coming of Kuznets turning point, which is the signal for improving income distribution so that the labor's share of income will appear a long-term upward trend in the future.

Therefore, we argue that to decide whether the economic turning point of the labor's share of has been formed or not needs a further analysis about whether the increase of real labor's share of income is a short-term phenomenon or a long-term trend, i.e., distinguishing whether the U-shape change of the labor's share of income is caused by the increase of nominal wage driven by labor demand and

[14]Cai and Du's (2011) research indicates that industrial average wage, the wage of migrant workers and wage of employed farm workers have experienced rapid growth since 2003. Li et al. (2012) find that the annual growth rate of the real wage between 1998 and 2010 has reached to 13.8 %, which is 1.1 % higher than the real GDP growth.

supply or the increase of labor productivity driven by technological progress. We argue that the increase of nominal wage driven by labor demand and supply is short-term and unsustainable, while the increase of labor's share of income caused by the increase of labor productivity is long-term and sustainable. The policy implications for further distinction is that although the traditional way of developing capital-intensive industries trough replacing labor by capital can only win a short-term economic development but will deteriorate the distribution relationship between labor and capital factors in national income distribution. Therefore, the economic development mode in future China should change the traditional development mode by boosting labor-biased technological progress, developing modern service industry in favor of labor factor and improving the labor productivity to boost long-term and steady economic development so that labor factor can better enjoy the fruits of rapid economic development.

5.4 Conclusion and Policy Implication

Current estimation studies haven't considered the effect of price factors on the estimation of labor's share of income. We argue that after considering price factors, the real labor's share of income will be a more reasonable index for measuring national income distribution. Our research shows that the real labor's share of income by considering the price factors is lower than the estimated nominal value in the literature by 6–14 %. Meanwhile, the real labor's share of income has a higher and longer decreasing trend from 1978 to 2007. The change of the real labor's share of income indicates the worsening situation of national income distribution and matches with the direct feeling of income distribution by ordinary workers. We also find that the reason of relative low real labor's share of income is that the CPI is significantly higher than GDP deflator and PPI. This means that labor faces higher price than capital and it also means that there is price discrimination of "paying attention to capital, looking down on labor" in the process of price policy making by the Chinese government.

Furthermore, different from the periodical change of the nominal labor's share of income, we find that the real labor's share of income has a U-shape moving trend and enters the increasing path after 2004. We argue that the graphic turning point of the real labor's share of income does not necessary mean that the economic turning point. We think that the although the turning point of the real labor's share of income matches better with the Lewis turning point, we need to further analyze about whether the change of the real labor's share of income from decrease to increase is caused by the increase of nominal wage driven by labor demand and supply or the increase of labor productivity driven by technological progress, where the former is a short-term phenomenon and the latter is a long-term trend. Therefore, it is insufficient to judge the turning point of the labor's share of income or Lewis turning point based on labor demand and supply changes. The true U-shape turning point of the real labor's share of income can be realized by the

increase of labor productivity so that the national income distribution will incline to labor factor. We argue that China should change the traditional development mode of capital replacing labor by boosting labor-biased technological progress, developing modern service industry in favor of labor factor and improving the human capital and labor productivity so that labor factor can better enjoy the fruits of rapid economic development and the whole economy can achieve win-win situation of both economic and social development and improving income distribution.

At least for the income distribution issues in China, it is meaningful to distinguish the real and nominal labor's share of income. We argue that the real labor's share of income after considering price factors is more suitable to describe the real situation of national income distribution in China. However, international studies use the nominal labor's share of income as a more common measurement of distributional relationship between capital and labor income in the primary distribution. A natural question is that why foreign studies don't distinguish the real and nominal terms. Perhaps in other countries, consumers and producers face not so large prices as China so that there is no significant difference between nominal and real labor's share of income. It also might be the reason that such distinction hasn't attracted enough attention. Of course, exploring the differences between the nominal and real labor's share of income across nations is a worthwhile direction for further research so that it can reply the critics this chapter might face.

References

Bai C, Qian Z (2009) Factor income share in china: the story behind the statistics [J]. Econ Res J 3:27–41

Bai C, Qian Z (2010) Determinants of labor's share of income: evidence from provincial panel data in China [J], J World Econ, 12:3–27

Cai F (2010) Demographic transition demographic dividend and lewis turning point in China. Econ Res J 4:4–13

Cai F, Du Y (2011) Wage Growth. Wage convergence and lewis turning point, economic perspectives 9:9–16

Gomme P, Rupert P (2004) Measuring labor's share of income [EB/OL]. Policy discussion papers, Federal Reserve Bank of Cleveland

Guo Q, Lv B (2011) The influence of tax on factor income distribution [J]. Econ Res J 6:16–30

Johnson DG (1954) The functional distribution of income in the United States, 1850-1952 [J]. Rev Econ Stat 36(2):175–182

Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: A U-shaped curve [J]. Econ Res J 1:70–82

Li H, Li L, Wu B, Xiong Y (2012) The End of Cheap Chinese Labor [J]. J Econ Perspect 26 (4):57–74

Luo C, Zhang J (2009a) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79

Luo C, Zhang J (2009b) The economic explanation of decrease of labor income share: empirical evidence from China's provincial data [J]. Manag World 5:25–35

Lv G (2011) Measurement research on labor income share in China: 1993–2008 [J], Statistical Research, 28(12):22–28

Sun W (2012) The evolution and the driving causes of labor income share in China: an analysis from the final demand and the efficiency of technology perspective [J]. Econ Res J 5:120–131
Zhang J, Zhang S (2010) Changes in primary income distribution and resulting problems: a view of labor share in GDP [J], Chin J Popul Sci, 5:24–35
Zhang J (2012) Estimation and analysis of China's labor share in GDP and total wage level [J]. Econ Perspect 9:10–19
Zhou M, Xiao W, Yao X (2010) Unbalanced economic growth and uneven national income distribution: evidence from China [J]. China Ind Econ 6:34–45
Zhu Z, Xu C (2012) Study on method of China's GDP accounts under constant prices. Peking University Press, Beijing

Chapter 6
Decomposition and Mechanism of Movement of China's Labor's Share of Income

This chapter decomposes the movement of labor's share of income into employment, compensation and output effects since China's reform and opening up. We find that the movement of labor's share of income is mainly determined by the net effects of the opposite movement of compensation and output, and the employment effect is relatively small. Meanwhile, the paper distinguishes the decomposition of nominal and real labor's share of income, and finds that the real labor's share of income by considering the price factors reflects the current situation of national income distribution of China. By using level and difference equation, this chapter not only discusses the determinants of labor's share of income, but also analyzes the mechanism of movement of labor's share of income. We find that the affecting mechanisms of each variable on labor's share of income through three channels are different, but are consistent with the theoretical hypothesis and practical prediction. The output effect of industrial structure variable exceeds other two effects, and the overall effect of industrial structure has the largest impact on the decrease of labor's share of income, supporting the "Kuznets fact" of movement of factor income's share.

6.1 Introduction

Since the reform and opening up, China's economy has achieved the miracle of rapid growth under the background of urban and rural integration and transition of economic development mode. However, in the recent years, national income distribution in China appears an unbalanced and even distorted trend. From the perspective of factor distribution structure, labor compensation is at a low share and continuously declines in the primary distribution, decreasing from 51.9 % in 1995 to 39.7 % in 2007, which is the lowest historical level. From the perspective of distribution among main entities, the share of households income in national is relatively low and has decreased continuously from 68.7 % in 1992 to 60.5 % in 2009. On the one hand, the deterioration of distorted and unbalanced national income distribution structure will directly restrain the consumption power of people

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and cause sluggish domestic demand. On the other hand, it will indirectly impede the process of social re-production, hinder the expansion of aggregate national income and deteriorate the environment of social and economic development.

Current studies mainly focus on two aspects to analyze the reason of decreasing labor's share of income. Some studies combine the labor's share of income with industrial structural changes during the economic development process, indicating that the industrial structural change from the agricultural sector to non- agricultural sectors is the main reason for decreasing labor's share of income and within-industry effect is the partial reason (Bai and Qian 2009a; Luo and Zhang 2009b; Xiao and Zhou 2010; Qian 2011). Other studies focus more on the effects of economic transition factors, e.g., change of industry structure and ownership structure, on decreasing labor's share of income (Bai and Qian 2009a; Li et al. 2009; Luo and Zhang 2009b; Zhou et al. 2010a; Bai and Qian 2010). More recent studies begin to emphasize the impacts of taxes on factor income distribution (Guo and Lv 2011 2012, 2012).

Although exploring the reason of decreasing labor's share of income is one of the main goals of this chapter, it distinguishes with previous studies from methods and perspectives. First, we decompose the movement of labor compensation share into employment, compensation and output effects based on its internal economic factors so that we can know the impacts of labor demand and supply, labor price level and overall economic development on the change of the labor's share of income. Second, we distinguish the decomposition of the nominal and real labor's share of income so that we can explore the effect of price factors on the change and decomposition of the labor's share of income. Finally, by using level and difference equation, we not only discuss the determinants of the labor's share of income, but also analyze the mechanism of movement of labor's share of income.

Compared with previous studies, we have found several new results. First, the change of the labor's share of income is mainly driven by the net effects of opposite moving of compensation and output. The employment effect is relatively small. Second, after excluding price factors, the change of the real labor's share of income and its decomposition can help us to re-evaluate and explain the reason of changing labor's share of income, which can reflect the real situation of the change of national income distribution in China. Third, three variables have different influence mechanisms on the change of the labor's share of income through three channels. The output effect of industrial structure variable exceeds other two effects, posing a downward pressure on the labor's share of income and supporting the "Kuznets" fact of the labor's share of income. Therefore, we argue that the strength, pace and speed of government industry policies should not only promote the requirement of further upgrading the economic structure, but also keep a relatively stable income distribution pattern in China.

6.2 Decomposing the Change of the Labor's Share of Income

6.2.1 *Decomposition Equations of the Change of Labor's Share of Income*

Current studies about the decomposition of the labor's share of income discuss mainly from industrial and sectoral perspective. Bai and Qian (2009a), Luo and Zhang (2009b) and Xiao and Hao (2009) have decomposed the change of the labor's share of income in three main industries in China into structural effect, within-industry effect and covariance effect. They argue that the structure change from agriculture industry to non-agriculture industry is the main reason of the change of total labor's share of income in China. Xiao and Zhou (2010) use flow of funds account to analyze the sectoral change of the labor's share of income in three main sectors, i.e., firms, households and governments sectors. They argue that the change of the labor's share of income within the firms is the main reason of the change of total labor's share of income. Although the above decompositions discuss external economic structure of the labor's share of income, they ignore the internal economic factors of the change of the labor's share of income. Obviously, these internal economic factors, i.e., labor supply and demand, labor price level and interaction between wage growth and economic development are more important and fundamental. Therefore, we follow the method of Kalleberg et al. (1984) and decompose the change of the labor's share of income into three effects which are employment, compensation and output effects.

We know that the labor's share of income can be expressed as the ratio between labor compensation and total value-added.

$$Ls = \frac{wL}{Y} \tag{6.1}$$

L_S is the labor's share of income, w is the average labor compensation, L is the employment population, and Y is GDP. Therefore, we can decompose the change of labor's share of income by conducting total differentiation in terms of Eq. (6.1).

$$\frac{dLs}{dt} = \frac{w}{Y}\frac{dL}{dt} + \frac{L}{Y}\frac{dw}{dt} - Ls\frac{1}{Y}\frac{dY}{dt} \tag{6.2}$$

Because current data only provide the total labor compensation C and number of employment L, therefore, we cannot directly measure the change of average labor compensation w. However, we can use the change of average labor compensation (C/L) as an alternative measure.

$$\frac{dw}{dt} = \frac{d}{dt}(C/L) = \frac{1}{L}\frac{dC}{dt} - \frac{C}{L^2}\frac{dL}{dt} \tag{6.3}$$

Substituting Eq. (6.3) into (6.2), we can get:

$$\frac{dLs}{dt} = \frac{w}{Y}\frac{dL}{dt} + \frac{1}{Y}\left(\frac{dC}{dt} - \frac{C}{L}\frac{dL}{dt}\right) - Ls\frac{1}{Y}\frac{dY}{dt} \tag{6.4}$$

The instantaneous change of each variable is unobservable. We can use the discrete as alternatives for continuous change. Let the first-order difference equation as $\Delta_t Y = Y_t - Y_{t-1}$, then Eq. (6.4) can be expressed as difference form of each variable[1]:

$$\Delta_t Ls = \left(\frac{w}{Y}\right)_{t-1}\Delta_t L + \left(\frac{1}{Y}\right)_{t-1}\left[\Delta_t C - \left(\frac{C}{L}\right)_{t-1}\Delta_t L\right] - Ls_{t-1}\left(\frac{1}{Y}\right)_{t-1}\Delta_t Y \tag{6.5}$$

The subscript $(t-1)$ of brackets in Eq. (5.5) denotes as the one year lag of these variables. Therefore, the change of labor's share of income can be decomposed as three additive terms: the change of employment number, the change of labor compensation and the change of the total value-added. Therefore, we can discuss the labor's share of income, the compound economic variable, by alternatively discussing three macroeconomic variables, i.e., employment, compensation and output. In other words, we can distinguish the change of the labor's share of income into three changing effects, i.e., employment, compensation and output effects. From the signs, employment and compensation changes have positive impacts since they are nominators in the equation. This means that the labor's share of income will increase when employment increases or labor compensation increases, ceteris paribus. Since the value-added is the denominator, therefore its change will have negative effect on the labor's share of income. This means when the increase of output will pose downward pressure on the labor's share of income, ceteris paribus.

6.2.2 *Decomposing the Change of Labor's Share of Income in China*

According to the above decomposition equations, we can decompose the change of labor's share of income in China by using income approach of GDP data.

[1]Difference equation is an approximation of differential equation. To get the complete equality, we need to add pair-wise covariance for each pair of variables and joint covariance for all three variables. Considering the covariance terms are high-order infinitesimals, we ignore them here. More specific discussions can be found in the paper of Kalleberg et al. (1984).

When estimating the change of labor's share of income, we distinguish the change of the nominal and real labor's share of income and decompose the nominal and real share respectively. Results are shown in Table 6.1.[2] Equations (6.2)–(6.5) are decompositions for the nominal labor's share of income and Eqs. (6.6)–(6.9) are decompositions for the real labor's share of income.

The total nominal labor's share of income (see Fig. 6.1) shows periodical moving feature. The rural reform at the beginning of reform and opening up have increased farmers' income thus increased the nominal labor's share of income by 4 % from 1979 to 1984. After that, the nominal labor's share of income has shown a downward trend, decreasing by 2 % from 1985 to 1989 and 3 % from 1990 to 1994. This indicates that the main focus of the reform has shifted from rural area to urban area, causing the phenomenon of national income distribution inclining to capital. The most recent change has lasted for a relatively long period and the change of the nominal labor's share of income basically is negative from 1998. This indicates that the deepening reform and accelerating transition poses downward pressure on the nominal labor's share of income.

Decomposing the nominal labor's share of income, we find that three effects are different among each other (see Fig. 6.2). First, employment effect is mainly for increasing nominal labor's share of income, showing a V-shape moving trend. The lowest point is closely associated with the short-term employment shock trigged by the mass lay-off in SOEs around 1998. Second, compensation effect has a significant pulling effect on the nominal labor's share of income, but fluctuating over time with biggest changing extent during earlier 1990s. The peak points of each wave are in 1985, 1988, 1994 and 2004. Third, output effect poses downward pressure on the nominal labor's share of income, also fluctuating over time with biggest changing extent during earlier 1990s. The bottom points of each wave are in 1985, 1988, 1993 and 2004. By looking at the relationship among three effects, the employment effect has a relatively small influence while the compensation and output effects cancel with each other, forming a mirroring relationship. In conclusion, the change of nominal labor's share of income mainly depends on the difference between compensation and output changing effects.

We can find that when decomposing of nominal labor's share of income, the timing of peak and bottom points of compensation and output effects are at the same pace. The changes of compensation and output effects also co-move with the inflation.[3] Therefore, after excluding the price factor, the real labor's share of income and its decomposition can better reflect the change of national income distribution

[2]Because we lack the provincial income approach of GDP data in 2008 and the number rebound back substantially in 2009 which may be caused by the re-adjustment of statistical caliber (Zhang Zhang 2012), we confine our analysis of the change of labor's share of income between 1978 and 2007.

[3]We find that the correlation between compensation effect and CPI is 0.79 and the correlation between output effect and GDP deflator is as high as 0.91.

Table 6.1 The change of labor's share of income and its decomposition 1979–2007

Year	Nominal labor's share of income				Real labor's share of income			
	Total change	Employment effect	Compensation effect	Output effect	Total change	Employment effect	compensation effect	Output effect
1979–1984	0.04	0.11	0.40	−0.46	0.02	0.09	0.24	−0.31
1985–1989	−0.02	0.08	0.43	−0.54	−0.12	0.07	0.03	−0.23
1990–1994	−0.03	0.06	0.59	−0.68	0.00	0.04	0.17	−0.22
1995–1999	0.02	0.01	0.41	−0.40	−0.03	0.01	0.16	−0.20
2000–2004	−0.05	0.04	0.31	−0.40	0.01	0.02	0.18	−0.19
2005–2007	−0.01	0.04	0.24	−0.29	0.02	0.03	0.14	−0.14

Data sources China's GDP Accounting: Historical Data 1952–1995, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*

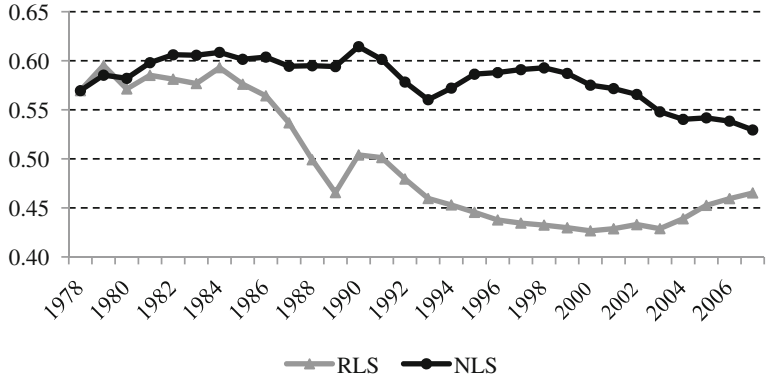

Fig. 6.1 The change of the nominal and real labor's share of income in China 1978–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*

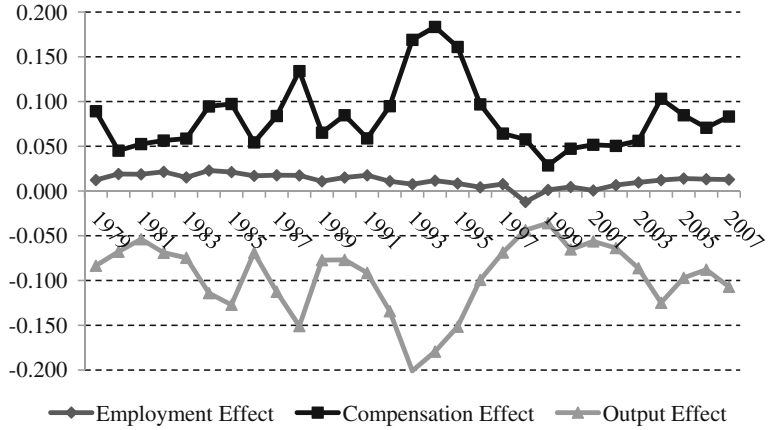

Fig. 6.2 Three decomposition effects of the nominal labor's share of income in China 1979–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*

and its internal structure.[4] The total real labor's share of income (see Fig. 6.1) changes as a U-shape curve. Rural reform at the beginning of reform and opening up stabilize the change of the real labor's share of income. After that, the reform inclining to the urban areas incentivizes the power of capital, leading to a "profit eroding wage" phenomenon and causing significant downward trend of the real labor's share of income. Until 2004, the real labor's share of income shows an upward trend for recovery, passing the turning point of U-shape curve and entering the increasing path. The U-shape turning point of the labor's share of income's is consistent with Lewis turning point, the point which narrows the urban rural gaps in the dual economic structure (Cai 2010; Cai and Du 2011). This means that the growth of labor demand has surpassed the growth of labor supply. And we expect that the rapid wage growth of migrant workers is coming to be true in the near future.

Similarly, we find that three effects for decomposing the real labor's share of income are different among each other (see Fig. 6.3). First, because the estimation of the real labor's share of income doesn't influence employment variable, therefore the employment effect is the same as decomposing the nominal share. Second, the real compensation effect, which has a relative large fluctuation during 1979–1990 and becomes relatively stable after 1990, is relatively smaller than nominal compensation effect. Third, real output effect, which shows an upward fluctuating trend, is also relatively smaller than nominal output effect. By looking at the relationship among three effects, the importance of employment effect increases but still have a relative small impact. The real compensation and output effects have negative but weak correlation with each other. Similarly, the net effect of real compensation and output determines the changing direction and extent of the real labor's share of income.

6.2.3 Decomposing Provincial Labor's Share of Income

The decomposing results of the nominal labor's share of income across provinces are similar to the case of the whole nation (see Fig. 6.4). First, compared with nominal compensation and output effect, employment effect is weaker. The correlation between employment effect and the change of nominal labor's share of income across provinces is only 0.029. Second, nominal compensation and output effects form a mirroring relationship, with negative correlation (−0.749). This also means that price fluctuation is the main reason for the high negative correlation. Nominal compensation effect has the biggest explanatory power and its correlation with the change of the nominal labor's share of income is 0.641. The explanatory

[4]Zhou (2014) specifically discusses the influence of distinguishing the nominal and real labor's share of income on the changing trend of the labor's share of income in China. According to this study, the calculation of the real labor's share of income can be divided into three steps. First, we divide labor compensation by CPI to get real labor compensation; second, we divide nominal GDP by GDP deflator to get real GDP; finally, we divide real labor compensation by real GDP to get the real labor's share of income after excluding the price factors.

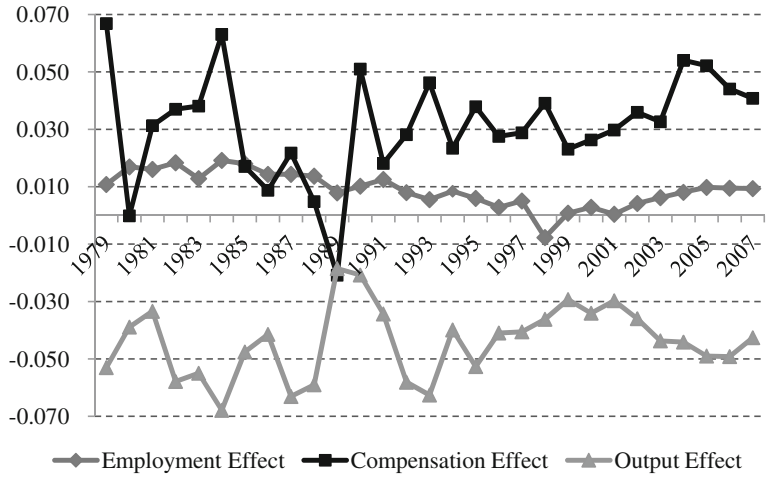

Fig. 6.3 Three decomposition effects of the real labor's share of income in China 1979–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996-2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008*

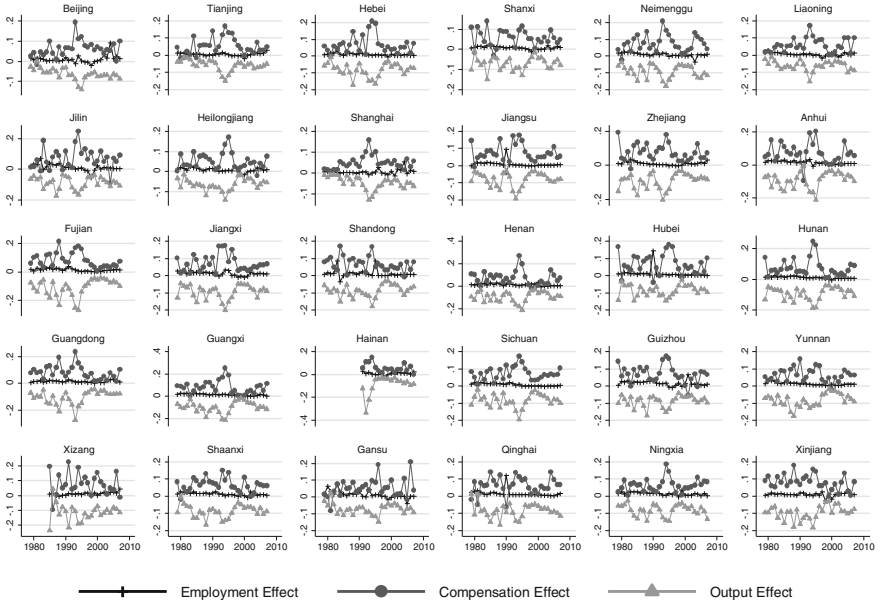

Fig. 6.4 Three decomposition effects of provincial nominal labor's share of income in China 1979–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008. Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

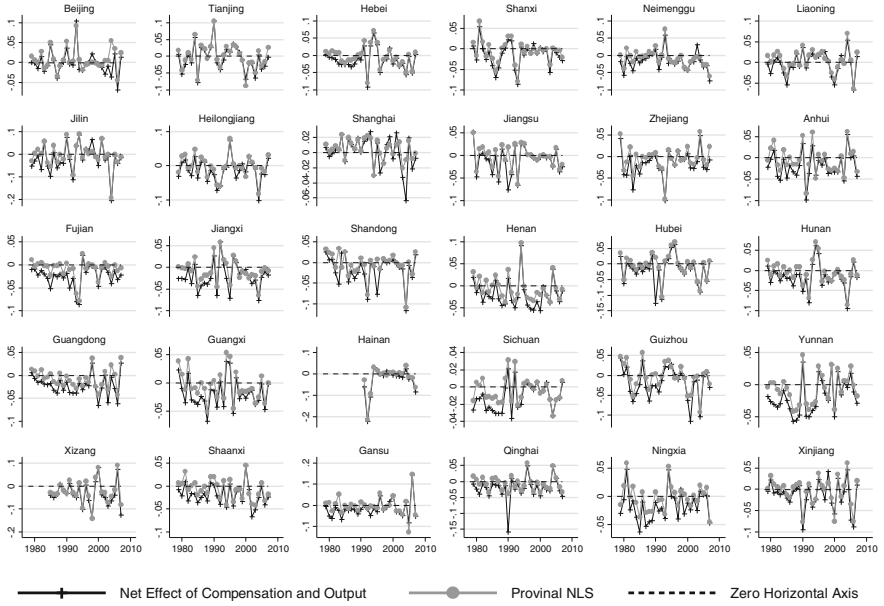

Fig. 6.5 The change of provincial nominal labor's share of income and net changing effect of compensation and output in China 1979–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008. Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

power of nominal output effect is mild and its correlation with the change of the nominal labor's share of income is 0.217. Finally, the net effects of nominal compensation and output across provinces best explain the change of the nominal labor's share of income, with correlation as high as 0.906 (see Fig. 6.5).

Similarly, the decomposing results of the real labor's share of income across provinces are similar to the case of the whole nation (see Fig. 6.6). First, compared with real compensation and output effect, employment effect is still weaker. The correlation between employment effect and the change of real labor's share of income across provinces is only 0.020. Second, real compensation and output effects negatively correlate with each other whose correlation is −0.396. We can see that the correlation between two effects becomes weaker because of excluding the price factors. Real compensation effect has the biggest explanatory power and its correlation with the change of the nominal labor's share of income is 0.724. The explanatory power of real output effect is relatively mild and its correlation with the change of the nominal labor's share of income is 0.260. Finally, the net effects of nominal compensation and output across provinces determine the change of the nominal labor's share of income, with correlation as high as 0.937 (see Fig. 6.7).

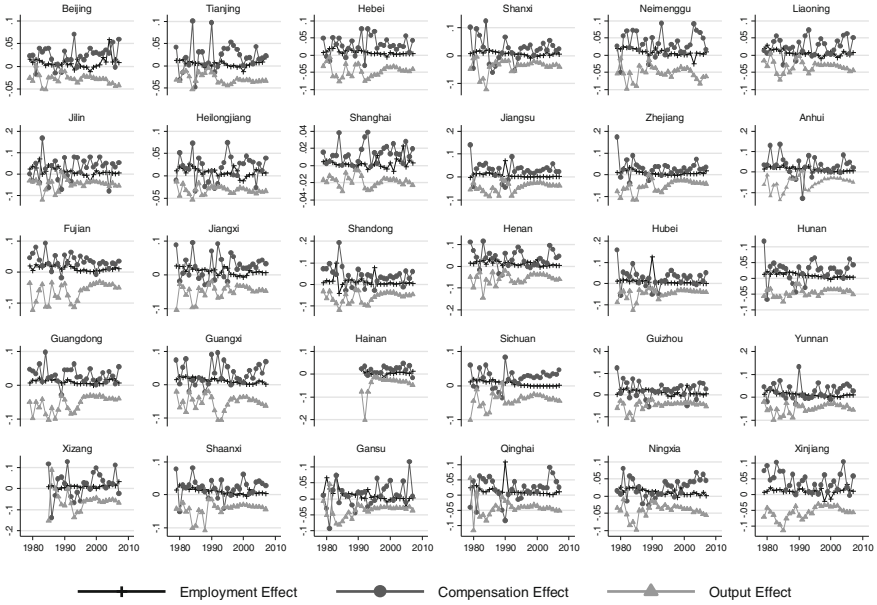

Fig. 6.6 Three decomposition effects of provincial real labor's share of income in China 1979–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008. Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

6.3 The Theoretical Mechanism of the Change of Labor's Share of Income

6.3.1 The Theoretical Model of Labor's Share of Income and Its Expansion

In the previous section, we have decomposed the change of labor's share of income into three effects, i.e., employment, compensation and output effects. In this part, we are going to construct econometric model for systematically analyzing the determinist factors and influencing mechanism of the change of labor's share of income. Based on the functional relationship between the labor's share of income and capital output ratio, Bentolila and Saint-Paul (2003) have constructed the determinist model of the labor's share of income under neoclassical framework. For illustrative purpose, we use Fig. 6.8 to discuss the relationship between the labor's share of income and capital output ratio which Bentolila and Saint-Paul (2003) refer as *SK* curve. The horizontal axis stands for the capital output ratio k and vertical axis is the labor's share of income S_L.

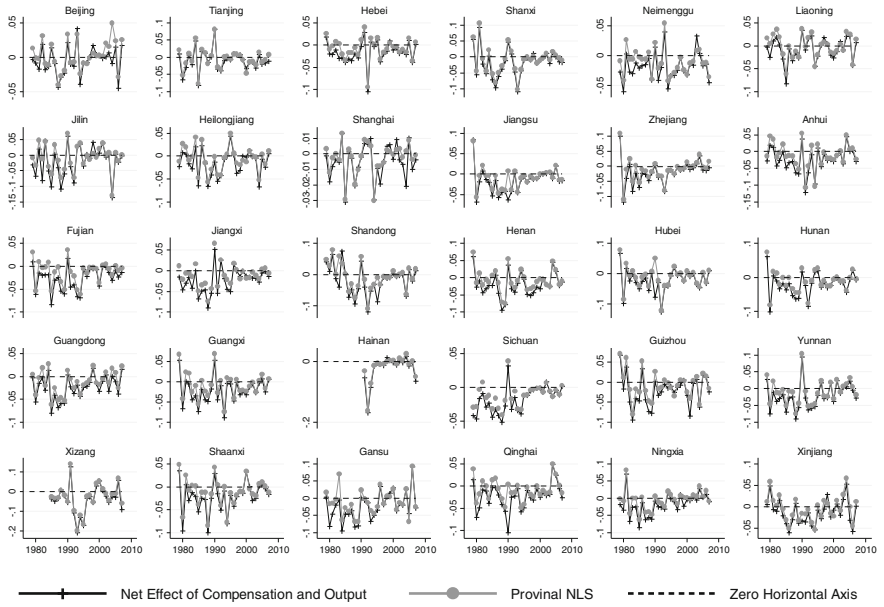

Fig. 6.7 The change of provincial real labor's share of income and net changing effect of compensation and output in China 1979–2007, *Data sources China's GDP Accounting: Historical Data 1952–1995*, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, and *China Statistical Yearbook 2005–2008. Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007

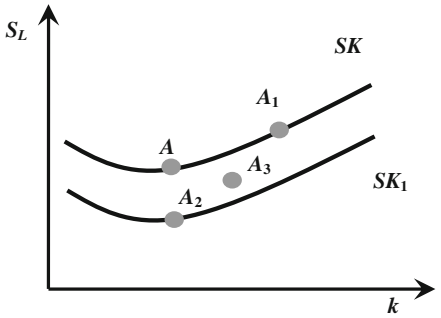

Fig. 6.8 Functional relations between the labor's share of income and capital output ratio

Bentolila and Saint-Paul (2003) argue that the change of capital output ratio will move labor's share of income up along the *SK* curve, moving from A to A_1. This effect is called "moving" effect. Despite of factor input ratios, other factors may influence the labor's share of income through two possible channels. One is to change labor's share of income by shifting *SK* curve. If we keep capital output ratio unchanged, point A on the *SK* curve will be shifted to A_2. This effect is called

"shifting" effect. The other channel is to make labor's share of income deviate from the original *SK* curve from point *A* on *SK* curve to point A_3. This effect is called "deviating" effect. Therefore, the model proposed by Bentolila and Saint-Paul (2003) can be expressed by the following econometric equation:

$$Ls_{i,t} = \alpha_0 + \alpha_1 KtY_{i,t} + \sum_{j=1}^{m} \beta_j SE_{i,t}^{j} + \sum_{j=1}^{n} \gamma_j ME_{i,t}^{j} + \varepsilon_{i,t} \tag{6.6}$$

Here, L_S is the labor's share of income, *KtY* is capital output ratio which causes "moving" effect, *SE* stands for factors which cause "shifting" effects and *ME* stands for factors which cause "deviating" effect. Superscript *j* denotes the number of variable and subscript *i* and *t* denotes for different province and time period.

We not only care about the determinist factors of the labor's share of income, but also about the impacts of economic factors on the change of the labor's share of income. Let the first-order difference of the labor's share of income as $\Delta_t Ls_t = Ls_t - Ls_{t-1}$, then we can transform the Eq. (6.6) into a first-order difference equation[5]:

$$\Delta Ls_{i,t} = \alpha_1 \Delta KtY_{i,t} + \sum_{j=1}^{m} \beta_j \Delta SE_{i,t}^{j} + \sum_{j=1}^{n} \gamma_j \Delta ME_{i,t}^{j} + \varepsilon'_{i,t} \tag{6.7}$$

In the previous section, we have decomposed the change of labor's share of income into three effects, i.e., employment, compensation and output effects. According to the analysis of the mechanism of the labor's share of income, we can further analyze how "moving", "shifting" and "deviating effects influence the change of thee labor's share of income through employment, compensation and output channels. Therefore, we can extend the above theoretical framework and construct econometric equations for each decomposition part of the change of the labor's share of income. First, the determinist equation of the change of the labor's share of income caused by employment changes can be expressed as:

$$\left\{ \left(\frac{W}{Y} \right)_{t-1} \Delta_t L \right\}_{i,t} = \alpha_{11} \Delta KtY_{i,t} + \sum_{j=1}^{m} \beta_{j1} \Delta SE_{i,t}^{j} + \sum_{j=1}^{n} \gamma_{j1} \Delta ME_{i,t}^{j} + \varepsilon'_{i1,t} \tag{6.8}$$

Second, the determinist equation of the change of the labor's share of income caused by average compensation changes can be expressed as:

$$\left\{ \left(\frac{1}{Y} \right)_{t-1} \left(\Delta_t C - \frac{C}{L} \Delta_t L \right) \right\}_{i,t} = \alpha_{12} \Delta KtY_{i,t} + \sum_{j=1}^{m} \beta_{j2} \Delta SE_{i,t}^{j} + \sum_{j=1}^{n} \gamma_{j2} \Delta ME_{i,t}^{j} + \varepsilon'_{i2,t} \tag{6.9}$$

[5]Different from Eq. (6.6), Eq. (6.7) does not include the factors that don't change over time, e.g., the constant term and region fixed effect.

Third, the determinist equation of the change of the labor's share of income caused by value-added changes can be expressed as:

$$\left\{ Ls_{t-1}\left(\frac{1}{Y}\right)_{t-1}\Delta_t Y \right\}_{i,t} = \alpha_{13}\Delta KtY_{i,t} + \sum_{j=1}^{m}\beta_{j3}\Delta SE_{i,t}^{j} + \sum_{j=1}^{n}\gamma_{j3}\Delta ME_{i,t}^{j} + \varepsilon'_{i3,t} \quad (6.10)$$

6.3.2 Variables and Theoretical Hypothesis

6.3.2.1 Capital Output Ratio

Capital output ratio will move the labor's share of income along *SK* curve and the influential direction of capital output ratio on the labor's share of income depends on the substitution elasticity between labor and capital. By using provincial data in China from 1987 to 2004, Luo and Zhang (2009a, b) find a significant and positive correlation between capital output ratio and the labor's share of income. They argue that because of abundant labor, capital accumulation can increase the capital per labor and labor marginal production, indicating a supplementary not substitutionary relationship between capital and labor. This conclusion is also supported by other studies (Bai and Qian 2009b; Shao and Huang 2010). However, by using panel data of Chinese industrial firms from 1998 to 2005, Bai and Qian (2009a) find that capital output ratio has a relatively small influence on the labor's share of income, suggesting that the substitution elasticity between labor and capital is 1. By using Chinese firm-level survey data from 2000–2004, Li et al. (2009) find that capital labor ratio negatively correlates with the labor's share of income, indicating that the substitution elasticity between labor and capital is larger than 1.

6.3.2.2 Technological Progress

Bentolila and Saint-Paul (2003) propose that technological progress can shift *SK* curve in order to change the labor's share of income, which is called "shifting" effect. Acemoglu (2003) argues that when the economy is in economic transition, technological progress is capital-augmenting, which will shift the *SK* curve downward to SK_1 so that the labor's share of income moves from point *A* to A_2 (see Fig. 6.5). This means that China, a country operating on the economic transition path, the labor's share of income will be influenced by capital-biased technological progress. By introducing Hicks' factor biased technological progress, Huang and Xu (2009) argue that 70 % of the decrease of the labor's share of income in China can be explained by capital-augmenting technological progress. However, the technological progress in China not only exhibits the factor biased feature, but also skill biased feature (Pan 2007; Song et al. 2010). Skill biased technological progress will decrease the labor's share of income by lowering the labor demand of unskilled workers and increasing

the returns on physical capital (Wang and Sheng 2010; Weng and Zhou 2010). However, in empirical studies, technological progress can be expressed by several indicators, such as total factor productivity (TFP), ratio of research and development (R&D) in sales, share of sales for new products and etc. Because of different measurements for technological progress, there is no consensus about its effects on the labor's share of income at the moment. Some studies get significant and negative effects (Huang and Xu 2009; Weng and Zhou 2010) while some other studies get insignificant results (Bai and Qian 2009a; Luo and Zhang 2009b).

6.3.2.3 Open Factors: International Trade and Foreign Direct Investment

The labor's share of income can possibly be influenced by other factors so that it deviates from the original *SK* curve. Opening factors can bring such "deviating" effect to the labor's share of income. Opening factors refers to global mobility of goods and factors whose main forms are international trade and foreign investment. The influences of international trade on the labor's share of income are different for different theoretical framework. Neoclassical theory proposes that international trade can promote international division of labors and specialization by producing and exchanging goods and services among different countries based on their comparative advantages. International trade and specialization will increase the demand and utilization of relatively abundant factors and decrease the demand and utilization of relatively scarce factors so that the income share of abundant factors will increase and the income share of scarce factors will decrease.

As for developing countries, labor is relatively abundant compared with capital. Therefore, neoclassical trade theory predicts that the labor's share of income will appear an upward trend in developing countries. Based on firm heterogeneity, the newly developed trade theory proposes that firms which engage in trade are usually large size and high productivity firms (Melitz 2003; Helpman et al. 2004). According to this theory, the increase of export will expand shares of high productivity firms so that export will decrease the labor's share of income. From the empirical perspective, international trade has unclear influences on the labor's share of income. Some studies find positive influences of export on the labor's share of income, supporting the prediction of neoclassical trade theory (Jiang and Zhang 2008; Shao and Huang 2010; Weng and Zhou 2010), while using the similar data sets, others have concluded insignificant effects (Bai and Qian 2009a; Luo and Zhang 2009b).

There are also theoretical disputes for the effects of FDI, another measurement for open factors. Dunning's (1988) specific location advantage theory argues that the natural and factor endowment of a specific location will determine whether this place will have the advantage of attracting foreign investment. Therefore, firms producing labor-intensive goods will choose to invest in the countries which are relatively abundant in labor and firms producing capital-intensive goods will choose to invest in the countries which are relatively abundant in capital. This means that foreign direct investment will further expand the factor abundant sectors in the host

countries. Therefore, FDI should be able to increase the output elasticity and income share of the abundant factor. Similarly, based on the framework of firm heterogeneity, FDI has two effects on the labor's share of income for the host country (Decreuse and Maarek 2008). First, foreign firms will pay higher wages to labor force in the host country so as to increase the the labor's share of income in domestic country which can be called "wage competition effect". Second, foreign firms have stronger ability of financing and more advanced technology so that their productivity is significantly higher than domestic firms which will decrease the labor's share of income in the host country. This can be called "productivity difference effect". This means that the net effect of FDI will depend on the size of "wage competition effect" and "productivity difference effect". When the former is larger, the labor's share of income in the host country will decrease in the face of increasing FDI flows (Decreuse and Maarek 2008).

Based on the reality in China, Luo and Zhang (2009a, b) argue that the competition of attracting foreign investments in different regions in China can be the main factor to strengthen the bargaining power of capital. The local governments have put the low labor cost and low labor protection as the main strategy to attract foreign investment which increase the bargaining power of capital and weaken the bargaining status of labor force. Foreign capital can move across different provinces easily by the way of "vote by foot" but labor force has various hindrances for mobility because of the constraints such as House Registration System (Hukou System).

Their study shows that FDI and the labor's share of income interact with each other. They argue that the competition of attracting foreign investments by local governments in China has weakened the bargaining power of laborers and the influx motive of foreign investments has due to the China's cheap labor and preferential policy lead to the decrease of the labor's share of income. Shao and Huang (2010) also propose the negative effect of FDI on the labor's share of income. However, they argue that this is mainly caused by negative "wage spillover" effect.

6.3.2.4 Transition Factors: Changes in Industry and Institutional Structures

As for China, neoclassical framework and opening perspective are still insufficient to explain the phenomenon of decreasing labor's share of income. Institutional reform and economic transition are important factors for understanding the economic operation in China. Therefore, we need to combine the economic and institutional transition after the reform and opening up to analyze the dynamic changes of the labor's share of income. Similar as the opening factors, the transition factors, e.g., changes in industry and institutional structures, will make the labor's share of income deviate from *SK* curve, causing the "deviation" effect. More than thirty years' reform and opening up helps China develop from a traditional agricultural country to a modern industrialized country. From the perspective of industry structure, the share of agriculture sector decreases continuously while the industrial sector increases rapidly. In addition, Li et al. (2009) argues that the

economic development with the feature of urbanization and industrialization has massively transferred labor force from agriculture sector to industrial sector. Therefore, the non-agricultural industry structure and the rural labor transfer in economic transition in China are the main reasons for explaining the current decreasing labor's share of income (Li et al. 2009; Gong and Yang 2010a, b; Bai and Qian 2009a; Luo and Zhang 2009b; Xiao and Zhou 2010).

The change of economic structure can also be reflected by the change of institutional structure. The reform of SOEs, privatization and entering of FDI are three main features of the change of ownership structure. SOEs are relatively low efficient due to policy burden and soft budget constraint (Lin and Tan 1999; Lin and Li 2004) while foreign firms have high productivity because of high ability of financing and advanced technology (Decreuse and Maarek 2008). Based on the theory of firm heterogeneity, the change of ownership structure in china, featured by reform of SOEs, privatization and entering of FDI, will increase the efficiency of economy but decrease the labor's share of income (Zhou et al. 2010a). By using industrial firm-level data, Bai et al. (2008) and Bai and Qian (2009a) indicate that the reform of SOEs causes industrial labor's share of income to decrease by 7 %. On the other hand, Luo and Zhang (2009b) have found negative impact of privatization on the labor's share of income. They argue that after privatization, firms' wage payment can better reflect the demand and supply relationship in the labor market. However, the redundant labor force due to the reform of SOEs has posed a supply shock on the labor market which poses a downward pressure on wage. With regard to the effect of entering of FDI, we have already discussed from the opening perspective and its effect is also negative.

6.4 The Empirical Analysis of the Change of the Labor's Share of Income in China

6.4.1 Econometric Results of the Level Equations

First, we would like to analyze the determinist factors of the labor's share of income. According to the discussion about variables in the previous sector, we can get more specific econometric equation for Eq. (6.6).

$$\begin{aligned} Ls_{i,t} = {} & \alpha_0 + \alpha_1 \ln KtY_{i,t} + \beta_1 \ln Tfp_{i,t} + \gamma_1 Expt_{i,t} + \gamma_2 \mathrm{Im}pt + \gamma_3 Fdi_{i,t} \\ & + \gamma_4 Sir_{i,t} + \gamma_5 Tir_{i,t} + \gamma_6 Soe_{i,t} + \gamma_7 \ln Rpgdp + \gamma_8 (\ln Rpgdp)^2 + \varepsilon_{i,t} \end{aligned} \tag{6.11}$$

Here, *Ls* is the labor's share of income which we define as the share of labor compensation in GDP after excluding the net taxes on production. The data during 1978–1992 is from *China's GDP Accounting: Historical Data 1952–1995*, data during 1993 to 2003 is from *China's GDP Accounting: Historical Data 1952–2004*. In terms of data from 2004 to 2007, we use *China Statistical Yearbook 2005–*

2008 and adjust them by the employment data. *KtY* is the capital output ratio, which is represented by the share of capital stock in GDP and measured for factor input. *Tfp* is the regional total factor productivity calculated as the "Solow residuals", measuring for technological progress. By using perpetual inventory method, Shan (2008) has obtained the panel data of Chinese provincial capital stock from 1978 to 2006. We use the same method to expand the data to year 2007. Then we use this panel data to calculate the above two variables, i.e., capital output ratio (*KtY*) and technological progress (*Tfp*).[6] *Expt* is the share of export in GDP, measuring the effect of foreign trade. *Impt* is the share of import in GDP, measuring the role of import penetration rate. *Fdi* is the share of foreign investment inflows in GDP. Interestingly, the foreign investment effect is not only a measure for the extent of opening, but also can reflect the change of the ownership structure. *Sir* and *Tir* are shares of value-added of secondary and tertiary industry in total GDP respectively, measuring for the effect of changing industry structure. *Soe* is the share of employment of SOEs in total employment, measuring for the effect of reform of SOEs in the ownership structure. In addition, the labor's share of income is also closely related to the regional differences in economic development. And we know from the previous analysis that the labor's share of income is negatively correlated regional economic development. Besides, some studies show that the labor's share of income will have a U-shape movement along with economic development (Li et al. 2009; Luo and Zhang 2009b). Therefore, we add real GDP per capita (*Rpgdp*) and its quadratic term to control the effect of economic development. Data of all these variables are from *China Compendium of Statistics: 1949–2008*. The statistical description of the data is presented in Table 6.2.

We first use regional panel data to estimate econometric model (6.11). We choose 30 regions in China from 1978 to 2007 as our panel sample. We know that panel data model can be categorized as fixed effects model and random effects model based on the different assumptions to the cross-sectional fixed effects. We are going to choose suitable estimation model based on the Hausman test. Table 6.3 provides estimation results of 5 models. The result of Hausman test makes us to choose the fixed effects model. In Table 6.3, row (1) to (3) are the level equations of the determination of the nominal labor's share of income and row (4)-(6) are the level equations of the determination of the real labor's share of income.

In the regression equation of the nominal labor's share of income, row (1) only considers the "moving" and "shifting" effects on the *SK* curve. In other words, we run regression only regard to capital output ratio (*KtY*) and technological progress

[6]There are two ways for calculating the capital output ratio. One is to use perpetual inventory method and 1952 constant price to get capital stock and then divide the capital stock by 1952 constant price GDP to get constant price capital output ratio. The other is to recover the 1952 constant price capital stock to current price capital stock and then divide the capital stock by current price GDP to get current price capital output ratio. In some specific years and for some specific regions, there are significant differences between these two methods. Therefore, we combine two methods to get more reasonable capital output ratios.

Table 6.2 Variables names and statistical description

Variables names	Sample	Mean	S.D.	Min	Max
NLS	882	0.522	0.100	0.227	1.000
RLS	882	0.428	0.135	0.149	1.000
KtY	900	1.808	0.702	0.202	4.213
Tfp	882	1.055	0.383	0.478	3.076
Expt	882	0.133	0.212	0.001	1.937
Impt	882	0.129	0.331	0.000	3.259
Fdi	882	0.021	0.033	0.000	0.243
Sir	882	0.434	0.100	0.119	0.774
Tir	882	0.326	0.092	0.130	0.721
Soe	900	0.618	0.187	0.115	1.036
Rpgdp	900	19.66	25.04	0.000	252.1

Data sources China's GDP Accounting: Historical Data 1952–1995, *China's GDP Accounting: Historical Data 1996–2002*, *China's GDP Accounting: Historical Data 1952–2004*, *China Statistical Yearbook 2005–2008* and *China Compendium of Statistics: 1949–2008. Note* The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007. *NLS* and *RLS* stands for nominal and real labor's share of income respectively

(*Tfp*). We find that the coefficient of capital output ratio is negative, which implies that the substitution elasticity between labor and capital is larger than 1 in China. In other words, capital and labor substitute rather than complement with each other. This finding is consistent with the research results of Li et al. (2009). Meanwhile, we also find that the coefficient of technological progress is also negative, indicating the capital-biased feature of the technological progress in China. This means that technological progress will decrease labor's share of income. Therefore, the effects of factor input ratio and technological progress are expected.

In the row (2), we introduce the "deviating" factors such as opening and economic transition. We find that opening factors such as export and import have opposite effects on the labor's share of income. The effect of the former is negative while the latter is positive. This result seems to accord with the prediction of neoclassical trade theory about factor income share. Export will increase the demand of labor-intensive industries in China, which will increase the demand of labor and increase the labor's share of income. Import will increase the demand of capital factor, which will pose a downward trend pressure on the labor's share of income. Meanwhile, opening factors such as FDI has a negative effect on the labor's share of income. This result is consistent with the research results of Luo and Zhang's (2009b) and Shao and Huang's (2010). Although some studies (Bai and Qian 2009a; Luo and Zhang 2009b) have used industry decomposition method to find strong explanatory power change of industry structure in understanding the decline of the labor's share of income, few studies put the industry structure variables into regression analysis. Our empirical

Table 6.3 Estimation results of level equations

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Nominal labor's share of income			Real labor's share of income		
KtY	−0.0955*** (0.00433)	−0.0237*** (0.00350)	−0.0276*** (0.00392)	−0.112*** (0.00720)	−0.0184*** (0.00522)	−0.0219*** (0.00559)
Tfp	−0.229*** (0.00781)	−0.0934*** (0.00655)	−0.0981*** (0.00724)	−0.192*** (0.0130)	−0.0517*** (0.00978)	−0.0649*** (0.0103)
Expt		0.0281** (0.0119)	0.0236* (0.0120)		0.0388** (0.0178)	0.0221 (0.0172)
Impt		−0.0273*** (0.00728)	−0.0268*** (0.00725)		−0.00736 (0.0109)	−0.00469 (0.0104)
Fdi		−0.189*** (0.0541)	−0.183*** (0.0568)		−0.622*** (0.0808)	−0.552*** (0.0811)
Sir		−0.672*** (0.0222)	−0.629*** (0.0277)		−0.765*** (0.0332)	−0.556*** (0.0396)
Tir		−0.344*** (0.0260)	−0.277*** (0.0401)		−0.869*** (0.0388)	−0.524*** (0.0572)
Soe		0.0302*** (0.0108)	0.0256* (0.0139)		0.0882*** (0.0161)	0.0463** (0.0199)
Rpgdp			−0.0302*** (0.00986)			−0.133*** (0.0141)
$Rpgdp^2$			0.00441*** (0.00160)			0.0174*** (0.00228)
Constant	0.939*** (0.0147)	1.054*** (0.0175)	1.073*** (0.0190)	0.837*** (0.0244)	1.068*** (0.0261)	(0.0272)
Obs.	882	881	881	882	881	881
R^2	0.502	0.779	0.786	0.245	0.729	0.751
Wald Chi2	123.65 [2]	239.64 [8]	193.46 [10]	61.28 [2]	401.95 [8]	366.66 [10]
Prob > Chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Data sources China's GDP Accounting: Historical Data 1952-1995, *China's GDP Accounting: Historical Data 1996-2002*, *China's GDP Accounting: Historical Data 1952-2004*, *China Statistical Yearbook 2005–2008* and *China Compendium of Statistics: 1949–2008. Note* (1) The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007; (2) the numbers in the table corresponding to the explanatory variables are regression coefficients and the numbers in the parentheses are standard errors, ***p < 0.01, **p < 0.05, *p < 0.1. Explanatory variables such as capital output ratio (*KtY*), technological progress (*Tfp*) and real GDP per capita (*Rpgdp*) are taken in the logarithm form; (3) the last two rows are Chi-square statistics and probability corresponding to the Hausman tests

result shows that the increasing shares of secondary and tertiary industries will decrease the labor's share of income. The coefficients of capital output ratio and technological progress become significantly smaller when introducing the industry structure variables. Both from the size and significance of the coefficients, the impacts of the industry structure variables are the biggest, indicating that the non-agricultural industry structure is the main reason for the decline of the labor's share of income in China. Therefore, our studies support the "Kuznets fact" instead of "Kaldor fact".[7] From the change of institutional structure, we find that the effect of SOEs' reform is positive, which means that the decreasing share of SOEs will decrease the labor's share of income. This is consistent with current research results. Of course, we can also consider FDI as an institutional structure variable. We find that the entering of FDI decreases the labor's share of income by increasing economic efficiency. Therefore, its coefficient is negative and significant.

Row (3) in Table 6.3 controls the regional differences in economic development. We find that the labor's share of income will decrease along with the economic development. This result is the same with Luo and Zhang's (2009a, b). Furthermore, we also find that the quadratic term of economic development is also significant and positive, which supports the arguments of Li et al. (2009) that there is an U-shape relationship between the labor's share of income and level of economic development. In addition, we find that the explanatory power of the model haven't increased significantly after introducing the GDP per capita variables, indicating that opening and transition factors have already well reflected the change of economic development.

Besides, row (5) to (8) in Table 6.3 are level equations for the determination of the real labor's share of income. We find that the coefficients signs of the variables are basically the same with the regression results for the nominal labor's share of income. There are some differences in the size and significance of these coefficients. For example, trade variables become insignificant while the negative effect of FDI becomes even stronger. In addition, the effects of industry structure variables are still largest, indicating the robustness of the regression results.

6.4.2 Econometric Results of the Difference Equations

The above analysis discusses the determination of the "level" of the labor's share of income. In the following section, we are going to analyze the determination of the "change" of the labor's share of income.

[7]From the perspective of the labor's share of income, the so-called "Kuznets fact" means that, with economic development, the change of the industry structure and the difference of labor's share of income in each industry lead to the unstable distribution between labor and capital. On the contrary, "Kaldor fact" refers the long run stability of the labor's share of income, regarded as the one of the six stylized facts in macroeconomic growth by Kaldor (1961).

Compared with previous studies, this can help us to analyze the change of the labor's share of income and its relationship with changes of other variables, eliminating the fixed effects of regional differences. Furthermore, it can help us to discuss the channels and mechanisms through which these explanatory variables have impacted on the change of the labor's share of income. To implement our analyzing purpose, we transform Eq. (6.11) to difference equation according to Eq. (6.7):

$$\begin{aligned}\Delta Ls_{i,t} = {} & \alpha_1 \ln \Delta KtY_{i,t} + \beta_1 \ln \Delta Tfp_{i,t} + \gamma_1 \Delta Expt_{i,t} + \gamma_2 \Delta \mathrm{Im}pt_{i,t} \\ & + \gamma_3 \Delta Fdi_{i,t} + \gamma_4 \Delta Sir_{i,t} + \gamma_5 \Delta Tir_{i,t} + \gamma_6 \Delta Soe_{i,t} + \varepsilon_{i,t}\end{aligned} \tag{6.12}$$

We would like to note that the difference term of GDP per capita hasn't been put into Eq. (6.12). This is because the decomposition of the change of the labor's share of income has already included the influence of GDP changes. We use ordinary least square (OLS) to estimate the panel data based on the Eq. (6.12). Since we have conduct first order difference to all variables, this regression is a first order difference model. Similarly to the previous section, row (1) and row (5) are difference equations of the change of nominal and real labor's share of income respectively. Compared with the level equations, coefficients signs are consistent with the level regression results but the size and significance of coefficients become smaller. We would like to emphasize that the coefficients of secondary and tertiary industry are significant and negative with the largest absolute value, indicating that the change of industry structure has the strongest explanatory power. Therefore, both for the "level" and "difference" equations of the labor's share of income, industry structure can not only reflect regional differences in labor's share of income, but also reflect the changing trend of the labor's share of income over time. This again manifests the change of labor's share of income in China is consistent with the "Kuznets fact".

To further understand the changing mechanism of labor's share of income, we use Eqs. (6.8), (6.9) and (6.10) to decompose the labor's share of income into three main channels, i.e., employment, compensation and output effect, to conduct regression estimation. For the regression equations of each channel, we still use OLS to obtain the regression estimation of first order difference for each channel. Meanwhile, we explore the changing mechanism of nominal and real labor's share of income respectively. The regression results for the nominal labor's share of income are listed in row (2) to row (4) in Table 6.4. The regression results of the real labor's share of income are listed in row (6) to row (8) in Table 6.4.

By comparing the impacts of each variable on the change of the labor's share of income and three decomposition effects, we can empirically analyze the influencing mechanism of the labor's share of income. That is to say, how each variable has synthesized impacts on the labor's share of income through employment, compensation and output channels? For the regression equations of the nominal labor's share of income, we find that the employment and compensation effect of capital output ratio are negative, indicating that capital substitutes labor through negative employment and compensation effect. Similarly, the employment effect and

Table 6.4 Estimation results of difference equations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Nominal labor's share of income				Real labor's share of income			
	NLS	Components of NLS			RLS	Components of RLS		
		Employment	Compensation	Output		Employment	Compensation	Output
KtY	−0.115*** (0.00965)	−0.0157** (0.00758)	−0.170*** (0.0339)	0.0479 (0.0376)	−0.0558*** (0.0117)	−0.0157** (0.00674)	−0.0510*** (0.0193)	0.00259 (0.0207)
Tfp	−0.397*** (0.0211)	−0.0404** (0.0166)	−0.820*** (0.0740)	0.388*** (0.0822)	−0.263*** (0.0255)	−0.0333** (0.0147)	−0.235*** (0.0421)	−0.0273 (0.0453)
Expt	0.0217* (0.0126)	0.0281*** (0.00992)	0.0826* (0.0444)	−0.0825* (0.0492)	0.0206 (0.0153)	0.0198** (0.00883)	0.0392 (0.0252)	−0.0354 (0.0271)
Impt	0.00211 (0.0110)	0.0166* (0.00863)	0.0154 (0.0386)	−0.0273 (0.0428)	0.000133 (0.0133)	0.0115 (0.00768)	0.0209 (0.0220)	−0.0313 (0.0236)
Fdi	−0.160** (0.0648)	0.110** (0.0509)	1.212*** (0.227)	−1.566*** (0.253)	−0.301*** (0.0783)	0.0957** (0.0453)	0.217* (0.129)	−0.689*** (0.139)
Sir	−0.304*** (0.0385)	−0.00184 (0.0302)	0.314** (0.135)	−0.667*** (0.150)	−0.521*** (0.0464)	−0.0157 (0.0269)	−0.213*** (0.0768)	−0.344*** (0.0826)
Tir	−0.309*** (0.0437)	0.231*** (0.0343)	0.764*** (0.153)	−1.366*** (0.170)	−0.697*** (0.0528)	0.216*** (0.0305)	−0.138 (0.0873)	−0.851*** (0.0939)
Soe	−0.00967 (0.0204)	−0.173*** (0.0160)	−0.868*** (0.0716)	1.025*** (0.0795)	−0.0403 (0.0246)	−0.141*** (0.0142)	−0.443*** (0.0407)	0.541*** (0.0438)
Obs.	850	850	822	822	792	822	822	822
R^2	0.410	0.204	0.297	0.301	0.338	0.190	0.162	0.279

Data sources China's GDP Accounting: Historical Data 1952-1995, *China's GDP Accounting: Historical Data 1996-2002*, *China's GDP Accounting: Historical Data 1952-2004*, *China Statistical Yearbook 2005–2008* and *China Compendium of Statistics: 1949–2008*. *Note* (1) The data series of Chongqing only starts from 1996. Therefore, we merge Chongqing into Sichuan province. Data of Hainan is from 1990 to 2007 and data of Xizang is from 1984 to 2007; (2) the numbers in the table corresponding to the explanatory variables are regression coefficients and the numbers in the parentheses are standard errors, ***p < 0.01, **p < 0.05, *p < 0.1. Explanatory variables such as capital output ratio (*KtY*), technological progress (*Tfp*) and real GDP per capita (*Rpgdp*) are taken in the logarithm form; (3) *NLS* and *RLS* stands for nominal and real labor's share of income respectively

compensation effect of technological progress are also negative and these negative effects are larger than the positive output effect. This means that capital-biased technological progress strengthens the substitution effect of capital to labor.

In terms of opening factors, export increases the labor's share of income through increasing employment and wage but decreases the labor's share of income through increasing output. These two effects cancel with each other, leaving positive but marginal significant synthesized effect which is consistent with the neoclassical trade theory. Another opening factor, i.e., FDI, have positive impacts on the labor's share of income by means of increasing the employment and compensation, which can be referred as "wage premium" effect. However, FDI poses a downward shock on the labor's share of income by increasing output and such negative effect outweighs "wage premium" effect, which is one of the most important factors for the decrease of total labor's share of income. Interestingly, our regression results provide direct evidence about the tentative inference of Luo and Zhang (2009b) about the influencing mechanisms of FDI variable. Compared with other ownership types, although FDI firms enjoy wage premium effects, their labor productivity are much higher than other two ownership types (private-owned and state-owned) so that FDI firms has the lowest labor's share of income (Zhou et al. 2010a).

We argue that it is necessary to acknowledge the positive effects of FDI for promoting technological progress and productivity in China, however, we shall also aware that the labor compensation paid by FDI firms are relatively lower compared with such high productivity. This implies that the low labor cost is still the main attracting reasons for the entry of foreign capital to China.

From the perspective of ownership structure, economic efficiency and the speed of development has experienced rapid increase because the industry structure has transformed from agriculture industry to industrial and service industries in China. Therefore, the output effects for the industry structure variables (the shares of secondary and tertiary industry) are negative and larger than the positive employment and compensation effects which pose a downward pressure on the labor's share of income. This again suggests that the moving of the labor's share of income in China is more consistent with the "Kuznets" fact. Different from level equations, coefficients of reform of SOEs in the difference equations are not significant which is the result of cancelling effects between positive output effect and negative employment and compensation effects.

We also find that the regression results of the real labor's share of income are consistent with the regression results of nominal labor's share of income, indicating the robustness of the regression results. Meanwhile, we also find some minor differences between regression results for nominal and real labor's share of income. For example, export variable doesn't become significant any more for the real labor's share of income. In addition, the coefficients of industry structure variables are also different from the nominal labor's share of income. We find negative compensation effect for secondary industry for the real labor's share of income. We argue that the sufficient supply of rural surplus labor and fast development of industrial sector will be helpful for the increase of nominal labor's compensation but don't necessarily increase the real labor's compensation which will hinder the

increase of the real labor's share of income. Therefore, industrialization will accelerate the decreasing for the real labor's share by overlapping negative compensation and output effects. We also find that negative effects of industry structure variables for the real labor's share of income are much stronger, indicating more significant "Kuznets" facts of the labor's share of income.

6.5 Conclusion and Policy Implication

First, by using decomposition equations for the labor's share of income, this chapter decomposes the movement of the labor's share of income into employment, compensation and output effects. Based on the decomposition equations, we not only distinguish the three effects between the nominal and real labor's share of income but also examine the movements of three effects of labor's share of income for the whole China and across provinces since reform and opening up. Both decompositions of the nominal and real labor's share of income show that employment effect is relatively small and the change of labor's share of income is mainly determined by the opposite movements between compensation and output effects. The decomposing results of the nominal and real labor's share of income across provinces are similar to the case of the whole nation, indicating that the three effects and their relations converge across provinces. By decomposing the movements of the labor's share of income into employment, compensation and output effects, we are able to discuss the reasons behind the movements of the labor's share of income through different channels. It is also helpful for examining the interactions between labor's share of income and other basic macroeconomic variables, adding more economic insights for the empirical analysis. Through decomposition, we are able to know the extent of impacts of the volume of labor supply and demand, the price level of the labor forces and overall economic development on the movements of the labor's share of income. We find that the compensation and output effects for the nominal labor's share of income closely relate to the movement of the general price. Such close relations will lead us to get a wrong estimation about the direction and extent of the movement of the labor's share of income if we are not able to separate the price impacts. After excluding the price factors, the real labor's share and its decomposition help us to re-evaluate and re-explain the movement of the labor's share of income so that we can get the real picture of the movement of national income distribution in China.

Secondly, this chapter uses the provincial panel data to analyze the movement of the labor's share of income and its determinants in China from 1978 to 2007. By using neoclassical framework, we not only discuss the traditional variables such as factor input ratio and technological progress, but also opening factors such as export and FDI and transition factors such as industry and ownership structure. We use both level and difference equations to discuss the determinants of the movement of the

labor's share of income. We find that capital and labor strongly substitute with each other in China and the capital-biased technological progress has further made the income distribute more inclining to the capital. Meanwhile, both regression results of level and difference equations for the industry structure variables (measured by the shares of secondary and tertiary industry) have relatively strong explaining power for the decreasing of the labor's share of income. This means that from the perspective of regional level, the movement of the labor's share of income in China is more consistent with the "Kuznets" fact. In addition, trade variables as opening factors are consistent with the prediction of neoclassical trade theory. And foreign investment variable has a significant and negative effect to labor's share of income. Besides, we also examine how these variables have impacts on the movement of the labor's share of income through three main channels, i.e., employment, compensation and output channels. We find that capital substitutes labor mainly through the negative employment and compensation effects and capital-biased technological progress further strengthens such substitution effect.

The composite effect of export is positive and marginally significant because of the cancelling between two effects which is also consistent with neoclassical trade theory. The negative output effect of FDI outweighs the "wage premium" effect which accelerates the decrease of total labor's share of income. In terms of industry structure variables, the output effect outweighs other two effects which pose a downward pressure on the labor's share of income, supporting the "Kuznets" fact of the labor's share of income again.

To further promote the urbanization development strategy, the industry structure in China will continue to transfer from agriculture sector to industrial sector. Meanwhile, in order to accelerate the transition of economic development mode, the industry structure within the industrial sector will transfer from labor-intensive industries to capital-intensive, technology-intensive and knowledge-intensive industries. One of the import features of such transitions is that the industry structure change has transferred from industries with high labor's share of income to industries with low labor's share of income. Therefore, both types of industry structure changes pose unfavorable factors on the labor's share of income. However, with further economic development, the economy will move towards the post-modernization era after the establishment of industrialization and the tertiary industries, represented by the service industry, will become the new engine of economic growth. Since the labor's share of income in the service sector is relatively higher than that in the industrial sector, the promotion of the service sector is helpful for preventing the decrease of the labor's share of income. Therefore, when conducting industrial policies, government should consider whether the industry structure change will influence the distribution pattern between labor and capital or not and whether it will deviate the balanced distribution path between labor and capital or not. We argue that when promoting the transition of economic and industry structure, government should, on the one hand, rely on the coordination of industry structures from the primary to secondary and tertiary industries, on the

other hand, it should rely on the transition promoted by technological progress, increasing labor skills and management innovation. The pace, speed and strength of conducting industrial policies should not only fulfill the requirement of upgrading the China's economic structure, but also aim to keep a relatively stable distribution pattern for China.

References

Acemoglu D (2003) Labor- and capital-augmenting technical change [J]. J Eur Econ Assoc 1(1):1–37
Bai C, Qian Z (2009a) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41
Bai C, Qian Z (2009b) On the increase in the Chinese aggregate capital income share: an investigation from provincial perspective [J]. J Tsinghua Univ (Philos Soc Sci) 24(4):137–147
Bai C, Qian Z (2010) Determinants of labor's share of income: evidence from provincial panel data in china. J World Econ 12:3–27
Bai C, Qian Z, Wu K (2008) Determinants of factor shares in China's industrial sector [J]. Econ Res J 8:16–28
Bentolila S, Saint-Paul G (2003) Explaining movements in labor income share [J]. Contrib Macroecon 3(1):1103–1136
Cai F (2010) Demographic transition. Demogr Dividend Lewis Turn Point China, Econo Res J 4:4–13
Cai F, Du Y (2011) Wage growth. Wage Converg Lewis Turn Point, Econ Perspect 9:9–16
Decreuse B, Maarek P (2008) FDI and the labor share in developing countries: a theory and some evidence [EB/OL], Working Paper, GREQAM, University of Aix-Marseilles
Dunning JH (1988) Explaining international production [M]. Unwin Hyman, London
Gong G, Yang G (2010a) Analysis of China's unequal distribution of income from the perspective of functional income distribution [J]. Soc Sci China 2:54–68
Gong G, Yang G (2010b) The evolution of the share of wage income in national income [J]. Manag World 5:45–55
Guo Q, Lv B (2011) The influence of tax on factor income distribution [J]. Econ Res J 6:16–30
Guo Q, Lv B (2012) On the effects of factor income distribution on the residents' income distribution [J]. Soc Sci China 12:46–62
Helpman E, Melitz MJ, Yeaple SR (2004) Export versus FDI with heterogeneous firms [J]. Am Econ Rev 94(1):300–316
Huang Q, Wei X (2010) Macroeconomic effects of decreasing share of labor incomes in China: empirical analysis based on provencal panel data [J]. Financ Trade Econ 4:121–127
Huang X, Xu S (2009) Reasons for the decline of labor share: from the angle of labor-saving technical progress [J]. Econ Res J 7:34–44
Jiang L (2008) Trend and influential factors of labor share in China: an analysis based on China's provincial panel data [J]. Mod Econ Sci 30(4):7–12
Kaldor N (1961) Capital accumulation and economic growth [A]. In: Lutz FA, Hague DC (eds) The theory of capital [C]. St. Martin Press, New York
Kalleberg AL, Wallace M, Raffalovich LE (1984) Accounting for labor's share: class and income istribution in the printing industry [J]. Ind Labor Relat Rev 37(3):386–402
Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: A U-shaped curve [J]. Econ Res J 1:70–82
Lin Y, Li Z (2004) Policy burden, moral hazard and soft budget constraint [J]. Econ Res J 2:17–27
Lin JY, Tan G (1999) Policy burdens, accountability, and the soft budget constraint [J]. Am Econ Rev 89(2):426–431

Luo C, Zhang J (2009a) The economic explanation of decrease of labor income share: empirical evidence from China's provincial data [J]. Manag World 5:25–35
Luo C, Zhang J (2009b) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79
Melitz MJ (2003) The impact of trade on intra-industry reallocations and aggregate industry productivity [J]. Econometrica 71(6):1695–1725
Pan S (2007) Trade liberalization, biased learning effect and wage inequality in developing countries [J]. Econ Res J 6:98–105
Qian Z (2011) Research on factor income distribution of China [M]. China Financial Publishing House, Beijing
Shan H (2008) Re-estimating the capital stock of China: 1952-2006 [J]. J Quant Tech Econ 10:17–31
Shao M, Huang J (2010) FDI and China's regional labor share: empirical evidence from industry [J], 9(4): 1189–1210
Song D, Wang L, Dong Z (2010) Does skill-biased technological progress exist: evidences from China's empirical evidences [J]. Econ Res J 5:68–81
Wang Y, Sheng D (2010) Factor accumulation, skill-biased technological progress and labor's share of income [J]. World Econ Pap 4:33–50
Wen J, Zhou L (2010) Variations in the labor income share in China's industry during 1997-2008 [J]. Chin J Popul Sci 4:31–45
Xiao H, Hao F (2009) Comparative research on the structure of primary distribution of income among China and foreign countries [J]. Financ Trade Econ 2:13–21
Xiao W, Zhou M (2010) Change of trade mode and decrease of labor share: empirical evidence from China's industrial sector [J]. J Zhejiang Univ (Humanit Soc Sci) 5:154–163
Zhang J (2012) Estimation and analysis of China's labor share in GDP and total wage level [J]. Econ Perspect 9:10–19
Zhou M (2014) Estimation and analysis of movements of real labor's income share [J]. Chin J Popul Sci 1:108–116
Zhou M, Xiao W, Yao X (2010a) Firm heterogeneity, ownership structure and labor income share [J]. Manag World 10:24–33
Zhou M, Xiao W, Yao X (2010b) Unbalanced economic growth and uneven national income distribution: evidence from China [J]. China Ind Econ 6:34–45

Chapter 7
Change of Trade Mode and Decrease of Labor's Income Share: Empirical Evidence from China's Industrial Sector

This chapter decomposes the labor's share of income in industrial sector and finds the movement of industrial structure within the industrial sector explains minor part of the reason for declining labor's share of income. We also analyze the effects of trade, technological progress and state-owned monopoly power by using the production cost model. It indicates that technological progress and decrease of monopoly power will impose a decrease on labor's share of income. Ceteris paribus, the coefficient of import penetration rate in the trade variables is positive and significant. Regression in different stages shows that the changing of trade mode is main reason for declining labor's share of income. In the time of import–export related processing trade in Pearl River delta, import penetration rate promote labor demand thus raise the labor's share of income. While, in the time of export-led processing trade in Yangtze River delta, the simultaneous decline of import penetration rate and labor's share of income is the result of lowering raw material and labor cost from profit maximizing enterprises. Therefore, the import penetration has different mechanisms on labor's share of income in different development stages in China.

7.1 Introduction

Since the reform and opening up in 1978, China has achieved the miracle of amazingly high economic growth. The annual growth rate in China from 1978 to 2008 is about 10 %. However, the living condition of people in China hasn't caught up with the rapid pace of economic growth. During the thirty years' of reform and opening up, the annual growth rate of employees' wage for above scale enterprises, i.e., enterprises with annual revenue of 5 million RMB or more from their main business operations, is 2.8 % less than the economic growth rate. The sluggish growth rate of wage will inevitably result in the decrease of labor's share of income. Based on the income approach of GDP, the share of labor's compensation in GDP decreased from 52.9 % in 1985 to 39.7 % in 2007, decreasing by 13 % in total. Similarly, the share of total wage of urban employees in the value-added in the industrial sector decreased from 17 % in 1980 to 11.3 % in 2007, decreasing by

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5.7 % in total. Therefore, laborers who depend on wage income for the living are getting less and less shares from the fruit of China's economic development, which will at some extent influence the sustainability of economic development and stability and prosperity of society for China. On the one hand, slow growth of income will constraint the residents' consumption power so that the investment and export driven economy will have to face surplus production capacity and ineffective demand (Economists 2007). On the other hand, the decrease of laborers' income will enlarge the income disparity between laborers and capital owners. Such widening inequality will pose a dramatic challenge on the social and political stability.

Because of the joining of competition of global market by emerging economies, e.g., China, the labor's share of income in many industrialized countries also has experienced significant decrease during the last three decades. Many economists blame trade and globalization as the main reasons for decreasing labor's share of income. Their arguments are mainly based on Heckscher-Ohlin (HO) model which claim that importing labor intensive goods through trade liberalization by developed countries has resulted in the decrease of domestic labor demand thus lead to the decrease of labor's share of income. Empirical studies of several OECD and industrial countries support the logics of HO theory (Harrison 2002; Guscina 2006; Jaumotte and Irina 2007). In addition, economists also provide some other reasons that possibly explain the decrease of labor's share of income in developed countries, such as skill-biased technological progress (Bentolila and Saint-Paul 2003) and the weakening power of trade union (Glyn 2006).

In the recent years, labor's share of income in China has also experienced notable decrease which attracts attention from various audiences. Bai and Qian (2009) argue that the change of the statistical caliber[1] can account for at least 50 % of the decrease of labor's share of income. In addition, their study shows that the change of industry structure from agriculture sector with high labor's share of income to non-agriculture sector with low labor's share of income is another important reason for decreasing labor's share of income. Similarly, Li et al. (2009) argue that labor's share of income will move along with economic development and form a U-shape curve. They claim that China still positions at the first half part of the U-shape curve, i.e., the labor's share of income are in the decreasing path.

Meanwhile, scholars also discuss the influencing factors of decreasing labor's share of income in China. Luo (2008) argues that the decreasing labor's share of income in China may be caused by the positive shocks from the labor market, the competition for foreign investment by local government, capital-biased technological progress and heavy industrialization. Jiang and Zhang (2008) argue that the export has a positive effect on the labor's share of income while the import has a negative effect. In order to explain the decreasing labor's share of income, Bai et al. (2008) find that the explanatory contribution by the restructuring state-owned

[1]Before 2004, labor's compensation and operational profits for the proprietors are categorized as labor's compensation. After 2004, all proprietors' income is categorized as operational profits.

economy, increasing monopoly power and other factors including technology are 60, 30 and 10 % respectively. Regression results for micro firm level data by Li et al. (2009) show that the labor's share of income are closely relate to the bargaining power of workers and state-owned share. They find that the increase of bargaining power of workers will help to increase the labor's share of income while the increase of capital intensive SOEs will lead to the decrease of labor's share of income.

The scope of this chapter is different from previous studies for the following points. First, previous studies have discussed the decrease of labor's share of income from the perspectives of three main industries which will be subject to policy and statistical factors.[2] However, this chapter will focus on the change of industry structure with the industrial sector so as to avoid the above complications. Second, most studies have implied neoclassical trade theory for explaining the decrease of labor's share of income but such theory seems to contradicts with the reality in China. This chapter will try to discuss the impacts of trade on the labor's share of income in China from a new perspective. Third, by collecting trade data within the industrial sector, this chapter is able to analyze trade effects at the two digit industry level. Fourth, this chapter will also control factors such as technological progress and monopoly power of SOEs to reflect transition features of Chinese economy.

7.2 Industrial Differences and Decomposition of Labor's Share of Income

7.2.1 Industrial Differences of Chinese Labor's Share of Income

Total labor's share of income can be understood as the weighted average of each industry's labor's share of income where the weight is value-added share in each industry. Therefore, the decrease of labor's share of income can be decomposed into results of two effects. The first result is due to the decrease of labor's share of income within each industry and the second result is due to the adjustment of industry structure. Decomposing labor's share of income by industry is a main way to examine the effects of industry structure change (Solow 1958; Young 2006).

[2]It is worthwhile to note that there are significant differences of labor's share of income between China and US, with the former higher than 80 % while the latter lower than 20 %. Part of the reason for overestimation of labor's share of income in the agriculture sector is that NBS has put all incomes of people who engage in the agriculture industry (i.e., Farming, Forestry, Animal Husbandry and Fishery) as labor's compensation before 2004 (Bai and Qian 2009). If the agriculture labor's share of income in China is the same as US, the structure change from agriculture to non-agriculture industry will help to increase the labor's share of income rather than decrease it. Such counter-factual analysis indicates that the labor's share of income in agriculture sector will be significantly affected by agriculture policy and statistical factors.

Bai and Qian (2009) and Luo and Zhang (2009) have decomposed the labor's share of income by three main industries. Their results show that the decrease of labor's share of income is partly due to the industry structure change, i.e., the decrease of labor's share of income by transforming from agriculture industry to non-agriculture industry, and partly due to the decrease of labor's share of income within the secondary industry. Table 7.1 can illustrate their points in a more clear way. First, there are significant differences of the labor's share of income among three main industries. The primary industry has the relatively high labor's share of income (around 0.85) while the labor's shares of income in the secondary and tertiary industries are relatively lower (0.45–0.50 in the secondary industry and 0.54–0.63 in the tertiary industry). Second, from the changes of industry structure, the share of primary industry decreases significantly (it decreases by 7 % for the observing period), the share of secondary industry is relatively stable (it keeps between 0.45 and 0.47), and the share of tertiary industry experiences significant increase (it increases by 6–7 % for the observing period). Therefore, the changes of industry structure from high share agriculture industry to low share non-agriculture industry will pose downward pressure on the total labor's share of income. Finally, if we examine the movements of labor's share of income within each industry, we can find that the movement of labor's share of income within the secondary industry is consistent with the movement of total labor's share of income. Both labor's shares of income experience a U-shape movement with the turning point at 1998. Therefore, besides the factor of industry structure change, the movement of the labor's share of income within the secondary industry is an important factor for total labor's share of income.

Table 7.1 Value-added shares of three main industries and their labor's share of income 1993–2004

Year	National	Labor's share of income within each industry			Value-added shares of each industry		
		Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
1993	0.5603	0.8787	0.4502	0.6316	0.1993	0.4703	0.3303
1994	0.5721	0.8728	0.4566	0.6386	0.2032	0.4662	0.3307
1995	0.5863	0.8833	0.4803	0.6291	0.2052	0.4563	0.3386
1996	0.5879	0.8879	0.4816	0.6181	0.2018	0.4514	0.3468
1997	0.5909	0.8876	0.4936	0.6066	0.1894	0.4511	0.3595
1998	0.5927	0.8889	0.5020	0.5993	0.1792	0.4482	0.3726
1999	0.5871	0.8866	0.4974	0.5929	0.1652	0.4465	0.3883
2000	0.5751	0.8792	0.4818	0.5818	0.1503	0.4498	0.3999
2001	0.5717	0.8764	0.4791	0.5845	0.1427	0.4460	0.4113
2002	0.5657	0.8712	0.4740	0.5912	0.1342	0.4465	0.4193
2003	0.5480	0.8607	0.4601	0.5857	0.1231	0.4644	0.4125
2004_adj	0.5466	0.8654	0.4502	0.5411	0.1245	0.4761	0.3993

Note Data from 1993 to 2003 are from *China's GDP Accounting: Historical Data 1952–2004*; The adjusted data in 2004 are from Bai and Qian (2009) in their Table 4

7.2.2 *Decomposing Labor's Share of Income Within the Industrial Sector*

Bai and Qian (2009) further argue that the movement of labor's share of income within the industrial sector in the secondary industry is more important.[3] Therefore, we are going to use data of 33 sub-industries[4] within the industrial sector to examine the change of the labor's share of income for the entire industrial sector and its sub-industries. Table 7.2 lists the change of labor's share of income of 6 representative sub-industries categorized by factor intensity. Due to the space limit, we only choose 7 years to report (see more details in Appendix Table 7.5). It can be found that labor's share of income has shown a consistent moving trend during the observing period, whether from individual representative industrial, from the classification of factor intensity or from the total industrial sector. The labor's share of income has shown an increasing trend during 1993 to 1996 and reached the peak point in 1996, and then it has shown a significant decreasing trend from 1997 to 2007.[5] However, the changing extent is different among these sub-industries. For example, Mining and Washing of Coal which has the highest labor's share of income exhibits the largest changing extent, while Manufacture of Tobacco which has the lowest labor's share of income shows relatively stable movement. In addition, Manufacture of Textile, a typical labor intensive industry, shows a relative large changing extent. The labor's share of income in this industry has decreased by 72 % from 1996 to 2007.

In order to examine the effect of industry structure change within industrial sector on the labor's share of income, we are going to use the method of comparing differences between fixed weights and weighted average labor's share of income. The basic idea for such comparison is that: first, we will calculate the value-added share of each sub-industry in 1993, then we will fix the value-added shares at 1993 level for the following years, and finally we get the movement of labor's share of income by keeping the industry structure at 1993 level. We can now compare the

[3]The secondary industry is composed by two sectors, i.e., construction sector and industrial sector. Construction sector accounts for a small share of the secondary industry and movement of its labor's share of income are relatively stable so that the impact from construction sector is small. Therefore, we are going to focus only on the industrial sector.

[4]The industrial classification in this chapter is based on *Industrial Classification for National Economic Activities* (GB/T4754-2002). To ensure the time consistency for the data due to the change of classification over time, we delete several industries, i.e., Mining of Other Ores, Transport of Timber and Bamboo, Manufacture of Artwork and Other Manufacturing, Recycling and Disposal of Waste. We merge Processing of Food from Agricultural Products with Manufacture of Foods to form Processing and Manufacture of Foods. And we merge Production and Distribution of Electric Power and Heat Power, Production and Distribution of Gas and Production and Distribution of Water together to form Production and Distribution of Electric Power, Gas and Water. Therefore, 39 subindustries are condensed into 33 sub-industries. For the following data used in regression, we also adopt the same industrial classification in order to keep consistency for the data.

[5]Mining and Washing of Coal is an exception. The labor's share of income in this industry increases to 0.545 in 1994 and then decreases afterwards.

Table 7.2 Labor's share of income within the industrial sector 1993–2007 (representative industries and years)

Types of industrial sector	Weight	1993	1996	1999	2002	2005	2006	2007
Categorized by factor intensity								
Primary products sector	0.220	0.177	0.205	0.157	0.134	0.092	0.085	0.080
Labor and resource intensive products sector	0.198	0.164	0.196	0.161	0.118	0.090	0.086	0.078
Low-tech products sector	0.095	0.136	0.245	0.197	0.140	0.078	0.071	0.066
Medium-tech products sector	0.181	0.206	0.262	0.200	0.144	0.105	0.098	0.088
High-tech products sector	0.171	0.173	0.193	0.146	0.115	0.082	0.081	0.081
Unclassified products sector	0.134	0.102	0.126	0.110	0.104	0.093	0.090	0.084
Representative sub-industries								
Mining and washing of coal	0.033	0.509	0.472	0.432	0.363	0.230	0.232	0.207
Manufacture of tobacco	0.037	0.029	0.045	0.044	0.041	0.038	0.034	0.034
Manufacture of textile	0.054	0.201	0.264	0.181	0.129	0.089	0.084	0.073
Manufacture of medicines	0.022	0.140	0.174	0.147	0.127	0.100	0.094	0.084
Manufacture of general purpose machinery	0.041	0.237	0.316	0.248	0.171	0.104	0.096	0.089
Manufacture of communication equipment, computers and other electronic equipment	0.062	0.164	0.172	0.115	0.104	0.080	0.083	0.095
Aggregated Industrial Sector (weighted average)	–	0.166	0.204	0.159	0.125	0.091	0.086	0.080
Aggregated Industrial Sector (fixed weights in 1993)	–	0.166	0.222	0.175	0.129	0.098	0.083	0.076

Note Data sources are from various issues of *China Statistical Yearbook* and *China Labor Statistical Yearbook*; numbers in the first column are average weights of value-added shares from 1993 to 2007; numbers in column two to eight are shares of total wage in value-added of each industry; numbers in the second last row are weighted average labor's share of income aggregated on the level of industrial sector; numbers in the last row are the aggregate labor's share of income with the assumption that the value-added share of each industry are kept at 1993 level; The factor intensity classification are based on Sheng and Ma (2008) in their Table 1; Industrial classification for sub-industries is based on *Industrial Classification for National Economic Activities* (GB/T4754-2002)

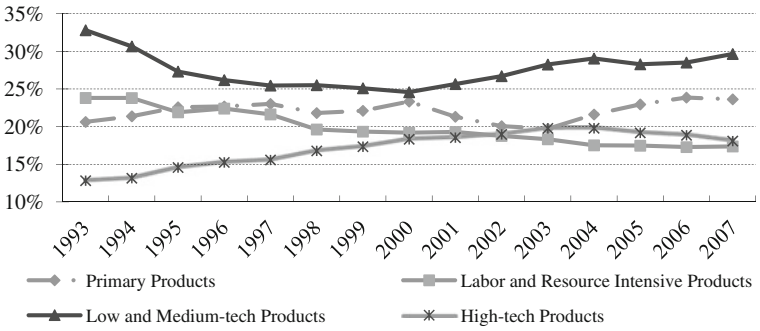

Fig. 7.1 Industry structure change by factor intensity 1993–2007

fixed weight series with the weighted average labor's share of income for discussing the impact of industry structure change. If the former series is higher than the latter, it means that the change of industry structure results in the decrease of labor's share of income. If the former series is lower than the latter, it means that the change of industry structure results in the increase of labor's share of income. From Table 7.2, the last two rows have given the fixed weights and weighted average labor's share of income for the observing period. Through comparison, we find that in most years, labor's shares of income with fixed weights are higher, which means that the industrial structure has moves from industries with high labor's share of income to industries with low labor's share of income, leading to the decrease of total labor's share of income with in the industrial sector.

In addition, we examine detail changes of industrial structure within the industrial sector based on the classification of factor intensity. In Fig. 7.1, we find that the value-added shares in labor and resource intensive products sector have experienced significant decrease, while the shares in high-tech products sector increases significantly from 1993 to 2007. This means that the industry structure within the industrial sector has transferred from labor intensive to technology intensive which is one of the reasons for the decrease of labor's share of income within the industrial sector. However, we don't find significant differences between fixed weights and average weighted labor's share of income. The variances for both labor's shares of income are 0.0024 and 0.0022 during 1993 to 2007 respectively. Therefore, we argue that the decrease of labor's share of income within the industrial sector is mainly driven by the decrease of labor's share of income within each sub-industry.

7.2.3 Robustness Test from Input–Output Table

There are two main issues for the labor's share of income obtained by the previous section. First, the statistical caliber of labor's compensation by using data of wage and employment numbers is too narrow. The definition of employees in the *China Statistical Yearbook* is that all kinds of people who are working in and paid by

state-owned, urban collective, joint venture, shareholding, foreign-owned, HMT invested firms and other units and their subsidiaries. Similarly, the statistical range of wage includes state-owned units, collective units, shareholding firms, joint venture firms, limited corporations, share limited corporation, HMT invested firms and foreign invested firms, covering 0.12 billion urban employees. Labor statistical reporting system lacks of recording information of private-owned enterprises (POEs).[6] Second, the current statistics for the industrial sector are mainly based on the above scale industrial firms,[7] ignoring the statistics of below scale industrial firms which are mainly POEs. Since reform and opening up, the private economy in China develops rapidly and has become an important component of the national economy. At current, number of employees in the urban POEs has reached to more than 60 million, accounting for half of the employees in urban units and third quarters of the employees in urban enterprises. The average wage incomes of employees in POEs are relative lower compared with other employees. Based on the survey for several regions, the average wage in POEs is about 60 % of those average wages of the urban labor in the statistical yearbook (Xinhua News 2009). The aggregate wage data form above scale industrial firms will be downward biased due to the omission of POEs. In order to examine the impacts such possible biases, we would like to use other comparable data to conduct a robustness test.

Another channel for measuring industrial labor's share of income is by using input–output table. Input–output table will be made for years with last number 2 and 7. The extension input–output table will be made for years with last number 0 and 5. Different from the statistical yearbook, input–output table will directly GDP accounts of each sub-industry based on the income approach of GDP. Therefore, we can get the labor's share of income of each sub-industry directly. In order to correspond to the industrial classification and time span in the above section, we've collected related data of input–output table from 1992 to 2007.[8] Similarly as Tables 7.2 and 7.3 lists the movements of labor's share of income of sub-industries categorized by factor intensity and 6 representative sub-industries from input–

[6]The statistical range of wage in China Statistical Yearbook doesn't include wages of the following employees: (1) employees in town and village enterprises (TVEs); (2) employees in the private-owned enterprises; (3) proprietors in the urban region; (4) retired workers; (6) teachers in the private school; (7) foreigners (including people from Hong Kong, Taiwan and Macau) working in the urban units; (8) others who are not included in the statistical range.

[7]The definition of above scale firms evolves over time in China. They are referred as independent accounting industrial firms during 1993–1997. From 1998 and 2006, they are referred as all state-owned and firms with annual revenue of 5 million RMB or more from their main business operations. Between 2007 and 2008, they are redefined as industrial firms with annual revenue of 5 million RMB or more from their main business operations.

[8]In 2002, China has adopted a new industrial classification for national economic activity (GB/T4574-2002). We have made adjustments according to the change of the industrial classification, forming 20 consistently comparable sub-industries with in the industrial sector from 1992 to 2007.

output table (see more details in Appendix Table 7.6). We find that the labor's shares of income calculated from input–output table are significantly higher than the shares based on the wages from the statistical yearbook, indicating the existence of downward biases from the previous method. However, it is worthwhile to note that the moving trends of both shares are consistent with each other. The industrial labor's share of income calculated from input–output table has also shown a U-shape curve with the turning point at 1997. Since the movement of labor's share of income is our main focus, we would like to argue that the labor's share of income based on the wages from the statistical yearbook are still reliable. Although the labor's share of income calculated from input–output table is more direct and accurate, we are not able to get a continuous panel data from this data source which is the main drawback of input–output table. Therefore, the econometric analysis will still use the labor's share of income based on the wages from the statistical yearbook.

7.3 Empirical Model and Data Description

7.3.1 Trans-Log Cost Function Model

By decomposing the labor's share of income within the industrial sector, we find that the industry structure cannot explain the fact of decreasing labor's share of income in the industrial sector. Therefore, we are going to use regression analysis to explain the reasons for decreasing labor's share of income within each sub-industry. The empirical model used in this chapter is mainly based on Kohli's (1991) trans-logarithm model of firm's cost function. Feenstra and Hanson (2001) use this model to discuss wage difference between skilled and unskilled workers. Different from Feenstra and Hanson (2001), this chapter will apply their idea into discussion about the income difference between capital and labor. Meanwhile, we will use this model to explore the effect of trade factors on the labor's share of income. More specifically, we examine firms who aim to minimize their cost, where cost function is C(l, k, z). Here, l and k are labor and capital input respectively, and z is a set of exogenous structural variables which will shift the cost function. Assume that the cost function is homogenous linear, then the trans-log form of cost function can be expressed as:

$$\begin{aligned}\ln C = {} & \theta_0 + \beta_1 \ln l + \beta_2 \ln k + \frac{1}{2}\beta_3 (\ln l)^2 + \frac{1}{2}\beta_4 (\ln k)^2 + \beta_5 \ln l \times \ln k \\ & + \sum \delta_j z_j + \sum \varphi_j z_j \ln l + \sum \phi_j z_j \ln k\end{aligned} \tag{7.1}$$

Here, j is the subscript of structure variables. If we differentiate the cost function regarding to labor and capital respectively, we can get the following two equations.

$$\frac{\partial \ln C}{\partial \ln l} = \frac{l \cdot \partial C/\partial l}{C} = S_L = \beta_1 + \beta_3 \ln l + \beta_5 \ln k + \sum \varphi_j z_j \tag{7.2}$$

$$\frac{\partial \ln C}{\partial \ln k} = \frac{k \cdot \partial C/\partial k}{C} = S_K = \beta_2 + \beta_4 \ln l + \beta_5 \ln k + \sum \phi_j z_j \tag{7.3}$$

We can easily know that the labor's share of income is the derivation of cost function to labor. The nominator of the labor's share of income is product of number of laborers and marginal product of labor, i.e., labor income, and denominator of the labor's share of income is total cost. Similarly, taking derivation of cost function to capital, we can get the capital's share of income. The denominator is the product of capital volume and marginal product of capital, i.e., capital income and denominator is total cost. Now, let's assume that there are only two input factors in the economy which are labor and capital. Then, the game between labor and capital is a constant sum. That is to say, capital's share of income is the subtraction between a constant, i.e., one, and the labor's share of income. The decrease of labor's share of income means the increase of capital income and vice versa. For simplification, this chapter only discusses the determinist factors of the labor's share of income so that we only need to transform Eq. (7.2) into econometrics model.

$$Ls_{i,t} = \alpha_0 + \alpha_1 \ln l_{i,t} + \alpha_2 \ln k_{i,t} + \Phi Z_{i,t} + \varepsilon_{i,t} \tag{7.4}$$

$$\Phi Z_{i,t} = \varphi_1 state_{i,t} + \varphi_2 tech_{i,t} + \varphi_3 x^e_{i,t} + \varphi_4 x^m_{i,t} \tag{7.5}$$

In Eq. (7.4), L_S is the labor's share of income, l is number of laborers, k is capital stock and Z is a set of the structural variables influencing the labor's share of income. In addition, we further decompose structural variables Z into 4 sub-factors which can be expressed in Eq. (7.5). The monopoly power of SOEs represented by the share of state-owned and state-controlled enterprises is denoted as *state*, the technological progress represented by total factor production (TFP) is denoted as *tech* and export dependence rate and import penetration rate are denoted as x^e and x^m respectively for measuring the impacts of trade. Besides, ε is the error term of regression equation, α and Φ is the coefficient of regression variables, φ is the coefficient of specific structural variable and subscript i and t represent industries and years.

7.3.2 Explanatory Variables and Data Description

Since reform and opening up, Chinese trade mainly concentrates in industrial manufacturing sector. Therefore, this chapter will take sub-industries within the

industrial sector cross-section observations. In 1992, after Deng Xiaoping's famous Southern Tour, foreign export has entered into an accelerating period. Meanwhile, system industrial classification of national economic activities (GB/T4754-1994) has been established in 1994, making the statistical data of sub-industries within the industrial sector readily available. Therefore, this chapter will use time series data from 1993 to 2007.

Labor's share of income, *Ls*, is defined as the share of total employees' wages in value-added of each sub-industry; number of laborers, *l*, is defined as the employment number for each sub-industry within the industrial sector; monopoly power of SOEs, *state*, is measured by the share of state-controlled enterprises' value-added in the industrial value-added. When this share is large, it means that monopoly power of SOEs is relatively strong and vice versa. By referring to the study of Zhang et al. (2009), we use perpetual inventory method to estimate capital stock, *k*, in each sub-industry. After deflating the price, we use the net value of fixed assets in 1986 as the base year for capital stock. In addition, we use the price index of fixed asset to deflate new investment[9] during 1986 to 2007. The depreciation rate is calculated by the ratio between current year's depreciation[10] and last year's original value of fixed asset. Meanwhile, combining the output, labor and capital data within industrial sector, we estimate the TFP in each subindustry based on Solow residual method[11] and then use it to measure technological progress, *tech*. Data for measuring above variables are from *China Labor Statistical Yearbook* and *China Industry Statistical Yearbook*.

In order to analyze the effect of trade factors on the labor's share of income, we also collect trade related data. Since 1992, China has recorded trade data according to *The Harmonized Commodity Description and Coding System* (HS). However, one of the drawbacks is that such data are based on the commodity classification rather than industry classification. For comparison purposes, we transfer trade data from commodity classification into industry classification. Sheng (2002) has provided conversion tables among custom's harmonized coding system (HS), Standard International Trade Classification (SITC) and Industry Classification of National Economic Activities (see more in Appendix Tables 7.7 and 7.8). Based on his

[9]The equation for calculating the new investment is as follows: new investment = (original value of fixed assets this year—original value of fixed assets last year)/price index of fixed assets.

[10]Current year's depreciation is the difference between current year's accumulated depreciation and last year's accumulated depreciation. And the equation of current year's depreciation can be expressed as: current year's depreciation = (original value of fixed assets—average balance of net value of fixed assets).

[11]The steps of Solow residual method are as follows: first we use ordinary least square (OLS) regression for Cobb-Douglas (CD) function so as to estimate parameter α and β in CD function; then we difference the real output with the estimated output based on OLS regression to get TFP.

Table 7.3 The determinist factors of labor's share of income in industrial sector 1993–2007

Variables	(a)	(b)	(c)	(d)	(e)	(f)
lnl	0.0662*** (10.22)	0.0919*** (17.22)	0.0782*** (13.07)	0.0818*** (13.27)	0.0702*** (3.27)	0.0922*** (22.08)
lnk	−0.0861*** (−18.86)	−0.0607*** (−15.82)	−0.0442*** (−7.49)	−0.0537*** (−8.10)	−0.0449** (−2.30)	−0.0712*** (−18.26)
x^e	−0.0580** (−2.23)	−0.0331 (−1.53)	−0.0220 (−1.21)	−0.0121 (−1.14)	0.0754** (2.41)	0.0014 (0.08)
x^m	0.0687*** (3.48)	0.0307** (2.03)	0.0351*** (2.65)	0.0358*** (3.70)	0.1237*** (4.00)	0.0330** (2.51)
State	–	0.0632*** (3.74)	0.0398** (2.46)	0.0619*** (3.73)	0.0003 (0.01)	0.0949*** (5.58)
Tech	–	−0.0814*** (−16.86)	−0.0764*** (−14.52)	−0.0853*** (−13.22)	−0.1349*** (−9.96)	−0.0281*** (−4.22)
Year_dum	No	No	Yes	Yes	Yes	Yes
Cons	0.3760*** (9.17)	0.1519*** (4.08)	0.1149*** (3.38)	0.1607*** (5.22)	0.2145*** (3.28)	0.2116*** (6.29)
Time Period	1993–2007	1993–2007	1993–2007	1993–2007	1993–1996	1997–2007
Obs	433	433	433	446	128	310
R^2: overall	0.2996	0.5370	0.5469	0.5317	0.3365	0.5914
Wald Chi^2	432.39 [4]	1216.15 [6]	1536.62 [8]	1383.42 [8]	268.28 [8]	1594.68 [8]

Note Numbers in the table corresponding to the explanatory variables are regression coefficients; the numbers in the parentheses are t statistics; ***p < 0.01, **p < 0.05, *p < 0.1; the last four rows are time period, sample size, overall goodness of fit (R^2) and χ^2 statistics of Wald test for each model respectively

conversion tables, this chapter has used the HS and SITC trade data in the UN Comtrade database to compose sub-industrial import and export data within industrial sector from 1993 to 2007. Meanwhile, we use the middle price of RMB exchange rate against US dollar to get trade volume measured by RMB. In addition, we adjust the data by using effective exchange rate. Then we can get trade variables, i.e., export dependence rate and import penetration rate by diving trade volumes by output.

It is worthwhile to note that China has revised and implemented new Industry Classification of National Economic Activities (GB/T4754-2002) in order to meet with the economic development and international standards. The change of the industry classification will create problems such as inconsistency of the statistical caliber over time. This chapter has dealt with such issues. In addition, total outputs, value-added and original value of fixed assets are not available in 2004. We've

adjusted and estimated these data by using China Economic Census Yearbook in 2004.[12] Besides, we also use linear interpolation method to fill the missing data as a substitutive method. Of course, the modification of data may lower down the robustness of regression results.

7.4 Empirical Results and Discussion

7.4.1 Empirical Results

When conducting regressions on the panel data, we adopt random effect model according to Hausman Test. Regression results are shown in Table 7.3. Column (a) provides regression results when only considering input and trade factors. It can be found that the regression coefficients of labor and capital in the baseline model are expected. The coefficient of labor is significant and positive, meaning that the increase of number of workers will increase the labor's share of income. The coefficient of capital stock is significant and negative, meaning that there is a tradeoff relationship between capital and labor. The increase of capital stock can increase the bargaining power of capital relative to labor, which will decrease labor's share of income. This finding is consistent with the arguments of Li et al. (2009).

From the perspective of industry, the effect of trade on the labor's share of income is different from neoclassical trade theory and also different from the conclusion of Jiang and Zhang (2008) by using provincial panel data. We find that the coefficient of export dependence rate is negative with significant level at 5 %. This does not accord with the prediction of neoclassical trade theory that export can increase the labor demand thus increase the labor's share of income. Meanwhile, we find that the coefficient of import penetration rate is significant and positive, which is also different from the prediction in neoclassical trade theory that importing capital-intensive and technology-intensive products will decrease the labor's share of income in China. At the moment, we are going to first control other factors that may also influence the labor's share of income and we will discuss the effects of trade factor in more detail later.

In regression (b), we introduce other factors that may influence the labor's share of income besides trade factors. The result of regression shows that the coefficient

[12]The assets and output numbers in economic census yearbook for above scale industrial firms are consistently bigger than the corresponding capital value in the statistical yearbook 2004. Therefore, we scale down the output data based on the ratio of capital data between two yearbooks. Then we get the value-added data by considering the proportional relationship between output and value-added. Similarly, we estimate the original value of fixed asset by using such method.

Table 7.4 Labor's share of income within the industrial sector by using input–output table 1992–2007

Types of industrial sector	1992	1995	1997	2002	2005	2007
Categorized by factor intensity						
Primary products sector	0.278	0.257	0.401	0.408	0.263	0.364
Labor intensive products sector	0.343	0.356	0.481	0.454	0.400	0.398
Resource intensive products sector	0.106	0.155	0.231	0.222	0.175	0.248
Technology products sector	0.258	0.336	0.431	0.413	0.327	0.326
Representative sub-industries						
Mining and washing of coal	0.614	0.627	0.682	0.623	0.380	0.480
Manufacture of textile	0.321	0.459	0.475	0.405	0.389	0.376
Processing of timber, manufacture of furniture	0.313	0.324	0.481	0.440	0.359	0.397
Processing of petroleum, coking, and nuclear fuel	0.128	0.205	0.241	0.305	0.208	0.299
Manufacture of electrical machinery and equipment	0.270	0.283	0.434	0.389	0.357	0.294
Manufacture of communication equipment, computers and other electronic equipment	0.263	0.181	0.395	0.339	0.391	0.345
Aggregated industrial sector (weighted average)	0.260	0.302	0.408	0.383	0.298	0.321

Note Data are from corresponding years *China Input and Output Table*. IO table has data of 32 sectors in 1992, 33 sectors in 1995, 40 sectors in 1997, 42 sectors in 2002, 2005, and 2007. 2000 data is missing at current. Numbers in the last row are weighted average labor's share of income aggregated on the level of industrial sector; The factor intensity classification are based on Sheng and Ma (2008) in their Table 1; Industrial classification for sub-industries is based on *Industrial Classification for National Economic Activities* (GB/T4754-1994). Therefore, this classification has some differences with Table 7.2

of state-controlled enterprises is positive, meaning that the decreasing monopoly power is the main reason for decreasing labor's share of income. From time perspective, in mid 1990s, SOE reforms have transferred many small scale SOEs to POEs, maintaining a part of large scale SOEs who enjoy monopolistic status. SOE reforms have changed the determination of employment and wage so that employment and wage is determined mostly by market forces rather than administrative distribution. From then on, a large amount of unemployed workers who formerly employed in state sector now face the question of re-employment and these abundant workers pose a downward shock on the wage level in labor market. From the perspective of industry, the remaining SOEs tend to pay higher wage due to its high monopolistic profit. Therefore, it may appear that some industry with higher share of SOEs will have higher labor's share of income and industry with lower share of SOEs will have lower labor's share of income. We also find that the effect of technological progress measured by TFP on the labor's share of income is significant and negative, meaning that the technological progress will decrease the labor's share of income. We argue that the capital-biased technological progress will increase the allocating capability of capital on production and increase its bargaining power against labor thus decrease the labor's share of income. After controlling factors such as technological progress and state-owned monopoly power, we find that the coefficient of export dependence rate is not significant anymore. This result is similar to Jaumotte and Tytell (2007), meaning that the effects of technological progress and SOE reforms are larger than export effect. On the other hand, the trade index measured by import penetration rate is still significant at 5 % level, meaning that trade factors influence the labor's share of income mainly through import penetration rate.

7.4.2 Robustness Test

To test the robustness of the results, we've added two dummy variables for year 1996 and 2001. In 1996, China has drastically lowered down the unilateral tariff to facilitate trade with outside and be ready for entering the World Trade Organization (WTO). With such efforts, China has succeeded in joining the WTO in 2001. Therefore, the purpose of introducing these two variables is to explore the policy effects of trade opening. We find that both coefficients of dummy variables are significant and negative, indicating that trade opening has a negative effect on the labor's share of income. Again, such results are not consistent with the prediction of neoclassical model. Meanwhile, the introduction of dummy variables has not changed the significance and sign of other variables in a large degree (see column c).

In addition, Statistical Department of General Administration of Customs start to compile *China's Foreign Trade Index* from 1994 and published monthly issues of *China's Foreign Trade Index* in 2005. Therefore, we can obtain monthly import and export value index categorized by Industry Classification of National Economic Activities from 1993 to 2007. After transforming monthly data into annual data, we

use the industrial trade data of starting year, 1993, and value index from 1993 to 2007 to estimate the export dependence rate and import penetration rate. Therefore, we can conduct a robustness test for replacing trade data compiled by using conversion table from Sheng (2002) by industrial trade data from Customs. The results by using new trade data are listed in column (d). We don't find significant difference for coefficients of export dependence rate and import penetration rate by using two data sources, indicating substitutive relationship between two data series. Finally, we compare the two ways of dealing missing data, i.e., linear interpolation method and estimation method by using *China Economic Census Yearbook 2004*. We find that these two methods don't change the previous regression results.

7.4.3 Discussion of Empirical Results

Based on the empirical results above, we find that the determinist factors of the labor's share of income include employment numbers, capital stock, trade variables, technological progress and SOE monopoly power. However, effects of trade variables on the labor's share of income are inconsistent and even opposite with prediction of neoclassical. Therefore, we are going to relationship between trade and the labor's share of income for China.

From the perspective of export and trade opening, trade opening doesn't lead to the increase of the labor's share of income as predicted by neoclassical trade theory. However, trade opening poses a negative effect on the change of labor's share of income. In recent years, China not only exports a large number of labor-intensive products, but also exports a large amount of mechanical and electrical products. Increasing export of these capital-intensive or skill-intensive products will decrease labor demand thus decrease the labor's share of income. Rodrik (2006) shows that the complexity of Chinese export products is much higher than countries with the same per capita GDP. Therefore, this means that export products in China experience transition from labor-intensive to technology-intensive and capital-intensive, which make the export dependence rate fail to reflect the export degree of labor-intensive products. After controlling technological progress and SOE reform, export dependence rate has insignificant effect on the labor's share of income, meaning that technological progress and SOE reform effects are larger and absorb trade effect measured by export dependence rate.

From the perspective of import, regression results indicate that import penetration rate is positively related to the labor's share of income. This means that the movement of import share has similar trend with the movement of the labor's share of income. From Table 7.4, we can find that our explained variable, i.e., the labor's share of income, has a non-linear movement during 1993–2007. Before 1996, the labor's share of income has experienced a relatively fast increase then it rapidly decrease after 1996. We find that the movement of import penetration rate is similar to the change of the labor's share of income. The average import penetration rate

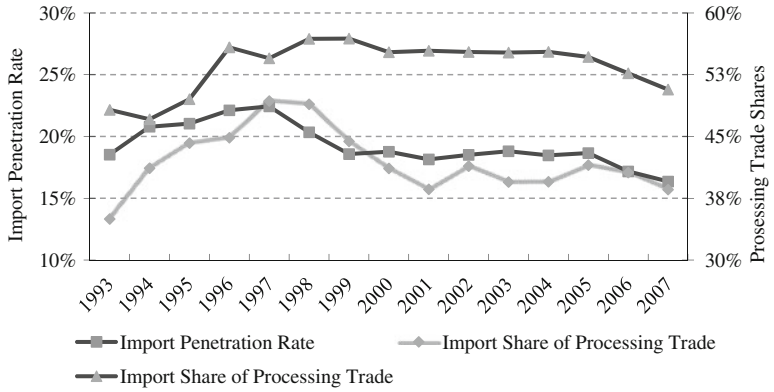

Fig. 7.2 The movement of import penetration rate and its relation to processing trade 1993–2007

increases from 0.18 in 1993 to 0.22 in 1997. It decreases after 1997 and decreases to 0.16 in 2007 with a short period increasing around 2001 (See Fig. 7.2).

We argue that the movement of import penetration rate reflects the change of trade mode in China. The distinctive feature of processing trade has made import penetration rate don't reflect the import situation of capital-intensive or technology-intensive products, but rather the import extent of raw materials and spare parts. Different form traditional trade, processing trade doesn't fit the theory of comparative advantage and resource endowment. By importing raw material and then processing and assembling using cheap labor, processing trade has formed an interdependent relationship between export and import. This is obviously different from the traditional trade between labor and capital among countries based on their comparative advantage. In order to show the distinctive feature of China's processing trade, Fig. 7.2 shows the change of export and import shares of processing trade from 1993 to 2007. We find that the import share of processing trade closely relates to the change of import penetration rate with correlation coefficient up to 0.7.

On the other hand, we can observe the change situation of trade mode in China by looking at the change of import and export share of processing trade. Before 1997, processing trade mode exhibits features that import increases along with the increase of export orders. After 1997, export shares of processing trade remain the same while import shares have experienced dramatic drops. Such change of processing trade mode can be also reflected in the movement of the import penetration rate which also shows a decreasing trend after 1997. We argue that such change of processing mode will also have impacts on the labor demand. When the processing trade develops dramatically, firms will need more labor for processing and assembling raw materials and spare parts. Therefore, firms will employ more workers and pay higher wages. This may explain the rapid increase of the labor's share of income before 1996.

After that, China's trade mode starts to transfer from processing trade mode with close relation between import and export towards export-led processing trade mode.

From the perspective of geography, trade center transfers from Pearl River Delta to Yangtze River Delta. This geographical change poses a significant effect on labor demand. In order to increase the competitiveness of products in the international markets, entrepreneurs, on the one hand, try to search for cheaper raw materials from the domestic market instead of importing materials from abroad to lower down the cost, on the on the hand, they try to lower labor cost to gain more profit. Therefore, the change of the trade center not only decreases of import shares of processing trade but also decreases the labor's share of income through such transition.

In order to test the explaining power of the arguments above, we use separate regressions to discuss the effects of trade mode on the labor's share of income. The labor's share of income appears a turning point in 1996, meanwhile, the result of Chow test also suggest that the structure of the regression model is different before and after 1996.[13] Therefore, this chapter uses separate regressions with 1996 as the cutting point. Column (e) and column (f) in Table 7.2 show regression results of two periods respectively. We find that the coefficient of trade variables has shown changes during two periods. The coefficient of import penetration rate is significant and positive before 1996 and coefficient of export dependence rate is significantly positive at 5 % level. This coincides with the feature of processing trade mode before 1996. Both import penetration rate and export dependence rate increase, leading to the increase of the labor's share of income through increasing labor demand. After 1996, only import penetration rate in trade variables is still significantly positive, with decreasing size and significance of the coefficient. This means that the change of trade mode has decreased both import penetration rate and the labor's share of income. In addition, the coefficients of SOE share also exhibit notable difference during two phases. Before 1996, the coefficient of SOE share is not significant, while it becomes significant and positive after 1996, meaning that the decreasing effects of the monopoly power of SOE only works in the second phase.

7.5 Conclusion and Policy Implications

This chapter decomposes the change of labor's share of income within industrial sector and we find that the labor's share of income decreases in each sub-industry. Meanwhile, we find that the industrial structure change from labor-intensive to capital-intensive industry will pose a downward pressure on the labor's share of income. By comparing fixed weights and weighted average total labor's share of income, we find that the industrial structure has a limited explanatory power for decreasing labor's share of income. The determination of the labor's share of income is factors in sub-industries within industrial sector.

By using econometric regressions, we find that employment numbers, capital stock, trade factors, technological progress and SOE monopoly power are main

[13]The F value of Chow test is 5.96, the significant p value is 0.000, indicating structural differences.

factors influencing the labor's share of income. Regression results show that technological progress decreases the labor's share of income. We propose that this is possibly because capital-biased technological progress will change bargaining power between capital and labor. The decrease of SOE monopoly causes the decrease of the labor's share of income. We argue that the SOE reform helps to form a market oriented determination of employment and wage based by supply and demand relationship in labor market. The large amount of abundant labor due to SOE reform poses a downward pressure on labor's compensation. Meanwhile, the remaining SOEs still tend to pay higher wage than market clearing wage due to high monopolistic profit, which will influence the labor's share of income in different industries. After controlling other factors, the transition of Chinese export from labor-intensive to capital-intensive products may make the export effect insignificant. And the coefficient of import penetration rate in trade variables is significantly positive, contradicting with neoclassical trade theory.

We also find that import penetration rate, import share of processing trade and the labor's share of income show consistent movements with each other and all appear an inversed U-shape movement. In order to explain the relationship between the labor's share of income and trade variables, we take 1996 as the separating point to make separate discussing in two periods of time. Our study shows that effects of trade variables have notable differences in these two periods. Import penetration rate is significantly positive in these two periods, but still differs in the coefficient size and significance. We argue that the change of trade mode is the important reason for the change of the labor's share of income. In the time of import-export related processing trade in Pearl River delta, import penetration rate promote labor demand thus raise the labor's share of income. While, in the time of export-led processing trade in Yangtze River delta, the simultaneous decline of import penetration rate and labor's share of income is the result of lowering raw material and labor cost from profit maximizing enterprises. Therefore, the import penetration has different mechanisms on labor's share of income in different development stages in China.

It is worthwhile to discuss that from the perspective of export, the increasing complexities of export products may have already changed "labor-intensive" industrial distribution in our old perception. From the perspective of import, the current change of trade mode is also closely associated with the decreasing labor's share of income. When Chinese firms are able to produce high value-added products, the increasing technology will generate demands for skilled workers which will help to increase the labor's compensation. Therefore, the transition from "extensive" trade mode to "intensive" trade mode will make sure the sustainable economic development for China and move towards a better labor and capital relations in the future.

Appendix

See Tables 7.5, 7.6 and 7.7.

Table 7.5 Labor's share of income within the industrial sector 1993–2007

Types of industrial sector	Weight	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Mining and washing of coal	0.033	0.509	0.546	0.488	0.472	0.460	0.445	0.432	0.432	0.411	0.363	0.340	0.263	0.230	0.232	0.207
Extraction of petroleum and natural gas	0.063	0.109	0.117	0.126	0.135	0.122	0.118	0.101	0.061	0.069	0.082	0.082	0.071	0.053	0.050	0.056
Mining and processing of ferrous metal ores	0.004	0.201	0.278	0.317	0.238	0.222	0.214	0.230	0.203	0.182	0.199	0.130	0.113	0.069	0.058	0.043
Mining and processing of non-ferrous metal ores	0.006	0.212	0.292	0.282	0.274	0.234	0.230	0.205	0.192	0.185	0.196	0.167	0.122	0.108	0.084	0.077
Mining and processing of nonmetal ores	0.006	0.144	0.174	0.212	0.169	0.152	0.220	0.198	0.179	0.174	0.156	0.133	0.103	0.107	0.088	0.073
Processing and manufacture of foods	0.054	0.094	0.102	0.150	0.114	0.105	0.104	0.096	0.089	0.079	0.071	0.070	0.059	0.054	0.051	0.046
Manufacture of beverages	0.022	0.115	0.125	0.153	0.132	0.118	0.113	0.112	0.108	0.104	0.098	0.098	0.088	0.080	0.077	0.071
Processing of tobacco	0.037	0.029	0.039	0.047	0.045	0.046	0.044	0.044	0.048	0.046	0.041	0.038	0.037	0.038	0.034	0.034
Manufacture of textile	0.054	0.201	0.217	0.309	0.264	0.243	0.204	0.181	0.164	0.144	0.129	0.112	0.095	0.089	0.084	0.073
Manufacture of textile wearing	0.023	0.156	0.196	0.226	0.186	0.185	0.166	0.167	0.154	0.145	0.154	0.146	0.162	0.151	0.150	0.148

(continued)

Table 7.5 (continued)

Types of industrial sector	Weight	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
apparel, footwear, and caps																
Manufacture of leather, fur, feather and related products	0.014	0.169	0.164	0.211	0.160	0.154	0.151	0.144	0.141	0.113	0.111	0.102	0.098	0.112	0.114	0.106
Processing of timber, manufacture of wood, bamboo, rattan, palm, and straw products	0.007	0.175	0.212	0.243	0.162	0.138	0.164	0.143	0.117	0.091	0.088	0.083	0.077	0.061	0.055	0.044
Manufacture of furniture	0.004	0.178	0.178	0.240	0.164	0.146	0.141	0.140	0.114	0.099	0.106	0.092	0.086	0.092	0.091	0.091
Manufacture of paper and paper products	0.016	0.221	0.222	0.245	0.187	0.176	0.151	0.132	0.113	0.098	0.086	0.080	0.071	0.061	0.060	0.056
Printing, reproduction of recording media	0.008	0.210	0.276	0.339	0.280	0.262	0.255	0.241	0.241	0.201	0.186	0.162	0.158	0.132	0.122	0.112
Manufacture of articles for culture, education and sport activity	0.006	0.175	0.185	0.224	0.187	0.165	0.154	0.163	0.153	0.134	0.140	0.144	0.140	0.129	0.138	0.136
Processing of petroleum, coking, processing of nuclear fuel	0.030	0.090	0.107	0.108	0.125	0.119	0.141	0.137	0.119	0.102	0.097	0.084	0.084	0.070	0.067	0.063

(continued)

Table 7.5 (continued)

Types of industrial sector	Weight	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Manufacture of raw chemical materials and chemical products	0.060	0.186	0.216	0.238	0.206	0.204	0.194	0.174	0.149	0.132	0.120	0.104	0.085	0.073	0.070	0.062
Manufacture of medicines	0.022	0.140	0.174	0.213	0.174	0.160	0.163	0.147	0.134	0.130	0.127	0.122	0.114	0.100	0.094	0.084
Manufacture of chemical fibers	0.010	0.125	0.155	0.163	0.193	0.179	0.181	0.127	0.115	0.144	0.118	0.084	0.081	0.064	0.058	0.053
Manufacture of rubber	0.009	0.203	0.232	0.273	0.214	0.192	0.182	0.180	0.154	0.143	0.124	0.106	0.106	0.086	0.086	0.081
Manufacture of plastics	0.018	0.139	0.162	0.213	0.158	0.145	0.137	0.125	0.106	0.091	0.090	0.087	0.085	0.072	0.067	0.065
Manufacture of non-metallic mineral products	0.050	0.142	0.170	0.218	0.189	0.175	0.185	0.167	0.146	0.133	0.122	0.106	0.099	0.085	0.075	0.065
Smelting and pressing of ferrous metals	0.068	0.134	0.178	0.247	0.278	0.265	0.242	0.227	0.198	0.177	0.158	0.120	0.089	0.077	0.072	0.066
Smelting and pressing of non-ferrous metals	0.023	0.143	0.208	0.225	0.240	0.244	0.213	0.190	0.174	0.159	0.148	0.118	0.088	0.070	0.051	0.047
Manufacture of metal products	0.026	0.144	0.167	0.220	0.176	0.169	0.147	0.137	0.123	0.109	0.102	0.088	0.079	0.080	0.070	0.065
Manufacture of general purpose machinery	0.041	0.237	0.282	0.315	0.316	0.285	0.266	0.248	0.215	0.193	0.171	0.145	0.123	0.104	0.096	0.089

(continued)

Table 7.5 (continued)

Types of industrial sector	Weight	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Manufacture of special purpose machinery	0.027	0.242	0.255	0.347	0.296	0.287	0.260	0.245	0.214	0.203	0.179	0.191	0.165	0.150	0.135	0.120
Manufacture of transport Equipment	0.057	0.195	0.233	0.283	0.264	0.255	0.220	0.210	0.194	0.170	0.148	0.125	0.125	0.119	0.113	0.095
Manufacture of electrical machinery and equipment	0.047	0.157	0.183	0.220	0.193	0.177	0.149	0.134	0.111	0.104	0.106	0.089	0.081	0.073	0.068	0.062
Manufacture of communication equipment, computers and other electronic equipment	0.062	0.164	0.175	0.173	0.172	0.145	0.120	0.115	0.103	0.110	0.104	0.091	0.085	0.080	0.083	0.095
Manufacture of measuring instruments and machinery for cultural activity and office work	0.009	0.246	0.301	0.366	0.318	0.329	0.245	0.233	0.199	0.198	0.201	0.173	0.163	0.128	0.131	0.127
Production and distribution of electric power, heat power and water	0.082	0.122	0.148	0.134	0.147	0.135	0.126	0.121	0.125	0.125	0.121	0.124	0.138	0.107	0.103	0.096
	–	0.166	0.191	0.222	0.204	0.189	0.173	0.159	0.140	0.132	0.125	0.113	0.103	0.091	0.086	0.080

(continued)

Table 7.5 (continued)

Types of industrial sector	Weight	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Aggregated industrial sector (weighted average)																
Aggregated industrial sector (fixed weights in 1993)	–	0.166	0.193	0.231	0.213	0.200	0.186	0.173	0.155	0.143	0.132	0.117	0.103	0.091	0.086	0.079

Note Data sources are from various issues of *China Statistical Yearbook* and *China Labor Statistical Yearbook*; numbers in the first column are average weights of value-added shares from 1993 to 2007; numbers in column two to eight are shares of total wage in value-added of each industry; numbers in the second last row are weighted average labor's share of income aggregated on the level of industrial sector; numbers in the last row are the aggregate labor's share of income with the assumption that the value-added share of each industry are kept at 1993 level; Industrial classification for sub-industries is based on *Industrial Classification for National Economic Activities* (GB/T4754-2002)

Table 7.6 Labor's share of income within the industrial sector by using input–output table 1992–2007

Types of industrial sector	1992	1995	1997	2002	2005	2007
Primary products sector	0.278	0.257	0.401	0.408	0.263	0.364
Labor intensive products sector	0.343	0.356	0.481	0.454	0.400	0.398
Resource intensive products sector	0.106	0.155	0.231	0.222	0.175	0.248
Technology products sector	0.258	0.336	0.431	0.413	0.327	0.326
Mining and washing of coal	0.614	0.627	0.682	0.623	0.380	0.480
Extraction of petroleum and natural gas	0.067	0.134	0.190	0.194	0.091	0.229
Mining and processing of metal ores	0.312	0.515	0.513	0.454	0.242	0.377
Mining and processing of nonmetal ores	0.361	0.424	0.531	0.562	0.312	0.408
Manufacture of foods	0.150	0.128	0.277	0.268	0.210	0.304
Manufacture of textile	0.321	0.459	0.405	0.475	0.389	0.376
Sewing and manufacture of leather	0.404	0.257	0.555	0.482	0.477	0.470
Processing of timber and manufacture of furniture	0.313	0.324	0.481	0.440	0.359	0.397
Manufacture of paper, articles for culture, Education and sport activity	0.348	0.333	0.522	0.420	0.346	0.349
Processing of petroleum, coking, processing of nuclear fuel	0.128	0.205	0.241	0.305	0.208	0.299
Manufacture of chemistry	0.207	0.285	0.375	0.351	0.299	0.300
Construction materials and manufacture of non-metallic mineral products	0.298	0.356	0.476	0.518	0.328	0.350
Smelting and pressing of metals	0.188	0.338	0.480	0.439	0.243	0.262
Manufacture of metal products	0.337	0.330	0.498	0.447	0.353	0.339
Manufacture of general and special purpose machinery	0.324	0.468	0.431	0.483	0.357	0.368
Manufacture of transport equipment	0.223	0.362	0.412	0.399	0.352	0.394
Manufacture of electrical machinery and equipment	0.270	0.283	0.434	0.389	0.357	0.294
Manufacture of communication equipment, computers and other electronic equipment	0.263	0.181	0.395	0.339	0.391	0.345
Manufacture of measuring instruments and machinery for cultural activity and office work	0.385	0.527	0.476	0.510	0.395	0.388
Production and distribution of electric power and heat power	0.121	0.144	0.256	0.216	0.215	0.238
Others	0.368	0.330	0.262	0.217	0.186	0.145
Aggregated industrial sector (weighted average)	0.260	0.302	0.408	0.383	0.298	0.321

Note Data are from corresponding years *China Input and Output Table*. IO table has data of 32 sectors in 1992, 33 sectors in 1995, 40 sectors in 1997, 42 sectors in 2002, 2005, and 2007. 2000 data is missing at current. Numbers in the last row are weighted average labor's share of income aggregated on the level of industrial sector; The factor intensity classification are based on Sheng and Ma (2008) in their Table 1; Industrial classification for sub-industries is based on *Industrial Classification for National Economic Activities* (GB/T4754-1994). Therefore, this classification has some differences with Table 7.2

Table 7.7 Conversion table between industry classification of chinese industrial sector and HS code

Industry	HS code (4 digit)	Industry	HS code (4 digit)
Mining and washing of coal	2701–2703	Processing of petroleum, coking, processing of nuclear fuel	2704 2706–2710 2712–2713 2715
Extraction of petroleum and natural gas	2709–2711 2714	Manufacture of raw chemical materials and chemical products	1518-1520 2801–2806 2901–2913 Chapter 31–38 3901 4002
Mining and processing of ferrous metal ores	2601–2602 2610	Manufacture of medicines	Chapter 30
Mining and processing of non-ferrous metal ores	2603–2617 2620	Manufacture of chemical fibers	Chapter 54–55
Mining and processing of nonmetal ores	Chapter 25 (not including 2501)	Manufacture of rubber	Chapter 40 (not including 4001–4002)
Transport of timber and bamboo	4401–4403 4501–4502	Manufacture of Plastics	3902
Processing and manufacture of foods	Chapter 2 0303–0306 Chapter 4 0710–0712 0811–0812 0814 0901 1006 Chapter 11 1208 Chapter 15–21 2209 Chapter 23	Manufacture of non-metallic mineral products	Chapter 68–70 9003–9004
Manufacture of beverages	0902 Chapter 22 (not including 2209)	Smelting and pressing of ferrous metals	2618–2619 7201–7204 8111
Processing of tobacco	2402–2403	Smelting and pressing of non-ferrous metals	7401–7410 7501–7506 7601–7607 7801–7804 7901–7905 8001–8005 Chapter 81 (not including 8111)
Manufacture of textile	Chapter 50 (not including 5001–5003) Chapter 51(not including 5101–5104) Chapter 52 (not including 5201–5202) 53 (not including 5306–5311) Chapter 56–61 Chapter 63	Manufacture of metal products	6601 Chapter 73 7411–7419 7507–08 7608–7616 7805–7806 7906–7907 8006–8007 Chapter 82–83 9406
Manufacture of textile wearing Apparel, footwear, and caps	Chapter 62 Chapter 65	Manufacture of general Purpose machinery	8401–8414 8416 8418–8420 8452 8456–8468 8480–8485

(continued)

Table 7.7 (continued)

Industry	HS code (4 digit)	Industry	HS code (4 digit)
Manufacture of leather, fur, feather and related products	Chapter 41 (not including 4101–4103) Chapter 42 Chapter 43 (not including 4301) Chapter 64 Chapter 67 (not including 6702) 9404	Manufacture of special purpose machinery	8417 8421–8422 8424–8449 8451 8453–8455 8474–8479 9018–9022
Processing of timber, manufacture of wood, bamboo, rattan, palm, and straw products	Chapter 44 (not including 4401–4403) 4503-4504 Chapter 46	Manufacture of transport equipment	Chapter 86–89
Manufacture of furniture	9401–9403	Manufacture of electrical machinery and equipment	8415 8450 8501–8516 8531–8539 8544–8548 9405
Manufacture of paper and paper products	Chapter 47 Chapter 48 (not including 4802)	Manufacture of communication equipment, computers and other electronic equipment	8470–8471 8517–8529 8540–8543
Printing, reproduction of recording media	Chapter 49	Manufacture of measuring instruments and machinery for cultural activity and office work	8423 8469 8472 9001–9002 9005–9017 9023–9033 Chapter 91
Manufacture of articles for culture, education and sport activity	4820 Chapter 92 Chapter 95 9008–9612	Production and distribution of electric power, heat power and water	2716

Note The conversion table is compiled based on Sheng (2002) and Zhou (2006)

Table 7.8 Conversion Table between Industry Classification of Chinese Industrial Sector and SITC Code

Industry	SITC (3 digit)	Industry	SITC code (3 digit)
Mining and washing of coal	321 322	Processing of petroleum, coking, processing of nuclear fuel	325 334 335
Extraction of petroleum and natural gas	333 342 343	Manufacture of raw chemical materials and chemical products	232 511–516 522–525 531–533 554 562 571–575 579 591–593 597–598
Mining and processing of ferrous metal ores	281 282	Manufacture of medicines	541–542
Mining and processing of non-ferrous metal ores	283–289	Manufacture of chemical fibers	266–267

(continued)

Table 7.8 (continued)

Industry	SITC (3 digit)	Industry	SITC code (3 digit)
Mining and processing of nonmetal ores	272–274 277–278	Manufacture of rubber	621 625 629
Transport of timber and bamboo	244–248	Manufacture of Plastics	581–583 893
Processing and manufacture of foods	011–012 016–017 022–025 034–035 037 042 045–048 054 056 058–062 071073 075 081 091 098 411 421 422 431	Manufacture of non-metallic mineral products	661–667
Manufacture of beverages	074 111–112	Smelting and pressing of ferrous metals	671–679
Processing of tobacco	122	Smelting and pressing of non-ferrous metals	681–689
Manufacture of textile	269 651–659	Manufacture of metal products	691–699 811–812
Manufacture of textile wearing Apparel, footwear, and caps	841–846 848	Manufacture of general Purpose machinery	711–714 716 718 731 733 735 737 741–749
Manufacture of leather, fur, feather and related products	611–613 831 851	Manufacture of special purpose machinery	721–728 774 872 881–883
Processing of timber, manufacture of wood, bamboo, rattan, palm, and straw products	633–635	Manufacture of transport equipment	781–786 791–793
Manufacture of furniture	821	Manufacture of electrical machinery and equipment	771–773 775–776 778 813
Manufacture of paper and paper products	251 641–642	Manufacture of communication equipment, computers and other electronic equipment	752 761–764
Printing, reproduction of recording media	892	Manufacture of measuring instruments and machinery for cultural activity and office work	751 759 871 873–874 884–885
Manufacture of articles for culture, education and sport activity	894–895 898	Production and distribution of electric power, heat power and water	351

Note The conversion table is compiled based on Sheng (2002)

References

Bai C, Qian Z (2009) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41

Bai C, Qian Z, Wu K (2008) Determinants of factor shares in China's Industrial Sector [J]. Econ Res J 8:16–28

Bentolila S, Saint-Paul G (2003) Explaining movements in labor income share [J]. Contrib Macroecon 3(1):1103–1136

Economists (2007) A workers' manifesto for China: how workers are losing out in China, and why it matters to the rest of the world [EB/OL]

Feenstra RC, Hanson GH (2001) Global production sharing and rising inequality: a survey of trade and wages [EB/OL], NBER Working Papers No. 8372, Cambridge, MA

Glyn A (2006) Explaining labor's declining share of national income [EB/OL], G-24 Policy Brief No. 4

Guscina A (2006) Effects of globalization on labor's share in national income [EB/OL], IMF Working Paper, 6 (294), Washington DC

Harrison AE (2002) Has globalization eroded labor's share? some cross-country evidence [EB/OL], Mimeo, University of California at Berkeley and NBER

Jaumotte F, Tytell I (2007) Globalization of Labor [EB/OL], IMF World Economic Outlook 2007, Chapter 5

Jiang L, Zhang Y (2008) Impacts of foreign trade on labor distribution ratio: analysis of China's provincial panel data [J]. J Int Trade 10:26–33

Kohli U (1991) Technology, duality, and foreign trade: the GNP function approach to modeling imports and exports [M]. University of Michigan Press, Ann Arbor

Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: a U-shaped curve [J]. Econ Res J 1:70–82

Luo C (2008) Rethinking the Kardo stylized facts: the share of labor income revisited [J]. J World Econ 1:86–96

Luo C, Zhang J (2009) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79

Rodrik D (2006) What's so special about China's exports? [J]. China World Econ 14(5):1–19

Sheng B (2002) The political economic analysis about China foreign trade policy [M]. Shanghai People's Publishing House, Shanghai

Sheng B, Ma T (2008) The effects of intermediate products trade on China's labor demand: evidences from dynamic panel data in industrial sector [J]. J World Econ 3:12–20

Solow RM (1958) A skeptical note on the constancy of relative shares [J]. Am Econ Rev 48 (4):618–631

Xinhua News (2009) How to Get Wage Statistics and Why Only Publish "Average Wage"? [EB/OL], Xinhua Net, 2009, 27th February

Young AT (2006) One of the things we know that ain't so: why us labor's share is not relatively stable [EB/OL]. University of Mississippi, Mimeo

Zhang J, Chen S, Jefferson HG (2009) Structure reform and growth of chinese industry sector [J]. Econ Res J 7:4–20

Zhou S (2006) Impacts of trade liberalization on the elasticity of China's labor demand [J]. J World Econ 2:31–40

Chapter 8
Firm Heterogeneity, Ownership Structure and Labor's Share of Income

This chapter constructs a theoretical model from the micro firm perspective and analyses the firm heterogeneity that will lead to significant differences among different types of firms. The theoretical model is extended to three types of firms those that are state-owned, private and foreign enterprises. Thus, this chapter discusses the impact of ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on the labor's share of income during China's economic transition and opening process. Utilizing the World Bank Investment Climate Survey, the paper investigates the difference of the labor's share of income by types of ownership, and claims that change of ownership structure will reduce factor distortion and promote economic efficiency, which in turn will impose a positive and transitory impact on the decreasing labor's share of income. By using System-GMM estimation, it shows that, after controlling for other factors, firm with private and foreign ownership have negative impacts on the labor's share of income. By examining time series change of state-owned enterprises, it finds that their productivity rises dramatically two years after the ownership restructuring. The chapter also introduces the government enterprise relationship variable, which shows that competition among local government in attracting foreign enterprises in order to pursue GDP does exist. Finally, it is shown that the "foreign investment led" feature of China's export enterprises may be the reason of the failure of neoclassic trade theory prediction for China.

8.1 Introduction

In the thirty years' reform and opening up, China's economy has made a drastic growth miracle, in which the annual economic growth rate between 1978 and 2008 is 9.85 %. With this economic growth, national income distribution in the thirty years has been also experiencing several significant changes. Since the beginning of reform and opening up, the share of the national income accruing to labor has raised

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steadily, from 52.2 % in 1978 to 72.2 % in 1990.[1] The national income has an inclining trend towards individuals, which Dai and Li (1988) summarized as "wage erodes profits" phenomenon. However, Li (1992) considered that it is a natural come back from distorted labor price.

Recently, the pattern of China's national income distribution shows new changes. According to the income approach of GDP, labor's share of income in GDP decreased from 51.9 % in 1995 to 39.7 % in 2007,[2] which indicates that the fall in labor's share of income is becoming an undisputed fact (Cai 2005; Li 2007). Correspondingly, profits of enterprises have increased, evident in the jumping capital income share of enterprises in the GDP data, which increased from 34.9 % in 1997 to 46.1 % in 2007. The pattern of national income distribution changes from "wage erodes profits" at the beginning of reform to "strong capital and weak labor" relations (Yao 2005).

Economists try to explain the underlying factors in the story behind the decreasing labor's share of income from two perspectives. Firstly, they point to industrial structural changes during the economic development process. Bai and Qian 2009a, b indicate that the industrial structural changes in the agricultural sector, in which the labor's share of income is relatively high when compared to non-agricultural sectors with a lower labor's share of income, has resulted in the labor's share of income dropping by 3.36 % from 1995 to 2004. Meanwhile, the adjustment of China's industrial structure shows the pattern that drastic industrialization and drawling post-modernization, which in turn impeded the further increasing of labor's share of income (Luo 2008; Luo and Zhang 2009a). Based on this, Li et al. (2009) show that at the end of the labor transfer from agricultural sector to the industrial sectors, the marginal labor production rose rapidly which will make the labor's share of income stop decreasing and turn to an increasing trajectory. By using multi-national data, they show a U-shaped curve of labor's share of income in GDP, which is confirmed by Luo and Zhang (2009b) using China's provincial panel data. Interestingly, both studies state that the lowest point of the U-shaped curve will be at about US$3000 per capita GDP level (2000 nominal exchange rate). Therefore, they draw an optimistic conclusion that the labor's share of income will be increasing trajectory in next two years.

Secondly, studies mainly focus on the empirical evidence of factors that have an impact on the decrease of China's labor's share of income using data of firm and provincial level. Bai et al (2008); Bai and Qian (2009a) find that ownership restructuring of state-owned enterprise has made the labor's share of income in

[1]The data is from Table 8.1 in Liyang, "Adjustment of Functional Income Distribution: Thinking of the Phenomenon of National Income Inclining to Individual." *The Economic Research Journal*, 1992, No.7.

[2]Data before 2004 is from *China's GDP Accounting: Historical Data 1952−2004(G)*. Data after 2004 is from China's Statistical Yearbook aggregating by provincial panel data. Recent Study of Bai and Qian (2009a) indicates that changes of statistical definition made an overestimate the extent of decreasing of labor income share. However, even after the adjustment of statistical caliber, labor income share still dropped 5 per cent from 1995 to 2004.

industrial sector drop by 4.7 % by using firm level data. They explain that the average labor's share of income in state-owned enterprises were obviously higher than in the non-state-owned enterprises, and the decrease of labor's share of income was caused by the distortion reducing in factor market. This point is consistent with Luo and Zhang (2009b) who claim negative effects of privatization on the labor's share of income. Meanwhile, the increase of enterprises' monopoly power and the technological progress are also main reasons for the decrease of labor's share of income. On the contrary, Li et al. (2009) claim that the labor's share of income is negatively correlated with the share of state's stake by using firm level data, and explain that the state-owned enterprises represent capital intensive industries with lower labor's share of income. Therefore, they claim that the increasing share of state-owned enterprises will lead to the decrease of labor's share of income. Comparing with the empirical evidences by using firm level data in a closed setting, studies based on provincial panel data combine labor's share of income with the China's embracing of economic globalization. Luo and Zhang's (2009b) empirical results indicate that there were mutual correlations between FDI and labor's share of income, and explain that competition among local government in attracting foreign capital weakened the bargaining position of labor. Meanwhile, export had non-significant positive impacts on labor's share of income, and they explain that this may be caused by increase of foreign capital engaged in exporting and raising sophistication of export product. However, the results are not supported by other empirical studies by using provincial data (Jiang and Zhang 2008; Bai and Qian 2009b). Additionally, Luo and Zhang (2009b) assert that other factors like fiscal expenditure, physical and human capital accumulation will have positive impacts on labor's share of income.

This chapter analyzes factors which determine the movement of labor's share of income from micro-firm perspectives. Comparing with the available empirical work, the results of this chapter differ significantly in several aspects. Firstly, we find that the labor's share of income in three different types of ownership those that are state-owned, private and foreign firms are different from one another. We explain that this is caused by the firm heterogeneity. Therefore, by constructing a theoretical model, this chapter could analyze the impact of ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on labor's share of income in a unified framework. We consider that this will decrease factor distortion and promote economic efficiency though labor's share of income is decreasing. Secondly, by using the World Band Enterprise Survey data, we can test mechanism of factors that affect on the labor's share of income directly. By tracing time series changes of state-owned enterprises, we actually find that their production efficiency rises dramatically two years after the ownership restructuring, which brings significant drop of labor's share of income. By investigating government and firm relations, we find the proof that there are remarkable competition effects among local government in attracting foreign capital in order to pursue their GDP growth. Thirdly, we find labor's share of income of exporting firms are significantly lower than that of non-exporting firms, indicating that export will have a significant negative impact on labor's share of income. We explain that the reason for the

failure of neoclassic trade theory prediction for China may lie in the "foreign investment leaded" feature of our export enterprises.

8.2 Theoretical Model

Theoretically, research of labor's share of income can be traced back to Ricardo (1981) and Marx (1972). Marx discusses the rules of division of production between wage and profit from perspectives of production relations based on the labor value and surplus value theory. Neoclassicist discusses functional income distribution from the productivity perspective, and they considered the distribution patterns between wage and profit as the result of marginal productivity of labor and capital (Cobb and Douglas 1928). Bentolila and Saint-Paul (2003) start from the neoclassical framework, and they find the one to one functional relations between labor's share of income and capital output ratio, which they call SK curve, by constructing linear production function with constant returns to scale. They claim that other factors such as technological progress, imperfect competition market, price of export product, and labor heterogeneity will move off the SK curve to affect on the labor's share of income. However, the theory assumes that the firms are homogenous, neglecting the firm heterogeneity in the real world.

Many empirical studies indicate the firm heterogeneity in the same industry (e.g. scale and productivity). It is found that those who engaged in exporting and foreign investment are a few of firms with large scale, advanced technology, high wage rate, and high productivity level (Bernard and Jensen 1999; Clerides et al. 1998; Bernard et al. 2006).[3] Helpman and Itskhoki (2010) and Egger and Kreickemeier (2009) construct models to discuss effects of trade liberalization on labor market based on the assumption of firm heterogeneity. This chapter, which differs from above, combines firm heterogeneity with labor's share of income, which discusses the impact of changes of ownership structure such as ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on labor's share of income. The chapter refers to the theoretical framework of Decreuse and Maarek (2008) which discusses the impacts of FDI on labor's share of income in the host country. We modify the model and extend to discuss the impacts of changes of ownership structure.

Assume that there are two types of firms in the economy, which produce two substitutive products. The firms differ from each other, in other words, one type of firm will have higher productivity, so that $y_1 > y_2$. The heterogeneous firm may be caused by technology, finance ability, and institutional factors. The proportion of the first type of firm in the economy is α, thus $(1 - \alpha)$ for the second type. Assume

[3]The breaking through of the new trade theory thought that the firm heterogeneity made them to engage in the exporting and foreign investment business by a self-selected mechanism (Bernard et al. 2003; Melitz 2003; Helpman et al. 2004).

that labors are homogenous, and they are looking for jobs between two types of firms. Therefore, firms are facing all labor supply, which can be standardized as one. There are matching problems between firm and labor, meaning that there are wage competition effects when both types of firm want to hire labors. Finally, we assume that the firm has perfect information and follow rules of profit maximization, meaning that the firms know other firms' productivity, and make payment decision based on the information.

Our model is dynamic compared with the static one of Decreuse and Maarek (2008). We assume that the second type of firms with lower productivity exists firstly in the economy and it pays wage w_2 to the labors according to its productivity y_2. The first type of firms with higher productivity enters into the economy thereafter, and it will compete with the second type of firms into hiring labors, thus it tends to pay wages higher than w_2. Meanwhile, this type of firms will pay wages w_1 not based on its productivity but on the average productivity of all firms in the economy. Therefore, the wages paid by the first type of firms are satisfied with the following equation:

$$w_1 = \frac{\alpha y_1 + (1-\alpha)y_2}{y_2} w_2 \tag{8.1}$$

It can be easily proved that the wages paid by two types of firms satisfy the condition $w_1 > w_2$. Meanwhile, the wages paid by the first type of firms are decided by the structure of heterogeneous firms with dynamic feature. Naturally, the labor's share of income of two types of firms is:

$$LS_1 = \frac{w_1}{y_1} = \frac{[\alpha y_1 + (1-\alpha)y_2]w_2}{y_1 y_2}; LS_2 = \frac{w_2}{y_2} \tag{8.2}$$

Proposition 1 *When heterogeneous firms exist in the economy, the higher the productivity of the firms, the lower the labor's shares of income of these firms are. That is to say, when* $y_1 > y_2$, *it can be proved that* $LS_1 < LS_2$. *This means firm heterogeneity will lead to difference of labor's share of income among firms.*

The conclusion drew from above are static and micro. We also wish to examine how the aggregate labor's share of income changes as macro variable with changing structure of heterogeneous firms. Therefore, we first get aggregate labor's share of income:

$$LS = \frac{\alpha w_1 + (1-\alpha)w_2}{\alpha y_1 + (1-\alpha)y_2} = \frac{w_2}{y_2} \frac{\alpha[\alpha y_1 + (1-\alpha)y_2] + (1-\alpha)y_2}{\alpha y_1 + (1-\alpha)y_2} \tag{8.3}$$

From above equation, aggregate labor's share of income is determined by firm heterogeneity and distribution of different types of firms. From dynamic perspective, we concern more about how the labor's share of income changes with the

proportion of the first type of firms (α). Concretely, we can differentiate the aggregate labor's share of income with the proportion α:

$$\frac{dLS}{d\alpha} \overset{sign}{=} -dY/d\alpha \times LS + dW/d\alpha \overset{sign}{=} -(y_1 - y_2) \times LS\frac{y_2}{w_2} + 2\alpha(y_1 - y_2) \tag{8.4}$$

For simplicity, the above equation neglects items which have no effects on the sign. It can be seen that there are two opposite effects when the proportion of firms with higher productivity α increases. The first is the technological gap effect: an increase in the proportion of firms with higher productivity raises output, as they benefit from better productivity. At given wages, this reduces the labor's share of income, which is the first part of the right hand of the equation. The second is the wage competition effect: an increase in the proportion of firms with higher productivity intensifies wage competition among firms. At given output, this raises the labor's share of income, which is the second part of the right hand of the equation. The interaction of the two effects determines the relationship between firm structure and labor's share of income. When wage competition effect is smaller than the technological effects, the labor's share of income will decrease as the proportion of firms with higher productivity increases and vice versa. Then, Eq. (8.4) is simplified further, and we can get the moving trend of labor's share of income with the proportion of the first type of firms:

$$\frac{dLS}{d\alpha} \overset{sign}{=} \left[\alpha^2 y_1 - (1-\alpha)^2 y_2\right] \tag{8.5}$$

We can find that $dLS/d\alpha$ is a non-monotonic function of proportion α. Meanwhile, the second order derivative $d^2LS/d\alpha^2 > 0$, which indicate that the labor's share of income decreases with α at first, then turn direction as it reaches the bottom, and have an increasing trend afterwards. Therefore, we can get another proposition.

Proposition 2 *With the firm heterogeneity, when the proportion of firms with higher productivity (α) increases in the economy, the labor's share of income will move as a U-shaped curve. This means firm heterogeneity will lead to the movement of aggregate labor's share of income.*

When $dLS/d\alpha$ is equal to zero, the labor's share of income reaches to the bottom of the U-shaped curve, thus this point α^* is:

$$\alpha^* = \frac{(y_1 y_2)^{1/2} - y_2}{y_1 - y_2} \tag{8.6}$$

From above equation, we can see that the lowest point of the labor's share of income reflects the pattern of productive heterogeneity among firms. In addition, because $0 \leq \alpha \leq 1$, we could confirm the boundary point of the U-shaped curve:

$$\underset{\alpha=0}{LS} = LS_2 = \frac{w_2}{y_2}; \underset{\alpha=1}{LS} = LS_1 = \frac{w_1}{y_1} = \frac{[\alpha y_1 + (1-\alpha)y_2]w_2}{y_1 y_2} \tag{8.7}$$

Compared with the two boundary points, we find that the U-shaped curve has a higher left shoulder than the right one in the interval $\alpha \in [0,1]$.

$$\underset{\alpha=0}{LS} - \underset{\alpha=1}{LS} = LS_2 - LS_1 > 0 \tag{8.8}$$

Therefore, we draw the U-shaped curve of labor's share of income with respects to the structure movement of the heterogeneous firm (see Fig. 8.1):

Harrison (2002) claims that financial openness will affect the proportion of the first type of firms with higher productivity when discussing the impact of globalization to labor's share of income. Decreuse and Maarek (2008) assert that the increase of multinational firms in the host country will let the labor's share of income move along the U-shaped curve from left to right. However, their study shows that the proportion of foreign firms was not only constrained by the extent of financial openness of the host country, but also related to opportunity cost of alternative investment. Therefore, the proportion of firm with higher productivity cannot reach to the lowest point α^*, whereas constrained by $\bar{\alpha}$. Their empirical study indicated most of the developing countries are located in decreasing trajectory of the U-shaped curve. Thus, this may indicate that the technological gap effects will surpass the wage competition effect so that the curve is along the decreasing trajectory.

So far, we assume two types of firms in the economy, the model can be extended to three or more types of firms. As an implication of the theoretical model, combining with the reality of the China's economic transition and opening up, we can discuss about the impact of ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on labor's share of income. We categorize different types of firms according to the division of ownership, which are state-owned, private, and foreign firms. The corresponding productivity is y_S, y_P, y_F

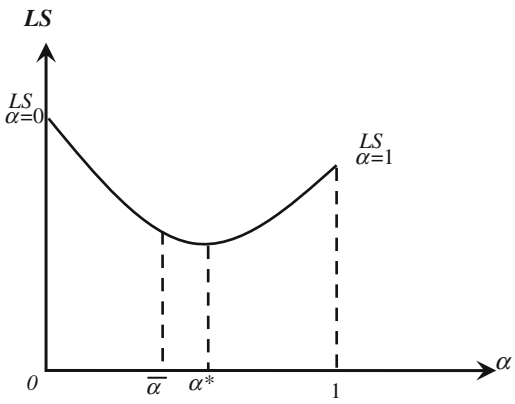

Fig. 8.1 Movement of labor's share of income with structure change of heterogeneous firm

respectively. The state-owned enterprises have relatively low efficiency because of policy burden and soft budget constraint (Lin and Tan 1999; Lin and Li 2004). Foreign enterprises have relatively high efficiency because of advanced technology and financial support. And the efficiency of private enterprises are between other two types of firms, so that $y_S < y_P < y_F$. This means that different types of firms' ownership satisfy the assumption of heterogeneity. Based on the theoretical model, we can conclude that the relationship of labor's share of income among three types of firms are $LS_S > LS_P > LS_F$, indicating that the impacts of heterogeneity on the difference of labor's share of income. Meanwhile, we assume the proportion of three types of firms in the economy is α, β, γ respectively. Then we can analyze the impacts of change of ownership structure. Ceteris paribus, ownership restructuring of state-owned enterprises (or privatization) means that the decrease of α and increase of β in the economy, which put a downward trend of the labor's share of income. And the entry of foreign investment (increase of γ) also means that the decrease of the labor's share of income. Therefore, as inference of generalization of the model, the change of ownership structure, summarized as "privatization and the foreign capitalization", is the main reason for the decrease of labor's share of income in China's economy.

8.3 Data and Statistical Facts

The data of this chapter is from the Investment Climate Survey of Work Bank in 2003. This is the second enterprise survey of China conducted by World Bank, of which the range covers 2400 enterprises in 18 cities[4] and 14 industries[5] which belongs to manufacturing and service. The survey provides panel data from 1999 to 2002 about corporate finance, technology innovation, international trade, and government and firm relations. To be noted, World Bank only provides the survey year data for the qualitative questions.

Corresponding to the theoretical model, Table 8.1 reports the ownership structure of firms in the survey data. This chapter categorizes the ownership type by proportions of state, private and foreign shareholders. Where, the foreign firms are defined when the proportion of foreign shareholders are bigger than or equal to

[4]Of the cities surveyed, four are in the northeast (Benxi, Changchun, Dalian and Harbin), four along the coast (Hangzhou, Jiangmen, Shenzhen and Wenzhou), four in the central region (Changsha, Nanchang, Wuhan and Zhengzhou), and six in the western region (Chongqing, Guilin, Kunming, Nanning, Lanzhou and Xi'an).

[5]The manufacturing industries include: clothing and leather products, electronic and communication equipment making, electronic components, household electrical goods, auto and auto parts, food processing, petrochemical and medicines, biotechnology products and Chinese medicine, machinery and equipment, and electricity equipments, ship, and orbit transporting machines and aircraft. The services industries consist of information technology services, communication services, accounting, auditing and non-bank financial services, advertising and marketing services, and business logistics services.

Table 8.1 Structure of shareholders and types of ownership

ICS (2003)	Firm number	State-owned firms	Private firms	Foreign firms
Overall	2400	521	1581	298
State shareholders (%)	21.9	96.7	0.8	3.1
Private shareholders %)	70.2	3.2	99.2	33.5
Foreign shareholders (%)	7.9	0.1	0.0	63.4

Note The numbers are calculated by authors from the Investment climate survey of world bank (China 2003)

10 %. Among the domestic firms, the types are determined by maximum of the proportion of state-owned and private shareholders. The results show that there are 1581 private firms which are most, 521 state-owned firms which ranks second, and 298 foreign firms. By observing the structure of shareholders in each type of firms, we find that the state share takes up for 96.7 % in the state-owned enterprises, the private share takes up 99.2 %, indicating the robustness of the classification. However, the foreign firms are jointly held by the private and foreign shareholders, indicating the joint feature of foreign and private firms.

The ratio of firm's labor compensation to total value of sales is the proxy of the labor's share of income,[6] and we try to identify the difference of labor's share of income in different types of ownership. Interestingly, three types of firms significantly differ from one another, and the order is exactly predicted by the theoretical model, which is $LS_S > LS_P > LS_F$ (see Table 8.2). In Table 8.2, the labor's share of income of state-owned and private firms is relatively close to each other, while that of foreign firms is the lowest. According to the theoretical model, the differences of labor's share of income are caused by the firm heterogeneity, which are the differences of productivity among three types of firms. We use the ratio of total value of sales to the number of employment as the labor productivity to be a proxy. And we also find strong evidence that the labor productivity differs significantly among three types of firms. We get the expected order, that is $y_S < y_P < y_F$, in which foreign firms are higher than the others. Therefore, the enterprise survey data support the prediction of the theoretical model with respects to the labor's share of income difference among different ownership structure. The results show that the relatively low efficiency of the state-owned enterprises and high efficiency of foreign firms due to its technological and financial advantage.

In the theoretical framework, we also discuss about the wage competition effects, and here we use average to identify the effects among three types of firms. A lot of empirical evidence showed that foreign firms tended to pay higher wages than domestic firms (Aitken et al. 1996; Lipsey 2002), and the extent of wage premium

[6]The more accurate definition is the labor compensation divided by value added of the firms. Because part of the firms' business profit are less than zero, so that the labor income share will be bigger than 1 (Kalleberg and Wallace 1984). In addition, even though we can get the value added by computing the firms' related financial data, it will substantially reduce the validity and number of our sample. Therefore, we use this proxy as a second best measures.

Table 8.2 Ownership difference of labor's share of income and elementary explanation

ICS (2003)	Unit: ¥1000	1999	2000	2001	2002
Overall	Labor's share of income (%)	16.3	15.5	15.4	15.7
	Average wage	8.6	9.4	10.5	10.7
	Labor productivity	95.9	111.9	120.9	126.2
State-owned	Labor's share of income (%)	18.6	17.6	18.2	19.1
	Average wage	7.1	7.8	9.2	9.7
	Labor productivity	69.9	79.0	86.3	96.1
Private	Labor's share of income (%)	16.7	16.0	15.9	16.0
	Average wage	8.2	9.1	10.0	10.2
	Labor productivity	91.3	107.2	118.3	119.6
Foreign	Labor's share of income (%)	11.1	10.4	9.8	10.2
	Average wage	12.4	13.9	14.6	15.1
	Labor productivity	246.4	297.8	306.4	328.6
Restructuring (54)	Labor's share of income (%)	20.2	20.0	18.3	17.7
	Average wage	9.9	12.2	14.9	13.3
	Labor productivity	73.6	77.6	107.2	110.8

Note The numbers are calculated by authors from the investment climate survey of world bank (China 2003), and all are average numbers of the survey firms

of foreign firms is higher in developing countries (Lipsey and Sjöholm 2004; Zhao 2002; Liu et al. 2004). The data of Table 8.2 also supports the above judgments, so that the average wages in foreign firms are higher than state-owned and private firms. Interestingly, we find the average wages in state-owned are the lowest, indicating that the high labor's share of income in state-owned enterprises is not due to its high wage payment,[7] but rather the result of the low production efficiency. Correspondingly, private firms don't depend on the low wage strategy for raising their benefit, but rather through institutional and technological innovation strategy.

From the above analysis, if the types of ownership are considered as dummy variable to examine the effects on labor's share of income, the sign of coefficients of private and foreign firms are expected to be negative. Although it is an static inference, the dynamic theoretical meaning is that ownership restructuring of state-owned enterprises and entry of foreign firms will dramatically raise economic efficiency and surpass the wage competition effect, so that the labor's share of income will have a downward trend in the short term. The survey data of World Bank provides structure of shareholders of firms in the first and last year, so that we can directly examine the effects of restructuring of state-owned enterprises into private firms. The study shows that there are 54 firms which qualify the rigorous

[7]Large state-owned enterprises tend to pay high wages due to their monopoly power. These state-owned enterprises are concentrated on monopoly industry such as electricity, petroleum, hydropower, and this will give rises to the high wage illusion for the state-owned enterprises. We consider that most of the small and medium state-owned enterprises are low efficiency and low wage payment, which is confirmed by the survey data of World Bank.

Table 8.3 Difference of finance of foreign and domestic firms and government-firm relation

ICS (2003)	Survey item	Overall	State-owned	Private	Foreign
Finance situation	Share of foreign exchange borrowing (%)	3.14	0.69	1.54	14.9
	Share of bank loan (%)	23.0	26.0	20.8	29.6
	Numbers of banks related	2.81	3.17	2.54	3.63
	Share of collateral in loan value (%)	59.2	62.4	58.4	57.7
	Annual loan's interest rate (%)	5.39	5.78	5.13	5.87
Relation with government	Days dealing with officials (each month)	7.4	8.3	7.0	8.2
	Help from government (0−6)	3.1	3.5	2.9	3.6
	Share of efficient service (%)	35.5	36.4	34.0	42.0
	Predictability of laws (%)	27.6	29.8	26.5	29.4
	Fairness in the business disputes (%)	64.0	67.6	62.6	64.7
	Share of competent officials (%)	50.9	51.6	50.4	52.2
	Share of helping officials (%)	34.3	35.0	33.2	39.2

Note The numbers are calculated by authors from the investment climate survey of world bank (China 2003), and all are average numbers of the survey firms

definition[8] of restructuring of state-owned enterprises in the time interval. Last three rows of Table 8.2 reports the situation of restructuring firms before and after. It can be seen that after two years of restructuring of state-owned enterprises, the production efficiency has significantly raised by 46 %, so that the labor's share of income drops from 0.202 in 1999 to 0.177 in 2002.

Although we cannot directly examine the impacts of the entry of foreign capital to labor's share of income, studies of Diwan (2000; 2001), Decreuse and Maarek (2008) claimed that the proportion of foreign investment γ can be raised by financial openness, which will oppose a downward pressure on labor's share of income. Therefore, we can compare the finance situation of foreign and domestic firms horizontally (see Table 8.3 line 2−6). It can be seen that the financial channel of foreign firms are relatively abundant. They can not only finance through foreign exchange from parent countries, but also welcomed by the domestic financial institution. Despite of relative high loan's interest rate, the financial environment of foreign enterprises is little bit better than the state-owned enterprises, much better than private firms. This means that the foreign firms will still actively invest in China due to the loose financial environment.

[8]The definition of restructuring of state-owned enterprises is as follows: the state-owned enterprises (which the state shareholders dominate in 1999) are changed into private enterprises (which the private shareholders dominate in 2002).

On the other hand, the entry of foreign firms is also affected by the policy environment. Luo and Zhang (2009b) claimed that there are competition effects of local government in attracting foreign investment. Local government offered a lot of favorable policies to foreign firms, and considered low labor cost as necessary means to attract investors, so that the negotiation power of capital is rising, and the negotiation position of labor is weakening. By using government and firm relation data of World Bank (see Table 8.3 line 7−13), we can testify the above assumption directly. Interestingly, the survey data shows that the affinity of foreign firms and government are as close as state-owned firms, and much closer than private firms. Some of the indexes are even higher than the state-owned enterprises. This indicates that the competition in attracting capital of local government does exist in the economy. In the theoretical part, we have already claimed that the entry of foreign firms will improve the production efficiency in the economy to oppose a positive strike on the decrease of labor's share of income. However, we suggest that the local government should not give foreign firms excessive policy inclination. This policy inclination will deliver distorted incentive signal, so that it will accelerate the extent of decrease of labor's share of income.

8.4 Empirical Model, Variables and Estimation Methods

So far till now, we analyze the ownership difference of labor's share of income in China and provide elementary explanations. If we regress private and foreign ownership on labor's share of income, the expected sign of both variables are negative. In order to draw robust conclusion, we must control other factors that may affect on labor's share of income. This chapter set up variables according to model used by Bentolila and Saint-Paul (2003) in determining labor's share of income in the neoclassical framework. In order to capture institutional factors during the economic transition in China, we supplement several variables related to recent literature (Bai et al. 2008; 2009a, b; Luo and Zhang 2009b). On concrete, the following linear model by using panel data is:

$$\begin{aligned} LS_{i,t} = {} & \beta_0 + \beta_1 pri + \beta_2 for + \beta_3 KtY_{i,t} + \beta_4 exp + \beta_5 mkup \\ & + \beta_6 newp + \beta_7 gov + \sum \omega_i city_i + \sum \varphi_i ind_i + \sum \psi_t year_t + \varepsilon_{i,t} \end{aligned} \tag{8.9}$$

where, *LS* stands for labor's share of income; *pri* is the proportion of private shareholders; *for* is the proportion of foreign shareholders; *KtY* is the capital output ratio, which is book value of fixed assets; *exp* is the export sales ratio, which is proportion of firm's export divided by total value of sales; *mkup* is the mark up of the price, which identifies the extent of monopoly of firms[9]; *newp* is the development of new product,

[9]The computational equation is *mkup* = (total value of sales—total cost of production sold)/total value of sales.

which is share of sales of new products, measuring innovation and technology progress; *gov* identifies the relationship between government and enterprises. By using the survey data, this chapter constructs 0−6 ordinal index to measure the extent to which government assist the enterprises[10]; *city, ind* are dummy variables control for the city and industrial effects; *year* is the time dummy; ε is error term, β_0 is constant, β_1-β_7 are coefficients of regressors, ω, φ, ψ are the coefficients of industry, city, and time dummy, subscription i and t represent firm i and year t respectively.

The shares of ownership of private and foreign are the main concerning variables, expecting negative sign. Meanwhile, we will construct dummy variable for private and foreign firms by above categorization to check robustness.[11] As for capital out ratio, the theoretical framework of Bentolila and Saint-Paul (2003) considered that when the substitutive elasticity between capital and labor is bigger than one, the coefficient of this variable is negative; when the elasticity is smaller than 1, the coefficient is positive. Diwan (2000) found that the former is suited for rich country and the latter is for the poor country. The empirical studies using provincial panel data supported the evidence that the substitutive elasticity is smaller than one in China (Luo and Zhang 2009b; Shao and Huang 2010; Bai and Qian 2009b), however, results from enterprise data supported the evidence that the elasticity is bigger or equal to one (Bai and Qian 2009a; Li et al. 2009). We incline to support the supplementary hypothesis between capital and labor. As for the export sales ratio, the neoclassical theory claimed that international trade and specialization should increase the income share of abundant factors and decrease the income share of scarce factors. It suggested that international trade will raise China's labor's share of income. However, available researches indicated weak correlation between trade and labor's share of income. And this chapter will give empirical results from firm data, and try to explain from the ownership structure perspective. The coefficient of price markup *mkup* is expected to be negative. Bentolila and Saint-Paul (2003) claimed that when imperfect competition existed in the product market, the increase of monopoly would raise monopoly rent thus decrease labor's share of income. Empirical results of Bai et al. 2008; Bai and Qian (2009a, b) supported above assertion. The next index is innovation and technological progress *newp*, and Bentolila and Saint-Paul (2003) claimed that capital biased technological progress would accelerate the capital accumulation, thus decrease the labor's share of income. According to the Sect. 8.3, we find that the relationship between government and firms are quite different among three types of firms. Therefore, this chapter adds a new ordinal variable *gov* to discuss the impacts of government policy to labor's share of income. Finally, we control for city and industry dummies for robustness.

[10]This index is constructed by the part H in the questionnaire of World Bank survey. The question is "During the year 2002 did any government agency or official assist you in: (1) Identifying foreign investors; (2) Locating foreign technology to license; (3) Identifying potential foreign clients; (4) Identifying potential foreign suppliers; (5) Obtaining bank financing; (6) Identifying potential domestic clients. If the answer is yes, we code 1, if else we code 0. Then we sum all six questions to get the index whose interval is 0−6.

[11]No matter the share or categorization of ownership, we should omit state-owned preventing the multilinear problem.

Table 8.4 Summary statistics of main variables

Variables	Definition	Samples	Average	S.D.	Max	Min
LS	Labor's share of income (%)	7513	15.8	15.7	1	98.0
pri	Share of private ownership (%)	9554	69.1	43.4	0	100
for	Share of foreign ownership (%)	9554	7.8	23.2	0	100
KtY	Capital output ratio (¥)	9053	1.22	1.65	3.07	29.7
exp	Export sales ratio (%)	9369	8.2	25.1	0	100
mkup	Price mark up (%)	9199	23.3	20.4	0	100
newp	Share of new product sales (%)	9600	9.9	21.2	0	100
gov	Government-firm relations (0−6)	9312	0.62	1.16	0	6

Note The numbers are from the investment climate survey of world bank (China 2003), which obtained after organizing into panel data structure

In the model, the relationship between government and firms are qualitative index, and World Bank only provides data in 2002. Therefore, we will run OLS regression for the cross sectional data of firms in 2002 firstly. Then, we will run pooled OLS regression when the index is extended to all years. However, pooled OLS regression will overestimate the coefficient of regressors in face of endogenous problem. In our econometric model, there is strong simultaneous problem exists between capital output ratio and labor's share of income. Low labor's share of income indicates high capital share, and firm with high capital share will have more retained profits which will also raise the capital output ratio. Therefore, this chapter adopts "system GMM" estimation method outlined by Arellano and Bover (1995) and fully developed by Blundell and Bond (1998), and this method will solve the endogenous problems for the independent variables. Meanwhile, the "system GMM" is more suitable for "small T, large N"[12] panel data structure compared with "difference GMM", which was put forward by Arellano and Bond (1991). Thus our dataset is suitable for "system GMM". In addition, some researched suggested that foreign direct investment is also endogenous (Decreuse and Maarek 2008; Luo and Zhang 2009b). The ownership structure along the survey interval doesn't dramatically changes. For instance, the number restructuring stat-owned firms is 54, which only takes 2 % of total firms. And the proportion of foreign shareholders merely changes between 1999 and 2002 which are 7.86 and 7.93 % respectively. Therefore, the concerning variable of private and foreign ownership can be considered as exogenous. We will compare the results of OLS and GMM regressions, and tests robustness of each estimation method. Table 8.4 gives the summary statistics of main variables, in which the number of samples are adjusted by treating

[12]"Difference GMM" will directly difference the regression model, using lagged explanatory variables as instrument variables. This will subtract the time dimension of panel data, and also difference out the dummy variable from regression equation. "System GMM" combines difference equation with level equation, and adds a group of lagged differencing variable as instrument variables for the level equation. The biggest advantage is that this doesn't reduce the sample volume.

missing data and outliers. It should also be noted that the survey doesn't provide the data of share of new product sales in 1999, and we substitute with data in 2000.

8.5 Empirical Tests and Discussion

Our research finds that the labor's share of income decreases in three years between 1999 and 2002 (see Table 8.2). The aggregate labor's share of income in China also experienced a decreasing trend in the same time, so that the micro and macro data are matching with each other. Therefore, we will report and discuss the estimating results of model (8.9) by econometric regression (see Table 8.5). We will mainly focus on the coefficients of private and foreign ownership after controlling other variables. Estimation 1 estimates the impacting factors of labor's share of income by using cross sectional data in 2002 directly. Estimation 2 estimates results by pooling data of each year. In order to solve the endogenous problem of capital output ratio, estimation 3 and 4 will give system GMM estimating results with one-step and two-step method respectively. In the GMM estimation, we the first and second order of lagged capital output ratio as instrument variable of the difference equation, and the first and second order of differenced capital output ratio as instrument variable of the level equation. Meanwhile, the Arellano-Bond serial correlation test and Sargan and Hansen instrument variable over identification and effectiveness test. To test the robustness of coefficient of main variables, private and foreign ownership and export and sale ratio is replaced in estimation 5. And private and foreign ownership is replaced by dummy variable of private and foreign firm (see the discussion in Table 8.1 of Sect. 8.2). And export sales ratio is replaced by dummy variable of export firms, and we set export firms whose export sales ratio is bigger than 10 %. Finally, we consider that the wage setting of this year may be depended on the real wage of last year. Therefore, estimation 6 will set first order lagged labor's share of income as regressors so that the panel data will have dynamic feature.

It can be seen that the results of all estimations are very close to each other, and the coefficient all variables are significant above 5 %. In the cross sectional and pooled OLS, the coefficient and significance of capital output ratio KtY are relatively high so that the capital output ratio may be overestimated because of endogenous problem. After using system GMM estimation, the coefficient and significance will reduce dramatically, indicating that the endogenous of this variable may exist. Meanwhile, after dealing with the endogenous problem, the coefficient and significance of other variables are improving compared from estimation 2 with estimation 3. No matter the one-step and two-step system GMM estimation,[13] coefficients of all variables are consistent with each other and both estimations pass through test of

[13]In system GMM, two-step estimation is relatively effective compared with one-step estimation (Roodman 2006). The result of this paper shows that the coefficients of both estimations are nearly the same. The coefficient of endogenous variable KtY decreases further and the significance of all variable also become smaller.

Table 8.5 Results of regression of determinants of labor's share of income

Regressors	Estimation 1 cross sectional OLS	Estimation 2 pooled OLS	Estimation 3 system GMM (1)	Estimation 4 system GMM (2)	Estimation 5 variable substitution	Estimation 6 dynamic feature
pri	−0.019** (−2.05)	−0.012*** (−2.68)	−0.020*** (−7.62)	−0.020** (−2.35)	−0.018** (−2.22)	−0.016** (−2.12)
for	−0.048*** (−2.76)	−0.037*** (−4.37)	−0.041*** (−9.48)	−0.041*** (−2.58)	−0.043*** (−3.99)	−0.033*** (−2.66)
KtY	0.016*** (13.50)	0.013*** (20.98)	0.0062** (5.58)	0.0055** (2.17)	0.0055** (2.16)	0.0053** (1.91)
exp	−0.031** (−3.25)	−0.039*** (−4.93)	−0.043*** (−10.83)	−0.044** (−4.05)	−0.034** (−4.53)	−0.033** (−3.45)
mkup	−0.072*** (−3.77)	−0.097*** (−10.09)	−0.101*** (−20.85)	−0.101*** (−6.50)	−0.099*** (−6.39)	−0.077*** (−5.80)
newp	−0.045*** (−3.23)	−0.038*** (−4.81)	−0.044*** (−10.87)	−0.045*** (−4.45)	−0.044*** (−4.35)	−0.039*** (−4.20)
gov	−0.010*** (−3.60)	−0.010*** (−7.12)	−0.010*** (−13.58)	−0.010*** (−4.80)	−0.009*** (−4.69)	−0.007*** (−3.82)
City dummy	Yes	Yes	Yes	Yes	Yes	Yes
Ind dummy	Yes	Yes	Yes	Yes	Yes	Yes
Year dummy	No	Yes	Yes	Yes	Yes	Yes
Constant	0.269*** (12.43)	0.276*** (24.82)	0.299*** (44.16)	0.302*** (11.89)	0.300*** (11.97)	0.2116*** (6.29)
No of sample	1815	7055	7055	7055	7055	5261
F test	14.73	45.47	–	–	–	–
Adjusted R2	0.2188	0.2014	–	–	–	–
AB (1) test	–	–	0.000	0.000	0.000	0.000
AB (2) test	–	–	0.130	0.548	0.543	0.007
Sargan test	–	–	0.283	0.283	0.294	–
Hansen test	–	–	–	0.653	0.663	0.288
Dif-in-Sargan	–	–	0.135	–	–	–
Dif-in-Hansen	–	–	–	0.374	0.383	0.489

Note Number in brackets are T statistics; *stands for 10 % significant level; **stands for 5 % significant level, ***stands for 1 % significant level; AB(1) and AB(2) are first and second order serial correlation tests respectively; Dif-in-Sargan and Dif-in-Hansen are effectiveness test of extra instrument variables, the original assumption is that these instrument variables are effective

serial correlation and over identification and effectiveness test of instrument variable, indicating that the robustness of GMM estimation. Therefore, we use estimation as our final result. Through analysis of coefficient of all variables, we can conclude as follows.

Firstly, the coefficient of our main concerned variable, which are private and foreign ownership, are significantly negative, this is consistent with the theoretical analysis. The coefficient of private ownership is −0.02, indicating that the raising of ownership by one per cent will make labor's share of income fall by 0.02 %. The effect of foreign ownership is bigger, that the raising of ownership by one percent

will make labor's share of income fall by 0.04 %. From the above analysis, the labor's share of income of foreign firms is significantly lower than other two types of firms.

Secondly, the coefficient of capital output ratio is significant on the 5 % level, indicating that the substitutive elasticity between capital and labor is smaller than one. Therefore, our empirical result is consistent with other studies using provincial panel data of China. We consider that the capital accumulation not only promote the capital per worker, but also raise the marginal capital of labor, thus raising labor's share of income. The variable *mkup* measuring the extent of firm monopoly is significantly negative, indicating that the more the extent of firm monopoly, the less labor's share of income it will be. This result is consistent with Bai et al. 2008; Bai and Qian (2009a). The innovation index *newp* is also negative, indicating that firms which engage in the new product development and sales are capital intensive firms, and innovation and technological progress will promote capital accumulation of firms.

Thirdly, this chapter introduces new variable *gov* so that we may directly examine the effect of government policy to labor's share of income. We find that the coefficient of this variable −0.01, indicating that the labor's share of income will fall one per cent when the relationship of firm and government is raising one. Despite of the policy burden by proving help to state-owned enterprises, the policy leaning of local government to those high scale and efficiency firms will increase capital share of these firms and decrease labor's share of income. Meanwhile, the competition among local government in attracting foreign capitals will accelerate the inequality of government policy among firms.

Fourthly, the coefficient of trade variables *exp* is significantly negative, which contradicts with the prediction of neoclassic trade theory, and contrasts with the weak correlation between trade and labor's share of income of empirical study by Luo and Zhang (2009b). Meanwhile, the result also doesn't agree with the assertion that the export products of China mainly concentrate on labor intensive industries.

In order to get more robust results, we use dummy variable of export firms instead of export sales ratio as regressor. Meanwhile, the ownership of private and foreign firms is substituted by dummy variable of private and foreign firms. The concrete results are showed in Table 8.5 estimation 5. We find that the alternative dummy variables are still negative, whose coefficients are close with that in estimation 4. It not only tests the robustness of the regression, but also indicates that the main effects of ownership and export sales ratio are mainly through firm heterogeneity. For the difference of labor's share of income with different ownership, this chapter has already had a detailed discussion. For the export dummy, this means that there is difference of labor's share of income between export and non-export firms, and the former is smaller than the latter.[14] According to the data from World Bank, we find that the labor's share of income of export firms are much lower than

[14]The new development of trade theory seems to be consistent with our study. And this theory claimed that export firms have high productivity than non-export firms, so that the relative effectiveness of export firm will make the labor's share of income relatively lower.

Table 8.6 Difference of labor's share of income export and non-export firms

ICS (2003)	Firm type	1999	2000	2001	2002
Labor share (%)	Overall	16.3	15.5	15.4	15.7
	Export firms	11.4	10.6	11.0	10.6
	Non-export firms	17.0	16.3	16.1	16.5
The ownership distribution of export firm (number)	Overall	381	293	301	306
	State-owned firms	39	30	33	29
	Private firms	220	152	154	152
	Foreign firms	122	111	114	125

Note The numbers are calculated by authors from the investment climate survey of world bank (China 2003)

that of non-export firms (see Table 8.6 line 2−4) during the survey year. In 2002, the discrepancy between average labor's share of income of both firms reaches 6 %.

We consider that there are two possibilities to explain the negative effects of export to labor's share of income. Firstly, the structure of export products is transferred from labor intensive to capital intensive. For example, Rodrik (2006) claimed that the sophistication of China's export products were higher than its per capita GDP level. Secondly, foreign firms play an increasing important role in China's export. Form macro data, the share of export mechanizes of foreign firms is 20.4 % in 1992, and it increases to 55.3 % in 2008.[15] Combined with our analysis, if the more foreign firms engage in exporting business, the lower will the labor's share of income of export firms. Following this, we further divide export firms into different types of ownership. Table 8.6 also shows that the share of foreign firms in export firms increases from 32 % in 1999 to 41 % in 2002 in the survey data. This is highly consistent with the macro merchandize data. Meanwhile, the number of state-owned export firms is relatively smaller. In 2002, there are only 29 state-owned export firms, which further explain the reason why labor's share of income of export firms is smaller. In addition, because of the advanced technology and high productivity of foreign firms, the increasing extent of foreign firms engaging in exporting business will raise the sophistication of China's export products. Therefore, the "foreign investment leaded" feature of our export enterprises may be the reason of the failure of neoclassic trade theory prediction for China. And the negative effects of export can be explained from a unified framework of firm heterogeneity and ownership.

Finally, considering the dynamic feature of the panel data, we use first order lagged labor's share of income as regressor, and we also treat first order and second order lagged variable as instrument variable for difference equation of system GMM, which is the estimation 6. The coefficient of lagged labor's share of income

[15]Data is from *China Statistical Yearbook*, 1995 and 2009.

is 0.26, indicating that the positive impact of last period on the current period.[16] In addition, the coefficients of other variables don't change much and are also significant. Meanwhile, estimation 6 pass through Hansen test. It should be noted that the joint F tests of dummy variables of regions, industries and time shows significant time and fixed effects.

8.6 Conclusion and Policy Implication

This chapter constructs a theoretical model, which, from the micro firm perspective, analyses the firm heterogeneity that will lead to significant difference among different types of firms. The theoretical model is extended to three types of firms, which are state-owned, private and foreign enterprises. Thus, this chapter discusses the impact of ownership restructuring of state-owned enterprises, privatization, and entry of foreign investment on labor's share of income during the economic transition and opening process. Utilizing the World Bank Investment Climate Survey, the chapter testifies the difference of labor's share of income by types of ownership, and claims that change of ownership structure will reduce factor distortion and promote economic efficiency which will impose a positive and transitory impact on labor's share of income decrease. By using OLS and System-GMM estimation, it shows that, after controlling other factors, increase of private and foreign ownership will lead to decrease of labor's share of income. The two estimation and robustness test shows that the raising of private and foreign ownership by one per cent will make labor's share of income decreases by 0.02 and 0.04 % respectively.

Because of low wage and low productivity of state-owned firms, the labor's share of income of this is the highest among three types of firms. Therefore, as a kind of form of ownership change, restructuring of state-owned enterprises to private firms will increase the productivity and decrease labor's share of income. By tracing time series change of state-owned enterprises, it finds that their production efficiency rises dramatically two years after the ownership restructuring. We claim that the restructuring of state-owned enterprises means economic improvement in the economic sense. Therefore, the impact on decreasing labor's share of income can be seen as positive.

Study shows that although the wage premium of foreign firm is significant, the productivity of foreign firm is much bigger than other two types of firms, which make relatively low labor's share of income of foreign firms. We should affirm the positive effect which foreign firms help to raise the technology and productivity of China. However, we should also note that the labor payment is relatively low compared with its own productivity. This also means that the low labor cost is the main reason of attracting foreign firms. On the other hand, this research testifies that competition among local government in attracting foreign enterprises in order to

[16]We omit this result in Table 8.5 for sake of briefness.

pursue GDP does exist. The leaning government policy towards foreign firms will provide distorted incentive signal for attracting even more foreign firms. Therefore, as the capital and financial globalization trend, foreign firms will still enter into China with a rapid pace, that may accelerate the decreasing extent of labor's share of income. It may also have a negative effect on the pattern of national income distribution, which needs more attention. The policy advice is that we should fully utilize the productivity promoting effects of foreign firms, and avoid the unfair competition and distortion of factor distribution because of leaning government policy. In 2007, China implemented a unified 25 % income tax for foreign and domestic enterprises which is an attempt to remedy the distortion.

In the econometric regression, we find that the labor's share of income of export firms is significantly smaller than that of non-export firms. The research shows that there are about 30-40 % foreign firms engaging in export business, and the high productivity will impose a downward pressure on labor's share of income of export firms.

The chapter also introduces the government enterprise relationship variable, which testifies that competition among local government in attracting foreign enterprises in order to pursue GDP does exist. Finally, the "foreign investment leaded" feature of our export enterprises may be the reason of the failure of neo-classic trade theory prediction for China. Therefore, we use a unified framework of firm heterogeneity and ownership to explain the failure of HO theory prediction for China.

Acemoglu (2003) claimed that in the short run, when economy was operating on the transitional path, the technological progress and rising productivity will decreases labor's share of income. The transitional feature in China can be expressed as restructuring of state-owned enterprises, privatization and entry of foreign firms, so that they will put a downward impact on labor's share of income. In the long run, when economy was operating on the balanced growth path, Acemoglu claimed that the labor compensation would be determined by marginal labor product to stabilize the labor's share of income. Therefore, after the completeness of restructuring of state-owned enterprises and the orderly introduction of foreign investment, we will realize the balanced growth by promoting economic efficiency while stabilizing distributional relations.

Appendix

I Proof: $w_1 > w_2$, and high profits for the first type of firms.

$$\begin{aligned} w_1 - w_2 &= \frac{\alpha y_1 + (1-\alpha)y_2}{y_2} w_2 - w_2 \\ \therefore w_1 &> w_2 \ \#\text{End} \\ \Delta profit &= (y_1 - w_1) - (y_2 - w_2) \\ &= (y_1 - y_2) - (w_1 - w_2) \\ &= (y_1 - y_2) - \frac{\alpha w_2 (y_1 - y_2)}{y_2} \\ &= \frac{(y_1 - y_2)(y_2 - \alpha w_2)}{y_2} > 0 \end{aligned}$$

∴ The first type of firms pay high wage and obtain high profits.
II Proof: $LS_1 < LS_2$:

$$\begin{aligned} LS_1 - LS_2 &= \frac{w_1}{y_1} - \frac{w_2}{y_2} \\ &= \frac{[\alpha y_1 + (1-\alpha)y_2]w_2}{y_1 y_2} - \frac{w_2}{y_2} \\ &= \frac{w_2[\alpha y_1 + (1-\alpha)y_2 - y_1]}{y_1 y_2} \\ &= \frac{-\alpha w_2 (y_1 - y_2)}{y_1 y_2} < 0 \\ \therefore LS_1 &< LS_2 \ \#\text{End} \end{aligned}$$

III Total Labor's share of income LS:

$$\begin{aligned} W &= \alpha w_1 + (1-\alpha)w_2 \\ Y &= \alpha y_1 + (1-\alpha)y_2 \\ LS = \frac{W}{Y} &= \frac{\alpha w_1 + (1-\alpha)w_2}{\alpha y_1 + (1-\alpha)y_2} \\ &= \frac{\frac{\alpha[\alpha y_1 + (1-\alpha)y_2]w_2}{y_2} + (1-\alpha)w_2}{\alpha y_1 + (1-\alpha)y_2} \\ &= \frac{w_2}{y_2} \frac{\alpha[\alpha y_1 + (1-\alpha)y_2] + (1-\alpha)y_2}{\alpha y_1 + (1-\alpha)y_2} \end{aligned}$$

IV Differentiate labor's share of income with the proportion of first type of firm $dLS/d\alpha$:

$$\begin{aligned}\frac{dLS}{d\alpha} &= \frac{1}{Y}(-dY/d\alpha \times LS + dW/d\alpha) \\ &= \frac{1}{Y} \times \frac{w_2}{y_2}\left[-(y_1 - y_2) \times LS\frac{y_2}{w_2} + 2\alpha(y_1 - y_2)\right] \\ &= \frac{1}{Y^2} \times \frac{w_2}{y_2}(y_1 - y_2)\{-\alpha[\alpha y_1 + (1-\alpha)y_2] - (1-\alpha)y_2 + 2\alpha[\alpha y_1 + (1-\alpha)y_2]\} \\ &= \frac{1}{Y^2} \times \frac{w_2}{y_2}(y_1 - y_2)\left[\alpha^2 y_1 - (1-\alpha)^2 y_2\right]\end{aligned}$$

V The lowest point of U-shaped curve α^*

$$\begin{aligned}\frac{dLS}{d\alpha} &= 0 \\ \because \frac{1}{Y^2}\frac{w_2}{y_2}(y_1 - y_2) &> 0 \\ \therefore \alpha^2 y_1 - (1-\alpha)^2 y_2 &= 0 \\ \frac{(1-\alpha)^2}{\alpha^2} &= \frac{y_1}{y_2} \\ \frac{1}{\alpha} &= \sqrt{\frac{y_1}{y_2}} + 1 \\ \alpha^* &= \frac{\sqrt{y_2}}{\sqrt{y_1} + \sqrt{y_2}} = \frac{(y_1 y_2)^{1/2} - y_2}{y_1 - y_2}\end{aligned}$$

References

Acemoglu D (2003) Labor- and capital-augmenting technical change [J]. J Eur Econ Assoc 1(1):1–37

Aitken B, Harrison AE, Lipsey RE (1996) Wages and foreign ownership: a comparative study of Mexico, Venezuela, and the United States [J]. J Int Econ 40(3–4):345–371

Arellano M, Bond S (1991) Some tests of specification for panel data: monte carlo evidence and an application to employment equations [J]. Rev Econ Stud 58(2):77–297

Arellano M, Bover O (1995) Another look at the instrumental variable estimation of error-component models [J]. J Econom 68:29–51

Bai C, Qian Z, Wu K (2008) Determinants of factor shares in china's industrial sector [J]. Econ Res J 8:16–28

Bai C, Qian Z (2009a) Factor income share in China: the story behind the statistics [J]. Econ Res J 3:27–41

Bai C, Qian Z (2009b) On the increase in the Chinese aggregate capital income share: an investigation from provincial perspective [J]. J Tsinghua Univ (Philos Soc Sci) 24(4):137–147

Bentolila S, Saint-Paul G (2003) Explaining movements in labor income share [J]. Contrib Macroecon 3(1):1103–1136

Bernard AB, Jensen JB (1999) Exceptional exporter performance: cause, effect, or both? [J]. J Int Econ 47(1):1–25
Bernard AB, Jonathan E, Jensen JB, Kortum S (2003) Plants and productivity in international trade [J]. Am Econ Rev 93(4):1268–1290
Bernard AB, Jensen JB, Schott PK (2006) Trade costs, firms and productivity [J]. J Monet Econ 53 (5):917–937
Blundell R, Bond S (1998) Initial conditions and moment restrictions in dynamic panel data models [J]. J Econom 87(1):115–143
Cai F (2005) Explore fair distribution mechanism with economic development [N], People forum, 17th October 2005
Clerides SK, Lach S, Tybout JR (1998) Is learning by exporting important? micro-dynamic evidence from Colombia, Mexico, and Morocco [J]. Q J Econ 113(3):903–947
Cobb CW, Douglas PH (1928) A theory of production [J]. Am Econ Rev 18(Supplement):139–165
Dai Y, Li H (1988) Wage erodes profits: the potential risks in China's reform of economic institution [J]. Econ Res J 6:3–11
Decreuse B, Maarek P (2008) FDI and the labor share in developing countries: a theory and some evidence [EB/OL], Working paper, GREQAM, University of Aix-Marseilles
Diwan I (2000) Labor income shares and globalization [EB/OL], World Bank Working Paper, Washington
Diwan I (2001) Debt as sweat: labor, financial crises, and the globalization of capital [EB/OL], World Bank Working Paper, Washington
Egger H, Kreickemeier U (2009) Firm heterogeneity and the labor market effects of trade liberalization [J]. Int Econ Rev 50(1):187–216
Harrison AE (2002) Has globalization eroded labor's share? some cross-country evidence [EB/OL], mimeo, University of California at Berkeley and NBER
Helpman E, Itskhoki O (2010) Labor market rigidities, trade and unemployment [J]. Rev Econ Stud 77(3):1100–1137
Helpman E, Melitz MJ, Yeaple SR (2004) Export versus FDI with heterogeneous firms [J]. Am Econ Rev 94(1):300–316
Jiang L, Zhang Y (2008) Impacts of foreign trade on labor distribution ratio: analysis of Chin's provincial panel data [J]. J Int Trade 10:26–33
Kalleberg AL, Wallace M, Raffalovich LE (1984) Accounting for labor's share: class and income distribution in the printing industry [J]. Ind Labor Relat Rev 37(3):386–402
Li Y (1992) Adjustment of functional income distribution: thinking of the phenomenon of national income inclining to individual [J]. Econ Res J 7:34–44
Li D (2007) Pay attention to the decreasing labor income share of GDP [N], New fortune, 21st September 2007
Li D, Liu L, Wang H (2009) Changes in the labor's share of income of GDP: A U-shaped curve [J]. Econ Res J 1:70–82
Lin Y, Li Z (2004) Policy burden, moral hazard and soft budget constraint [J]. Econ Res J 2:17–27
Lin JY, Tan G (1999) Policy burdens, accountability, and the soft budget constraint [J]. Am Econ Rev 89(2):426–431
Lipsey RE (2002) Home and host country effects of FDI [EB/OL], NBER Working Paper no.9293, Cambridge
Lipsey RE, Sjöholm F (2004) Foreign direct investment, education and wages in indonesian manufacturing [J]. J Dev Econ 73(1):415–422
Liu M, Xu L, Liu L (2004) Wage-related labor standards and FDI in China: some survey findings from guangdong province [J]. Pac Econ Rev 9(3):225–243
Luo C (2008) Rethinking the kardo "stylized facts": the share of labor income revisited [J]. J World Econ 1:86–96
Luo C, Zhang J (2009a) Labor income share in economic development: empirical evidence from China's industrial data [J]. Soc Sci China 1:65–79

Luo C, Zhang J (2009b) The economic explanation of decrease of labor income share: empirical evidence from China's provincial data [J]. Manag World 5:25–35
Marx C (1972) (translated by Guo, D. and Wang, Y.) Das kapital [M], vol 1–3. People's Publishing House, Beijing
Melitz MJ (2003) The impact of trade on intra-industry reallocations and aggregate industry productivity [J]. Econometrica 71(6):1695–1725
Rodrik D (2006) What's so special about China's exports? [J]. China and World Econ 14(5):1–19
Roodman D (2006) How to do xtabond2: an introduction to 'difference' and 'system' GMM in stata [EB/OL], Working paper no. 103, Center for Global Development, Washington
Ricardo D (1981) (translated by Guo D and Wang Y) On the principles of political economy and taxation [M]. Commercial Press, Beijing
Shao M, Huang J (2010) FDI and China's Regional Labor Share: Empirical Evidence from Industry [J]. China Economic Quarterly, 9(4):1189–1210
Yao X (2005) Economic development of private economy and adjustment of labor capital relations [J]. Zhejiang Soc Sci 2:78–86
Zhao Y (2002) Earnings differentials between state and non-state enterprises in urban China [J]. Pac Econ Rev 7(1):181–197

Chapter 9
Conclusions and Policy Implications of this Book

Income distribution, as a research topic, has never lost its attractions to economists. Since the research about income distribution by Ricardo (1981), classical theory, neoclassical theory, Keynesian theory and modern economic theory have never stopped their study about income distribution throughout the history of past 200 years. Generally, income distribution can be divided into two aspects, i.e., size income distribution and functional income distribution. Size income distribution discusses the distributional relationship among different groups while functional income distribution focuses on distributional relationship of income among different factors.

For a long period of time, studies about China's income distribution issues mainly focus on the size income distribution from the perspective of person, urban-rural and region, but ignore the functional income distribution from the perspective of factors such as labor, human capital and physical capital. However, the enlarging income disparity between urban and rural areas, among different regions and across different people comes along with the unbalanced factor distribution between labor and capital. In the recent years, the national income distribution structure in China appears to be "strong capital and weak labor". The share of labor's compensation in GDP decreases from 59.3 % in 1998 to 52.9 % in 2007. The decrease of the labor's share of income is an indisputable fact. Therefore, this book regards the labor's share of income as the main focus and examines the change of income distribution pattern among economic factors from the perspective of functional income distribution.

Therefore, this book tries to answer the following two core questions: since reform and opening up, how does the labor's share of income move? Why there is a continuous decrease of the labor's share of income in the past 10 years? In order to answer the above questions, this book has reviewed the theoretical and empirical development about studies related to labor's share of income distribution. More specially, it examines the recent literatures which discuss the decrease of the labor's share of income in China. We find that there are still places for further study both for the discussion about the measurement of the labor's share of income and the theoretical explanation of movement of the labor's share of income. We argue that the price is important to get a more accurate and plausible measurement about labor's share of income for better understanding the true movement of the labor's

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share of income in China. We further argue that opening and transition are two key factors for understanding the decrease of labor's share of income in China.

Throughout the book, we study the labor's share of income in China following three steps. The first step is measurement. In order to get an accurate and plausible measurement of the labor's share of income, we try to compare data series from different sources, e.g., national and provincial income approach of GDP, flow of funds account, and input-output table. In order to consistently measure the labor's share of income over time, we use employment data to adjust the change of statistical caliber by NBS. More importantly, we argue that the current measurement about the labor's share of income ignores the roles of price factors, forming an improper firm's profitability perspective. On the other hand, we distinguishes the nominal and real labor's share of income by considering price factors to get a new estimation of real labor's share of income which matches with the direct feeling of income distribution by ordinary workers. Discussions about the measurement of the labor's share of income can be found in Chaps. 3, 4 and 5.

The second step is decomposition. In order to look at the movement of the labor's share of income in China, it is plausible to examine the structural components of the labor's share of income. In this book, we use several strategies to decompose the labor's share of income in China. We decompose the labor's share of income by industry to discuss the effect of industry structure on the labor's share of income. Different from previous studies, our industrial decomposition is confined to the subindustries within industrial sector. We decompose the labor's share of income by different sectors, i.e., governments sector, firms sector and households sector so that we can discuss the importance of structural effects and within-sector effects. We decompose the labor's share of income into raw labor's share and human capital's share so that we can discuss income shares of different types of workers and their impacts. In addition, we also decompose the labor's share of income into employment, compensation and output effects. Such decomposition is helpful to examine the interactions between labor's share of income and other basic macroeconomic variables, i.e., employment, price and output, adding more economic insights for the empirical analysis. Discussions about the decomposition of the labor's share of income can be found in Chaps. 3, 4, 6 and 7.

The third step is explanation. In order to discuss deterministic factors behind the movement of the labor's share of income in a more comprehensive and deep way, this book conduct studies from three main aspects which are macro, meso and micro level and from three main perspectives which are growth, transition and opening. Furthermore, we divided the question of decreasing labor's share of income into four sub-questions: (1) From macro perspective, how do unbalanced growth rates of economic factors influence the distributional relationship among these factors? (2) From regional perspective, what are the effects of changes of economic and industrial structure on the decrease of the labor's share of income? (3) From industrial perspective, how does the change of trade mode influence the decrease of the labor's share of income within industrial sector? (4) From the micro-firms' perspective, how does firm heterogeneity influence the distribution of

capital and labor within firms? Discussions about the explanation of the movement of the labor's share of income can be found in Chaps. 4, 6, 7 and 8.

For this chapter, we are going to make a brief summary about the conclusions obtained from this research. Based on this summary, we will raise some shortcomings of this research and will point out directions for further study.

9.1 Main Conclusions

The conclusions of this study can be summarized in a nutshell as followings. The decrease of the labor's share of income in China from mid-1990s to mid-2000s is an indisputable fact, especially from national and provincial income approach of GDP data. The real labor's share of income by considering the price factors is lower than the estimated nominal value in the literature by 6−14 %, indicating the worsening situation of national income distribution. Industry structure change from agriculture industry to non-agriculture industry is the main reason for the decrease of total labor's share of income, but such industry structure change within industrial sector has limitations for explaining the decrease of the labor's share of income within industrial sector. Stagnation of raw labor's compensation (mainly labor's compensation of migrant workers in China) is the main reason for dramatic decrease of raw labor's share of income thus explains the decrease of total labor's share of income in a bigger extent. The deterministic factors for explaining the decrease of the labor's share of income can be discussed in five aspects: from micro aspect, unbalanced growth of economic factors is the main reason for uneven distribution among these factors; from regional aspect, industry structure change can better explain the regional differences of the labor's share of income and their movements; from sub-industries within industrial sector aspect, the change of trade mode is the main reason of decreasing labor's share of income; from the firms' perspective, firm heterogeneity is the important reason for differences of the labor's share of income among firms. Because of firm heterogeneity, ownership structure change is one of the important reasons for the decrease of labor's share of income.

More specifically, the above main conclusions can be elaborated as the followings.

First, this book re-measures the labor's share of income of income since the reform and opening up by amending and supplementing the corresponding data during 2004−2007. We find that the labor's share of income decreases steadily from 59.3 % in 1998 to 52.9 % in 2007, indicating the national income distribution leaning towards capital. The book provides new estimation of the labor's share of income, distinguishes the nominal and real labor's share of income, and discusses the impacts of such distinction on the movement trends of China's labor's share of income. We find that the real labor's share of income by considering the price factors is lower than the estimated nominal value in the literature by 6−14 % with higher and longer decreasing trend, indicating the worsening situation of national

income distribution and matching with the direct feeling of income distribution by ordinary workers. The U-shape turning point of real labor's share of income may indicate the short term trend of rising wage by the change of supply and demand relation of labor, and it may also be a long term effect by the increase of labor productivity.

Second, we analyze the reason behind the unbalanced national income distribution pattern from the macro perspective. By using large sample individual microdata, we divide labor factor further into raw labor and human capital so that we are able to discuss income shares within labor. We find that the income share of human capital increases steadily while the income share of raw labor decrease continuously in China from 1988 to 2007. By using extended MRW growth framework, we find that the movement of China's national income distribution pattern is closely related to the unbalanced growth of three factors which are physical capital, human capital and raw labor. The high growth rate of physical and human capital bring upward trend of their income share, while the stagnant state of raw labor will bring its share to decrease rapidly. By using various sources of factor growth data from 1995 to 2007, we confirm the inference of the extended model. And we find that the steady growth of physical capital, the slowing down of the growth rate of human capital, and the negative growth rate of raw labor are the causes of decreasing labor's share of income of GDP during 1998–2006. Relate raw labor with minimum wage, we suggest that the unmatched economic contribution and return of rural surplus labors is the key to understand the leaning of national income distribution towards capital. And we suggest that the main approach to achieve harmonious distribution relations is to raise the labors compensation of such people.

Third, we analyze the determination of the change of the labor's share of income from the regional perspective. By using provincial panel data from 1978 to 2007, we find that there are significant differences of the change of the labor's share of income across provinces in China. Such differences are closely related to the industry structure and economic development in each region. This book decomposes the movement of labor's share of income into employment, compensation and output effects since China's reform and opening up. We find that the movement of labor's share of income is mainly determined by the net effects of the opposite movement of compensation and output, and the employment effect is relatively small. By using level and difference equation, this book not only discusses the determinants of labor's share of income, but also analyzes the mechanism of movement of labor's share of income. We find that the affecting mechanisms of each variable on labor's share of income through three channels are different, but are consistent with the theoretical hypothesis and practical prediction. The output effect of industrial structure variable exceeds other two effects, and the overall effect of industrial structure has the largest impact on the decrease of labor's share of income, supporting the "Kuznets fact" of movement of factor income's share.

Fourth, we analyze the determination of the change of the labor's share of income from the industrial perspective. By decomposing the labor's share of

income in industrial sector from 1993 to 2007, we find the movement of industrial structure within the industrial sector explains minor part of the reason for declining labor's share of income. We analyze the effects of trade, technological progress and state-owned monopoly power which are more important economic factors within industrial sector by using the production cost model. It indicates that technological progress and decrease of monopoly power will impose a decrease on labor's share of income. Ceteris paribus, the coefficient of import penetration rate in the trade variables is positive and significant. Regression in different stages shows that the changing of trade mode is main reason for declining labor's share of income. In the time of import-export related processing trade in Pearl River delta, import penetration rate promote labor demand thus raise the labor's share of income. While, in the time of export-led processing trade in Yangtze River delta, the simultaneous decline of import penetration rate and labor's share of income is the result of lowering raw material and labor cost from profit maximizing enterprises. Therefore, the import penetration has different mechanisms on labor's share of income in different development stages in China.

Finally, we analyze the determinist factors of the change of the labor's share of income from the micro-firms' perspective. By using the World Bank Investment Climate Survey data, we find that there are significant differences of the labor's share of income among three ownership types of firms which are state-owned enterprises (SOEs), private-owned enterprises (POEs) and foreign-owned enterprises (FOEs). By constructing a theoretical model of micro firms, we argue that firm heterogeneity will lead to significant differences among different types of firms. By introducing firm heterogeneity, we are able to discuss the impact of ownership restructuring of SOEs, privatization, and entry of foreign investment on labor's share of income during China's economic transition and opening process in a general framework. We argue that the change of ownership structure will reduce factor distortion and promote economic efficiency, which in turn will impose a positive and transitory impact on the decreasing labor's share of income. Utilizing the World Bank Investment Climate Survey, we not only able to examine the difference of the labor's share of income by types of ownership, but also discuss the mechanism behind the decrease of the labor's share of income. By using System-GMM estimation, it shows that, after controlling for other factors, firm with private and foreign ownership have negative impacts on the labor's share of income. By examining time series change of state-owned enterprises, the book finds that their productivity rises dramatically two years after the ownership restructuring. The book also introduces the government enterprise relationship variable, which shows that competition among local government in attracting foreign enterprises in order to pursue GDP does exist. Finally, it is shown that the "foreign investment led" feature of China's export enterprises may be the reason of the failure of neoclassic trade theory prediction for China.

9.2 Policy Implications

Although we have discussed the decreasing labor's share of income in national income distribution in China from different aspects and perspectives, our research can draw internally consistent policy implications.

First, our research shows that the reason of relative low real labor's share of income compared with the nominal labor's share of income is that the CPI is significantly higher than GDP deflator and PPI. This means that labor faces higher price than capital and it also means that there is price discrimination of "paying attention to capital, looking down on labor" in the process of price policy making by the Chinese government. We find that the real labor's share of income has a U-shape moving trend and enters the increasing path after 2004. We argue that the graphic turning point of the real labor's share of income does not necessary mean that the economic turning point. If the change of the real labor's share of income from decrease to increase is caused by the increase of nominal wage driven by labor demand and supply, then it is a short-term phenomenon. If the change of the real labor's share of income from decrease to increase is caused by the increase of labor productivity driven by technological progress, then it is a long-term trend. The true U-shape turning point of the real labor's share of income can be realized by the increase of labor productivity so that the national income distribution will incline to labor factor. We argue that China should change the traditional development mode of capital replacing labor by boosting labor-biased technological progress, developing modern service industry in favor of labor factor and improving the human capital and labor productivity so that labor factor can better enjoy the fruits of rapid economic development and the whole economy can achieve win-win situation of both economic and social development and improving income distribution.

Second, the unbalanced feature of economic growth is the key to understand China's economy. The unbalanced feature of China's economy can be shown as the high growth rate of physical and human capital and stagnant growth rate of raw labors. Since 1998, the slowing down of the growth rate of human capital and the negative growth rate of raw labor is the cause of decreasing labor's share of income of GDP. Therefore, the unbalanced feature of economic growth finally turns out to be uneven functional income distribution. The unbalanced feature of China's economic growth utilizes the high performance-to-price of migrant workers to realized economic growth under the "Pareto Improvement". The stagnant growth of raw labor indicates the stagnant income of rural migrant workers. This means that the economic contribution and return of those workers are unmatched. Therefore, the economic growth of China is realized at the expense of relative benefits of rural migrant workers. Therefore, contrasting with "reflexible" suggestions as "the share of labor compensation in the primary distribution should be raised", our suggestion focuses on raising labors compensation for those who get minimum wages, especially for rural migrant workers. In recent years, the implementation of minimum wage policy and release of new *Law on Employment Contracts*, exert active effects on protecting labor's rights and interests and promoting income of low qualified employees.

Third, the feature of economic transitions in China is important to understand the change of the labor's share of income. One of the import features of such transitions is that the industry structure change has transferred from industries with high labor's share of income to industries with low labor's share of income. Therefore, both types of industry structure changes pose unfavorable factors on the labor's share of income. However, with further economic development, the economy will move towards the post-modernization era after the establishment of industrialization and the development of service industries will become the new engine of economic growth. Since the labor's share of income in the service sector is relatively higher than that in the industrial sector, the promotion of the service sector is helpful for preventing the decrease of the labor's share of income. Therefore, when conducting industrial policies, government should consider whether the industry structure change will influence the distribution pattern between labor and capital or not and whether it will deviate the balanced distribution path between labor and capital or not. We argue that when promoting the transition of economic and industry structure, government should, on the one hand, rely on the coordination of industry structures from the primary to secondary and tertiary industries, on the other hand, it should rely on the transition promoted by technological progress, increasing labor skills and management innovation. The pace, speed and strength of conducting industrial policies should not only fulfill the requirement of upgrading the China's economic structure, but also aim to keep a relatively stable distribution pattern for China.

Fourth, we should not ignore the effects of opening factors for understanding the distributional relationship between labor and capital in China. From the perspective of export, the increasing complexities of export products and "FDI driven" features of export firms may have already changed "labor-intensive" industrial distribution in our old perception so that the neoclassical trade theory is no longer useful to explain the decrease of the labor's share of income in China. From the perspective of import, the current change of trade mode is also closely associated with the decreasing labor's share of income. When Chinese firms are able to produce high value-added products, the increasing technology will generate demands for skilled workers which will help to increase the labor's compensation. Therefore, the government shall promote transition from "extensive" trade mode to "intensive" trade mode on the one hand, it should also pay attention to the training and cultivating the skilled workers on the other hand in order to make sure the sustainable economic development for China and move towards a better labor and capital relations in the future.

Finally, we argue that it is necessary to distinguish the positive and negative factors for the decreasing labor's share of income. The rule for judgement should be based on whether the factor promotes the economic efficiency or not. Ownership structure changes such as SOE reform, privatization and entry of foreign firms increase productivity for economy on the one hand, but such changes, on the other hand, increase the heterogeneity among firms which poses positive shock to the labor's share of income. However, other factors will not only worsen the income distribution, but also lead to efficiency loss. For example, the leaning local

government policy towards foreign firms will provide distorted incentive signal for attracting even more foreign firms. Therefore, as the capital and financial globalization trend, foreign firms will still enter into China with a rapid pace, that may accelerate the decreasing extent of labor's share of income. It may also have a negative effect on the pattern of national income distribution, which needs more attention. The policy advice is that we should fully utilize the productivity promoting effects of foreign firms, and avoid the unfair competition and distortion of factor distribution because of leaning government policy. In 2007, China implemented a unified 25 % income tax for foreign and domestic enterprises which is an attempt to remedy the distortion.

9.3 Future Direction of Study

This book discusses the issue of decreasing labor's share of income in China in a relatively comprehensive and deep way. However, due to author's limitation, there are still many issues worth to be discussed in the future.

First, when measuring the labor's share of income, we use the employment data information to adjust the labor's share of income in China in the past 30 years. However, such adjustment only makes data of the labor's share of income consistently comparable over time without proper treatment about distributional relations between labor and capital in essence, especially for the proprietors' economy. Distinguishing labor and capital income within proprietors' economy is still a difficult point. Meanwhile, a large number of proprietors' income in the economy hasn't been included in China's National System of Accounts (NSA). These issues will make us harder to judge the real situation of the evolution of income distribution structure. We know that most of the income of proprietors' income will be finally owned by the laborers so that the labor's share of income will increase with the development of proprietors' economy. During the process of industrialization, the production mode of proprietors' economy is replaced by firm production, and the effects of proprietors' economy on the income distribution weaken over time. However, when we enter into the post-industrial era, the development of service economy and internet economy will cultivate the prosperity of proprietors' economy. It can be predicted that proprietors' economy is going to play bigger roles in China which can help to improve the national income distribution pattern in China. Therefore, by using household micro-level data, estimating the impacts of proprietors' economy on the labor's share of income is one research direction can be studied further.

Second, current studies mainly focus on explaining the reasons and mechanisms of decreasing labor's share of income. By exploring the reason and mechanism of the decrease of the labor's share of income in China, we've provided some policy advices for improving national income distribution. However, as a microeconomic variable, the size of the labor's share of income directly means labor cost of the firm which is an import indicator for firm's micro-behaviors and decisions. As a

macroeconomic variable, the labor's share of income is not only the constraints of the consumption ability of society but also a justice measurement for the social distribution. The increase of labor's share of income represents as the improvement of relationship between distributional factors and boost economy by increasing consumption in society. However, the increase of labor's share of income represents the increase of the firm's labor cost from micro perspective, which will lower the firm productivity and hinder economic growth. However, no matter from which perspective, the change of labor's share of income will pose an important influence on economic growth (Huang and Wei 2010). Therefore, it is worthwhile to further explore how labor's share of income influences firm's microeconomic efficiency and macroeconomic growth.

Third, the decrease of labor's share of income means the income disparity between labor owners and capital owners will enlarge continuously, therefore, the uneven functional income distribution also reflects the enlarging of income disparity across people (Stiglitz 1969; Daudey and Garcia-Penalosa 2007). For a long time, studies about Chinese income distribution only focus on size income distribution from the personal, urban-rural and regional perspective, or only explore the functional distribution from the perspective of labor and capital factor but ignore the interactions between functional and size income distribution. However, it is not only meaningful to discuss theoretical linkages between functional and size income distribution, but also meaningful for policy making. Increasing labor's compensation can not only help to improve the distributional relationship between labor and capital, but also help to improve the worsening situation of personal income disparity. Therefore, by looking for the link between functional and size income distribution, it is helpful for us to discuss the issue of income distribution in a uniformed framework.

References

Huang Q, Wei X (2010) Macroeconomic effects of decreasing share of labor incomes in China: empirical analysis based on provencal panel data [J]. Financ Trade Econ 4:121–127

Daudey E, Garcia-Penalosa C (2007) The Personal and the factor distributions of income in a income in a cross-section of countries [J]. J Dev Stud 43(5):812–829

Ricardo D (1981) (translated by Guo, D. and Wang, Y.) On the principles of political economy and taxation [M]. Commercial Press, Beijing

Stiglitz JE (1969) Distribution of income and wealth among individuals [J]. Econometrica 37 (3):382–397

Bibliography

Atkinson AB (1997) Bringing income distribution in from the cold [J]. Econ J 107(441):297–321

Autor DH, Katz LF, Krueger AB (1998) Computing inequality: have computers changed the labor market? [J]. Q J Econ 113(4):1169–1213

Bental B, Demougin D (2010) Declining labor shares and bargaining power: an institutional explanation [J]. J Macroecon 32:443–456

Bertola G (1993) Factor shares and savings in endogenous growth [J]. Am Econ Rev 83(5):1184–1198

Bertola G (1996) Factor shares in OLG models of growth [J]. Eur Econ Rev 40:1541–1560

Bertoli S, Farina F (2007) The functional distribution of income: a review of the theoretical literature and of the empirical evidence around its recent pattern in European countries [EB/OL]. In: DEPFID working papers, No. 5, 2007

Boggio L, Dall'Aglio V, Magnani M (2009) On labor shares in recent decades: a survey [EB/OL]. In: Working papers of DISCE, 2009

Breuss F (2010) Globalisation, EU enlargement and income distribution [J]. Int J Pub Policy 6(1–2):16–34

Brown PEH, Hart PE (1952) The share of wages in national income [J]. Econ J 62(246):253–277

Brown M, Cani JSD (1963) Technological change and the distribution of income [J]. Int Econ Rev 4(3):289–309

Buchele R, Christiansen J (2007) Globalization and the declining share of labor income in the United States [EB/OL]. In: Working papers of international working party on labor market segmentation, 2007

Decreuse B, Maarek P (2010) Can the HOS model explain changes in labor shares: a tale of trade and wage rigidities [EB/OL]. In: Working Papers of GREQAM, Universite d' Aix-Marseille, 2010

Denison EF (1954) Income types and the size distribution [J]. Am Econ Rev 44(2):254–269

Dixon R (1981) The wage share and capital accumulation [J]. J Post Keynes Econ 4(1):3–9

Droucopoulos V, Lianos TP (1993) Labor's share and market power: evidence from the greek manufacturing industries [J]. J Post Keynes Econ 15(2):263–280

Esteban J (1986) Income-share elasticity and the size distribution of income [J]. Int Econ Rev 27 (2):439–444

Feenstra RC (2004) Advanced international trade: theory and evidence [M]. Princeton University Press, Princeton

Hsueh T-T, Li Q (1999) China's National Income: 1952–1995 [M]. Westview Press, UK

Kaldor N (1957) A model of economic growth [J]. Econ J 67(268):591–624

Katz LF, Murphy KM (1992) Changes in relative wages, 1963–1987: supply-demand factors [J]. Q J Econ 107(1):35–78

Kuznets S (1955) Economic growth and income inequality [J]. Am Econ Rev 45(1):1–28

Kuznets S (1955) Quantitative aspects of the economic growth of nations: iv. distribution of national income by factor shares [J]. Econ Dev Cultural Change 7(3):1–100

M. Zhou, *Labor's Share of Income*, DOI 10.1007/978-981-10-0173-4

Leamer E (1996) In Search of stolper-samuelson effects on US wages [EB/OL]. In: NBER working paper No. 5427, Cambridge, 1996
Lee JW (1970) Determinants of the changes in the relative factor share [J]. Rev Econ Stat 52 (3):331–336
Liu Jung-Chao (1978) Wages and profits of selected industries in China [J]. Econ Dev Cultural Change 26(4):747–761
Madsen JB (2009) The dynamics of labour's income shares and the wage curve phillips curve controversy [J]. Scott J Polit Econ 56(1):45–72
Maynard G (1958) Inflation, the terms of trade and the share of wages in national income [J]. Econ J 68(272):737–746
Moroney JR (1966) Time-series elasticities of substitution and labor's share in US manufacturing: the postwar period [J]. South Econ J 32(4):474–483
Phillips JD (1960) Labor's share and "wage parity" [J]. Rev Econ Stat 42(2):164–174
Raffalovich LE, Leicht KT, Wallace M (1992) Macroeconomic structure and labor's share of income: United States, 1950–1980 [J]. Am Sociol Rev 57(2):243–258
Reicher CP (2008) Can a labor matching model match labor's share? [EB/OL]. In: Working papers of University of California, San Diego, 2008
Ripatti A, Vilmunen J (2001) Declining labour share: evidence of a change in the underlying production technology? [EB/OL], Bank of Finland, Discussion papers, 2001
Rodriguez F, Jayadev A (2010) The declining labor share of income [EB/OL]. In: United Nations human development reports research paper No. 36, 2010
Rudd J, Whelan K (2005) Does labor's share drive inflation? [J]. J Money Credit Bank 37(2):297–312
Sargent TJ, Wallace N (1974) The elasticity of substitution and cyclical behavior of productivity, wages, and labor's share [J]. Am Econ Rev 64(2):257–263
Sattinger M (1980) The effect of labor quality on labor's factor share [J]. Atl Econ J 8(2):33–43
Sauramo P (2005) Is the labour share too low in finland? [J]. In: Piekkola H, Snellman K (eds) Collective bargaining and wage formation [M]. 153–168
Simler NJ (1961) Unionism and labor's share in manufacturing industries [J]. Rev Econ Stat 43 (4):369–378
Soltow L (1965) The share of lower income groups in income [J]. Rev Econ Stat 47(4):429–433
Stewart D, Udomsaph C (2005) Investment climate surveys, draft country profile [EB/OL]. In: China 2003 survey, the world bank group, investment climate unit, 2005
Tripp LR (1951) Labor's share in the national income [J]. Ann Am Acad Polit Soc Sci 274:47–56
Wood A (1994) North-south trade, employment and inequality [M]. Clarendon Press, Oxford
Young A (1995) the tyranny of numbers: confronting the statistical realities of the East Asian growth experience [J]. Q J Econ 110(3):641–680
Young AT (2004) Labor's share fluctuations, biased technical change, and the business cycle [J]. Rev Econ Dyn 7:916–931

Chinese Reference

Bronfenbrenner M (2009) The theory of income distribution [M], 1st edn. Huaxia Publishing House, Beijing

Department of National Economic Accounting of National Bureau of Statistics of China (2007a) China's GDP accounting: historical data 1952–2004 [M]. China Statistics Press, Beijing

Department of National Economic Accounting of National Bureau Of Statistics of China (2007b) Gross domestic production approach in year of China's economic census [M]. China Statistics Press, Beijing

Department of National Economic Accounting of National Bureau of Statistics of China (2007c) Flow of funds account in year of China's economic census [M]. China Statistics Press, Beijing

Department of National Economic Accounting of National Bureau of Statistics of China (2008) Gross domestic production approach in years without China's economic census [M]. China Statistics Press, Beijing

General Unit of Urban social and economic survey of national bureau of statistics. The 2002 handbook of the Chinese Urban household survey [R], Beijing, China, 2001

General Unit of Urban social and economic survey of national bureau of statistics. The 2002 handbook of the Chinese Urban household survey [R], Beijing, China, 2006

He J (2008) Estimation the capital stock of China [J]. J Quant Tech Econ 10:24–27

Jiang Z, Shi J (2001) School of thoughts in contemporary Western economics [M]. Fudan University Press, Shanghai

Krugman P, Obstfeld M (1998) International economics [M], 4th edn. China Renmin University Press, Beijing

Li Z (ed) (2000) Dictionary of world economics [M]. Economic Science Press, Beijing

Li D (2010) Looking at decreasing labor's share of income in a rational way [N]. Shanghai Econ 7:10

Li S, Geng Y (2005) The effects of tax revenue structure on economic growth and income distribution [J]. Econ Res J 5:118–126

Li S, Zhao R (1999) Re-study on the income distribution of Chinese citizens [J]. Econ Res J 4:3–17

Li S (2003) Review and outlook of studies on China's personal income distribution [J]. China Econ Q 2(2):379–402

Liu L (2008) Change of wage distribution in the process of economic growth: empirical analysis base on economic data in China [J]. Mod Econ Sci 30(4):43–49

Lin Y (2007) Realizing unified equity and efficiency in primary distribution [N]. People's Daily, 28 April 2007

Lin Y, Liu P (2008) Unifying equity and efficiency by primary distribution and promoting harmonious development: brief review and outlook of China's 30 years reform. In: Lin Y, Zhuang J, Tang M, Lin D (eds) Promoting social harmonious by inclusive growth [M]. China Planning Press, Beijing

Lu M, Chen Z, Wang G (2005) Equality for the sake of growth: the nexus of inequality, investment, education and growth in China [J]. Econ Res J 12:4–14

Lu M, Wang Y, Zhang Y (2006) For a consensus on controlling income inequality: what has economics contributed? [J]. Nankai Econ Stud 5:56–63

Lu M (2007) Labor and human recourse economics [M]. Shanghai People's Publishing House, Shanghai

Lu M (2009) Decreasing labor's share of income: why and how to do? [N]. Shanghai securities News, 9 September 2009

Lu M, Jiang S (2007) Restructuring, "Iron Triangle": China's labor market reform, income distribution and economic growth [J]. Manag World 6:14–22

Luo C, Zhang J (2010) Policy making shall not be one cut: the industrial decomposition of labor's share of income [N]. Social sciences in China Today, 26 January 2010

Marshall A (1987) Principles of economics [M]. Commercial Press
National Bureau of Statistics of China (2006) China economic census yearbook 2004 [M]. China Statistics Press, Beijing
Newman P (2005) The new palgrave dictionary of economics [M], vol 1–4. Scientific and Technical Documents Publishing House, Beijing
Research Group in Macroeconomic Research Institute of National Development and Reform Commission (2010) China's national income distribution patterns: changes, reasons and policies [J], 2010, 16:47–49
Romer D (2003) Advanced macroeconomics [M], 1st edn. Shanghai University of Finance and Economics Press, Shanghai
Samuelson PA, Nordhaus WD (1999) Economics [M], 16th edn. Huaxia Publishing House, Beijing
Smith A (1974) An inquiry into the nature and causes of the wealth of nations [M]. Commercial Press, Beijing
Stiglitz J (1997) Economics [M], 2nd edn. China Renmin University Press, Beijing
Wan G (2004) Measurement and decomposition of income distribution: a comment for research methods [J]. World Econ Pap 1:64–69
Xu X, Wang H (2008) Dynamics of factor payment: evidence from China [J]. Econ Res J 2:106–118
Xu X (2001) Review and outlook of studies on income distribution in China's transition period [J] 8:13–17
Xu C (2003) New Developments of internal system national accounts [EB/OL]. China Statics Information Net, 27 May2003
Yao X (1992) Income distribution theory of socialist enterprises [M]. Zhejiang University Press, Zhejiang
Yao X, Li X (2007) Rising wage inequality: structure effect and price effect [J]. Chin J Popul Sci 1:36–43
Yao X, Li X (2007) Maketization and rising wage inequality: changing extent and influencing factors [J]. J Zhejiang Univ (Humanit Soc Sci) 37(1):161–167
Yin H, Gong L, Zou H (2002) Survey on income distribution theory [J]. Econ Res J 8:83–95
Zhao J (2006) Analysis on China's distribution ratio between labor and capital [J]. Stat Res 12:7–12
Zhen Z (2008) Study on annexation of wages by profit in China's enterprise [J]. China Ind Econ 1:5–13
Zhou M (2014) Decomposition and mechanism of movement of China's labor's income share [J]. Stud Lab Econ 2(3):77–99
Zhou M, Yao X, Xiao W (2012) Functional and size income distribution: research development and future direction [J]. World Econ Pap 3:89–107