

**THE DYNAMIC RELATIONSHIPS BETWEEN PUBLIC SPENDING,
ECONOMIC GROWTH AND INCOME INEQUALITY IN CHINA**

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To my sister

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Abstract

China's economic development has performed spectacularly during the period of China's economic transition as a result of radical economic reform in the all markets. The country has also gone through extensive fiscal reforms in the last three decades. However, a number of problems have been associated with such rapid economic growth. One of these has been raising inequality. In both Keynesian and neoclassical endogenous growth theories, public spending can play an important role for economic growth and inequality. The majority of previous studies have focused on the relationship between public spending and economic growth, or between public spending and inequality separately. There is no doubt that public spending has an effect on both economic growth and equity simultaneously. In this respect, this thesis attempts to address the problems that have emerged during the period of China's fiscal reforms, and seeks to examine the effects of public spending on economic growth and equality in the same model.

This thesis investigates the dynamic relationships among these three variables in China. For aggregate national data, vector error correction model (VECM) has been used. Analysis at the provincial level is based on the panel vector auto-regression (PVAR) model. These methods help to solve the endogeneity in estimations. The national level analysis indicates that total public spending shows a long term Granger causality with GDP per capita, which supports the positive growth effect of public spending in the Keynesian and endogenous growth model. Social public spending has a negative effect on real output per capita in both the short term and long term, but it also has a negative impact on income inequality. Moreover, we find that a higher level of real GDP per capita will increase the level of inequality, but a higher level of inequality has a negative effect on real GDP per capita in the long term. Furthermore, total provincial public spending and provincial social spending have either a non-significant effect on economic growth. On the other hand, the SOEs' investment has a significant, positive growth effect at both the national and provincial level. As for the redistributive role of the public spending, the provincial total public spending and social spending have played an important role on income distribution. Furthermore, the Gini coefficient has a positive effect on the per capita growth rate at the provincial level, but the economic growth has no significant impact on the Gini coefficient.

Declaration of Authorship

I, Xiangbin Cheng, declare that this dissertation entitled ‘The effect of public spending on economic growth and inequality in China’ and the work presented in it are my own.

I confirm that:

This work was done wholly while in candidature for a Ph.D. at the University of Hertfordshire;

Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;

Where I have consulted the published work of others, this is always clearly attributed;

Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this dissertation is entirely my own work;

I have acknowledged all main sources of help;

Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

Part of this work has been presented as:

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Signed: _____

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List of Abbreviations

ADF	Augmented Dickey-Fuller
CFPS	China Family Panel Studies
CHIP	China Household Income Project
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IMF	International Monetary Fund
LDCS	Less Developing Countries
LSDV	Least-Squares Dummy Variable
NBS	National Bureau of Statistics
OECD	Organisation for Economic Co-operation and Development
PVAR	Panel Vector Auto-Regression
R&D	Research and Development
SOEs	State-Owned Enterprises
TSR	Tax-Sharing Reform
VAR	Vector Auto-Regression
VECM	Vector Error Correction Model

Chapter 1: Introduction

This dissertation will explore the effects of different types of public spending on economic growth and inequality. Firstly, I will provide a brief introduction to the Chinese fiscal system and Chinese social-economic development since the economic transition of 1978. Following this, the aims and objectives of this thesis will be explained, and the four researchable hypotheses will be introduced. Finally, the structure of the thesis will be outlined.

Since late 1978, China has been conducting market-oriented economic reforms. Public spending has played a vital role in China's reforms. A cornerstone of the transition from a centrally-planned to a market economy is the establishment of a well-defined system of property rights (Brandt et al., 2004). Although Chinese economic development has resulted in significant achievements, rising inequality has led to considerable criticism. In recent years, the slowdown of global economic growth and the uncertainty of the international economic environment have both challenged China's economic growth. Simultaneously, income inequality has reached a historically high level, and public spending on social welfare has been regarded as largely insufficient.

The worldwide attention paid to the economic activities of China's government has led to a significant refinement of Chinese macroeconomic policy. Public expenditure, as one of the instruments implemented by the government, affects resource allocation, income distribution and economic stability. Therefore, there is little doubt that public spending has an effect on both economic growth and equality simultaneously. Much of the current global debate about the approach to spur growth and reduce inequality in developing countries has centred on the need to promote a large increase in public investment (United Nations, The Millennium Development Goals Report, 2005). There have also been numerous empirical studies into the impact of public expenditure on economic growth. However, the distributional role of public spending has not been sufficiently explored; this is despite the fact that inequality is a major concern within economic development. In this respect, the first contribution of this thesis is to explore the role of public spending as regards economic growth and income inequality in China.

As there are conflicting views on the role of public spending in the process of development, this dissertation is designed to explore the perspectives of different economic schools. The Keynesian view assumes that there is unemployment in the economy, and that the correlation between interest rates and investment is low. Hence, an increase in public spending has little effect on interest rates, but it will raise income and output in the short run. In addition, government spending may stimulate further private spending due to its positive expectations, which therefore crowds in rather than crowds-out private consumption and investment (Aschauer, 1989; Kusteoli, 2005). New Keynesian models adopt the rational expectation assumption for individuals and some form of price rigidity, such as staggered prices or wages. Both new and traditional Keynesian models assert that public spending has a positive effect on output and employment, and that the only difference is how generous the multipliers are. In general, the multipliers are smaller in the newer Keynesian models compared with more traditional models.

In the earlier neoclassical model, public spending was considered to be exogenous in Solow (1956) and Swan's (1956) growth model. Hence, fiscal policy had little effect on the rate of capital accumulation or growth rate in the long run. Arrow and Kurz (1970) firstly considered public capital as another input apart from labour and private capital in the function of aggregate production. They also suggested that the determination of the optimal input allocation between public and private capital was key to keeping the whole economy on an optimal growth path. With the emergence and popularity of neoclassical growth theories, the endogenous growth model provided a foundation for the role of productive government spending in fostering long term economic growth. Government provision of public capital to the production process contributes to growth directly by adding to the existing capital stock, as well as indirectly by raising the marginal productivity of privately supplied factors of production (Barro, 1990).

Public capital was integrated into neoclassical growth theory in the 1970s. The most influential contribution was made by Aschauer in 1989, who estimated the elasticity of output with respect to public spending in the function of aggregate production. Aschauer (1989) found that the elasticity of output to public spending is 0.39 in the United States, which indicates that increasing public spending by 1 dollar will increase output by 0.39 dollars. He suggested that public spending was highly productive, and argued that the

decline in government productive spending in the US had largely contributed to the observed decline in productivity in the 1970s and 1980s. His paper suggested that the share of public investment within total public spending should be raised to improve the output potential of an economy. Empirically, there seems to be a consensus that public investment in basic physical infrastructure such as roads, transportation and communication is growth-enhancing. Agénor and Moreno-Dodson (2006) claim that spending in these areas has shown a positive impact on aggregate production because of a strong growth-promoting effect through their impact on the productivity of private inputs as well as the rate of return on capital, particularly when stocks of infrastructure assets are relatively low. More recently, a broader concept of human capital indicates that public spending on education also has significant growth effects in the long run.

The empirical results of the effects of public spending are quite diverse, and are often contested in different studies. Hemming et al., (2002) undertook an extensive survey of the theoretical and empirical literature regarding the impact of public spending on promoting economic output. They conclude that, in general, public spending has Keynesian effects on economic activity, but that the multiplying effect is small. Furthermore, they acknowledge the possibility of non-Keynesian effects. There have been ongoing concerns that substantial and growing public spending has negative effects on economic growth. The usual policy prescription calls for a scaling back of government activity and budgets, constraining public spending from growing faster than output. In countries facing fiscal imbalances and high debt burdens, this has prompted wide-ranging fiscal consolidation programmes to reduce government spending (Christie, 2011). The continued growth of public spending has become a heavy burden on some countries, and has precipitated fears that progressively larger governments may well compromise economic growth. Following the global economic crisis in 2008, some heavily-indebted governments have sought to reduce the size of the public sector, and attempted to become engaged in activities that can be carried out more efficiently by the private sector. In order to escape from a variety of economic problems, such as ineffective governance and inadequate economic growth, increasing numbers of countries have adopted strategies to cut public spending. Simultaneously, these reductions in public spending may well significantly affect the welfare of these countries' citizens.

The redistributive effects of public spending have not received as much attention in the theories of economic development. Since the governments of developed economies have increased the role of public spending through a host of programmes, such as public education, health care and pensions. The perception of market failure provides a rationale for government intervention, not only to correct purported resource misallocations by the market, but also to promote macroeconomic stability and economic growth (Lipford and Slice, 2007).

Sylwester (2000) examined whether higher public spending can reduce income inequality or promote economic growth simultaneously. He found that countries with a higher proportion of public spending on education relative to their Gross Domestic Product (GDP) have relatively higher levels of income inequality. Thus, public spending on education has a positive relationship with inequality. Conversely, public spending on education helps the development of human capital, which in turn should promote economic growth according to endogenous growth theory. Therefore, Sylwester (2000) states that an increase in public spending has a short term cost of rising inequality and a long term beneficial effect on economic growth.

Public expenditure policy plays an irreplaceable role in boosting national and regional coordinative economic growth, eliminating regional differences and achieving common prosperity. Theoretically, there exists an optimal level of government spending in each economy. Typically, a less developed country resides within its production possibility frontiers, so growth spurts are possible if the government can mobilize additional resources which the private sector has failed to provide. When the economy is on the production possibility frontier curve, allocative efficiency becomes important, and resources transferred from the private sector to the government may have a positive crowding-in effect or a negative crowding-out effect (Jamhour, 2012). In this respect, public spending has different effects according to the level of economic development. It can have a greater effect on output in developing countries, because their economies are usually in a sub-optimal position.

Moreover, there is a huge difference in the effects of public spending between countries according to their initial conditions of economic development and the size and composition of their public spending impulse (Giavazzi and Pagano, 1996). Due to

differences in the levels of economic development, the size and structure of public expenditure varies across countries, yet every country nevertheless desires more efficiency in their use of public resources. It is not clear how government expenditure affects longer term economic growth and inequality. Most previous studies have focused on the relationship between public spending and economic growth, or between public spending and inequality separately. In response to this major deficiency in the current literature on the empirical analysis of public spending, the second contribution of this thesis is to adopt both a national and provincial level analysis through Vector Error Correction Model (VECM) at the national level, and using the Panel Vector Auto-Regression (PVAR) estimation at provincial level data. The newly developed Vector Auto-Regression (VAR) and PVAR methods can examine the dynamic relationships between public spending, growth and inequality in the endogenous growth model without causing an endogeneity bias. Moreover, the provincial PVAR estimation can examine the relationship between public spending, economic growth and inequality at the provincial level to address a more comprehensive study of China's public spending.

1.1 Why studying China?

China¹ has witnessed a rapid growth rate since the late 1970s, when the period of reforms and opening-up first began. The period between 1978 and 2008 witnessed an annual growth rate of 9.1 per cent in China's real GDP, with per capita real GDP rising 8.3 per cent annually (National Bureau of Statistics of China, 2010). Such accomplishments have failed to help to improve public equality and welfare, while this fast economic growth has brought about numerous problems. The huge gaps in income levels and living standard between rural and urban areas, coastal and inland regions, may affect further economic growth and social stability. Johansson and Zhang (2014) state that China is now facing new challenges such as high income inequality and limitations in the growth model that has been so successful since the beginning of the economic reforms. A continued reliance on the 'growth-first strategy' led to income distribution biased toward capita and against

¹ China has four types of formal provincial administration under the central government, which is made up of 33 provincial level governments. These include 22 provinces (excluding Taiwan); 5 geographic entities that China calls 'autonomous regions', which have large ethnic minority populations (Guangxi, Inner Mongolia, Tibet, and Xinjiang); 4 municipalities that report directly to the central government (Beijing, Chongqing, Shanghai, and Tianjin); and 2 special administrative regions of Hong Kong and Macau.

labour, economic structure biased toward investment and against consumption, and government spending biased toward infrastructure and against social welfare (Du et al., 2014). This may result in an increase in social instability, and an inability to maintain growth due to an overreliance on investment and high inequality. This, in a worst-case scenario, could lead to a ‘middle-income trap’ in China. Hence, there is a fierce debate as to whether the Chinese government requires profound reforms to its fiscal system, especially in terms of increasing public spending on its public welfare system, in order to move the Chinese economy toward greater efficiency and equality.

In the context of China’s fiscal decentralization and economic reforms, the problem of rising inequality has also been observed and studied by an increasing number of scholars. During the process of fiscal decentralization, local governments became financially self-reliant, while simultaneously they were allocated greater expenditure duties, especially on social welfare. The disparity of fiscal capacity across local governments grew considerably during the reform period. Moreover, provincial governments have focused more on capital-intensive industries and on real estate development strategies in order to push for economic growth and fiscal revenue growth. It is argued that the problem of unmet fiscal needs at the local level is attributable to low fiscal capacity (Tsui and Wang, 2004; Du et al., 2014); however, the unmet needs in social services such as education, health and social security are also attributable to a perverse governmental incentive structure. Provincial governments have over-emphasised short term GDP growth, rather than their people’s welfare. Meanwhile, the gap between the rich and the poor, as measured by the Gini-coefficient, has been widening rapidly, jumping from 0.30 in 1982 to 0.48 in 2010, with the richest 10 per cent of families consuming 5.66 times as much as the poorest 10 per cent of families in 2010. With a Gini-coefficient approaching 0.5, China’s income inequality is in the same ballpark as that of relatively high-inequality Latin American countries, such as Mexico (0.51), Nicaragua (0.52) and Peru (0.48), although it is still lower than that of Brazil and Honduras (0.56-0.57) (World Bank, 2010). Hence, balancing the distribution of public spending is urgently required in further economic development in order to reduce income inequality.

A high level of income and wealth inequality increases the demand for redistributive public spending (Alesina and Rodrik, 1994). Thus, it is vital to gain a better understanding of the processes of rising inequality in China’s economic growth. An

important issue is whether governmental policies that target the specific spatial allocation of public investment have succeeded in reducing regional inequalities. It has been a common trend in China over the last few years that government spending has grown faster than GDP. However, a large proportion of public spending has gone on public investment in social infrastructure programmes and public administration. This has inevitably led to a relatively low proportion of public spending on essential social sectors such as the social security system, health, education and other basic public goods and services.

The role of good government as a key determinant of the productivity of public investment affects the relationship between public spending and output, particularly in developing countries. The problem of unmet public needs at the local level may also be the outcome of poor local governance. Keefer and Knack (2007) argue that public investment is much higher in those countries with bad institutions, which is a reflection of the ‘rent-seeking’ incentives in areas where property rights are less secured. In China, the state dominates the economy and, thereby, the misuse and misallocation of public investment is common. This may imply a very low return on public investment, and perhaps a negative impact on economic growth. Lastly, even though there has been a growth in the non-state sector since the 1980s, most financial resources, land, other factors of production and economic policies are still controlled and allocated by provincial governments. Therefore, political institutions prevailing incentive mechanisms can have significant impact on the local economic performance (Zhang, 2002).

There now appears to be a major focus by the Chinese government on greater income equality, less corruption and greater reform to enable the economy to get on a stable footing. In response to the global economic slowdown, China needs to focus on income disparity, not only on its economic growth rate. More importantly, this view was reinforced by the former General Secretary of the Communist Party of China, Hu Jintao, who pursued a ‘harmonious society’ policy agenda that emphasized equitable growth. This thesis focuses on the sub-national level to examine the effects of public spending on growth and inequality since China’s second major fiscal reform in 1994.

1.2 Aims of research

The existing research on public spending issues conducted over the last two decades has largely been based on the work of Barro (1990), who developed a theoretical model for public spending and economic output. Various authors address public spending and inequality via different economic theories. However, there is comparatively less literature on the dynamic relationship between public spending, economic growth and inequality. When research has touched upon this dynamic relationship, it has yielded several new, surprising findings. Hence, the investigation into the dynamic relationship between public spending, growth and inequality in the context of China can help improve our understanding of the performance of public spending during China's periods of economic transition.

Different theories indicate that public spending can either increase output by the multipliers effect in the short run, or enhance economic growth as an endogenous input in the long run. In the economics of the public sector, the positive role of public spending is based on the foundation of eliminating market failures and optimizing resource allocation. In the twentieth century, government expenditure has accounted for a rising proportion of national income worldwide. Numerous studies have compared the level of government spending across countries and attempted to explain its effects on economic development (Lindauer and Velenchik, 1992). Despite the fact that considerable institutional and geographic differences that exist among countries, it is nevertheless remarkable that the increase of public spending has been a general phenomenon (Tanzi and Schuknecht, 2000).

A number of recent studies have used various empirical estimations to investigate the complex links between public spending and economic growth. Moreover, economic development is not only about output growth, but also about income redistribution. If economic growth increases income inequality, economic development involves a trade-off between economic growth and equality, as demonstrated by Barro (2000), Forbes (2000), and Lundberg and Squire (2003). Hence, it is crucial to examine public spending, regional economic growth and inequality together to ascertain whether public spending can circumvent the trade-off between growth and equality. From the perspective of regional

public spending, this thesis explores the spatial impact of public spending on regional output and income disparity. Therefore, the three core research questions are as follows:

I. Does public spending have a positive growth effect in China?

Since late 1978, China has been carrying out market-oriented economic reforms. Fiscal decentralization has been adopted in order to improve production efficiency through economic liberalization and the provision of local public goods and services (Tsui and Wang, 2004). Since the tax reforms of 2004, China's public spending has increased from 12 per cent of GDP to 23 per cent from 1995 to 2010, which constitutes an annual growth rate of around 20 per cent. Private investment also increased from nearly zero in 1979 to more than two thirds of total investment in 2012. According to the empirical literature, public spending has different effects on economic growth across countries, while it can promote economic growth through improving infrastructure and the crowding-in effect on private investment in China. Hence, this dissertation distinguishes different types of public spending and examines the growth effect of total public spending and social public spending at both the national and provincial levels.

II. Does public spending have a negative effect on income inequality in China?

The traditional view of public spending in economic development rests on both economic growth and income redistribution. Hence, if China adopts an optimal social spending² level in order to achieve an egalitarian income distribution, then this spending should have a negative effect on inequality. This research question is designed to test whether public spending has a positive redistribution effect on income inequality in China.

III. Does economic growth have a negative effect on income inequality in China?

Since the economic opening up, China's government has placed economic growth at the forefront of economic development. China's government believes that if the annual

² Social spending is named public spending on people's well-being in Chinese government publications. It is the sum of public spending on education, health and social welfare, which has the most direct relationship with public welfare.

economic growth rate is greater than 8 per cent³; the consequent social economic problems during economic liberalization will be limited. However, overall inequality has risen significantly over the last two decades. Hence, the third hypothesis investigates whether economic growth has a positive effect on income inequality.

The objectives of this research are to analyze the growth and income redistribution effects of public spending in China. In response to the major deficiency in the current literature on the analysis of Chinese public spending, this dissertation is designed to apply the VAR model at the national level, and the newly-developed PAVR method to examine the effects of public spending on growth and equality at the provincial level. The national time series data is from 1979 to 2012, and the provincial panel dataset covers 24 Chinese regions for 16 years from 1995-2010.

1.3 Structure of the dissertation

This research will focus on both national and provincial level data to examine the relationships between public spending, economic growth and inequality. The thesis consists of seven chapters. This chapter has provided an introduction to the research and its aims and objectives, outlining the gaps in the existing literature, and introducing the research questions.

Overall, the literature review chapters (Chapters 2 and 3) include both the theoretical and empirical effects of public spending on growth and inequality. Chapter 2 reviews the effects of public spending on economic growth. It briefly discusses the role of the government in economic development, beginning with the views of Adam Smith, to those of Adolph Wager and subsequently John Maynard Keynes. This is where the importance of public finance in macroeconomics will be addressed. Then, Chapter 2 introduces the effects of public spending in Keynesian and neoclassical models, focusing on the debate regarding crowd-in or crowd-out effects, exogenous growth or endogenous growth models and its empirical effects on growth. Finally, it reviews the Chinese literature on public spending and economic growth.

³ For example, the 11th Five-Year Plan (2006-2010) adopted by the Chinese government targeted an economic growth rate of 7.5 per cent.

Chapter 3 investigates the redistributive role of public spending and its effects on inequality. Fast economic growth accompanied by a dramatic increase in income inequality has been the key phenomenon in China's path of economic development. According to Kuznets's inverted U curve hypothesis, economic growth will increase the level of inequality when initial income levels are low, but when income achieves a certain level, the additional increase of income will reduce inequality. Hence, this chapter also investigates the relationship between economic growth and inequality in order to provide a better understanding of the role of public spending for economic growth.

Chapter 4 outlines the historical and contemporary contexts of China's public spending system and economic development, and provides a brief overview of the relationship between public spending, economic growth and inequality. Firstly, this thesis focuses on the policy changes of the past three decades, and outlines the current challenges in the Chinese fiscal system. China has undertaken two significant fiscal reforms during the period of its economic opening up. These reforms have shifted China's public finance from a centrally-planned system to that of a market economy. The transformation of Chinese public spending can be discussed through the lens of economic theory. However, in the past, China's public spending strongly focused on infrastructure investment rather than people's welfare programmes, such as education, health and social security. This chapter will focus on social welfare spending in China to investigate the importance of the redistributive role of public spending. Then, I will focus on the changes in income equality in China at both inter-regional and intra-regional levels during the period of the economic opening up.

Chapter 5 features a presentation of the applied empirical econometric methods adopted in this thesis. It will use both econometric techniques of VECM and PVAR⁴ in the empirical section. The majority of previous studies have focused on the relationship between public spending and economic growth or between public spending and inequality separately. In response to this major deficiency in the current literature on the empirical analysis of public spending, this dissertation applies VAR method to examine the effects of public spending on growth and inequality in China. The VECM and PVAR models are able to examine the relationship between public spending, GDP per capita and the Gini

⁴ The VEC models test the national level data. PVAR models examine the provincial level data.

coefficient in the endogenous growth model without assuming exogeneity in the regression. Then, this chapter briefly introduces the data in regression analysis, such as Chinese public spending, GDP per capita and the Gini coefficient at both the national and provincial levels.

Chapter 6 discusses the relationships between public spending, economic growth and inequality at both the national and provincial levels. The findings demonstrate that national public spending has a negative effect on economic growth in the long run, but has a positive effect in the short run. Provincial public spending and its social spending have a negative effect on economic growth in the short run, yet a positive accumulative effect on economic growth in the long run. Total national spending has a negative relationship with inequality in both the short run and long run; provincial level public spending has a negative relationship with inequality in the short run, yet a positive relationship in the long run. Social spending at both national and provincial levels has a significant positive effect on inequality in the short run.

The final chapter provides a conclusion and the limitations of this research. One possible suggestion for future research is to investigate public spending via different econometric methods, because different econometric methods are likely to have different results. The most obvious solution to this problem is to apply other instrumental variables with a different econometric method to re-examine the results. However, there are significant data constraints in terms of the provincial Chinese data; consequently, we do not have sufficient instrumental variables in the econometric model. Moreover, Chinese economic policies include numerous adjustments and changes which are difficult to incorporate into the econometric model and over a long period of time. Hence, future research may adopt a case study approach towards a single province or city to demonstrate the effects of public policy shifts and economic development.

Chapter 2: Literature Review I: Effects of Government Spending on Economic Growth

2.1 Introduction

The role of government expenditure and its effects on economic growth has been widely debated by economists for decades. Over a century ago the German economist Wagner proposed that economic development had increased public or state activities worldwide. This is known as Wagner's Law, which establishes economic growth as the fundamental determinant of public sector growth (Wagner and Weber, 1977). Keynesian macroeconomic theory suggests that government spending can accelerate economic growth or avoid recession by stimulating aggregate demand. For example, if the economy initially has less than full employment, increasing public expenditure shifts the economy towards a higher level of output and interest rate. The effects on aggregate demand and output are dependent on the interest-elasticity⁵ of public expenditure (Snowdon and Vane, 2005). However, the general trend of growth in the average size of governments over time has precipitated fears that such progressively larger governments will compromise economic growth. This has prompted calls to scale back government activities and to cut budgets. Various strands of literature provide theoretical and empirical analyses of the crowding-out or crowding-in effect of public spending, which are based on conflicting views on the government's role in the process of economic development.

The recent emergence of endogenous growth theory provides a foundation for the role of productive government spending in fostering long term economic growth. Government provision of public capital to the production process contributes directly to growth by adding to the existing capital stock, as well as indirectly by raising the marginal productivity of privately supplied factors of production (Barro, 1990). While it is a matter

⁵ The interest-elasticity implies the slope of IS and LM curve, which results in the size of the crowding-out effect. The extreme Keynesian case is a vertical IS curve in which investment is perfectly interest-inelastic. On the other hand, a vertical LM curve refers to the zero effect (or 100 per cent crowding-out effect) of public expenditure, in which a rise in interest rates will reduce private investment by the same amount as the increase in government spending.

of debate as to what exactly constitutes productive government spending in practice, there nevertheless seems to be a consensus that public investment in basic physical infrastructure such as roads, transportation and communication, is indeed growth-enhancing.

Spending on these areas has been shown empirically to have a positive impact on aggregated production, because this spending may have a strong growth-promoting effect through its impact on the productivity of private inputs and the rate of return on capital—particularly when, to begin with, stocks of infrastructure assets are relatively low (Agénor and Moreno-Dodson, 2006). Endogenous growth models are characterized by allowing continued growth without the assumption of decreasing returns to capital. This is achieved by having technology evolve as a result of learning-by-doing, for example R&D or human capital accumulation (Romer, 1990; Kuhn, 2010). Hence, public spending may also increase the stock and quality of human capital through public investment in education and healthcare, which then results in increased output in the long run.

Moreover, an optimal level of public spending exists in the endogenous growth model. Before achieving the economic efficiency, it is possible for the government to mobilize additional resources to promote economic growth, which the private sector has failed to do. Once the economy reaches this production possibility frontier, increasing public spending may have a crowding-out effect on private investment. Barro (1990) specifies that the growth rate depends on the share of public spending in output, and he also derives a growth-maximizing spending share. The relationship between public spending and growth depends on the current spending level, which is positive if public spending is below the growth-maximizing share; however, if public spending goes beyond the optimal point, higher public spending will reduce economic growth. If the nonlinear hypothesis is valid, and the effect of government spending on long run economic growth varies with its size, this would not only help to explain the ambiguous findings in the empirical growth literature, but also offer a guideline as to the appropriate level of public spending for a country.

Nevertheless, macroeconomists remain uncertain about the effects of public spending. This uncertainty arises from the differing views as to the correct theoretical framework and econometric methodology. This chapter provides an overview of the recent literature

in this area, starting with the introduction of the role of government, and then presenting the various views on government spending. This is followed by an analysis of the empirical evidence regarding public spending on economic growth. Finally, the chapter outlines the debates among Chinese economists.

2.2 Role and objective of government

Different views have emerged about the role of government for economic development over the past two centuries. In his book ‘The Wealth of Nations’, Adam Smith (1776) advocated a limited role for government. He attempted to show how competition and the profit motive would lead individuals to pursue their own private interests to serve the public interest. The profit motive would lead individuals to supply the goods that other individuals wanted. He argued that the economy is led, as if by an invisible hand, to produce what was desired in the best possible way, which implies that the government should not regulate or control the private sector. Adam Smith’s views had a powerful influence on industrializing countries, in which the government expenditure formed only a small part of GDP, and government regulations were limited in the 19th century.

Conversely, Adolph Wagner was the first to recognize a positive correlation between government expenditure and economic growth, a notion referred to in the literature as Wagner’s Law (1883). This is accounted for by the increasing demands for regulatory and protective functions during economic development, such as the demand for education, healthcare and social services. In addition, during economic development, more government intervention is needed to manage and finance natural monopolies and to maintain well-functioning market forces (Bird, 1971). Several studies such as those by Gandhi (1971), Gupta (1967) and Dritsakis and Adamopoulos (2004) support this theory.

In the sphere of public economics, the first fundamental theorem suggests that a perfectly competitive market economy necessarily achieves a ‘Pareto optimal’⁶ allocation of resources. In the Pareto optimal level, it is not possible to make one person better off without making one person worse off. The second fundamental theorem suggests that ‘the

⁶ Consequently, for each commodity, the marginal rate of substitution in consumption equals to the marginal rate of transformation in production (MRS = MRT).

only thing the government needs to do is redistribute wealth, because every Pareto-efficient resource allocation can be obtained through a competitive market process with an initial redistribution of wealth' (Stiglitz, 2000, p.60). However, economies fail to achieve Pareto efficiency in most circumstances, mainly because of market failures. In the period between the Great Depression (1930s) and the early 1960s, economists became aware of a large number of market failures in the free market economy. In the 1930s in the U.S.A, the unemployment rate reached 25 per cent and national output fell by about 30 per cent from its peak in 1929. Even if the economy is efficient, there is no consideration of distribution among individuals. Hence, one of the objectives of government activities can be to alter the distribution between individuals, although such programmes may also have shortcomings. For example, critics of government intervention in the economy believe that government activities can be constrained by the government's failure (Stiglitz, 2000).

Since the Great Depression, the perception of market failure has provided a rationale for increasing government spending, not only to correct the purported resource misallocations by the market, but also to provide macroeconomic stability and economic growth. Musgrave (1959) stated that the three main objectives of public finance are: economic efficiency, the redistribution of public resources and macroeconomic stability. These three objectives are the traditional roles of fiscal policy in the western countries. The increasing emphasis on such government activity brought about a variety of reforms in public economics. In the developed economies, the economic activities of governments have increased significantly since World War Two. Although governments argue in favour of increasing their budgets to allow for the provision of productive public goods that will foster economic growth and increase public welfare, there has been an ongoing concern that such growth of governments may have deleterious effects on the long term growth of their economies. These opposing policies are based on conflicting views of the role of government in the process of economic development. For example, when the 2008 financial crisis hit the world economy, some high government debt countries carried out wide-ranging fiscal consolidation plans to reduce government spending in order to reduce the government's debt. However, most categories of public spending cuts are widely associated with welfare expenditure, such as education, healthcare and pension provision. Conversely, some governments have increased public investment in infrastructure to stimulate the economy in the short run and pay back borrowing or debt in the long run.

2.3 Keynesian views of public spending and its critiques

Keynesian economic theory has greatly affected public spending since the Great Recession. The aim of Keynesian economic policy is to avoid recession and to stimulate economic activity by using fiscal policy when a recession occurs. Traditional Keynesian theory suggests that governments should increase public spending and cut taxes in order to boost aggregate demand during a recession. Thus, the increase of aggregate demand stimulates firms to increase production, hire workers and this in turn also increases household income. Through these effects on aggregate demand, the fiscal policies of the government may, in turn, influence aggregate employment, output and price levels (Snowdon and Vane, 2005). Theoretically, the well-known hypothesis of the Keynesian approach suggests that positive government spending should induce economic stimulation by means of an income multiplier effect. Public spending can affect the economy by boosting aggregate demand and employment. Positive changes in capital stock may lead to increasing profit rates, which, in turn, leads to higher investment in the short run.

Private investment is a vital channel for economic growth. The effect of public spending on private investment is crucial due to its relevance to real economic growth. Crowding-out generally refers to the economic effects of an increase in government demand, financed by either taxes or borrowing; when this fails to stimulate total economic activity, private sector investment is considered to be crowded-out by the government's spending. The crowding-out effect is one of the issues, which helps to distinguish between Keynesians and Monetarists. Keynes contended that monetary policy was powerless to boost the economy out of a depression, because it depended on the interest rate. When an economy is in a depression, the interest rate is already close to zero. Conversely, increasing government spending would not only boost aggregate demand directly, but also set off a chain reaction of increased demand from workers and suppliers whose incomes had been increased by the government's expenditure. Similarly, a tax cut would put more disposable income into the wallets of consumers, which would also boost demand (Nelson, 2006).

Moreover, Keynesians believe that increasing government spending will also boost private investment in certain areas. For example, Aschauer (1987) suggests that an

increase of public investment spending should have a larger multiplier impact on private output than a similarly-sized increase in public consumption expenditure. Specifically, public investment induces an increase in the rate of return on private capital, and thereby stimulates private investment.

However, compared to the impact of the rational expectation theory postulated by Lucas (1972), traditional Keynesian theory fails to account for the economic development of the 1970s, when both high inflation and unemployment co-occurred. The new Keynesian models adopt the rational expectation assumption in terms of firms and individuals, various forms of price rigidity, usually staggered prices or wages, as well as market imperfections to provide a microeconomic foundation for government spending. Notwithstanding this incorporation of rational expectation into new Keynesian models, the role of public spending has not changed in improving macroeconomic stability and economic welfare (Krugman, 1998). The following section addresses effects of public spending on aggregate demand and output in Keynesian economic frameworks.

2.3.1 The AS-AD analysis

The Keynesian revolution resided in the fundamental way of analysing the effects of government spending on output. In his 'General Theory', Keynes (1936) indicated that national income is determined by the level of employment. In order to develop this theory, he emphasized the demand side of the economy. He argued that national income will increase κ times⁷ of the increase in investment (or public spending). The traditional Keynesian view assumes that the level of output is determined entirely by aggregate demand, where the market features less than full employment and the correlation between interest rates and investment is low. Hence, an increase in public spending will increase income and output with little effect on interest rates. In addition, consumption should rise in response to increased government spending. Moreover, government spending may boost private spending if it leads to positive expectations, hence, it may crowd-in rather than crowd-out private consumption and investment (Aschauer, 1989; Kusteoeli, 2005).

⁷ κ is the multiplier of investment, where $\Delta Y = \Delta I * \kappa$ (Keynes, 1936, p.115).

At the aggregate level, the aggregate supply (AS) curve indicates the total supply by producers at each price level. According to the Keynesian view, wages are sticky, so the economy cannot continuously have full employment. Phillips (1958) found a negative relationship between the unemployment rate and inflation in the United Kingdom. Hence, policy makers suffer the ‘trade off’ between the unemployment rate and inflation, which cannot be established at a very low level.

In general, the AS curve is shown as follows:

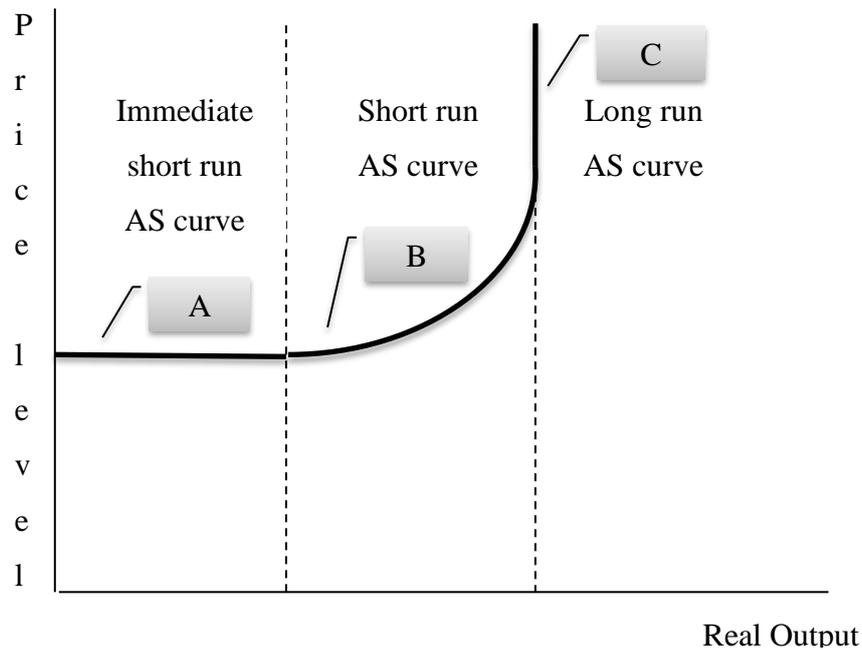
$$P_{t+1} = P_t[1 + \lambda(Y - Y^*)] \quad (2.1)$$

$$\lambda = \varepsilon/Y^*. \quad (2.2)$$

Y^* is the potential output level, and ε measures the response level between wages and unemployment. When $\varepsilon=0$, the price level $P_{t=1} = P$, which is the extreme Keynesian horizontal AS curve. When $\varepsilon \rightarrow \infty$, the output level is equal to the potential output level Y^* , which is the ‘classical’ vertical AS curve. Thus, the impact of a change in aggregate demand on output and inflation depends on the aggregate supply curve. If it is vertical, only inflation increases. If it is horizontal, only output increases. Furthermore, if there is a positive relationship between output and inflation (upward-sloping), both output and inflation will increase (Romer, 2006).

The aggregate supply curve shows the relationship between price levels and the real domestic output that firms in the economy produce. This relationship varies depending on the time horizon and how quickly output prices and input prices can change. Figure 2.1 features the three possible AS curves, which are the immediate short run AS curve, the short run AS curve and the long run AS curve. In the immediate short run aggregate supply curve (curve A), both input price and output price are fixed, which is the (extreme) Keynesian view. When the economy achieves far from its potential income, an increase in aggregate demand will not cause inflationary pressure. The immediate AS curve is horizontal, with strong assumptions about price rigidity (Romer, 2006). Hence, an increase in aggregate demand will cause firms to increase employment and output at the fixed price level in the immediate short run.

Figure 2.1: Three types of aggregate supply curve



Source: McConnell et al., 2011, Figure 10.3-10.5

The short run Keynesian aggregate supply curve (curve B in Figure 2.1) begins after the immediate short run ends i.e., period of time with sticky price or wage, or imperfect market. In all of these models, this state of imperfection causes the output of the economy to deviate from the classical assumption. As a result, the short run aggregate supply curve is upward-sloping, rather than vertical (Mankiw, 2011). Therefore, an increase in aggregate demand causes the level of output to deviate temporarily from its natural rate.

The long run aggregate curve (curve C in Figure 2.1) is vertical at the economy's full-employment output, irrespective of the level of prices. The 'natural rate hypothesis' of Friedman (1968) indicates that nominal variables, such as the money supply and inflation, could not have an impact on real output or unemployment in the long run. Therefore, prices and wages are flexible in the long run, and changes in aggregate demand do not affect real output or unemployment. In the new Keynesian model, monetary shocks are clearly non-neutral in the short run, but money remains neutral in the long run as the vertical long run aggregate supply curve. While new Keynesian economists have adopted the new classical micro foundations, they aim to construct a coherent theory of aggregate supply where wages and price stickiness can be rationalized (Snowdon and Vane, 2005).

To sum up, the immediate short run aggregate supply curve, the short run aggregate supply curve and the long run aggregate supply curve are all important, as each curve is appropriate to situations that match its respective assumptions about the flexibility of wages and prices. The Keynesian version of immediate short run aggregate supply curve implies that increasing the government spending has a real effect on real output and employment, because price levels are assumed to be fixed. By contrast, according to the new classical version of the aggregate supply curve, the economy's real full employment output is not affected by government spending shocks in the long run.

2.3.2 The multiplier effect of public spending in the IS-LM framework

In Keynesian theory, increasing government spending will increase aggregate demand; it will cause an increase in output and subsequently an increase in income; simultaneously, an initial increase in output leads to an increased demand for money, which then pushes up the real interest rate. The rise in interest rates may reduce private investment, the extent of which depends on the interest elasticity of investment. Hence, the effects of government spending on output and employment depends on the slopes of the IS and LM curves⁸. This section analyzes the effect of public spending on the IS-LM model, where the IS curve represents equilibrium in the goods market, the LM curve represents equilibrium in the market for real money balances, and the IS and LM curves together determine the interest rate and national income in the short run when the price level is fixed (Mankiw, 2011).

Assuming that consumption function is:

$$C = \bar{C} + c(Y + \bar{TR} - tY) \quad c > 0 \quad (2.3)$$

Where \bar{C} is autonomous consumption, and c is the marginal propensity to consume. Y is the total income, \bar{TR} is government transfer payment, and t is the tax rate. $c > 0$ indicates the positive relationship between consumption and disposable income.

⁸ The flatter LM curve and steeper IS curve represent less interest-elasticity of investment (crowding-out effect), in turn; that is, the greater effect of public spending on output.

Assuming the investment function is:

$$I = \bar{I} - bi \quad b > 0 \quad (2.4)$$

Where i is the interest rate, b measures the interest elasticity of investment, and \bar{I} is autonomous investment, which is not dependent on interest rate and income.

Hence, the aggregate demand can be written as:

$$\begin{aligned} AD &= C + I + G + NX = [\bar{C} + c\bar{TR} + c(1-t)Y] + (\bar{I} - bi) + \bar{G} + \bar{NX} \\ &= \bar{A} + c(1-t)Y - bi \end{aligned} \quad (2.5)$$

Here $\bar{A} = \bar{C} + \bar{TR} + \bar{I} + \bar{G} + \bar{NX}$, which is the autonomous spending level. According to the requirement of goods market clearing, we can get:

$$Y = AD = \bar{A} + c(1-t)Y - bi \quad (2.6)$$

Hence, we can get the IS curve:

$$i = \frac{\bar{A}}{b} - \frac{[1-c(1-t)]Y}{b} = \frac{\bar{A}}{b} - \frac{Y}{a_G b} \quad (2.7)$$

In (2.7), $\frac{1}{a_G b}$ is the slope of the IS curve and $a_G = \frac{1}{1-c(1-t)}$ is the multiplier of government spending. Where a_G and b are greater than zero, the slope of the IS curve is negative. The slope of the IS curve is determined by the multiplier of government spending a_G and the interest elasticity of investment b . If a_G and b are smaller, the slope of the IS curve is steeper. In other words, the IS curve will be steeper when the value of the multiplier⁹ is smaller, and less effect of investment on interest rate. In the extreme Keynesian case, where investment is perfectly interest-inelastic, the IS curve will be vertical.

The LM curve describes the equilibrium of the capital market, and provides a combination of interest and output level when money demand is equal to the money

⁹ The smaller the value of the multiplier, the less income will increase by a given increase in investment; hence, the IS curve will be steeper.

supply. Money supply is assumed to be exogenous by a central bank (Mankiw, 2011).

Real stock of money (or demand for money) is:

$$L = kY - hi, \quad k, h > 0 \quad (2.8)$$

We can see that the real stock of money is determined by the real income level (Y), interest rates (i), the income sensitivity of demand for money (k), and the interest rate sensitivity of the demand for money (h). In the equation (2.8), (k) and (i) are greater than zero, which means that the quantity of real money demand is positively related to income, and negatively related to the rate of interest. For example, an increase in national income will raise the demand for money, which depends on the increase in income, as well as the income and interest rate sensitivity of the demand for money.

The nominal money supply \bar{M} is determined by the central bank, and we know the price level is \bar{P} . The real money supply is \bar{M}/\bar{P} . According to the money market clear, the demand for money, or what Keynes called the liquidity preference (L), equals the supply of money \bar{M}/\bar{P} .

The LM curve can be written as:

$$i = \frac{1}{h} \left[kY - \frac{\bar{M}}{\bar{P}} \right] \quad (2.9)$$

The goods market and capital market short run equilibrium requires (2.7) to be equal to (2.9), which is the intersection of the IS-LM curves.

$$\frac{\bar{A}}{b} - \frac{Y}{a_G b} = \frac{1}{h} \left[kY - \frac{\bar{M}}{\bar{P}} \right] \quad (2.10)$$

Rewriting Y on the left side:

$$Y = a_G \left[\bar{A} - \frac{b}{h} \left[kY - \frac{\bar{M}}{\bar{P}} \right] \right] \quad (2.11)$$

To simplify the equation (2.11) gives:

$$Y = \gamma \bar{A} + \gamma \frac{b \bar{M}}{h p} \quad (2.12)$$

Where $\gamma = \frac{a_G}{1 + k a_G \frac{b}{h}}$ and $\bar{A} = \bar{C} + \bar{cTR} + \bar{I} + \bar{G} + \bar{NX}$

From 2.12, we can get $= \frac{\Delta Y}{\Delta G}$. Hence, $\gamma = \frac{a_G}{1 + k a_G \frac{b}{h}}$ is the equilibrium multiplier of fiscal policy, which indicates the change in national income for a given change in government spending, if the money supply remains constant.

The fiscal policy multiplier is given by the coefficient on autonomous spending \bar{A} in the equation (2.12). It is different from the government expenditure multiplier a_G because it takes into account the impacts on interest rates caused by rising government spending in the money market¹⁰. The simple expenditure multiplier is only derived from the goods market, and on the assumption that interest rates do not change when national income rises. Hence, the fiscal policy multiplier is smaller than the initial multiplier of government spending because of $a_G = \frac{1}{1 - c(1 - t)} > 0$ and $\frac{1}{1 + k a_G \frac{b}{h}} < 1$.

Assuming the interest rate does not change, increasing government spending drives the aggregate demand and the output level. However, interest rate will rise because of the increase in income and money supply. A higher interest rate reduces the supply of firms and aggregate demand. Conversely, private consumption and investment are crowded-out by the rise of interest rates after increasing government spending, so the equilibrium output demanded in the goods market is less than the initial increase in government spending (Romer, 2006).

Thus, in the new equilibrium, the increase in output is:

$$\Delta Y = Y'_0 - Y_0 = \gamma \cdot \Delta G = \frac{a_G}{1 + k a_G \frac{b}{h}} \cdot \Delta G \quad (2.13)$$

¹⁰ This indicates the government spending has a crowding-out effect on private investment in the money market.

And the crowding-out effect is:

$$Y_0'' - Y_0' = (a_G - \gamma) \cdot \Delta G = \left[a_G - \frac{a_G}{1 + k a_{G \frac{b}{h}}} \right] \cdot \Delta G > 0 \quad (2.14)$$

Where the crowding-out effect depends on the a_G , k , b , h . Recall, the k and h indicate the sensitivity of real money demand on income levels and interest rates respectively, and b represents the interest elasticity of investment. If the k , h and b are larger, the crowding-out effect is greater.

Figure 2.2: The expansionary public spending in IS-LM framework

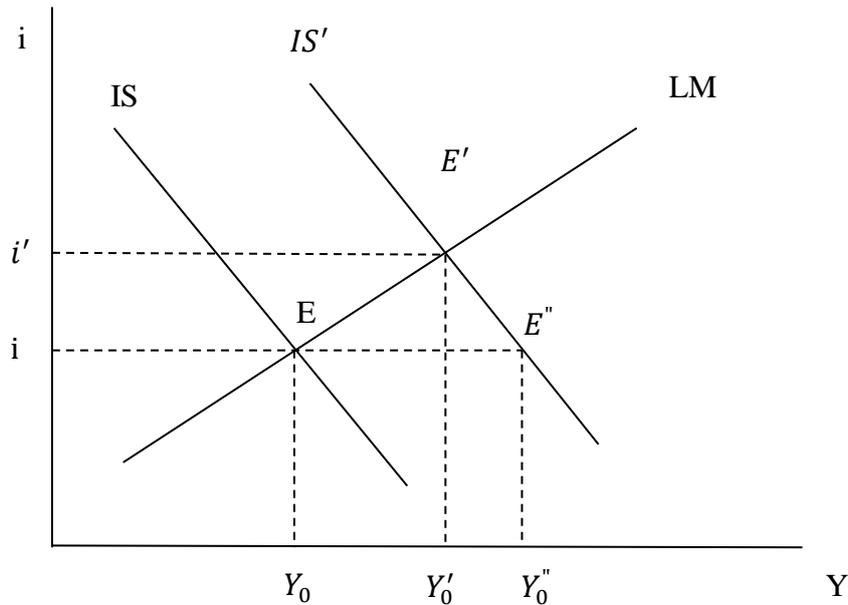


Figure 2.2 shows the effect of expansionary public spending on output in the equation (2.13) and (2.14). The economy is initially in equilibrium at point E (the intersection of IS and LM). In the Keynesian framework, the economy has less than full employment. An increase in government spending shifts the IS curve towards the right, from IS to IS' . The equilibrium moves from E to E' , which results in an increase in both the level of income (ΔY in equation 2.13) and interest rates. Compared with point E'' , the new equilibrium E' has less output, because the rise in interest rates in turn leads to a reduction in private investment (the degree of the crowding effect is shown in equation 2.14 by $Y_0'' - Y_0'$).

Hence, an increase in public spending will increase real output and interest rates in the short run, although the rise in interest rates has a crowding-out effect on private investment.

2.3.3 The post-Keynesian growth theory

In neoclassical economics full employment is ensured by market clearing condition for economic activity. In Keynesian economics employment depends on economic activity which in turn is determined by effective demand. Common denominators in post-Keynesian analyses are their emphasis on realism, uncertainty and social and institutional factors. Rational expectations hypothesis is rejected because the nature of human decision.

Human decisions affecting the future, whether the personal or political or economic, cannot depend on the strict mathematical expectation, since the basis for making such calculations does not exist (Keynesian, 1936, pp162).

Overall, economic output depends on aggregate private consumption demand, aggregate investment, government expenditures and net exports (Stockhammer et al., 2009). In the post-Keynesian economics, there is an investment function distinct from the savings function. Income is determined by effective demand and investment as a variable independent of consumption and saving (Pasinetti, 1962). The theory of income distribution in Post-Keynesian analysis plays an important role on economic growth. For example, rising wage shares can have a positive effect on economic growth through an increase in capacity utilization, which in turn leads to a strong accelerator effect resulting in higher investment, and higher profit rate. Thus, a rising inequality can cause an economic instability from a post-Keynesian perspective (Stockhammer and Onaran, 2012).

Bhaduri and Marglin (1990) analyse the changes in functional income distribution on aggregate demand. They demonstrated that economic development can be both wage-led and profit-led. It depends on the relative response of saving and investment to changes in

the profit share. If the effects of changes in the profit share on investment are dominated by the effects on saving, growth is wage-led. If the effects in the profit share on investment dominate the effects on saving, growth is profit-led. However, wages are the most important element of production costs and they are the main source of income of the biggest part of the population and, hence, have a prominent influence on aggregate demand.

Bhaduri and Marglin (1990) approach has increasingly inspired empirical work. Stockhammer et al., (2009) find the decline of wage share since 1981 has together with a reduction on growth rate and employment rate in Euro area. This indicates that the wage share has a positive effect on the output growth in Euro area (wage-led growth), although it has contradictory effects on the aggregate demand¹¹. Hein and Vogel (2008) examine the functional income distribution and economic growth in six countries. They suggest that wage-led growth becomes less feasible when the effects of distribution on foreign trade are taken into account, which is consistent with the conclusion of Bhaduri and Marglin (1990).

Bhaduri (2006) presents a demand side endogenous growth¹² model where labour productivity is driven by inter-class conflict over income distribution between workers and capitalists and it is adjusted through the gap between the growth rates of real wage and labour productivity. Bhaduri's endogenous model helps to overcome the error of 'omission' on the effective demand and the error of 'commission' on the supply side to the faulty assumption on the capital and labour substitution.

In order to introduce the effective demand, it requires the disequilibrium between investment and saving in a growing economy. In a start of equilibrium growth from a market clearing condition, where investment equals to saving ($I^*/S^*=I$). A higher ratio of investment ($I/I^*>I$) will adjust the economy by:

$$(g_y - g_y^*) = F[(I^*/S^*) + (I/I^* - S/S^*)] \quad (2.15)$$

¹¹ Theoretically, an increase in the wage share has positive effect on the private consumption, but a negative effect on investment and export. Therefore, the total effect of changing wage share on aggregate demand depends on the sum of these effects.

¹² The demand side growth model means that the economic growth depends on the effective demand.

Where $(I/I^* - S/S^*) = [(1 + g_I) - (1 + g_S)] = g_I - g_S$

Hence, the first order term is

$$dg_y/dt = a(g_I - g_S), a > 0 \quad (2.16)$$

The Investment function: $I = f(Y, X)$, on simple manipulation reduces to

$$g_I = \eta_y g_y + \eta_x g_x \quad (2.17)$$

Where Y is the output level, X is the labour productivity level, and η_y and η_x are positive partial elasticities of investment with respect to output and investment, respectively. Saving is treated as an increasing function of income:

$$g_S = \varepsilon_y g_y \quad (2.18)$$

Where ε_y is the positive partial elasticity of saving with respect to income. Inserting (2.17) and (2.18) to (2.16), we have

$$dg_y/dt = a[(\eta_y - \varepsilon_y)g_y + \eta_x g_x]; \eta_x, \eta_y, \varepsilon_y > 0 \quad (2.19)$$

If the employment grew at the same rate as labour supply, we have: $g_L = n$. And we assume

$$g_y = g_x + g_L \quad (2.20)$$

The labour productivity is driven by inter-class conflict in the labour market:

$$dg_x/dt = b(g_L - n) = b(g_y - g_x - n), b > 0 \quad (2.21)$$

Note: $dg_y/dt = 0$ implies $g_y = z g_x$, where $z = [\eta_x / (\varepsilon_y - \eta_y)]$, $z > 1$. And $dg_x/dt = 0$ implies $g_y = n + g_x$, $n > 0$

Thus, the steady growth is

$$g_y^* = nZ/Z - 1, \quad g_x^* = Z/Z - 1, \quad \text{and} \quad g_L^* = n \quad (2.22)$$

In the Bhaduri (2006) growth model, the long run steady-state growth rate is determined by the growth of labour, investment and saving decisions. This result shows that the endogenous growth of labour productivity provides long run output growth on the supply side. The growth in both the real wage rate and labour productivity is driven simultaneously by the forces of class conflict, and the wage rate remains constant over the long run. This ensures that the technical progress remains ‘neutral’ in the long run and the growth of aggregate demand and output absorb the growth in the labour productivity.

2.3.4 The shift and critics of Keynesian theory

Since the late 1970s, the neoclassical economists argue that the aggregate demand-driven models have failed to capture the significant aspects of fiscal policy in advanced economies. Lucas and Sargent (1978) pointed out that the Keynesian model failed to explain the ‘stagflation’ of the 1970s, which is based on a trade-off between the rate of unemployment and inflation. Friedman (1977) argued that, under normal circumstances, monetary policy is a more useful tool for economic stabilization than fiscal policy in the long run. He argued that the government should consider a macroeconomic policy within a rule-based framework. Lucas (1972) also supported Friedman’s ‘rule-based’ framework for macroeconomic policy, emphasizing the rational expectations. In contrast to both the Keynesian and monetarist models, Lucas (1976) proposed that a policy’s stabilizing effects can be retarded by the expectations and actions of rational agents who observe the government’s policy process. For example, investment might actually drop more during a recession in anticipation of a countercyclical investment incentive to be enacted in the near future; furthermore, consumption might not respond much to a countercyclical reduction in income taxes, as the wealth effects of such tax reductions are small when the reductions are regarded as temporary.

Following the ‘fiscal profligacy’ of the 1970s and 1980s, several advanced economies stabilized and reduced their debt to GDP ratios, which is called large fiscal adjustments.

In contrast to the prediction of standard Keynesian models driven by aggregate demand, the fiscal contractions in many advanced economies have been associated with higher growth, even in the very short term. Meanwhile, economic activity slowed during several episodes of rapid fiscal expansion. These empirical observations led to a significant interest in the so-called ‘non-Keynesian’ effects of fiscal policy, and, in particular, in the response of private consumption to major fiscal changes (Alesina et al., 2002).

For a number of decades after the emergence of Keynes’s general theory, discretionary adjustment of fiscal policy to maintain balance between the supply capacity of the economy and demand replaced the classical economic theory. Keynes’s theory has now been replaced by a variation of the classical theme (Garnaut, 2005). Since the 1980s, a large body of literature has explored the effects of government spending in the dynamic general equilibrium model, which is mainly based on the neoclassical growth model with constant returns to scale. In these studies, the effects of government spending have negative effects on real wages and private consumption.

The argument against government fiscal policy interventions would be the lags in the formulation of economic policy and further lags in the implementation and effects after the policy is enacted, a delay which makes it difficult for policymakers to time fiscal policy actions to stabilize the economy (Auerbach et al., 2010). Indeed, the neoclassical view assumes full employment and advocates competitive markets against government intervention. In the case of an increase in government spending, the interest rate has to increase to bring about capital market equilibrium, reducing private investment (Kusteoli, 2005). The Real Business Cycle (RBC) model predicts a decline in private consumption in response to a rise in government spending: with infinitely-lived Ricardian households, an increase in government spending lowers the present value of after-tax income, and thus generates a negative wealth effect on consumption (Furceri and Sousa, 2011).

Hence, the new Keynesian models adopt the rational expectation assumption regarding firms and individuals and some form of price rigidity, usually staggered prices or wages. The central arguments of the new Keynesian models are: the importance of the imperfect and incomplete market (Stiglitz, 2000), wage and price stickiness based on maximizing behaviour and rational expectations (Gordon, 1990). In both the traditional and new

Keynesian models, there is an absence of market clearing condition, so the demand or supply shocks will have substantial, real effects on output and employment, because the process of prices and wages adjustment is slow (Snowdon and Vane, 2005).

In the aftermath of studies by Aschauer (1989) and Giavazzi and Pagano (1990), there has been a substantial debate on the effects of public spending. However, the empirical results are mixed, and the debate has not yet been resolved. Aschauer (1989), using the United State time series data, found that an increase in public investment crowds-out private investment, but simultaneously raises the marginal productivity of private capital, which may crowd-in private capital.

In contrast, Giavazzi and Pagano (1990) show that public spending has non-Keynesian effects. Specifically, they claim that, under special circumstances, a fiscal contraction policy may have expansionary effects on consumption, investment and output. They examine two European countries, Denmark from 1983-1986 and Ireland from 1987-89. During these periods, the government deficit dropped by 9.5 per cent and 7.2 per cent of GDP respectively, and private consumption increased by 17.7 per cent and 14.5 per cent cumulatively. Moreover, Giavazzi and Pagano (1996) largely sought to answer whether public spending has Keynesian or non-Keynesian effects on economic activity. According to their research, the impact of fiscal policy depends on: (i) the type of the impulse (budget cut or expansion); (ii) its size and duration; (iii) the initial conditions (previous level or rate of growth of public debt, preceding exchange rate and money supply movements); and (iv) the composition of the impulse (changes in taxes and transfers relative to changes in government consumption, changes in public investment or in social security entitlements).

Hemming et al., (2002) conducted an extensive survey of the theoretical and empirical literature on the effectiveness of public spending in stimulating economic activity. They concluded that public spending does have Keynesian effects on economic activity, but the multiplier effect is small. Furthermore, they also acknowledged the possibility of non-Keynesian effects. Ramey (2011) reviewed the government spending multiplier on aggregated U.S. data and cross-country analysis. She indicated that the multiplier for a temporary, deficit-financed increase in government spending is probably between 0.8 and 1.5. This suggests that public spending has a Keynesian effect on the economy.

Moreover, there is a growing interest in including the experience of developing countries in this debate. Schlarek (2003) investigated the effects of fiscal policy on private consumption in both industrial and developing countries and indicated that fiscal policy can have Keynesian or non-Keynesian effects on private consumption, which is affected by the initial conditions of the economy. The impact of public spending on output is based on the market value of wealth and expectations about future taxes (Giavazzi et al., 2000). A fiscal contraction often reduces interest rates, raising the market value of stocks, bonds and real estate, thus stimulating aggregate demand. It is also suggested that public spending more often has non-Keynesian effects in developing countries, as opposed to Keynesian effects (Giavazzi et al., 2000).

To sum up, the government spending multiplier has been estimated in both traditional Keynesian and new Keynesian models, showing that the multipliers are smaller in the new Keynesian models as compared with traditional Keynesian models. Nevertheless, both the new Keynesian and traditional Keynesian models suggest that public spending has a positive effect on output and employment, the only difference between them being the size of the multipliers. Despite this, macroeconomists remain rather uncertain as to the quantitative effects of public spending. This uncertainty stems not only from the usual errors in empirical estimation, but also from different perspectives regarding the theoretical framework and econometric method.

2.4 Government spending in neoclassical growth models

The development of the neoclassical growth model provided a theoretical construct to explain the growth effects of government spending. The exogenous neoclassical growth model was developed by Solow (1956), and it proposes that, if there was no technological progress, then the effects of diminishing returns would eventually cause economic growth to cease. Hence, long-term economic growth is entirely dependent on technological progress. In the Solow neoclassical growth model, steady state growth is driven by exogenous factors, such as population growth and technological progress. Government spending has only temporary effects on growth during the transition to the steady state, which implies that fiscal policy cannot have an important impact on economic growth in

the long run (Easterly and Rebelo, 1993). According to the exogenous neoclassical growth model, the share of government in output, or the composition of expenditure and revenue, does not affect the long term growth of per capita income (Kneller et al., 1999). In these models, tax and expenditure measures that influence the saving rate or investment incentives ultimately affect the equilibrium factor ratios, rather than the steady state growth rate.

Arrow and Kurz (1970) developed a model wherein consumers derive utility from private consumption as well as from the public capital stock. In addition, private production benefits from the services of public capital stock. Arrow and Kurz (1970) assumed that all government investment was productive. Furthermore, their model was in the neoclassical tradition in which public spending only affected the economy's transitional growth rate; the steady-state growth rate remained unchangeable.

However, in the 1980s, the development of the endogenous growth model assigned the potential to fiscal policy (also other endogenous economic variables) to be a determinant of long term economic growth. In the endogenous growth model, public spending has a permanent effect on growth, and it can determine both the level of output and the steady state growth rate. Thus, public spending has an important impact on economic growth in the endogenous growth models. Any change in public spending can affect the growth rate for sustained periods of time, so that these accumulated effects during the transition to a new equilibrium may translate into potentially significant effects on the steady state level (Turnovsky, 2004).

There is a considerable body of literature which highlights the role of human capital and R&D in endogenous growth models. Lucas (1988) argued that public investment in education increases the level of human capital, which is a main source of long term economic growth. Barro (1990) and King and Rebelo (1990) claimed that investment in human capital has robust effects on the steady state growth rate, and consequently there is more scope for government fiscal policy to play a role in any economic growth. For example, Barro (1990) and Kneller et al., (1999) argued that recent endogenous models of economic growth can generate long term growth without relying on exogenous changes in technology or population. A general feature of these models is the presence of constant or increasing returns in the factors that can be accumulated. Because of externalities

associated with public expenditures and taxes, the privately determined values of saving and economic growth may be suboptimal.

The endogenous models suggest that an increase in the level of government spending results in an endogenous increase in total factor productivity. This implies that an increase in government spending may result in simultaneous increases in output, employment wages and consumption. This notion, therefore, rejects the invariant relationship between government spending and the Solow residual in the exogenous growth model. Aschauer (1989) adopted an endogenous assumption regarding the constant return of capital. He found that government spending in core infrastructures, such as roads, airports, highways, sewers and water systems have a significantly positive impact on the growth of productivity and, in turn, increasing the economic growth. One strand of these models features positive externalities to human capital or ideas, leading to too little growth in the absence of government intervention. Such externalities call for governmental actions, such as taxation, maintenance of law and order, provision of infrastructure services, protection of intellectual property rights and the regulation of international trade, financial markets and other aspects of the economy. The government, therefore, has great potential for good or ill through its influence on the long term rate of growth (Temple, 1999).

In the standard neoclassical growth model with constant returns to scale, real wages and private consumption are invariant to changes in the share of government spending in output. However, in the endogenous growth model with increasing returns, steady state real wages and private consumption are positively related to the share of government spending in output if the labour supply is sufficiently elastic. Hence, government spending will not crowd-out long term private consumption (Devarajan et al., 1996). Typically, long term growth models with productive government spending lump several goods and services, such as roads and highways, law and order, sewer systems, harbours and public sector R&D together into one category called 'public capital'. While increasing the stock of transportation may enhance the productivity of private factors, increasing police protection seems to operate in a fundamentally different manner. Without police protection, a high level of crime may prevail, such as stealing. Although stealing is purely redistributive in the given period, expectations of future stealing lowers rates of returns to investment (Glomm and Ravikuman, 1997).

2.4.1 Effect of public spending in the endogenous growth model

The Solow neoclassical model sought to study how the three exogenous factors affect or determine the long term growth of per capita output. Based on a series of assumptions concerning production and exogenous variables, the Solow model predicts that economic growth will enter into a steady state. During the period of the steady state, per capita output cannot be affected by any change in the level of endogenous and exogenous variables, except the technological growth rate.

Although the traditional Solow growth model has been extended to make the saving rate endogenous within the Ramsey-Cass-Koopmans model and the Diamond overlapping-generation model extended (Cass, 1965; Diamond, 1965; Koopmans, 1965), none of these models separately consider the economic effects of public capital (Song, 2011).

Arrow and Kurz (1970) included public capital as input in the production function, which is specified as follows:

$$Y(t) = F(K_p(t), K_g(t), L(t))$$

The simplest form of production is:

$$Y = AK$$

Where A represents the level of technology in the economy and K is the economy's stock of capital. The standard Solow neoclassical growth model, featuring diminishing returns of capital, was unable to account for the determinant of long term economic growth, since the economy converges to a steady state with a zero growth rate of per capita output at a certain technological level. The main reason for the failure of the Solow neoclassical growth model to account for the zero long term growth rates at the steady state without technological change is the assumption of the diminishing returns of capital. Therefore, in the AK model, the diminishing returns of capital are absent. Moreover, the AK model allows the endogenous parameters to determine the long term growth rate without technological changes.

The role of government spending in economic growth remains an unresolved issue theoretically, as well as empirically. The theoretical positions on the effect of government spending are quite diverse since Barro's (1990) model of government spending emerged as a single model of endogenous growth. Barro (1990) suggested a possible relationship between the share of government spending in GDP and the real GDP per capita growth rate. Hence, if changes in the share of government spending can affect real output growth rate, the size of government spending can potentially be a critical factor in accounting for the disparity in long term economic growth in different nations.

Barro (1990) devised a simple model of government spending and economic growth, one which assumes constant returns¹³ to both private and public capital. The representative household in a closed economy seeks to maximize overall utility, as given by:

$$U = \int_0^{\infty} u(c)e^{-\rho t} dt \quad (2.23)$$

Where c is consumption per person, and $\rho > 0$ is the constant rate of time preference. The utility function is:

$$u(c) = \frac{c^{1-\sigma}-1}{1-\sigma} \quad (2.24)$$

Where $\sigma > 0$, thus the marginal utility can have a constant elasticity of $-\sigma$.

Combining the equations (2.23) and (2.24), we can get

$$U = \int_0^{\infty} e^{-\rho t} (c^{1-\sigma} - 1)/(1 - \sigma) dt \quad (2.25)$$

Where we assume constant returns to scale, the intensive production function can be written as

$$y = \Phi(k, g) = k \cdot \phi\left(\frac{g}{k}\right) \quad (2.26)$$

Where Φ is positive and satisfies the diminishing marginal products, so that $\phi' > 0$

¹³ The constant return to capital implies that doubling all inputs causes output to double.

and $\phi'' < 0$. The variable g is per capita government spending, and k is the quantity of capital per worker. Subject to a government budget constraint, we get:

$$g = T = \tau y \quad (2.27)$$

Where we assume that government spending is financed by a flat-rate income tax, therefore we can get

$$g = \tau \cdot k \cdot \phi\left(\frac{g}{k}\right) \quad (2.28)$$

Where y is per capita output, τ is the average tax rate. The model allows government activities to enter as a separate input to private production. From the production function in equation (2.26) we can drive the marginal product of capital as:

$$\frac{\partial y}{\partial k} = (1 - \beta)\phi\left(\frac{g}{k}\right) \quad (2.29)$$

Where β is the elasticity of government spending, (g) on the output (y), so that $0 < \beta < 1$. Following the model above, the steady-state growth rate can be written as

$$\gamma = \frac{\dot{c}}{c} = \left[\left(1 - \frac{g}{y}\right) (1 - \beta)\phi\left(\frac{g}{k}\right) - \rho \right] / \sigma \quad (2.30)$$

Therefore, an increase in the share of public spending to output (g/y) affects γ in two counteracting ways. Firstly, it crowds out private investment, and therefore lowers the growth rate. Secondly, a higher g/y makes private capital more productive, raises $\partial y / \partial k$ and hence leads to a higher γ .

The net effect of government spending on per capita output (y) can be illustrated as:

$$\frac{\partial y}{\partial \left(\frac{g}{y}\right)} = \phi\left(\frac{g}{k}\right)(\phi' - 1) / \sigma \quad (2.31)$$

Furthermore, the effect depends on the size of government. An expansion of government spending will reduce output when the government is too large, such as $\phi' < 1$. Conversely, if the government is small enough, such as $\phi' > 1$, so $\frac{\partial y}{\partial \left(\frac{g}{y}\right)} > 0$, an increase in government

spending will result in a rise in the real output. With the Cobb-Douglas production function, the size of government maximizes the growth rate to achieve production efficiency. The optimal size of government requires $\varnothing'=1$, then $\frac{\partial y}{\partial (\frac{g}{y})} = 0$. At the optimum, any further marginal change of government spending will not affect the real output.

2.4.2 Optimal government spending in the endogenous growth model

Barro (1990) specifies that the share of public spending¹⁴ in output affects the growth rate, and he derives a growth-maximizing spending share for an optimizing government. The relationship between public spending and growth depends on the current spending level; it is positive (negative) if public spending is below (above) the growth-maximizing share¹⁵. Therefore, only when public investment is below its growth-maximizing share will additional public investment increase growth.

Let us assume that the government will purchase some private output, and that the government provides free public services. We can derive the Cobb-Douglas production by the number of i firms:

$$Y_i = AL_i^{1-\alpha} \cdot K_i^\alpha \cdot G^{1-\alpha} \quad (2.32)$$

In the equation (2.32), we assume $0 < \alpha < 1$ and a constant return to scale. Government spending G is financed on the tax rate τ on the total output, which is:

$$G = \tau \cdot Y \quad (2.33)$$

We assume tax rate τ does not change over time, and that public spending as the share of total output is constant. The after-tax profits of firms is:

$$L[(1 - \tau) \cdot A \cdot k^\alpha \cdot G^{1-\alpha} - w - (r + \delta)k_i] \quad (2.34)$$

¹⁴ The model for optimal public spending is based on a paper by Barro and Sala-i-Martin, 2003.

¹⁵ In this framework, (Barro, 1990, p. 123) concluded that the economy's growth rate and saving rate initially rise with the ratio of productive government expenditure to GNP, g/y , but each rate eventually reaches a peak and subsequently declines.

Where $k_i = K_i/L_i$, w is wage ratio and $r + \delta$ is rent ratio. The rent ratio depends on the interest rate r . Profit maximization requires that the wage ratio is equal to the marginal cost of labour, and that the rent ratio is equal to the marginal cost of capital. If we make k_i constant, the rent ratio equals:

$$r + \delta = (1 - \tau) \cdot \left(\frac{\partial Y_I}{\partial K_i} \right) = (1 - \tau) \cdot \alpha A \cdot k^{-(1-\alpha)} \cdot G^{1-\alpha} \quad (2.35)$$

From equations (2.24) and (2.25), we can rewrite government spending G :

$$G = \left(\tau A L^{\frac{1}{\alpha}} \right) \cdot k \quad (2.36)$$

Putting equation (2.36) into equation (2.35), we have:

$$r + \delta = (1 - \tau) \cdot \left(\frac{\partial Y_I}{\partial K_i} \right) = (1 - \tau) \cdot \alpha A \cdot k^{-(1-\alpha)} \cdot \left[(\tau A L)^{\frac{1}{\alpha}} \cdot k \right]^{1-\alpha} \quad (2.37)$$

According to the AK model, a balanced equilibrium requires the growth rates of per capita consumption, capital and output to be the same. The familiar condition for the consumption optimization growth rate is given by:

$$\gamma_c = \dot{c}/c = (1/\theta) \cdot (r - \rho) \quad (2.38)$$

Putting equation (2.37) into equation (2.38), we get a steady-state growth rate:

$$\gamma = (1/\theta) \cdot \left[\alpha A^{1/\alpha} \cdot (\tau L)^{(1-\alpha)/\alpha} \cdot (1 - \tau) - \delta - \rho \right] \quad (2.39)$$

From (2.39) we can see that the effect of government spending on economic growth depends on the tax ratio τ (see equation 2.33). The first difference in the tax ratio τ in (2.39):

$$\frac{\partial \gamma}{\partial \tau} = \frac{1}{\theta} \cdot \alpha \cdot A^{1-\alpha} \cdot L^{\frac{1-\alpha}{\alpha}} \cdot \tau^{\frac{1-\alpha}{\alpha}} [1 - \alpha - \tau] \quad (2.40)$$

According to (2.32), when the share of government spending as total output ($\tau < 1 - \alpha$) is small, increasing government spending can raise economic growth. However, when government spending exceeds a certain level ($\tau > 1 - \alpha$), an increase in government spending will have a negative effect on economic growth. Assuming $\frac{\partial \gamma}{\partial \tau} = 0$, we can get the optimal share of government spending to total output:

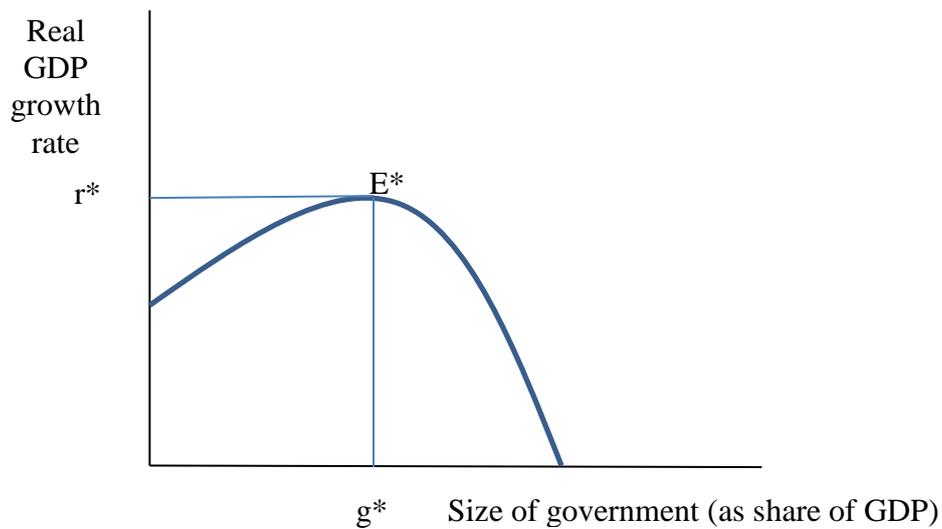
$$\tau^* = 1 - \alpha. \quad (2.41)$$

In order to interpret such a result, we need to calculate the marginal product of government expenditure given in equation (2.32) as follows:

$$\frac{\partial Y}{\partial G} = (1 - \alpha)(Y/G) = (1 - \alpha)/\tau \quad (2.42)$$

When $\tau^* = 1 - \alpha$, we can get $\frac{\partial Y}{\partial G} = 1$. This result corresponds to the natural efficiency condition for the size of the government, in which the marginal cost is equal to the marginal benefit (the equilibrium point E^* in Figure 2.3). Therefore, a benevolent government would seek to maximize the utility attained by the representative household in a first-best environment. However, although the condition $\frac{\partial Y}{\partial G} = 1$ would be part of this utility maximization problem, such a condition might not necessarily hold in a second-best scenario in which taxes were of a distorting nature (Stouraras, 2013).

Figure 2.3: Government spending and economic growth (the Armeiy curve)



Source: Armeiy (1995)

Armeiy (1995) developed the Armeiy Curve (Figure 2.3) to address the optimal size of government spending. He argued that the non-existence of government causes a state of anarchy and low levels of output per capita because there is no rule of law, and no protection of property rights. If the economy increases the government's spending on the allocation of resources, output should rise. Accordingly, the output-enhancing features of the government should dominate when the government is very small, and any expansion in governmental size should be associated with an increase in output. When public spending rises, additional projects financed by the government become increasingly less productive, and taxes and borrowing add to the government's burdens. Additionally, the Armeiy Curve indicates an optimal size of government, E^* . At some point E^* , the marginal benefits from increased government spending become zero. If public spending, as a share of GDP, is above the optimal point E^* , the marginal effect of extra public spending becomes negative, which would then reduce real economic growth.

2.5 Empirical evidence of government spending on economic growth

The importance of public spending on economic growth has been extensively studied in the literature. The traditional approach in endogenous growth models to analyze the

composition of government spending has been divided into two broad categories: productive and unproductive. Aschauer (1989) adopted a Cobb-Douglas production-function approach, which incorporates public and private capital as well as labour into a neoclassical production function of the private sector. Within an endogenous growth framework, Barro (1990) introduced public spending into the production function. Several empirical studies have followed this idea to investigate the possible link between government spending and growth, using different econometric techniques, empirical settings and samples from different countries. Even though public spending can be a significant determinant of growth for countries that are capable of using expenditure for productive purposes, the results are nevertheless mixed.

Different kinds of government expenditures have heterogeneous effects on economic growth. Some macroeconomists believe that the stock of public capital is an important factor in the production of total output. For example, public infrastructures, research and development and public education are often considered to be public goods, which have a positive effect on economic growth (Glomm and Ravikumar, 1997). At the other extreme, various authors believe that this correlation is completely spurious, reflecting a misspecification of trend. Thus, the provision of public sector capital has little effect on private productivity (Fernald, 1999). There have also been observations that growth in government spending, mainly based on non-productive spending, is accompanied by a reduction in economic growth. Thus, it is criticized that the greater the size of government intervention, the greater the negative impact on economic growth (Pieroni, 2009).

Table 2.1: The most-cited empirical literature on the relationship between public spending and economic growth

Author(s)	Data and Methods	Results
Grier and Tullock (1989)	Panel data on 115 countries, 1960-1981	Negative relationship between growth rate of real GDP and government consumption's share of GDP
Aschauer (1989)	Time series, 1954-1982, US data	Positive effect on output productivity
Barro (1990)	Panel data, 98 countries	Positive long term relationship between public spending and growth if (1) below optimal level of public spending, (2) productive public spending.
Munnell (1990b)	Panel data of 48 states in the U.S. from 1970 to 1986	Public capital has a positive effect on output growth

Easterly and Rebelo (1993)	Panel data, across countries, between 1970-1988	Public investment has both positive and negative effects on output growth
Devarajan et al., (1996)	Panel data, 69 developing countries, 1970-90	Different compositions of public spending have different effects on economic growth
Kneller et al., (1999)	Panel data, 22 OECD ¹⁶ countries over the period 1970-1995	Positive relation between public spending and growth, but depends on how taxation is financed
Fernald (1999)	Time series, 1953-1989, U.S. data	Public investment on roads had a positive relationship with economic growth before 1973
Alesina et al., (2002)	18 OECD countries, 1960-1996	Public spending has a large, negative impact on private investment
Afonso and Furceri (2010)	15 EU members and rest 14 OECD countries, from 1970 -2005	Public consumption spending has a negative impact on economic growth, and investment spending has no impact on economic growth

Although several theories suggest that government expenditure has a key role in securing a higher steady-state growth rate of the economy, the empirical findings are not always in line with these theoretical suggestions. In the endogenous growth model with increasing returns to scale, steady-state real wages and private consumption are positively related to the share of government spending in output, if the labour supply is sufficiently elastic. Hence, government spending will not crowd-out long term private consumption (Devereux et al., 1996). In Table 2.1, we can find that some forms of public spending have a negative effect on economic growth in some empirical studies. For example, Grier and Tullock (1989) use pooled cross-section/time-series data of 115 countries, including both developed and developing countries, in the post-World War Two period. They find a significantly negative relationship between the growth rate of real GDP and the government's share of GDP. Only government investment expenditure, such as the provision of infrastructure services, may have a positive impact on economic growth. Alesina et al., (2002) suggest that increases in public spending raise labour costs and reduce profits, and that private investment declines as well. These empirical observations have been called the 'non-Keynesian' effects of fiscal policy, in particular the crowding-out effect of public spending.

¹⁶ OECD: Organisation for Economic Co-operation and Development

The effects of public spending on output are diverse across different types of public spending, selected countries and time. Easterly and Rebelo (1993) state that fiscal policy is an important growth determinant in accounting for growth performance over the past three decades, but it varies according to the type of government consumption. Easterly and Rebelo (1993) used data from various countries to ascertain the effects of public investment on growth between 1970 and 1988. They included the key fiscal variables in the regressions, such as taxes, government expenditure and investment and transfer payments. Although they believed that public investment and other aspects of fiscal policy can contribute to economic growth, they found that total public investment, as well as public enterprise investment, has a negative effect on private investment. However, they found that transport and communication investment are robustly correlated with growth, and that the correlation between education, housing investment and growth is not significant.

It has been asserted that definitions of public infrastructure capital make the most sense from an economics standpoint, including large capital-intensive monopolies such as highways, other transportation facilities, water and sewer lines, as well as communications systems (Gramlich, 1994). The economics approach to infrastructure investment involves computing all the benefits and costs of projects and their rate of return. If the effective real rate of return exceeds the going real interest rate, then the investment is worthwhile. Fernald (1999) examined road investment's impact on productivity growth by using the U. S. data for the years 1953-89. He found that the road building contributed to the pre-1973 productivity growth, but did not offer the same benefits at later times. This indicates that public infrastructure spending in U.S. was higher than the optimal level after 1973. Moreover, this point differs from country to country, and may depend on economic factors such as the openness of the economy as well as social factors such as family size. For example, U.S. productivity growth slowed dramatically around 1973, and macroeconomists should have known that the slowdown in public investment after the early 1970s accounted for a substantial portion of the productivity slowdown, which occurred at around the same time in the United States and other Western countries.

Kneller et al., (1999) tested the impact of public spending on economic growth for 22 OECD countries over the period 1970-1995. They assumed that fiscal revenue was

collected from distortionary or non-distortionary taxation, and that public spending had productive and non-productive expenditures. They found that when the government budget was mainly financed by the non-distortionary taxation, an increase in productive expenditures significantly enhanced economic growth, and an increase in distortionary taxation significantly reduced economic growth rate.

Miller and Russek (1997) also examined the effects of national fiscal structures on national economic growth, using a cross-country sample of both developed and developing countries. Firstly, they found that the method of financing government expenditure played an important role in determining the effects of public expenditures on economic growth in both developing and developed countries. For example, in developing countries, debt-financed increases in government expenditure reduced economic growth, and tax-financed public expenditure promoted a higher growth. Contrastingly, for developed countries, debt-financed increases in government expenditure did not affect economic growth, and tax-financed increases led to lower growth. Secondly, they found that different expenditure categories affected growth differently. For example, increasing education expenditure by debt financing would have a positive effect on economic growth, rather than the predicted negative effects.

More recently, Schaltegger and Torgler (2006) have suggested that large public expenditure reduces growth in high income countries. Agell, Ohlsson, and Thoursie (2006) indicated that there is no robust relationship between growth and the share of government expenditure. Afonso and Furceri (2010) focused on the components of total spending (transfers, subsidies, government consumption and government investment) across OECD and EU countries. They found that subsidies and government consumption had a significant, negative impact on economic growth in both sets of countries, and that government investment did not have a significant effect on growth. Only the transfers had a significant effect on growth in the EU countries.

The composition of public spending is also a relevant issue. If the aim is to promote economic growth, the government should pay more attention to the more productive items of the budget. Based on the 'AK' model, Devarajan et al., (1996) asserted a positive effect of total government expenditure on economic growth; however, a negative effect of physical capital components of government expenditure on economic growth. They found

that a change in the mix of public spending could lead to a higher steady-state growth rate for the economy. The conditions depended not only on the physical productivity of the different components of public spending, but also on the share of government expenditure allocated to them. They also suggested that expenditure, which is normally considered as productive, could become unproductive if it reaches an excessive level.

Various studies exist that have examined the effects of the composition of public spending on the social sector. Kaganovich and Zilcha (1999) examined the growth effect of shifting public spending from social security to education. They found that such a shift would lower economic growth. Zhang and Zhang (1998) found that social security programmes may actually accelerate economic growth when there are interaction effects with fertility and investment in human capital.

Both the size of the government and the initial condition of the economy has a significant effect on the outcome of public spending. Perotti (1999) highlighted the importance of the initial condition of the economy, based on an analysis of both the positive and negative effects of fiscal policy on the economy. He argued that government expenditure shocks have a positive correlation with private consumption in normal times, and a negative correlation in bad times. The overall effect of fiscal policy may be determined by the initial condition of the economy, such as the initial level of debt. In general, Perotti argued that government expenditure shocks have positive effects at low levels of debt or deficit, yet negative effects in the opposite circumstances. Although public spending can harmonize conflicts between private and social interests, as well as provide a socially-optimal direction for growth and development, a large volume of public spending is likely to be detrimental to both efficiency and economic growth. For example, (i) government operations are often conducted inefficiently, (ii) the regulatory process imposes excessive burdens and costs on the economic system, and (iii) many of the government's fiscal and monetary policies tend to distort economic incentives and lessen the productivity of the system (Ram, 1986).

Even if we accept that the public spending has growth effects, it is not possible to address whether there is a causal relationship between public spending and economic growth. Firstly, we need to be cautious when drawing conclusions based on theories (both Keynesian and neoclassical growth theories) between a government's size and economic

growth. The theories cannot encompass every element that could potentially increase economic growth, such as human capital, technological progress, international trade and political reform, economic freedom and the fluctuations of inputs and exchange rate in the same model.

Furthermore, the theories are rather generalized, as they may postulate the same model for every country, and thereby exclude country-specific characteristics. Moreover, a larger public sector size does not necessarily imply a better satisfaction of public needs. The empirical studies have different results in terms of different countries, periods and the measurements of government spending. Agell et al., (1997) claimed that the statistical data and methodological problems have resulted in difficulties in creating comparable cross-country analysis. Traditional regression analysis assumes that explanatory variables do not depend on the rate of growth; an assumption of certainty is debatable when it comes to government expenditure. In most empirical studies, the problem is reduced to finding a simple linear relationship between growth and public spending by Wagner's Law. However, reality is more complicated than that, which is why the assumption of linearity is difficult to explain.

2.6. Empirical literature review of Chinese research

In recent years, the relationship between public expenditure and economic growth has drawn the attention of many scholars. After the advent of China's 'tax sharing'¹⁷ reform in 1994, the division of fiscal power was based on the economic decentralization to establish balanced relationships between central and local governments, as well as between governments and SOEs (Jia and Liu, 2015). Generally, current research can be classified as investigations into the relationship between the scale of public spending, as well as its compositions and economic growth, and the optimum compensation of fiscal expenditure at national or provincial level data. This section attempts to generalize current findings based on these two criteria.

¹⁷ The 'tax sharing' reform marked a milestone in the fiscal structural framework. It divided fiscal power and public spending between central and provincial governments, and defined the scope of their revenue according to the types of taxes.

2.6.1 Effects of public expenditure on economic growth at the national level

The literature on the effects of public expenditure on economic growth mainly concentrated on its share of GDP. Compared with the mixed empirical results regarding public spending in the previous chapter, most Chinese studies have suggested that public spending has a positive effect on economic growth in the period of economic reforms. In other words, increasing government expenditure promoted faster economic growth in China during the economic reform period. For example, OuYang (2004) examined the effect of public spending on economic growth, and established a positive relationship between public spending and economic growth in the 1990s. He suggested that public spending also has a strong Keynesian effect on economic growth. Chen and Dai (2008) examined the multiplier effect of government expenditure on economic growth with time serial data from 1985 to 2006. They calculated that the multiplier of fiscal spending towards economic growth was 4.26, indicating that an increase in government spending boosted GDP more than four-fold during the period of 1985 to 2006. Moreover, they found an inverted ‘U’ shape relationship¹⁸ between the size of government spending and economic growth. This suggests that, with an increase in public spending, the marginal effect of extra public spending will fall to zero at the optimal level. Under the framework of fiscal decentralization, Jia, Guo and Liu (2006) explored the optimal level of public spending on economic growth. Theoretically, they insisted that the relationship between public spending and economic growth has an inverted U shape. Based on the empirical tests, they claimed that public spending is lower than the optimal level, and suggested that increasing the ratio of public investment would accelerate economic growth.

We have discussed how different types of expenditure affect economic growth in different ways. There are different opinions regarding the growth effect of different types of public spending in China. According to Keynesian theory, investment is more important for economic growth, while new classical theory suggests human capital is crucial for long-term economic growth. Because the ratio of human resource investment to total capital investment is low in China, the marginal return to human capital

¹⁸ The inverted ‘U’ shape relationship is consistent with the Armey curve in Section 2.4.2.

investment is higher than that of capital investment. Therefore, public spending on education and social welfare should have a greater growth effect than capital spending. Song et al., (2008) found that public spending on human capital, the labour force, social welfare and education are positively related with economic growth, while economic construction¹⁹ and administrative spending have a negative relation. Zhu and Zhu (2008) found a similar relationship between categories of public expenditure and GNP per capita in China from 1978 to 2005. The results suggest that economic construction expenditure, social welfare, culture and educational expenditure and national defence expenditure have a positive effect on GNP per capita. In addition, social, cultural and educational expenditure have a greater impact on economic growth than economic construction expenditure.

In contrast, administration expenditure has very little impact on GNP per capita. Zhang (2010) also found that economic construction spending, social protection and educational expenditure can promote economic growth, but administrative and national defence expenditure will hinder economic growth. However, Sun (2004) and Wang (2009) postulate a negative relationship between public investment and economic growth, because infrastructure investment has surpassed the optimal value. They found that only education expenditure is positively associated with economic growth. In contrast, other types of spending, such as health expenditure, scientific research expenditure, economic construction expenditure, national defence spending and administration expenditure have a negative relationship with economic growth.

In recent years, a growing number of empirical studies have examined the causality²⁰ between public spending and economic growth. Dong and Teng (2007) and Zhou (2010) found a positive, long term dynamic relationship between fiscal expenditure and economic growth on the basis of the Granger causality analysis. By implementing a VAR (vector autoregression) model, Guo and Jia (2006) applied the endogenous growth model

¹⁹ This is the largest category according to the Chinese classification by categories before 2006. It includes all Capital Expenditure (Capital Construction, Innovation Funds and Science and Technology Promotion Funds) and from Current Expenditure: Economic Services (Geological Protecting, Agriculture, Operating Expenses of Industry, Commerce, and Transport, and Working Capital for State enterprises), Urban Maintenance and Construction Support for Developing Areas and Policy Subsidies. For full categories of spending, please see Appendix A. Source: Ministry of Finance (2004), OECD (2006).

²⁰ Causality here means that a correlation between two variables does not necessarily imply that one causes the other. This is usually the case in the Granger causality test and VAR models.

by dividing government investment into capital investment and human capital investment in order to examine the long term impacts of public investment from 1978 to 2004. They suggested that both capital and human investment have a positive relationship with long term economic growth. Moreover, the positive effect of capital investment on the economy is greater than that of human investment, and the bidirectional Granger Causality relationship between them had been established. The effect of human resource investment on long term economic growth is weakly positive, and may become negative in the short term. Li and Wu (2009) applied a vector error correction model (VECM) to analyze the impact of the scale and structure of public spending on economic growth from 1978 to 2006. The empirical results suggest that the total scale of public spending is a crucial factor in economic growth in the long term. In terms of the composition model, although educational, cultural and social welfare investment will increase the rate of economic growth in the long term, economic construction and administrative expenditure are not beneficial to economic growth.

To sum up, most Chinese scholars have found a positive relationship between public spending and economic growth in China over different time periods. However, the differing composition of public spending may result in different effects on economic growth. Although there are different views regarding the growth effect of public capital investment, spending on human resources has exhibited a greater growth effect than capital investment. Guo et al., (2003) indicated a different relationship with economic growth between productive and non-productive expenditure. Productive public expenditure, such as public investment, is positively associated with economic growth, while non-productive public spending, such as transfer payments and administrative expenditure, will restrain the growth of economy.

Meanwhile, the excessive growth of government consumption occupies a large proportion of productive expenditure, which constrains the growth effect of productive expenditure, and thus triggers a negative relationship between government spending and economic growth. Xia (2009) conducted a study of the impact of public expenditure on economic growth. There were various findings: excessive public capital spending on economic construction will depress the development of economy; there is a serious shortage in social welfare expenditure and educational spending although, because of its low

efficiency, the effect on economic growth is negative; to enhance income distribution as well as the economic growth rate, capital investment should be suppressed and human resources investment and social welfare spending should be encouraged.

2.6.2 Effects of public spending on economic growth at the provincial level

China began its fiscal decentralization reform when it began to open up. The evolution of China's fiscal system has passed from the centralized fiscal regime through to each administrative level having its own source of revenue and expenditure in the framework of a market economy. Fiscal decentralization is, in essence, the granting to local governments of a certain scope of taxation rights and expenditure responsibilities, and permitting them to decide upon their own budgets independently. Thus, local governments, at the grassroots level, have the right to design the scale and structure of their budgetary expenditures, select the policy model of their own free choice and actively take part in social management. The most significant change in provincial government spending is that the ratio of provincial spending has comprised approximately 80 per cent of total fiscal expenditure in recent years. Hence, a growing number of studies have focused on public spending at the provincial level.

Apart from fiscal decentralization, the impact of China's geography on economic development is also significant. Thus, there is a genuine need to include study at the provincial level to account for regional disparities. Whilst some studies focus on a single province or district, others target several provinces. As is the case with studies into the composition of national fiscal expenditure, studies of regional fiscal expenditure unanimously agree that regional public spending subcategories have different impacts on economic growth. Meanwhile, due to the differences in the choice of data and methods, the results on output growth vary.

I. Single province studies

Meng and Cui (2009) selected Liaoning province as an example to investigate the relationship between public expenditure and economic growth. With the Granger

causality relation test, they found a long-term relationship between total public expenditure and the level of GDP. In addition, culture and education expenditure and economic construction expenditure have a positive growth effect in the long term, while social expenditure and maintenance expenditure have a negative effect. Furthermore, according to the results of the Granger test, cultural and education expenditure will also promote GDP. On the other hand, GDP growth promotes greater social welfare expenditure. Zhang (2009) explored the relationships between different types of public expenditure and economic growth in Hunan province. He found a positive relationship between economic growth and several types of expenditure, including public infrastructure expenditure, cultural and educational expenditure. Public infrastructure expenditure has a positive effect on economic growth, although the coefficient is low. Cultural and educational expenditure is positively associated with economic growth, with more elasticity in growth than infrastructure expenditure. Other forms of public expenditure, such as national defence expenditure, agriculture expenditure, administration expenditure and city maintenance fees all have a negative effect on economic growth.

Based on the annual public expenditure data of Yunnan province from 1978 to 2006, Guo (2009) adopted the VAR model and found that the impact on GDP varies across the different types of expenditure. Although science and education expenditure have the most positive growth effect, the effects are relatively insignificant. In contrast, the volume of infrastructural and administrative spending is quite large, yet its coefficients are not statistically significant. Chen (2009) used the data of Fujian province in the VAR method to draw a similar conclusion; that is, that public spending on science and entrepreneurial innovation has a significant, positive relationship with economic growth.

Liang, Chang and Xu (2008) used the VAR technique to analyze the impact of fiscal expenditure based on data from 1978 to 2006 in Shaanxi province. The results suggest that the effect of total provincial public expenditure on economic growth is not statistically significant. Additionally, the various subcategories of expenditure have different effects on economic growth: public investment expenditure is ranked as having the greatest growth effect, followed by public consumption expenditure and administrative expenditure. Li and Yu (2010) also adopted the VAR technique on data from Gansu province. The results demonstrate that there is a negative relationship between infrastructure and administrative spending and economic growth, yet a positive

relationship with economic reconstruction ²¹ spending, innovation of enterprise expenditure, agricultural expenditure, social welfare, cultural expenditure and education.

Wu and Jiang (2010) focused on Hainan province from 1987 to 2006. Empirical analysis showed that science, cultural and education expenditures are significantly positively related to economic growth, but that administrative spending is negative. Liang et al. (2008) takes Shanxi province as an example to explore the same issue. Through the VAR model and impulse response function analysis, many findings emerged: economic construction expenditure has a positive relationship with the GDP growth rate, and the coefficient is strong; scientific, technological and cultural spending also has a significant growth effect, but makes a smaller contribution than capital spending; conversely, administrative expenditure and social welfare spending have a negative effect on economic growth and the coefficient of social welfare expenditure is higher than that for administrative spending.

Hence, the effects of public spending on economic growth in a single province are highly consistent. We can see that the public spending on science, economic reconstruction (public investment) and education have a significant effect on economic growth. Contrastingly, expenditure on social welfare and administration has a negative effect on economic growth.

II. Cross-provincial studies

Using provincial panel data, Wang and Zhou (2009) followed the econometric method of Aschauer (1989), including government investment within the production function with panel data from 1994 to 2006. They found provincial public investment to be quite low and lacking in efficiency. This result suggests that the direct impact of government investment is not strong, but that public investment will promote private production, which boosts the economy indirectly. Thus, an increase in government investment will crowd-in private investment, in turn, to promote faster economic growth.

Kou and Zhou (2007) followed the econometric model of Ghosh and Roy (2004), using

²¹ Economic reconstruction is public investment in China, according to the definition from the Statistical Yearbook of China.

panel data from 1993 to 2005, to analyze the effects of government expenditure in 30 provinces. From the perspective of capital spending and services spending, public spending on infrastructure, innovation of enterprises expenditure, agricultural spending, industry and transportation, education and cultural expenditure have significantly boosted economic growth. In contrast, scientific and technological expenditures, administration spending of fiscal departments and expenditure by public security organizations, procuratorial and people's courts have a negative impact on economic growth.

Yang (2009) studied the effects of public investment on economic growth by using panel data from 1994 to 2005, that is, data since the tax sharing reforms of 1994. He found that an increase in public spending on culture and education, infrastructure expenditure, agricultural expenditure and city maintenance fees will boost economic growth, whereas social welfare expenditure has a significantly negative relation with economic growth. However, scrutinizing the same time period from 1995 to 2005, Yu (2008) analyzed the relation between provincial government spending and economic growth in 31 provinces, districts and cities. He suggested that productive expenditure, such as economic reconstruction and the innovation of enterprises expenditure and regional agriculture expenditure, all have a significantly negative effect on economic growth, while the other types fail to show any impact on economic growth.

Yan and Gong (2009) investigated the impact of fiscal policy using an endogenous growth model. They indicated that the structure of public expenditure will affect economic growth through the choice of the ratio of productive public expenditure to total production. They sought to determine the optimal level of spending as a share of GDP. Specifically, this paper used data from 31 provinces, setting up the panel data model and exploring the impact of productive public expenditure on economic growth. The results showed that productive public production in China does not always boost the economy, and it exhibits strong geographical variations. They suggested that possible explanations for this are that the scale of productive public expenditure exceeds the acceptable level in some regions, or that the efficiency of this expenditure may be low.

Because geographical differences play a significant role in the impact of regional fiscal expenditure on regional economic growth, some scholars choose to divide the Chinese provinces by their geographical area, such as eastern, central and western regions, or

coastal and inland regions. Liu and Guo (2009) focused on the growth effect of public spending in the western, middle and eastern regions of China. In general, the ratio of infrastructure expenditure was shown to benefit the economy, but administrative expenditure had a negative effect on economic growth. The impact of educational expenditure, however, varies significantly across these three regions. With the panel data of the western part of China from 1996 to 2007, Wang et al., (2010) investigated the relationship between public expenditure and economic growth. They found a positive relation between government expenditure and economic growth.

However, an increase in public spending crowded-out private consumption in the western regions during this period. Li and Wang (2010) suggested that all the western, middle and eastern regions had a positive relationship between public spending and economic growth, but there were significant geographical differences. Public spending in the eastern provinces had the most significant effect on economic growth, while provinces in the central part of China had the least. Moreover, fiscal expenditure in the eastern and central parts of China crowded-in private consumption, while crowding-out private consumption in the western regions. The long term Granger causality relation existed among government expenditure, private consumption and economic growth in the eastern and central parts of China, but not in the western part. Simultaneously, the short term two-way Granger causality relation between public spending and economic growth emerged in the eastern part, whereas the single-way Granger causality relation existed in the central part.

To summarize, as regards the impact of total public expenditure scale on economic growth, there is an agreement among Chinese scholars on the positive effect of total expenditure on economic growth at both the national level and the provincial level. Compared with the empirical results of public spending (section 2.5) in other countries, China's public spending shows a strong Keynesian effect, one in which an increase of public spending (investment) will increase economic output. Moreover, some Chinese scholars have focused on the long term relationship between public spending and economic growth in the new classical endogenous growth model. These scholars²² suggest that public spending is an endogenous variable in promoting economic growth in the long term. There exist different views on the effect of public spending on private

²² See for example Guo and Jia (2006), Dong and Teng (2007), Li and Wu (2009) and Zhou (2010).

investment. For example, Li and Wang (2010) and Wang et al., (2010) find that public investment has a crowding-in effect on private investment in central and eastern parts of China, yet a crowding-out effect in the western parts of China. This result reveals the strong geographical variations as regards effects on economic development. The western parts²³ of China are the less developed areas of the country, including eleven provinces and one municipality - Chongqing. When the 'western development plan' began in 2000, a huge amount of public investment was launched in these provinces, an action which may have caused the reduction in the share of private investment in total investment. Hence, the 'western development plan' may have caused the crowding-out effect in western China temporarily.

As regards the impact of the fiscal expenditure structure on economic growth, scholars have demonstrated the varied impacts of different compositions of public spending on economic growth via diverse samples of data and econometric methods. However, most scholars find that public expenditure on science, economic reconstruction (public investment) and education have a significant growth effect on economic growth, while social welfare and administration expenditure have a negative effect on economic growth. However, there are different views²⁴ in terms of capital public spending (public investment). Some scholars emphasize that excessive infrastructure investment has surpassed the optimal value, or that it is relatively inefficient. They suggest that public spending on social sectors, such as education and social welfare, is more important for economic growth. They argue that a high level of public investment and administration spending will reduce economic efficiency and equality; in turn, a low share of social sector spending will reduce domestic consumption. From this review of current Chinese literature, we can find that public spending has a significant growth effect in China, and its structures need to adjust for balanced economic growth. This requires reducing the proportion of administrative public spending, and increasing the share of social sector spending and the efficiency of public spending, especially in the less developed western parts of China²⁵.

²³ Western China comprises 70 per cent of China's land, but only 30 per cent of its population, and 20 per cent of its total economic output at the end of 2010.

²⁴ See for example Sun (2004), Yu (2008), Wang (2009) and Xia (2009).

²⁵ This point of view was also embraced by the Chinese State Council on June 6th 2016. The state council ordered all levels of Chinese Government to implement policy measures that would include 'steady growth, adjusting structure, promoting reforms and benefit livelihood'.

2.7 Conclusion

This chapter began with a debate on the role of government; the main objectives of public fiscal policy are economic efficiency, the redistribution of public resources and macroeconomic stability. It has reviewed the Keynesian and neoclassical views of macroeconomics, public spending and output growth. Both Keynesian theory and endogenous growth theory have posited the positive effect of government spending on economic growth. However, while the theory identifies productive government expenditure as having a key role in obtaining a higher steady-state growth rate of the economy, the empirical findings are not consistent with the theoretical suggestions. The empirical review has focused on the impact of government spending, and it has demonstrated that the relationship with economic growth is different across different compositions and taxation methods.

The debate among economists shows that public spending has the potential to drive either positive or negative effects on real output or economic growth. The effect of public investment is considered to be positive if this investment is likely to enhance the productivity of the private sector. Conversely, if capital expenditure has been excessive in some circumstances, public spending can become unproductive at the margin. Hence, in order to achieve a positive outcome of public spending, governments need to pay attention to the scale and composition of public spending, and the ways of financing public expenditure at different time periods. In the empirical review of Chinese literature, we find a strong positive relationship between total public spending and economic growth at both the national level and the provincial level. In other words, the fast economic growth of China has depended heavily on public investment since its economic liberalization (Chen, 2012). Although there are regional economic differences between China's various provinces, education spending and public investment have a positive effect on GDP growth. In addition, social welfare spending constitutes only a small share of total public spending, and has a negative relationship with GDP growth in China. Contrastingly, public administrative spending accounts for a large share of total public spending, but has a negative effect on GDP growth. In order to maintain balanced economic growth, there is a need to adjust the structure of Chinese public spending towards greater efficiency and equality.

Chapter 3: Literature Review II: Government Spending and Inequality

3.1 Introduction

Although much of the attention in public policy is focused on the impact of public spending on economic output, economic growth in itself does not constitute an improvement in economic welfare for a sizable proportion of the population. In the field of public sector economics, the government is assumed to be a social welfare maximizer, providing public goods and services which the private sector regards as inefficient or unprofitable. Social welfare and equality are the key indicators to measure the redistributive role of government. There is a substantial body of literature on government spending and inequality which seeks to explore the question of whether public spending can reduce inequality in an era of global economic integration. Rudra (2004) compared the redistributive effects of social spending between the developing and the developed countries. He found that all of the categories of social spending help to improve income distribution in rich countries, yet the effects of social spending are much less favourable in Less Developing Countries (LDCs).

In China, previous economic and fiscal reforms played a crucial role in accounting for rapid economic development. Conversely, reforms may arguably have had negative effects on income equality over the past two decades. The overall gap between different geographic regions has become increasingly prominent at the regional level of economic growth and equality. The failure of balanced regional economic development threatens Chinese social stability, and it further increases the risk of political and social fragmentation, as well as massive interregional migration. This may have been caused by an inadequacy in public spending and unmet social needs in terms of public welfare. These points suggest that it is important to study public spending as a tool to making economic development more evenly distributed, as well as achieving growth. Because government budgets are limited, policymakers need to be able to evaluate the distributional effects of public spending components. To date, the relationship between

public spending and income inequality remains under-examined in the existing studies. This chapter reviews the theoretical and empirical literature on the relationship between public spending, inequality and growth. Section 3.2 introduces the rise of global inequality and the redistributive role of government spending. Section 3.3 reviews the theoretical models based on public spending and inequality. Section 3.4 concludes the empirical literature on public spending and inequality. Section 3.5 illustrates China's public spending on social welfare to reduce inequality. The final section provides the conclusion and limitations of this chapter.

3.2 Role of redistributive government spending

Public Economics, which can be defined as the study of government intervention in the market place, is intimately concerned with the welfare implications of governmental intervention in the marketplace. Traditionally, the subject has been split up into an analysis of the 'positive' question of efficiency, and the 'normative' question of choosing the right distribution of welfare among individuals (Jha, 1998). There exists a general agreement that resources should be used as effectively as possible to maximise the welfare of society, which is the objective of economic efficiency, or what is called 'Pareto optimality'. However, this approach does not address concerns about equality, even if an economy is indeed Pareto-efficient. One of the most important objectives of the government is to redistribute income by taking money away from some individuals and distributing the money to others. There are two major categories of explicit redistributive programmes, i.e., public assistance and social insurance (Stiglitz, 1988). Thus, public spending has been regarded as the main vehicle to achieving the goals of equality in an economy.

In Chapter 2, numerous studies indicated that the growth in public spending is not a handicap to economic growth, but that it seems to be an essential aspect of economic growth and development in most countries. This is not only because public spending has a crucial role in investment in infrastructure, but also because public spending is a more efficient way of producing numerous services, such as education, health and social protection. Unlike pure public goods, public goods or services can create either

externalities or problems of moral hazard (Musgrave, 1959; Inman, 1987). This can lead to an outcome of inefficiency under such market failures. However, compared to the private provision of public goods or services, government provision involves the concept of equality and income distribution. Therefore, the government's provision of public goods and services is introduced partly as the response to a market failure and income distribution.

In the western economies, there are two major types of social models, which are the liberal model in U.S.A. and the social democratic model in the Europe. In the 1980s, the social democratic model was under severe attack with the seeming exception of the Nordic countries. As unemployment rose substantially in the European welfare states and the crowning achievement of social democracy suffered cuts (Huber and Stephens, 1998). The spread of U.S. liberal model was facilitated through the deregulation of labor and financial markets and reduction in public expenditures. Navarro and Schmitt (2005) challenge the widely held view in neoliberal discourse that there is a necessary trade-off between higher efficiency and lower reduction of inequalities. They found that the liberal model has been less efficient economically (for example, slower economic growth, higher unemployment) than the social model in existence in the European Union.

On the other hand, developing and transition economies have different types of social model than western economies. It has been difficult to replicate either U.S. liberal model or European social democratic model in these economies. In the developing world, East Asian and Chinese models have been quite successful. In the 1980s and 1990s, many developing countries adopted western models but failed to achieve socioeconomic development and a stable democracy. Therefore, the China model can offer an alternative point of reference for developing economies.

Another major issue is whether the governmental policies that target the specific spatial allocation of public investment have in fact succeeded in reducing regional inequalities. These public policies are commonly grounded in the 'hypothesis of regional redistribution'. This hypothesis states that regional inequalities may decline as a result of a specific distribution of public investment, which is designed to encourage regional economic convergence (Costa-i-Font and Rodriguez-Oreggia, 2005). Among developed countries, public welfare spending has a relatively positive effect on income distribution.

Garrett (1988) states that a higher level of public spending on welfare programmes can be reconciled when this spending is indeed redistributive. Capital flow is not necessarily disrupted when a government devotes more resources to redistribution, because welfare states can bring about lower social strife and encourage social (labour market) cooperation. However, social spending in many LDCs is not redistributive, which suggests that the western models of social spending must be reassessed in LDCs. In developing countries, particularly in postcolonial societies, state apparatuses are sometimes overdeveloped when compared to the private sector, monopolizing and controlling the resources in the national economy. State-oriented policies encourage the uneven allocation of resources as well as income differentials between employees in the public and private sector, and governments prefer to invest in state-sponsored industries.

Moreover, government spending has been characterised largely by infrastructural investment in most developing countries. These policies have been justified by a number of authors in terms of the positive impact of public investment on economic growth (Aschauer 1989; Munnell 1990; Gramlich 1994; Fernald 1999). Public spending is increasingly playing a redistributive role, since a positive relationship between growth and inequality has been established, e.g. Barro (2000), which implies that the inequality will not reduce by itself after a certain level of economic growth, as it was suggested by Kuznets (1955). From this point of view, policymakers have to confront the issue that growth-enhancing policies may have a negative effect on the distribution of income, as they increase the return of capital, and when the capital is not equally distributed, a higher return to capital generates greater income inequality.

Hence, policymakers need to evaluate the distributional impacts of public spending components. The optimal level of public sector spending is determined by balancing the potential social gains against the loss in efficiency that is created by tax wedges, which are necessary to finance the public sector (Agell et al., 1997). Walle (1996) suggests that benefit incidence studies assume that the value of public services can be identified by the cost of providing them. Then, governments assign benefits to the users of the services ranked by various agreed measures of current welfare. These examine the distributional effects of the specific category of public spending on the chosen welfare indicator. This provides a way to determine whether the public spending component actually reduces or increases inequality.

3.3 Public spending and income inequality

This section explores the effect of government spending on distributive outcomes by either changing individuals' incomes, or by changing public infrastructure and services. In the literature on public choice, elected politicians should pursue policies aimed at maximizing net social benefit. For example, even though public education and health services do not change individuals' incomes, they expand opportunities to include those who could not afford these services in a completely private system. Governmental expenditure can also affect the distribution of income among generations. In many developed countries, governments transfer resources from the young to the old in the form of social security systems (Glomm and Kaganovich, 2003). Moreover, using different governmental fiscal policies can have different effects on income distribution. If public expenditure on infrastructure such as roads and railways are financed by taxes, rather than by borrowing, the current generation will subsidize future generations. In contrast, when workers are taxed to finance the social security payments to the retired generation, there is an income transfer from the younger to the older generation (Pogue and Sgontz, 1978).

The Keynesian view evolved out of the Great Depression, and it suggested that market economies are inherently unstable. Such instability generates welfare-reducing fluctuations in aggregate output and employment. The Keynesian view assumes that governments actually desire stability as a platonic guardian of social welfare. In the Keynesian framework, it is assumed that politicians will automatically take the necessary actions to maximize social welfare by following the impartial and well-informed advice provided by other economic advisers. However, in the new political economic perspective, policy makers will be strongly influenced by interest groups, political parties and a balance of conflict in voters. Therefore, the politico-economic approach to macroeconomic policy highlights the incentives, which confront politicians and influence their policy choices (Snowdon and Vane, 2005).

The political economy approach indicates that a higher level of inequality will lead the government to increase redistributive public spending via the pressure of voters. Mello and Tiongson (2006) suggest that the relationship between public spending and income

inequality is based on the median voter hypothesis, a notion proposed by Meltzer and Richard (1981). Meltzer and Richard (1981) argue that the rule of majority determines the size of a government. According to the majority rule, a balanced tax policy will follow the voters' choice. Under the model adopted by Meltzer and Richard (1981), there is a larger income gap between mean voters²⁶ and median voters in a more unequal country than that in a more equal country, which will have greater pressure for redistributive public spending. The median voters tend to pressurise the government to alter its policy of income redistribution, because the benefits that the median voters obtain from a new policy exceed those costs generated by taxation for redistribution. Until they achieve an equal society, people feel the same about redistribution, and no one wants higher taxation for redistributive policies.

Benabou (2000) attempts to address the question of standard political economy theory²⁷, in which more unequal countries tend to redistribute less than industrialised countries. He developed a stochastic model to examine the relationship between public spending and income inequality under the assumption of imperfect capital markets. Capital market imperfections enable individuals with high initial wealth to become richer, and thereby make society more unequal. He identified a negative relationship between income inequality and public spending in the long run. Redistributive public spending can improve welfare, which implies that their political supporters tend to reduce inequality. In the short term, he shows that the relationship between inequality and redistribution is nonlinear (U-shaped), and that there is potential for multiple steady states. In other words, when income inequality is low, government policies are likely to support large income transfers. Under the circumstances that there exists a high level of income inequality in a society, the government tends to use less public spending on income redistribution because the consensus for ex ante efficient redistribution policy breaks down, and beyond this point the standard effect eventually dominates. Intuitively, efficient redistributions meet with wide consequences in a relatively equal society, but opposition in an unequal one.

²⁶ Median voters' income is the median of all voters' income. The mean income is equal to the sum of all voters' income divided by the number of voters.

²⁷ The standard Political Economics theory means that policy makers have incentives to increase redistributive public spending when inequality is large.

Public spending as an effective tool to eliminate income inequality has been announced by the United Nations Millennium Reports over various years. It seems that those countries with higher inequality should spend more proportion of their public spending on income redistribution. Melllo and Tiongson (2006) investigate whether more unequal societies are likely to spend more on income redistribution than other societies that are more equal. Melllo and Tiongson (2006) apply the median voter hypothesis to investigate public spending based on the level of income equality among different countries. Their models allow for a nonlinear relationship between public spending and income inequality²⁸. Whilst Political Economics literature supports the notion that more unequal societies should have higher redistributive income spending, it also finds that unequal societies may actually spend less on income redistribution at the cross-country level, due to the imperfections of the capital market. For example, the incomplete market view suggests that income inequality is consistent, especially when poor people do not use capital markets to hedge economic shocks or economic crises to obtain profit from investment.

Moreover, due to different levels of political influence and rent seeking, a negative relationship between redistributive public spending and income inequality may also transpire. In Rodriguez's (2004) non-median voter model, the negative relationship between inequality and redistributive public spending can be accounted for, as more economic resources will be transferred from the poor to the rich with an increase in inequality; those with more economic resources have more political power, or are closer to the policymakers. Therefore, this context provides easier access for the rich to the policy makers, allowing them to bargain for their benefit maximization. Consequently, any increase in inequality will generate a lower level of equilibrium of redistributive public spending.

In addition, Moene and Wallerstein (2003) study the impact of income inequality on social welfare public spending in different categories on the basis of the median voter hypothesis. They find that public spending in most welfare spending categories is

²⁸The model is: $\frac{T_i}{Y_i} = a_0 + a_1I_1 + a_2I_i^2 + a_3C_i + u_i$. Where T stands for redistributive public spending, Y denotes GDP, I is the Gini coefficient that is used to measure income inequality, C indicates a vector of control variables, u is the error term and i identifies different countries in the sample

uncorrelated with income inequality. Corcoran and Evans (2010) employ the median voter model to investigate the relationship between public spending on education and income inequality. They conclude that income inequality is negatively related with public spending on education. Gradstein (2003) reviews the literature and identifies a bias that, under political pressure, public policies always err in favour of the rich. He argues that this bias, with its origins in extreme income inequality, is likely to induce an incidence bias called 'social exclusion'. In this argument, inequality in public spending on education leads to an increase in income inequality.

Contrastingly, there have been a number of empirical studies on the impact of public spending on inequality. Calderon and Chong (2004) show the relationship between public spending on infrastructure and income inequality in a cross-countries analysis during the period from 1960 to 1997. They use the measurements of railways, energy, roads and telecommunications, and they apply panel regressions for individual measurements and composite indices. Calderon and Chong (2004) find a negative link between the quantity and quality of public infrastructure and income inequality, in which the public infrastructure spending can help to reduce income inequality. Rudra (2004) tests the link between government public spending, including welfare, education, social security and health, openness and income inequality. The panel data set includes 35 LDCs and 11 industrial countries for the period 1972 to 1996. He finds that public spending in all categories can help reduce income inequality in developed countries, but similar effects cannot be found in LDCs, with the exception of the effect of education spending. Holzner (2011) focuses on the relationship between income inequality and public spending in Central, East and South East Europe from the late 1990s to the early 2000s. In general, government public spending negatively impacts on income inequality. Specifically, government public expenditure on health, social protection, housing and education will reduce income inequality. However, Adelantado and Cuevas (2006) examine the relationship between social protection spending, income inequality and the risk of poverty by focusing on the European Union. They find that the countries that spend more on social protection will increase income inequality and the risk of poverty. Conversely, the countries with less spending on social protection may reduce income inequality and the risk of poverty.

Social welfare spending provides income redistribution from rich to poor people or offers public insurance, but its effect on income inequality is related to the design of the government's policies. Moene and Wallerstein (2003) examined the impact of income inequality on public welfare spending in different categories among developed countries from 1980 to 1995. They found that welfare spending on health care, poverty alleviation, family benefits, housing subsidies and pensions are unrelated to income inequality. Nevertheless, welfare spending on income replacement programmes such as sickness pay, disability, unemployment insurance and occupational illness has a negative relationship with inequality. Finally, they indicated that public insurance on social welfare is appropriate. Costa-I-Font and Rodriguez-Oreggia (2005) investigate whether public investment can reduce regional income inequalities in Mexico. In their work, regions are classified into different groups according to their regional income. They found a significant negative relationship between public spending and regional inequality in the regions with the highest income. The findings suggest that public investment can reduce income inequality only in regions with a certain level of income.

Apart from social protection spending, education and health spending are also components of social spending. Corcoran and Evans (2010) studied the relationship between public spending on education and income inequality by using the panel data of U.S. school districts from 1970 to 2000. They used a median voter model and found that income inequality that decreases the tax share of median voters leads to a higher level of public spending on education. Furthermore, according to their estimates, 12 to 22 per cent of the increase in public education spending is attributable to the rise of income inequality. Conversely, Afonso et al., (2010) used a sample of OECD countries to investigate the impact of public spending of education on income inequality. They found that higher public spending on education induces more equal income distribution among OECD countries. Ghobarah et al., (2004) state that the resources used for public health care account for nearly 10 per cent of total worldwide economic resources. In order to investigate the variation at the level of public spending on health and the achievement of health, they use data from the World Health Organization (WHO) and develop an analytical framework. They find that severe income inequality reduces the amount of resources devoted to health care. Bidani and Ravallion (1997) and Gupta et al., (2003) examine whether public spending on health has a greater effect on the poor. They find that the poor countries are more likely to be in poor health, and that public spending on health

has a greater impact in poor countries. However, Selden and Sing (2008) investigate the incidence of public spending on health care in the United States. They find that public spending on health care provides more benefits to middle and upper income families than to lower income families.

To sum up, the standard Political Economics theory suggests a higher level of inequality will generate more public spending on redistribution, based on the median voter theorem. However, the opposite is the case: unequal countries have a relatively lower level of redistributive public spending at the cross-country level. In addition, redistributive public spending will only reduce inequality by achieving a certain level of income. Moreover, the design and efficiency of redistributive spending plays an important role in the reduction of inequality. As regards education spending, this will increase income inequality in the U.S., yet reduce inequality in the OECD countries. As with healthcare spending, there is also a huge difference in its effects in a single country or cross-country analysis, which should have a greater effect on poor populations in poor countries.

3.4 Economic growth and income inequality

Numerous theories have been constructed to assess the relationship between inequality and economic growth, ever since the advent of the inverted ‘U’ hypothesis by Kuznets (1955) in his paper “Economic Growth and Income Inequality”. Following the publication of this influential paper, many economists focused on the way in which a country can attain faster economic growth while simultaneously maintaining control over income inequality. In the Kuznets model, the agricultural and rural sector initially constitutes the economy with a low per capita income and inequality. Economic development involves a shift of people and resources from agriculture to industry. When the industrial and urban sectors start to grow, both income and inequality will increase at the early stages of development. Barro (2000) states that, in Kuznets’ theory, some people experience a rise in per capita income while others do not, and this possibly raises the overall level of inequality in the economy. According to other approaches, the poor sector may be the users of old technology, whereas the rich sector is that which employs more advanced technology. By contrast, Kuznets’ inverted ‘U’ hypothesis also suggests that

inequality has a positive effect on economic growth in low income countries, yet a negative effect in high income countries.

At the empirical level, most studies focus on the impact of inequality on economic growth. The results do not show a consistent sign for the effect of inequality on economic growth. In general, there are two main positions regarding the relationship between inequality and economic growth: a negative relationship (Perotti, 1993, Alesina and Rodrik, 1994; Clarke, 1995; Persson and Tabellini, 1994; Osberg, 1997; Deininger and Squire, 1998; Tanninenm, 1999; Panizza, 2002; Banerjee and Duflo, 2003; De la Croix and Doepke, 2003), and a positive one (Li and Zou, 1998; Forbes, 2000; Garcia-Penalosa and Turnovsky, 2006; Frank, 2008).

As can be seen, there are more studies that support the negative relationship between inequality and economic growth. Perotti (1993) introduced a model to test the impact of income inequality on economic growth in imperfect financial markets. In this model, education and training are considered as sources of economic growth. Perotti indicated that lower income individuals (in a high-inequality society) will reduce human capital investment, which will reduce economic growth. De la Croix and Doepke (2003) constructed a model which links the long term effects of income inequality with fertility differentials. Poorer families tend to have more children and spend less on education, which leads to a higher level of income inequality. This reduces the average education investment, which has a negative effect on economic growth. Therefore, the decline of fertility reduces the level of income inequality. Consequently, the improvement of human capital helps the growth of economy.

Alesina and Rodrik (1994) develop a Political Economics approach to address the negative relationship between inequality and growth. In a high-inequality society, voters will pressure public policymakers to adopt higher taxation on redistribution (from the rich to the poor). The redistributive transfer by a higher tax on income will generate a cost on total output, and reduce economic growth. Some scholars take into account other factors to investigate the relationship between income inequality and growth rates. To address the negative relationship between income inequality and economic growth, they construct a model which links the long term effects of income inequality with fertility differentials for different income brackets. Banerjee and Duflo (2003) also adopt a Political

Economics-based theory to explain the negative relationship between inequality and economic growth. They emphasize the inefficiency of the redistributive process of using tax reductions.

Clarke (1995) conducted a cross-countries analysis to investigate whether income inequality is harmful to economic growth, and finds three main results. Firstly, he finds that the level of income inequality is negatively correlated with economic growth, which is robust to different specifications of economic growth regression and to different measures of income inequality. Secondly, although the negative relationship is statistically significant, the size of the impact of income inequality on economic growth is small. Finally, the negative relationship between income inequality and economic growth is found both in democratic and non-democratic countries. To improve the quality of the dataset and to examine issues in new ways, Deininger and Squire (1998) examine the effect of income inequality on economic growth in a group of countries. Their data regarding income inequality had to be based on surveys from households, cover all sources of income and spending, and represent the results at national level. Deininger and Squire (1998) find significant negative relationships between income inequality and long term economic growth. However, the negative effect is only applicable to the poor, not to the rich.

A section of the literature focuses on data samples at a single country level to examine the relationship between income inequality and economic growth in long term series data. Osberg (1997) focuses on Canada to investigate the links between income inequality and growth rates with and between the peaks of birth rates in 1975, 1981, 1984, 1989 and 1994 respectively. The findings show that income inequality negatively impacted on the growth of income in the 1990s. Panizza (2002) uses a cross-state panel for the United States to study the link between income inequality and economic growth rates. Applying both the fixed effects and GMM²⁹ estimations, he finds a negative relationship between income inequality and national growth. However, the negative relationship is not robust to different measures of income inequality, which can significantly change the estimated link between income inequality and economic growth. Azzoni (2001) tested the correlation between regional income inequality and regional economic growth in Brazil from 1939 to

²⁹ GMM (generalized method of moments) is a method for estimating parameters in econometric analysis.

1995. To calculate the speed of convergence, he used the coefficient of variation, which can test the link between the fluctuations in income inequality and national economic growth rates. The results show that a convergence of regional income will reduce inequality between regions, which indicates a negative relationship between inequality and growth.

In contrast, Li and Zou (1998) and Forbes (2000) challenge the notion of the negative impact of income inequality on economic growth. Li and Zou (1998) set up a theoretical model for the relationship between inequality and economic growth. They indicate that income inequality may have a positive effect on economic growth if public consumption enters the utility function. Empirically, they find that a high level of income inequality can induce high economic growth. Forbes (2000) also shows a robust, positive relationship between the level of income inequality and economic growth. García-Penalosa and Turnovsky (2006) develop an endogenous growth model to take into account an elastic labour supply. In their framework, the level of income inequality and economic growth are jointly determined. They find that a faster economic growth rate is always associated with a higher level of income inequality. Frank (2009) examines the relationship between income inequality and economic growth at the U.S. level from 1945 to 2004. He shows that the level of income inequality experienced a long stable period after World War II, and subsequently a substantial increase during the 1980s and 1990s, and that it positively affects economic growth.

Barro (2000) found a non-linear relationship, but the results are inconsistent with the Kuznets inverted 'U' hypothesis. He states that, if considering poor countries and rich countries separately, the level of income inequality negatively affects economic growth in poor countries, and that there is a positive relationship between income inequality and economic growth rates in rich countries. García-Peñalosa and Turnovsky (2006) suggest that the relationship between growth and income inequality could be either positive or negative. They indicate that the relationship between income inequality and economic growth is negative in the long term and positive in the short term. This suggests that a country with a higher income equality will experience rapid growth for the present, but will end up with a lower growth rate in the long term. Charles-Coll (2013) states that there are remarkable disparities in the relationship between inequality and growth, which can be divided into three proposed relationships (negative, positive and non-linear). In

both the theoretical and empirical literature, there is no general agreement as to how income inequality results in a lower or higher GDP growth after a period of time, but distributional policies can impact on growth rates in the long run³⁰.

3.5 Effects of Chinese public spending on economic growth and inequality

Since the economic reforms of 1978, China's economy has grown at a rate of about 10 per cent annually. Simultaneously, the Chinese public spending system has undergone various important changes¹. Many economists have evaluated the effect of fiscal decentralization on economic growth in China. Lin and Liu (2000) investigated the effect of public spending decentralization, initiated in the mid-1980s in China, on the growth rate of per capita GDP. They found that fiscal decentralization has made a significant contribution to economic growth, which is consistent with the hypothesis that fiscal decentralization can increase economic efficiency. In addition, other market-oriented reforms, such as the household responsibility system in the rural sector, the privatization of the industrial sector, and non-state sector development, have also contributed to Chinese economic growth.

The wisdom behind China's economic reform was to improve production efficiency through economic liberalization and decentralization. Fiscal decentralization has been a central component of China's economic policy, and is expected to improve the provision of local public goods and services (Tsui and Wang, 2004). Moreover, fiscal decentralization in transition economies is the natural result of the transformation from an over-centralized socialist system to a market economy (Bird et al., 1995). Given the widespread implementation of fiscal decentralization in developing and transition countries, a growing number of scholars and policy-makers have started to scrutinize not only the potential benefits, but also the challenges, of this policy experiment. At the very least, local governments, being closer to local residents, may have more knowledge with regard to the preferences of local residents than does the central government.

³⁰ This point of view suggests that government spending has a more important role in economic growth.

During the economic liberalization and fiscal decentralization of the past three decades, the efficiency of Chinese public spending and State-Owned Enterprises (SOEs) has improved. According to endogenous growth theory, institutional arrangements (such as fiscal decentralization) can increase long term economic growth (King and Rebelo, 1990). Conversely, fiscal decentralization has also generated a number of negative trends. Although economic efficiency is the central argument of welfare economics, the potential negative impacts of fiscal decentralization on the distribution of resources across sub-national jurisdictions and macroeconomic stability are the key arguments against fiscal decentralization. This is because the objectives of income redistribution and macroeconomic stability may be better pursued by central or federal governments (Martinez-Vazquez and McNab, 2003). Moreover, the SOEs play an important role in China's social welfare system in urban areas. During the 1990s, the SOEs transferred their welfare support for their employees to local governments in order to improve their profitability and efficiency. Simultaneously, the local governments' progress was slow in terms of the establishing of a welfare system in both urban and rural areas. Wang (2007) indicates that 61 per cent of urban recipients were entitled to the minimum living assistance, yet failed to receive it, in 2004.

In the early 1990s, Oi (1992) argued that the role of local government had increased dramatically after the economic reforms. However, local governments always intervene in the markets to achieve their short term economic boom by using subsidies to SOEs. In turn, this reduces long term economic growth, and harms the economy in the rural areas. Park et al., (1996) argue that public spending decentralization can also undermine the government's ability to redistribute public financial resources between rich and poor regions. Forcing poor localities to be more fiscally self-reliant may have adverse consequences for their ability to provide basic services and to pursue coherent investment strategies to further their economic development. Increased pressure on local governments in less developed regions led to over-investment in revenue-generating industrial enterprises; it encouraged bureaucratic predation of enterprise resources and regional protectionism, and diverted attention away from long term economic development and environmental concerns. Moreover, Zhang and Zou (1998) examined the impacts of fiscal decentralization on economic growth based on 28 provinces' annual data in China from 1986 to 1992. They found that a higher degree of fiscal decentralization is associated with lower regional economic growth in China. Their results

suggested that increasing the share of local government expenditure to the level of central government expenditure causes a decline of income growth. The reason for this surprising finding may be that the central government only had only limited resources for public investment on infrastructure projects, which may have had a more significant impact on economic growth during that period.

Fan et al., (2000) developed a simultaneous model to estimate the effects of different types of government spending on growth, regional inequality and poverty. They found that educational spending has the greatest effect on economic growth, as well as reducing inequality and poverty. They also indicated that public spending in the western part of China had the greatest impact on reducing inequality and poverty, because this region is where most of China's poor are concentrated. Zheng and Kuroda (2013) also adopted a simultaneous model to explore the effects of public infrastructure spending on China's regional inequality and growth. In general, they found that improving infrastructure can enhance economic growth and reduce regional inequality. They also suggested that labour mobility is an important aspect of public spending, where higher labour mobility tends to have a greater effect on public infrastructure spending on stimulating growth and reducing inequality. Moreover, He (2005) and Tian (2012) examined the relationship between inequality and economic growth in China from 1992 to 2003 and 1985 to 2007, respectively. Both results show that income inequality has a negative impact on the economic growth rate. In addition, an increase in income inequality will reduce the saving rate and GDP growth rate in Tian's (2012) model.

However, the share of Chinese public spending on social welfare has been very low over the last three decades. Inadequate social welfare protection and the increasingly high cost of private expenditure on health and education have caused a lower level of private consumption in China. During the past thirty years of economic reforms, the ratio of private consumption to GDP dropped from 50 per cent to 37 per cent, and the saving rate increased from 11 per cent to 25 per cent (Baldacci et al., 2010). This low private consumption and high saving rate has been the key element in China's economic development. Xue and Xu (2012) examined the relationship between government spending and private consumption. They found that government spending has a positive relationship with urban households' consumption, but a negative relationship with rural households' consumption. Hence, they suggest government spending should focus on

rural areas in order to stimulate rural households' demand and reduce the income disparity between rural and urban areas.

In addition, public spending has been unequally distributed among regions and citizens, a factor which caused not only low private consumption, but also unsatisfied public resource needs in poorer areas. Zhang and Fan (2000) estimated the decomposing consequence of various types of public spending on regional inequality by using a provincial level data set for the period 1978 to 1995. They indicated that Chinese provincial public spending has a positive relationship with economic growth, but has increased overall inequality. In general, the government has pursued a coast-biased investment strategy, and this has contributed to the rapid rise in regional inequality. They suggest that, if the government continues to favour coastal regions in its public spending, then regional inequality will widen even further.

From the above analysis, we can see that the reforms in public spending in China have played an important role in the economic transition period. However, the decentralization of public spending has failed to promote balanced regional development, which has undermined Chinese socio-economic stability and caused massive interregional migration¹. These perceived dangers have led China's central government to give priority to public spending on low income households. In recent years, the Chinese government has placed increasing emphasis on stemming the growth in inequality. National strategies such as the 'western development plan', 'providing a social safety net' and 'building a harmonious society' have aimed to reduce the income disparity between urban and rural, and the east and western regions (Zhu and Wan, 2012).

However, a large proportion of public spending went on public infrastructure programmes and public administration, which inevitably caused a relatively low proportion of public spending on essential social sectors, such as the social security system, health, education and other basic public goods and services. Moreover, social welfare in terms of pensions, education, health and unemployment subsidies are more advanced in the urban areas and wealthier provinces. Therefore, further public spending reforms should focus on people's welfare rather than capital spending on public projects which directly push GDP in the short term.

3.6 Conclusion

This chapter has focused on the redistributive role of public spending to address the effects of public spending on income inequality. As is the case with the effects of public spending on economic growth, there is no unified empirical result regarding income distribution. Nevertheless, the objective of public spending is clear; it needs to promote the economy towards great efficiency and equality. This chapter has also reviewed the relationship between inequality and growth, which can indicate whether there is a positive relationship between economic growth and the rise of inequality. There exists a standard view of economic growth and inequality, which is the ‘inverted U’ curve. It suggests that inequality will rise inevitably as per capita income increases, which is frequently encountered in a country’s early stage of economic development. However, the results have not yet come to converge into one generalized position regarding the nature of the relationship. Conversely, numerous economists, such as Perotti (1993), Alesina and Rodrik (1994) and Clarke (1995), have posited a negative relationship between inequality and growth, in which countries with a higher level of inequality will experience reduced economic growth. In this perspective, inequality harms economic growth. In China, He (2005) and Tian (2012) have suggested that income inequality has a negative impact on the economic growth rate. Hence, as regards China’s widening regional disparity and its impact on further economic growth, debate continues regarding China’s public spending system, in terms of whether it has helped to stem the growth in overall inequality.

The review of the literature suggests that the effects of government spending on inequality as well as the relationship between inequality and growth are mixed. Various types of government spending have different impacts on economic growth and inequality, implying the existence of a greater potential to improve efficiency by reallocating among sectors. In many developing countries, capital spending accounts for a large proportion of total expenditure, reflecting the role of the government in providing infrastructure, such as transportation, communication and energy. Middle and low income countries are at the initial stages of economic development, so public spending projects play a vital role in increasing demand and supply. However, some public investment is commercial in nature, which may compete with or crowd-out private sector investment and activity.

Finally, the introduction of social welfare programmes in China is a difficult task, especially given China's huge population. Justino (2003) stated that, in developing countries, capital and insurance markets are under-developed, budget restrictions are high and tax revenues and income are low. These problems have led researchers and policy-makers to argue that the eradication of poverty and the provision of social security in developing countries would be better achieved through economic growth, which would raise the standard of living of the whole population. Over the past twenty years, Chinese governments have always set an economic growth target of 8 per cent in order to achieve fast economic growth and sound macroeconomic stability. However, although economic growth is an important factor in improving living standards and reducing poverty, it is unclear whether economic growth can promote social development and equality across the whole population. Growth-oriented policies have meant that disadvantaged groups slip further back down the distributional scale due to their inability to respond to economic shocks.

Chapter 4: Background to the Analysis of China's Fiscal Reforms, Economic Growth and Income Inequality

4.1 Introduction

From late 1978 onwards, China began to implement its market-oriented economic reforms. After 30 years of rapid economic growth, China became the world's second largest economy in 2010. China's socio-economic reforms aimed to improve production efficiency through economic liberalization and decentralization. Fiscal decentralization has been a central component of China's economic policy, and is expected to improve the provision of local public goods and services (Tsui and Wang, 2004). However, such rapid economic growth also brings numerous problems. The huge gaps in income levels and living standards between rural and urban, coastal and inland regions are expected to affect economic growth and social stability. Hence, there is a fierce debate as to whether the Chinese government needs to profoundly reform its fiscal system, especially increasing public spending on its public welfare system, in order to promote the Chinese economy toward greater effectiveness and equality.

The decentralization of control by the central government devolved greater responsibility to the provinces and governments at a lower level (Brun et al., 2002). During the fiscal reforms, the fiscal relationships between the centre and the provinces changed drastically, giving more power to provincial level governments. It was a common trend that the growth rate of government revenue was greater than the growth rate of GDP. However, China's public spending has mainly been channeled towards large, capital-intensive projects rather than on social spending, such as education, health and social protection. Moreover, over the last three decades, the Gini index of income inequality increased significantly from 0.33 in 1980 to 0.48 in 2010 (according to China's NBS, 2012), a fact which had already constrained China's substantial economic development. Hence, the debate outlined above has been rekindled by concerns over the effect of public spending and decentralization on income inequality.

This dissertation focuses on the growth and redistributive effect of public spending during China's unique period of economic growth. This chapter provides a brief overview of China's public spending system and economic development since its economic opening-up in 1978, which will shed light on China's unique economic developmental characteristics and its fiscal policy-making process. The discussion in this chapter will address various data analyses and interpretations, which will serve as a necessary prelude and help to improve the understanding of econometric analysis at the national and sub-national levels.

In this chapter, section 4.2 will focus on the policy changes within past fiscal reforms. It outlines the two periods of the Chinese fiscal system, and the evolution of Chinese fiscal positions of both central and provincial governments. Section 4.3 will explore China's economic growth and structure over the past three decades. Section 4.4 will investigate income inequality at different levels, an aspect which may compromise further social economic development in China. Section 4.5 will analyze China's redistributive public spending. Section 4.6 will investigate the relationship between inequality and income levels in China. Finally, a conclusion of Chinese public spending will be provided.

4.2 The two periods of China's fiscal reforms

The pre-reform fiscal system in China copied the system in the Soviet Union, one which had an overwhelming dependence on industry, and a reliance on the profits of state-owned enterprises (SOEs) for government revenue. In this centralized system, administrative prices were set to discriminate against agricultural and raw material producers. Surpluses from the agricultural and extractive sectors were transferred to the heavy industrial sector, where artificially high surpluses were created (Wong, 1991). Although China remained a unitary fiscal system, a variety of fiscal reforms were implemented to put local governments on an increasingly self-financing basis.

There were two phases of fiscal reform in China: (1) the fiscal contracting system between 1979 and 1993, (2) the tax assignment system after 1994 (Jin and Zhou, 2005). The first period provided better incentives for local governments to promote regional economies by 'devolution', and the second period of fiscal reform provided a rule-based

framework in the public finance system through splitting the existing tax bureau into national and local tax offices. Hence, the fundamental achievement of China's fiscal reforms over the past three decades has been the establishment of an institutionalized and standardized public fiscal system to meet the requirements of economic liberalization.

4.2.1 Fiscal contracting system (1979-1993)

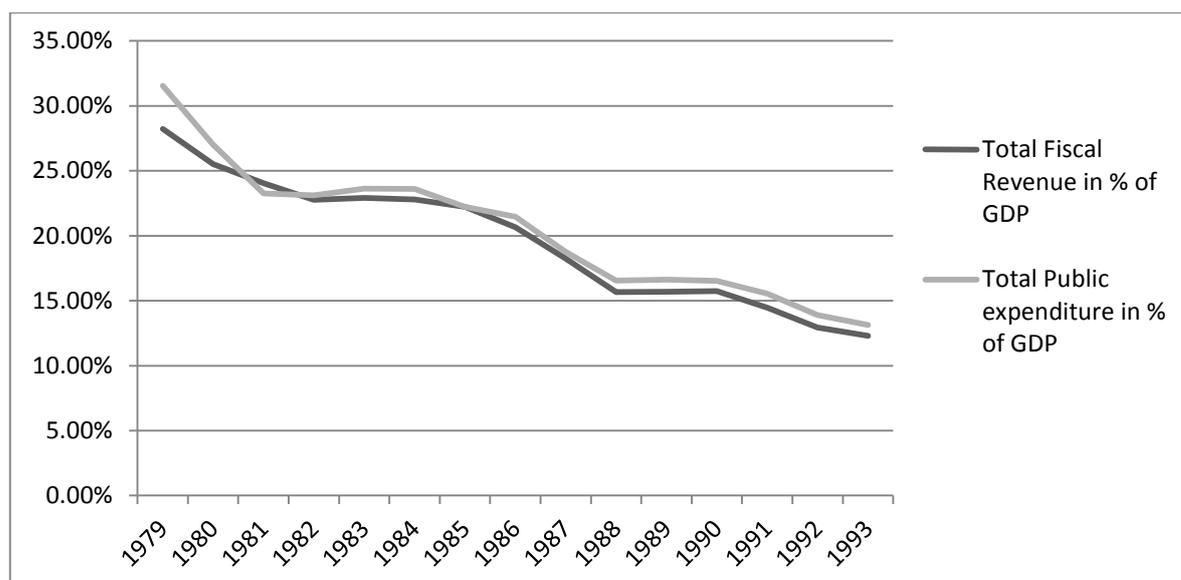
China promoted fiscal decentralization reform between 1979 and 1993, which made sub-national governments more fiscally self-reliant. China's fiscal decentralization resembled those of other transition economies, in which the central government delegates its fiscal power to sub-national governments. In theory, fiscal decentralization is an effective tool for increasing the efficiency of the provision of public goods and services, and it results in faster economic development. This is because a local government has better knowledge than the central government of providing public goods and services, ones which match local preferences and needs (Limi, 2005). China has promoted fiscal decentralization, which can be seen as a reaction to the failures of large, centralized bureaucracies; in the case of China, this bureaucracy was its planned economy. Policy makers believe that decentralization will improve the allocation of public resources and, therefore, promote economic growth and reduce poverty and inequality.

During the period of the fiscal contracting system, fiscal revenue and expenditure were clearly divided into the sub-national and central levels. Provincial governments had a contract to share revenue and expenditure with the central government, and central government agreed to subsidize the anticipated shortfall between contracted expenditure and revenue. The sub-national governments are responsible for local investment, wages and the provision of public goods and services (Park et al., 1996). Within the framework of the contracting system, tax revenue has occupied an increasing proportion of the total budget revenue, which rose from 49.3 per cent in 1980 to 97.8 per cent in 1993 (China Statistical Yearbook, 2006).

In the early 1980s, the government carried out a further fiscal reform by subjecting SOEs to income taxes, instead of turning in all its profits, which allowed SOEs to keep a proportion of their profits in order to expand production and increase workers' wages.

Thereby, SOEs were still required to submit a proportion of their profits to the government after paying corporate income taxes (Lin, 2009). Qian (1999) proposes that fiscal decentralization made SOEs more efficient by introducing the budgetary constraints system. The sub-national government had less control over banks, and therefore they could not bail SOEs out by unlimited extension of credit to SOEs as the central government did. However, an overreliance on subsidies and loans in SOEs has increased the risk of fiscal reforms. SOEs' low economic efficiency and profits had threatened the stability of the Chinese fiscal system, because a large share of fiscal revenue was dependent on them throughout the 1980s and 1990s. Nevertheless, from 1979 to 1993, fiscal reforms expanded the role of local government in the market economy. Simultaneously, local governments faced greatly expanded expenditure responsibilities, which led them to focus on economic growth (Wong, 1991).

Figure 4.1: The ratio of total fiscal revenue and expenditure to GDP from 1979 to 1993



Source: State Statistical Bureau of China: China Statistical Yearbook, 2011

However, the introduction of fiscal contracts between central and local governments failed to increase the total government budgetary revenue; consequently, public spending dropped significantly during the period of the fiscal contracting system. According to the National Bureau of Statistics of China, the Chinese government's revenue share of GDP decreased from 33 per cent to 11 per cent between 1978 and 1993, the same as on the expenditure side (Figure 4.1). Table 4.1 shows the share of government revenue and spending between central and local governments. In the beginning of 1979, the central

government collected 20 per cent of total revenue, but spent 51.1 per cent of total public spending. The local governments collected 80 per cent of total revenue, but only spent 48.9 per cent of total spending. Therefore, there was a huge revenue surplus for local governments. Under the decentralization of public spending, local public spending was increased to 71.4 per cent of total spending in 1993, which was more consistent with its revenues.

Table 4.1: The share of central and local governments' revenue and spending between 1979 and 1994

Year	Central Government Revenue in total Revenue (%)	Local Governments' Revenue in total Revenue (%)	Central Government Spending in total Spending (%)	Local Governments' Spending in total Spending (%)
1979	20.2	79.8	51.1	48.9
1980	24.5	75.5	54.3	45.7
1981	26.5	73.5	55.0	45.0
1982	28.6	71.4	53.0	47.0
1983	35.8	64.2	53.9	46.1
1984	40.5	59.5	52.5	47.5
1985	38.4	61.6	39.7	60.3
1986	36.7	63.3	37.9	62.1
1987	33.5	66.5	37.4	62.6
1988	32.9	67.1	33.9	66.1
1989	30.9	69.1	31.5	68.5
1990	33.8	66.2	32.6	67.4
1991	29.8	70.2	32.2	67.8
1992	28.1	71.9	31.3	68.7
1993	22.0	78.0	28.3	71.7

Source: State Statistical Bureau of China: China Statistical Yearbook, 2012

In the 'fiscal contracting system' period (1979-1993), a major shift in the distribution of public revenue and spending was that total public revenue and spending dropped significantly. At the same time, local governments had a bigger share of public revenue than the central government, and the central government accounted for more public spending than its collected revenue. Hence, some economists were deeply concerned about the prospect that insufficient central government revenue would have difficulty in financing basic public spending and promoting economic development. This attempt to

revamp the financial interaction between the central and provincial governments was made immensely more complicated by rapid changes in the fiscal system and the shifting composition of revenues and expenditures in the fiscal contracting system (Lin, 2009). Hence, the central government was determined to reverse this trend by introducing new fiscal reforms in 1994.

4.2.2 Tax-sharing system (after 1994)

In the first half of the 1990s, there was a concern that the fiscal decentralization in China had been implemented too rapidly; this decentralization had increased fiscal disparity among provinces and reduced the volume of government revenues. Furthermore, Zhang and Zou (1998) state that national priorities in public spending had often been crowded-out by local government's spending in the fiscal contracting system. Hence, in 1994, the government introduced its Tax-Sharing Reform (TSR) in order to boost central revenues and enhance intergovernmental transfers (Zhang, 2006).

Reforms in the intergovernmental fiscal system were implemented in the early 1990s to overcome declining fiscal revenue and expenditure. In 1994, the revenue-sharing system between central and local governments was replaced by a TSR, whereby local governments were granted the legal right to collect local taxes, while value added tax (VAT)³¹ was to be shared by both government tiers. This fiscal arrangement encouraged local governments to promote economic growth. Therefore, local fiscal autonomy was successfully preserved, in addition to substantially improving the fiscal status of the central government (Wong, 2000). Moreover, local governments were no longer permitted to grant tax breaks. The discretion to grant privileges of reduced taxes and tax exemptions had been a major loophole in the old system, one through which local governments frequently used to channel budgetary funds into extra-budgetary funds, thus reducing the revenues to be shared with the central government (Wang, 1997). Hence, the TSR was a comprehensive package designed to address three concerns: firstly, to increase government revenue, especially for the central government; secondly, to eliminate the distortionary elements of the tax structure and increasing transparency of government; thirdly, to revamp central-local revenue sharing arrangements. The transparency,

³¹ VAT: a tax on local production and distribution

accountability, controllability and overall effectiveness of public spending were greatly improved after the tax reforms. These efforts would help to ensure greater consistency in spending over time, and allow the rapid increase of fiscal revenues (OECD Report, 2006).

In the post-TSR period, China's tax categories became diversified, rather than consisting only of the contributions of SOEs. For example, by the year 2003, the source of fiscal revenue presented a diversified situation, known as 3:7: this meant that the contributions of SOEs constituted 29.5 per cent of total fiscal revenue, and multi-ownership enterprises including collective enterprises, corporate enterprises, private enterprises and foreign-invested enterprises and the contributions by urban residents constituted 70.5 per cent of total fiscal revenue. Within the framework of public finance, the tax revenue system plays a dominant role in fiscal revenue; it appeared to be more imperative to focus on the tax revenue system to reinforce the construction of the fiscal revenue system.

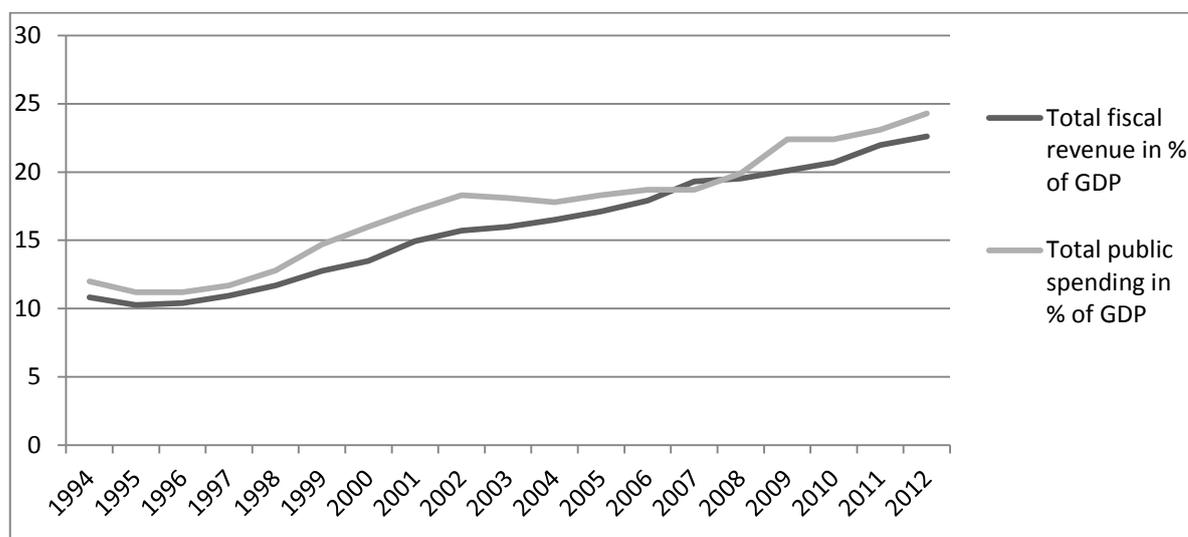
Since the TSR in 1994, the goal to improve China's public spending system has been addressed by the Chinese central government. A rising proportion of tax revenue increased the level of total fiscal revenue and public spending continuously. Jin and Zou (2005) suggest that at given level of expenditure decentralization, more revenue centralization contributes to growth. Their finding supports the view that the central government is better placed to allocate budgetary resources for horizontal balance, macroeconomic stability and investment in national projects. Therefore, the total revenue to GDP ratio and the share of central government revenue to total revenue has increased dramatically in the post-TSR period. Notwithstanding this, China's tax revenue system still has some weaknesses, for example the complexity of the tax system, the lack of unification of the tax system between urban and rural areas, the coexistence of tax categories and the lack of tax categories.

Firstly, two different kinds of tax system are set up between urban and rural areas, which cannot match up with the role of public finance that guarantees to treat people equally and reduce urban-rural inequality. Particularly before the cancellation of agricultural tax, poorer rural workers were overburdened because of the low profits on agricultural products, and because of the absence of social protection in rural areas. Moreover, in China's governmental revenue system, there are too many fees, charges and incomes outside tax revenue, which accounts for the extra-budgetary revenue of local government.

China has an excess of extra-budgetary funds; a large sum of charges floats outside of the government budget, and this phenomenon has experienced an unceasing trend year after year, which has significantly weakened the fiscal capacity of the Chinese government. Therefore, it is necessary to bring extra-budgetary revenue (especially governmental charges) into budget revenue management to achieve the goal of standardized fiscal management in China.

Nevertheless, the TSR has a crucial role in the Chinese public spending system, which increased both national fiscal revenue and public spending. Simultaneously, the public spending system has continuously decentralized to provincial level government. Compared with Figure 4.1, the following Figure 4.2 shows that total fiscal revenue and public spending have increased dramatically each year following the TSR in 1994. For example, the ratio of total fiscal revenue and public spending in GDP doubled from 1994 to 2012.

Figure 4.2: The share of total fiscal revenue and expenditure to GDP from 1993 to 2012



Source: State Statistical Bureau of China: China Statistical Yearbook, 2012

As shown in Table 4.2 below, central government revenue experienced a significant increase in 1994, and then levelled off at about 50 per cent of total revenue. Conversely, central public spending dropped from 30 per cent in 1994 to 15 per cent in 2012. Therefore, provincial level public spending increased from 70 per cent to 85 per cent of total spending, with roughly 50 per cent of total revenues. In other words, local government spending was 5.6 times greater than central public spending in 2012. Hence,

local governments played a more important role during decentralization, but they faced a greater pressure of shortage of fiscal revenue. Local governments are increasingly dependent on extra-budgetary revenues to meet the responsibility of their public spending. Moreover, the gap between local public revenue and spending has led provincial governments to fix economic growth as their priority, and thus they may neglect people's welfare and basic needs in the post-TSR period.

Table 4.2: The share of central and local governments' revenue and spending between 1994 and 2012

Year	Central government revenue in total revenue (%)	Local governments revenue in total revenue (%)	Central government spending in total spending (%)	Local governments spending in total spending (%)
1994	55.7	44.3	30.3	69.7
1995	52.2	47.8	29.2	70.8
1996	49.4	50.6	27.1	72.9
1997	48.9	51.1	27.4	72.6
1998	49.5	50.5	28.9	71.1
1999	51.1	48.9	31.5	68.5
2000	52.2	47.8	34.7	65.3
2001	52.4	47.6	30.5	69.5
2002	55.0	45.0	30.7	69.3
2003	54.6	45.4	30.1	69.9
2004	54.9	45.1	27.7	72.3
2005	52.3	47.7	25.9	74.1
2006	52.8	47.2	24.7	75.3
2007	54.1	45.9	23.0	77.0
2008	53.3	46.7	21.3	78.7
2009	52.4	47.6	20.0	80.0
2010	51.1	48.9	17.8	82.2
2011	49.4	50.6	15.1	84.9
2012	47.9	52.1	14.9	85.1

Source: State Statistical Bureau of China: China Statistical Yearbook, 2012

Through this investigation of the Chinese fiscal system, we can identify a significant decentralization of China's public spending. Firstly, the fiscal contracting reform has meant that fiscal revenue is sourced from different types of ownership, rather than solely

SOEs. The development of the market-oriented economy in China has resulted in a change of resource distribution methods, the transformation of government functions, the reform of taxation and the financial markets. Secondly, the TSR reform has continued the decentralization of public spending to local governments, wherein local government spending has increased significantly between 1995 and 2010. However, there are still numerous irregular phenomena that exist in China's current fiscal revenue system; for example, an unreasonable revenue structure, flaws in tax system design, too much extra-budgetary revenue and a lack of standardization in public funds' management. Hence, China still has a certain distance to go before achieving its goal of public spending attaining greater efficiency and equality in the process of economic liberalization.

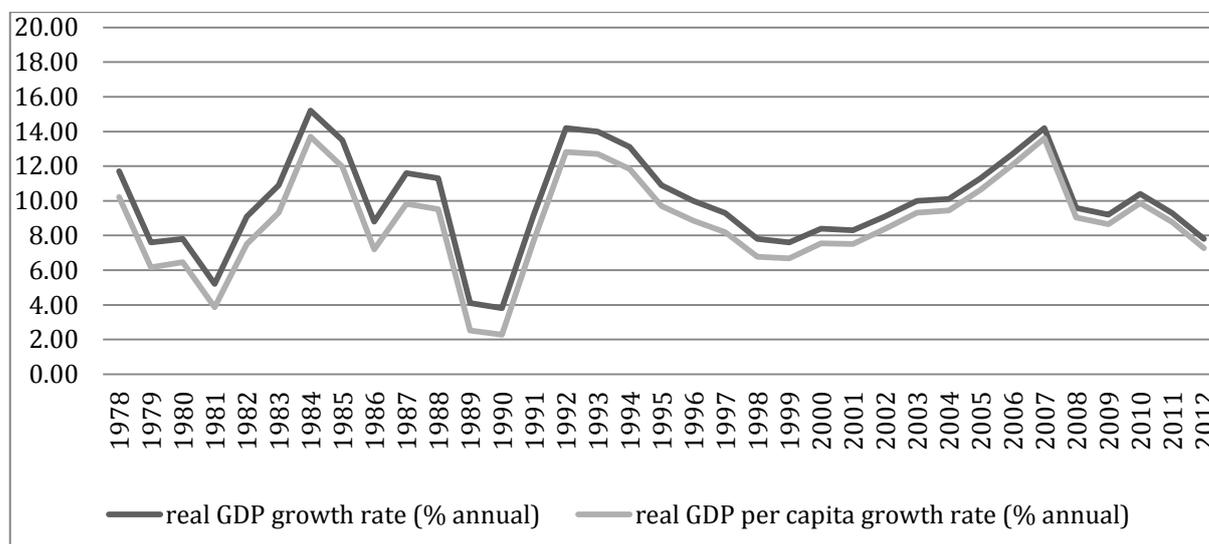
4.3 Economic development and growth in the post-economic reform era in China

In the last thirty years, China has shifted from a centrally planned economy to a market-based economy, and has experienced rapid economic and social development. The logic behind the economic reform was to improve economic efficiency through market liberalization and industrialization. However, China still has an organizational hierarchy in which its local governments are highly influenced by the central government, and this enables China to implement its national development plan relatively easily. Although there has been a growing non-state sector since the 1980s, most financial resources, land, other factors of production and economic policies are still controlled and allocated by local government. Therefore, political institutions have a profound influence on China's economic growth (Zhang, 2002). In this section, we will explore China's economic development and growth in the post-economic reform era in relation to its unique political institution.

In the following Figure 4.3, we can see the growth and fluctuations in the economy since the economic opening-up of 1978. The economic growth rate boomed in 1984, 1993 and 2006, and then quickly declined to below the average growth rate (10 per cent, annually). In December 1978, the Third Plenum of the 11th Central Committee established the economic reform and opening-up policy. The economic reform firstly started in rural

areas, whereby freedom was granted to rural households to use their land in return for meeting tax and quota obligations. After the economic reform, China's economic growth increased to 15 per cent in 1984 and then dropped to about 4 per cent in 1989.

Figure 4.3: China's real economic growth rate since 1978



Source: World Bank: World Development Indicator, 2013

During the economic reforms in rural and urban areas, slow price adjustment caused the significant price inflation in 1988 and 1989; for example, the inflation rate was 18.8 per cent in 1988. In 1992, Deng Xiaoping's speech³² in south China announced a new era for China's economic reforms by adopting a faster economic growth strategy, such as establishing special economic zones in the coastal provinces. However, the rapid economic development during the early 1990s reached an overheated peak of a 14 per cent growth rate in 1993, culminating once more in rapid inflation. In 1994, the inflation jumped to 24 per cent, and economic growth started to decline. In 1997, the Asian Financial Crisis reduced China's economic rate by 2 per cent, compared with 1996. The Crisis continued impacting on China's economy until 2000. From 2000 to 2007, China's economy experienced a third upward cycle, in which the growth rate reached 14 per cent in 2007. After the world economic slowdown in 2008, China's economic growth declined to 7.7 per cent in the years 2011 and 2012.

Economic liberalization has helped China to maintain an average 10 per cent annual

³² In 1992, the China's leader Deng Xiaoping announced the first growth strategy for the special economic zones in coastal areas.

economic growth and has improved income levels over the past three decades. In 2013, China's gross national income per capita reached \$6,560 US dollars, with a 7.7 per cent growth rate. However, 6.3 per cent of the Chinese population were living below the poverty line (\$1.25 a day), which is the second highest such population after India (World Bank, 2014). Simultaneously, the overall Gini coefficient in China reached a historically high level of 0.49 in 2008, compared with a very low level of income inequality at the beginning of the 1980s (China's NBS, 2014). The Chinese government also recognized this as a social problem which needs to be addressed. In fact, income inequality was the most frequently discussed topic during the recent National Congress³³ of the Communist Party of China (CPC). The 'Western Development Plan' was introduced at the start of the 10th Five-Year Plan (2001-2005), with a view to narrowing income differentials between the sparsely populated and under-developed western regions and the more prosperous and faster-growing eastern regions. This change in emphasis was evident in policy statements of the 17th National Congress (held in 2007), which called for a rebalancing between fairness and efficiency in distribution.

China started the 12th Five-Year Plan³⁴ in 2011, which highlighted the development of services and measures to address environmental and social imbalances, setting targets to reduce pollution, to increase energy efficiency, to improve access to education and healthcare and to expand social protection. The growth rate target was reduced by 1 per cent compared with the previous target of 8 per cent, which indicates the intention to focus on the quality and equality of economic development. China continuously improves its macroeconomic regulations and adjusts its economic structure, factors which have contributed to the rapid economic growth since opening up. There were four major changes involved in China's economic reforms and opening-up.

a) Change towards a free market economy

Since the late 1970s, China's economy has been transformed from a planned system to a socialist-market system. China's economic transition began in the rural areas, when the

³³ The National Congress of the CPC is held about once every five years, and it is the highest level decision-making process in the CPC and China's central government.

³⁴ The Five Year Plans are a series of social and economic development initiatives made by the National Congress (the highest level of decision making). The first Five Year Plan is from 1953 to 1957, and the twelfth Five Year Plan is from 2011 to 2015.

Household Responsibility System (HRS) dismantled the collectives and granted household rights to use land in return for meeting tax and quota obligations in late 1978. Under the original planned system, enterprises had no autonomy in their business activities including production, supply, sales and investment. All these activities were centrally planned. Under a socialist-market economy, economic entities acquired autonomy and market mechanisms, such as price leverage; in addition, competition mechanisms and factor markets were introduced. The market played an increasingly important role in resource allocation, which brought unprecedented vigor and vitality into China's economic development. Taking corporate ownership structures as an example, the proportion of enterprises with various ownerships to aggregate industrial output value experienced a major transformation. Before the economic reform, there were only two possible types of ownership structures for industrial enterprises: state-owned and collectively-owned. They accounted for 77.6 and 22.4 per cent, respectively, of aggregate industrial output value. During the reform and opening-up period, the reconstruction of the macroeconomic foundation enabled the joint development and synergy of economic entities of different ownership types. This also diversified market players and investment sources, and provided an important economic institutional premise for steady, rapid growth.

b) Sufficient resource supply and industrial restructuring

The fundamental role of the introduction of the market mechanism was to overcome the severe shortages of supply and resource allocation through changes in ownership structures. During the economic transition period in the 1980s, the supply bottleneck eased for resources such as coal, electricity, oil, transportation and materials (major raw materials such as steel and cement). Some goods even experienced a certain periodical surplus, which also supported rapid and steady economic growth. In terms of GDP, the output values of industries changed dramatically. For example, the proportion of primary industries declined from 50.5 per cent in 1952 to 28.2 per cent in 1978, before reaching 10.3 per cent in 2010. The proportion of secondary industries climbed from 20.9 per cent in 1952 to 47.9 per cent in 1978. Since the late 1970s, the proportion of secondary industries has been relatively stable, reaching 46.3 per cent in 2010. The proportion of tertiary industries reached 43.4 per cent in 2010 (NBS, 2011). Overall, primary industries have continued to decline in proportion, secondary industries have remained relatively

stable, while tertiary industries have increased significantly in proportion over the last three decades.

c) Urbanization and maintaining a high growth rate

Economic liberation has facilitated the flow of labour, advanced the process of industrialization and increased the urbanization ratio, which has created massive demand for urban construction and housing, resulting in a boom of the urban economy. In 1949, China's urbanization rate stood at only 11 per cent, and then increased to 18 per cent in 1978 and to 50 per cent in 2010. Correspondingly, the proportion of the rural population declined from 82.1 per cent in 1978 to 50.4 per cent in 2010 (China's NBS, 2012).

Simultaneously, there is a minimum growth target in the national development plan reports. For example, China's central government believes that the economic growth rate needs above at least 7 per cent during the economic transition period, because a low growth rate will also take a toll on fiscal revenue and social programmes, which are instrumental in maintaining socioeconomic stability. Liu (2011) suggests that market liberalization and urbanization have played an important role in driving China's rapid growth during the economic reforms. A higher urbanization ratio and further development in the real estate sector, particularly the housing sector, will continue to be a major source of growth in the coming decade.

d) Uneven regional development

When Deng Xiao Ping emphasized openness to international trade and the development of regional comparative advantages, the central government chose to experiment with an 'open door' in its coastal provinces, such as Fujian and Guangdong. The central government provided a number of advantages for these provinces through the creation of special economic zones. The objective was to promote growth in coastal regions, with the idea that there would be spillover effects to the inland provinces. Brun et al., (2002) studied the regional development spillover effects of the coastal provinces on inland provinces. They argued that the spillover effects of coastal growth to the western provinces are not significant. The relative failure to boost the development of western provinces with spillovers from the coastal regions' growth suggests that these effects have

been insufficient to ameliorate regional inequality in China. The failure of regional development threatens Chinese social stability, and increases the risk of political and social fragmentation as well as massive interregional migration. These perceived dangers in China have led the central government to prioritize public spending in the western regions and support low income households since the introduction of the 'western development plan' in 2000.

Table 4.3: China's provincial economic development in 2012

Provinces	Real GDP growth rate	Rate of Unemployment	Rate of Urbanization	Income gap of urban and rural	Ratio of public spending to GDP
Tianjin	13.8%	3.6%	81.6%	2.1	16.6%
Chongqing	13.6%	3.3%	57.0%	3.1	26.7%
Guizhou	13.6%	3.3%	36.4%	3.9	40.2%
Yunnan	13.0%	4.0%	39.3%	3.9	34.7%
Shaanxi	12.9%	3.2%	50.0%	3.6	23.0%
Gansu	12.6%	2.7%	38.8%	3.8	36.5%
Sichuan	12.6%	4.0%	43.5%	2.9	22.8%
Qinghai	12.3%	3.4%	47.4%	3.3	61.2%
Anhui	12.1%	3.7%	46.5%	2.9	23.0%
Jilin	12.0%	3.7%	53.7%	2.4	20.7%
Xinjiang	12.0%	3.4%	44.0%	2.8	36.2%
Tibet	11.8%	2.6%	22.8%	3.2	129.1%
Ningxia	11.5%	4.2%	50.7%	3.2	36.9%
Inner Mongolia	11.5%	3.7%	57.7%	3.0	21.6%
Fujian	11.4%	3.6%	59.6%	2.8	13.2%
Guangxi	11.3%	3.4%	43.5%	3.5	22.9%
Hunan	11.3%	4.2%	46.7%	2.9	18.6%
Hubei	11.3%	3.8%	53.5%	2.7	16.9%
Jiangxi	11.0%	3.0%	47.5%	2.5	23.3%
Henan	10.1%	3.1%	42.4%	2.7	16.9%
Shanxi	10.1%	3.3%	51.3%	3.2	22.8%
Jiangsu	10.1%	3.1%	63.0%	2.4	13.0%
Heilongjiang	10.0%	4.2%	56.9%	2.1	23.2%
Shandong	9.8%	3.3%	52.4%	2.7	11.8%
Hebei	9.6%	3.7%	46.8%	2.5	15.4%
Liaoning	9.5%	3.6%	65.7%	2.5	18.3%
Hainan	9.1%	2.0%	51.6%	2.8	31.9%
Guangdong	8.2%	2.5%	67.4%	2.9	12.9%
Zhejiang	8.0%	3.0%	63.2%	2.4	12.0%
Beijing	7.7%	1.3%	86.2%	2.2	20.6%

Shanghai	7.5%	3.1%	89.3%	2.3	20.7%
Median	11.3%	3.4%	51.3%	2.8	22.8%

Note: the rate of urbanization is derived from the urban population divided by total population. The income gap is derived from urban income divided by rural income.

Source: China Statistical Yearbook, 2012 and 2013 by China's NBS.

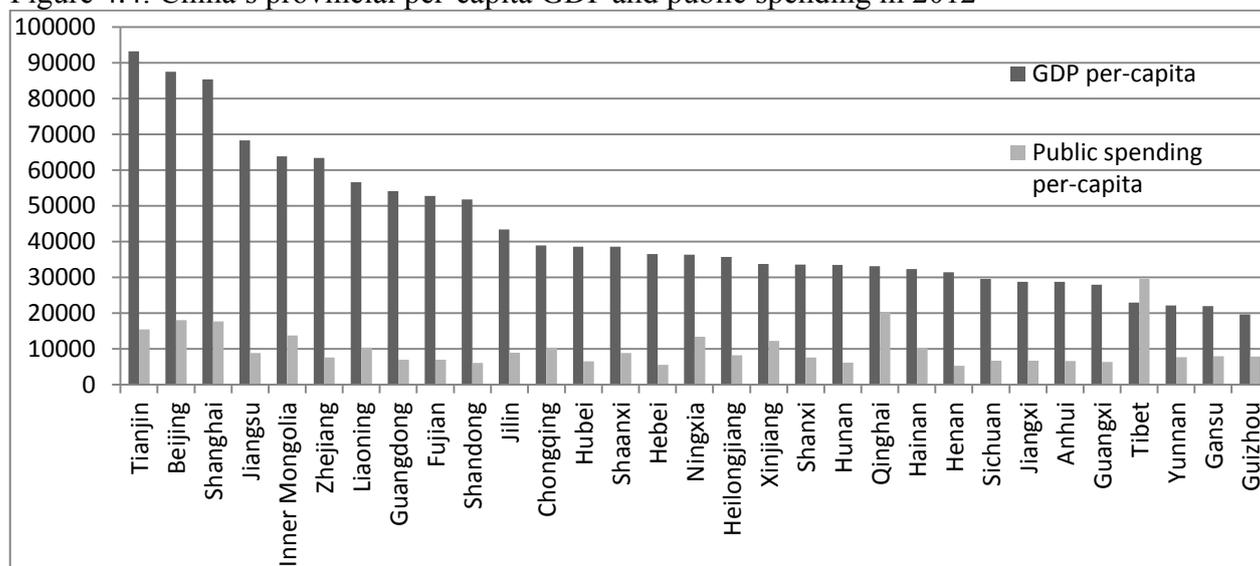
The Table 4.3 shows the level of regional economic development in 2012, which includes the real growth rate of GDP, the rates of unemployment and urbanization, the income gap between urban and rural areas and the ratio of public spending to GDP. Table 4.3 (as well as Figure 4.4 and 4.5) include all (mainland) Chinese provinces and four municipalities. The four municipalities are Beijing, Chongqing, Shanghai and Tianjin, which are treated the same as a provincial level government. In Table 4.3, these four municipalities are ranked in the two extremes in terms of real GDP growth in 2012, where Tianjin and Chongqing had the highest growth rate, and Beijing and Shanghai had the lowest growth rate. We can see that the urbanization rates in three of the four municipalities are above 80 per cent, with only Chongqing at 57 per cent. Simultaneously, Chongqing also had the highest ratio of public spending, accounting for 26.7 per cent of GDP. Excluding the four municipalities, we can see that the poorest province of Guizhou (in Figure 4.3) had the fastest economic growth in 2012. Similarly, most poor, western provinces had higher economic growth in 2012. For example, Yunnan, Shaanxi, Gansu, Sichuan, and Qinghai experienced an economic growth rate of more than 10 per cent. Hence, we can find that those provinces with a lower level of GDP per-capita are likely to experience more rapid economic growth than the wealthier provinces in China. In these poor provinces, the urbanization rate is lower than 50 per cent, which means the rural population is larger than the urban population. At the same time, the income gap between rural and urban areas is higher than the median level of 2.8 times, while public spending is higher than the median level of 22.8 per cent of GDP.

Conversely, the eastern coastal provinces, such as Guangdong, Jiangsu, Zhejiang, Fujian and Shandong, have a relatively lower level of public spending to GDP, a higher urbanization rate and a lower income gap between rural and urban areas. Urbanization and rural migration have played an important role in China's economic development, with rural households in poor provinces moving to urban areas in the rich provinces, a process which has produced cheaper labour and a housing demand to promote urban economic growth. Over the past thirty years of economic development, a huge gap has emerged

between urban and rural areas, and the eastern and western provinces.

Figure 4.4 shows the per-capita GDP and public spending in thirty-one Chinese provinces. We can see that the Tianjin, Beijing and Shanghai have the highest level of GDP per capita. Tianjin is the most industrialized city with the highest level of GDP per capita (93,173 Yuan³⁵), and Guizhou is the least advanced province with the lowest GDP per capita (19,701 Yuan). However, the poorer provinces have a relatively high level of public spending per capita. The richest, Tian, had 15,487 Yuan per capita public spending, and the poorest, Guizhou, 7,927 Yuan per capita public spending in 2012. The one extreme is Tibet, with 29,620 Yuan on public spending, more than its per capita GDP in 2012. This suggests a low level of private business and investment in Tibet. The eastern provinces have superior private investment and business environments, with a higher level of GDP per-capita. Conversely, public investment plays more important role in the western regions because of the low level of private capital. The Figure 4.5 suggests that the poorest province GuiZhou has the highest economic growth in 2012, as well as Yun Nan and Tibet. Hence, the Figure 4.5 indicates that the poor provinces have faster growth rate of GDP and public spending than rich provinces.

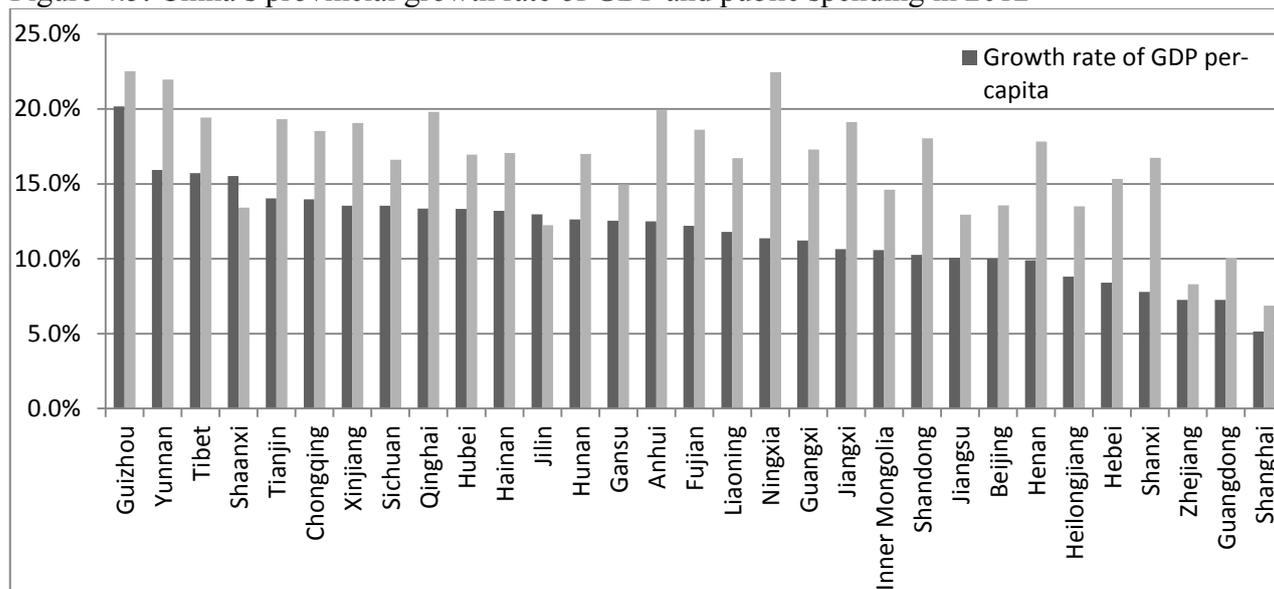
Figure 4.4: China's provincial per-capita GDP and public spending in 2012



Source: China Statistical Yearbook, 2012 and 2013 by China's NBS.

³⁵ The Yuan is the Chinese unit of currency: 1 British pound equals 10 Chinese Yuan.

Figure 4.5: China's provincial growth rate of GDP and public spending in 2012



Source: China Statistical Yearbook, 2012 and 2013 by China's NBS.

The multiple transformations that China has undergone since the late 1970s brought rapid economic growth, but many challenges as well, such as extreme inequality, rapid urbanization and environmental pollution. Moreover, the country also faces the demographic pressures of an aging population and internal migration of labour. Despite increasing public investment in rural areas and the western provinces since 2000, the disparity in regional development has remained unchanged. Hence, the higher growth rates in recent years in the western provinces only indicate a limited improvement in balancing regional growth. Similar past experiences (such as the economic growth experienced in Latin America) show that the transition from a middle income to a high income status will generate numerous economic uncertainties. Therefore, this is a huge challenge for further public spending reforms and adjustments, if the aim is to maintain sustainable growth in China.

4.4 Income Inequality in China

During the process of economic reforms, China's overall Gini coefficient rose from about 0.3 in the early 1980s to 0.49 in 2008. Although this figure declined slightly after 2008, it has still remained at a high level (around 0.45) in recent years (NBS, 2014). According to

studies on China's income inequality³⁶, there are two major types of inequality in China: urban-rural inequality and cross-regional inequality. In section 4.4.1, we explore the inequality between urban-rural areas, and then discuss cross-provincial inequality in section 4.4.2.

4.4.1 Urban-rural inequality

The urban-rural income gap is a major factor in Chinese inequality, and it has increased significantly during the period of economic reforms. Sicular (2013) states that urban-rural disparity in China arises in part from the '*Hu Kou*' system, which is an internal passport system to control the movement of the domestic population. Rural households have lower wages than urban households. Simultaneously, rural households also have poorer living standards than urban households, due to their more limited access to education, transport, health care, culture and leisure. The '*Hu Kou*' (household registration) system has served to restrict the movement between rural and urban of residents, and has maintained a fixed agricultural labour force in rural areas. In the early 2000s, the movement of residents was significantly relaxed in China, while currently it continues to register and identify 1.3 billion Chinese by their location and administrative categories (rural versus urban), which protects welfare and the employment rates in urban areas (Young, 2010).

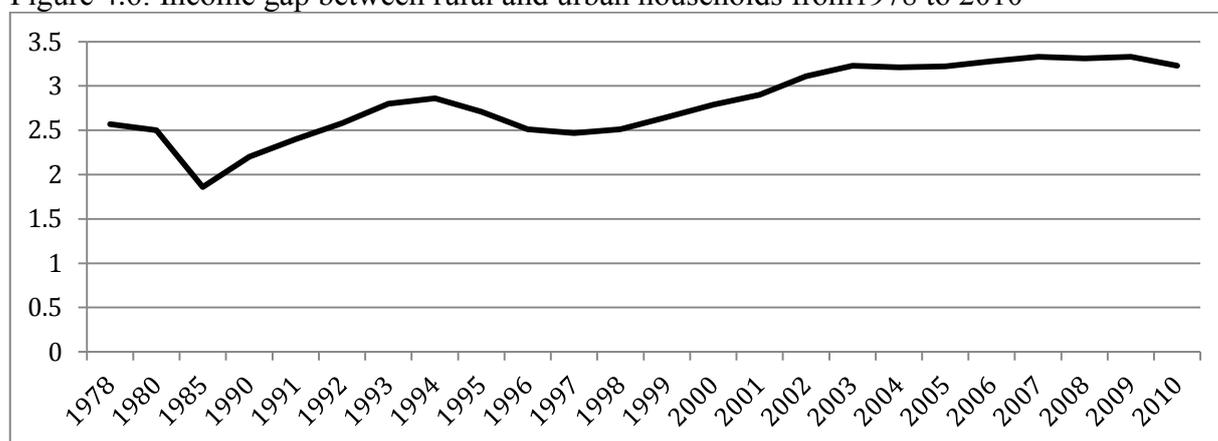
China's urban-rural gap has widened since the economic liberalization. Per capita income for urban households was three times higher than those of rural households in 2010, which is markedly high in terms of international standards (World Bank, 2012). In recent years, China's urban-rural income gap has been a major factor underlying national income inequality, which contributed to overall inequality by 45 per cent in 2002, and 51 per cent in 2007 (Li et al., 2013). Figure 4.6 shows the income³⁷ gap between rural and urban households in China from 1978 to 2010. We can see that urban income was 2.5 times more than the rural income in 1978, then dropped to less than two times in the mid-1980s, increased dramatically in the early 1990s and then dropped to 2.5 times during the late

³⁶ We have discussed the decompensation method to measure China's overall Gini, in Chen et al., (2010) and Tian (2012).

³⁷ According to the NBS of China, income in urban households is post-tax income, called the disposable income of urban households. The income in rural households is net income, which excludes the rent of land and other costs of farm production.

1990s. Since 1999, it has increased significantly to more than three times. We can see urban incomes increased faster than rural incomes during the last few decades. Consequently, the ratio of income gap between urban and rural has increased from 2.5 in 1978 to 3.2 in 2010, though the income gap declined in the early 1980s and mid-1990s.

Figure 4.6: Income gap between rural and urban households from 1978 to 2010



Source: State Statistical Bureau of China: China Statistical Yearbook, 2011.

Table 4.4 shows the composition of consumption between urban and rural households in percentages of total consumption. It includes consumption of food, clothing, household facilities, medical care and services, transport and communications, education and culture, housing maintenance, and other items between rural and urban households in 1990, 1995, 2000, 2005 and 2010 respectively.

Table 4.4: The composition of consumption between urban and rural households (in percentage of total consumption)

Item	Composition of Consumption Expenditure of Urban Households					Composition of Consumption Expenditure of Rural Households				
	1990	1995	2000	2005	2010	1990	1995	2000	2005	2010
Food	54.25	49.92	39.18	36.69	35.67	58.80	58.62	49.13	45.48	41.09
Clothing	13.36	13.55	10.01	10.08	10.72	7.77	6.85	5.75	5.81	6.03
Household Facilities	10.14	8.39	8.79	5.62	6.74	5.29	5.23	4.52	4.36	5.34
Health Care and Medical Services	2.01	3.11	6.36	7.56	6.47	3.25	3.24	5.24	6.58	7.44
Transport and Communications	1.20	4.83	7.90	12.55	14.73	1.44	2.58	5.58	9.59	10.52
Education and Culture	1.12	8.84	12.56	13.82	12.08	5.37	7.81	11.18	11.56	8.37
Housing maintenance	6.98	7.07	10.01	10.18	9.89	17.34	13.91	15.47	14.49	19.06
Others	0.94	4.28	5.17	3.50	3.71	0.74	1.76	3.14	2.13	2.15

Source: State Statistical Bureau of China: China Statistical Yearbook, 2001 and 2011

From Table 4.4 we can see the decline of food spending as a share of the total spending in both urban and rural households, although rural food spending share is higher than in urban areas. At the same time, the share of clothing spending is lower in rural areas, because of the poor living standards in rural area. On the other hand, there is increasing amount of spending on education, culture, transport and communications in both urban and rural areas; the figure in urban areas is higher than in rural areas, which indicates that urban areas have better education and standard of living. There is an increasing share of house maintenance spending in rural areas due to rural house improvements, while urban households do not spend much on housing maintenance because of the nature³⁸ of houses in urban areas. Hence, urban households spend a greater percentage on clothing, household facilities, transport and education, yet less on health and housing maintenance, than rural households.

Moreover, the leading urban areas have also promoted better education, healthcare and other social services than other areas. Luo and Zhu (2008) argue that the level of education and sector of employment are the key factors to explaining overall inequality. A decomposition analysis, based on households' income determination, shows that the increase in returns to education account for two-thirds of the income change in urban areas and one-sixth in rural areas. China's central government introduced two national strategies, 'Constructing a New Socialist Countryside' and 'Building a Harmonious Society', in 2006 to reduce urban-rural inequality through increasing public spending in less developed rural areas (Zhu and Wang, 2012). These national strategies include the improvement of education, health care and investment in rural areas, and abolishing agricultural taxation for rural households. However, it is a long term task for China's government to reduce the income gap between urban and rural areas in the unique model that is the Chinese economic growth model.

4.4.2 Cross-regional inequality

Cross-regional inequality is another major factor in China's overall inequality; it is linked

³⁸ Houses in urban areas are leasehold properties with 70-year leases; houses in rural areas are built by the land owners. The cost of purchasing a house is not included in this survey.

to high poverty rates in the western regions of China. In 2000, only 10 per cent of China's poor lived in the eastern (coastal) regions, compared with 28 per cent in central regions and 62 in the western regions (Wang et al., 2010). Park et al., (1996) find that China's fiscal reforms lead local governments to become increasingly self-reliant in meeting expenditure responsibilities. Furthermore, the reforms also led to greater inequality in the provision of public goods and services, because local governments have pursued economic growth at the expense of distributional objectives. Hence, provincial governments have accumulated large debts, and they rely increasingly on investment strategies to promote faster economic growth in order to pay the interest on these debts.

Due to the differences in initial economic structures and revenue bases, the fiscal burdens to support local government expenditures vary significantly across regions. Before the economic reforms, the coastal regions were endowed with a large share of non-farming economic activity, while inland regions still relied heavily on agriculture as the major source of economic output. Since China's fiscal decentralization, both types of regions have been responsible for collecting their own revenues and fulfilling the same responsibilities. Hence, the poorer regions initially relied on agricultural production as their major economic activity, which limited their resources for local public spending. The welfare of poor, rural households still largely relied on income from farm production. The lack of attention paid to regional economic growth has led to the emergence of great social disparities among provinces, while income equality is crucial for national cohesion and socio-economic development.

A major policy in China during the era of economic reforms has involved the trade-off between equity and efficiency in regional growth policies. The decentralization of control by the central government devolved greater responsibilities to the provinces and governments at lower level. During the fiscal reforms, the fiscal relationships between the centre and the provinces changed drastically, giving more power to provincial level governments. When Deng Xiao Ping emphasized openness to international trade and the development of regional comparative advantages, the central government chose to experiment with an 'open door' policy in coastal provinces such as Fujian and Guangdong. The central government provided a number of advantages for these provinces by the creation of special economic zones. The objective was to promote growth in coastal regions, with the idea being that there would be spillover effects to the inland provinces

(Brun et al., 2002).

In 1992, the Chinese government accelerated the process of economic liberalization in the coastal areas by establishing special economic zones, which shifted the focus of regional development to the coastal provinces, where there were favourable economic policies such as taxation reduction and special economic zones to attract more foreign investment. The combination of better location, infrastructure and economic foundations in these coastal areas promoted a higher rate of return on investment than in inland regions. Hence, the coastal provinces attracted far more foreign investment and generated more volume of trade than inland provinces during the liberalization process.

However, this resulted in uneven regional economic development between coastal and western provinces during the economic opening-up. Huang, Kuo and Kao (2003) find that the overall inequality has shifted from intra-province to inter-province, wherein the income disparity between the coastal and interior areas is the most significant determinant of the rising income inequality in China. Moreover, their larger economic gains have promoted better education, healthcare and other social services in these coastal areas. In turn, the coastal provinces have a more skilled population, which will in return receive higher salaries than those in the inland provinces.

Inequality in urban areas

Firstly, we have compared the inequality in urban areas across China's provinces. According to the NBS of China, the income inequality in urban areas was very low at the beginning of the economic reforms in 1978 because most urban employees received similar salaries in the system of SOEs. However, China accelerated privatization to finish off loss-making SOEs in 1997, a move which caused a rapid reduction in the number of employees in SOEs. For example, Solinger (2002) estimated that about 30 million workers were dismissed from SOEs between 1996 and 2001. Hence, the reform of these SOEs has made a significant contribution to the rise in urban inequality over the last two decades. Moreover, a huge number of rural households move to urban areas to find jobs each year. These unskilled rural workers tend to work in the lower-paid jobs than urban employees. Table 4.5 shows the regional income and consumption disparities in urban areas.

Table 4.5: Urban households' annual income and the consumption disparities between regions

Year	Indicator	Total Income	Income from Wages and Business	Income from Properties	Total Consumption	Food Expenditure	Clothing Expenditure	Healthcare Expenditure	Education and Cultural Expenditure
2000	Highest region	Shanghai	Shanghai	Guangdong	Shanghai	Shanghai	Tibet	Beijing	Beijing
	Lowest region	Shanxi	Heilongjiang	Tibet	Jiangxi	Inner Mongolia	Hainan	Jiangxi	Henan
	Gap	2.49	2.53	91.67	2.45	2.89	4.68	3.96	3.15
2005	Highest region	Shanghai	Shanghai	Zhejiang	Shanghai	Shanghai	Zhejiang	Beijing	Shanghai
	Lowest region	Guizhou	Qinghai	Tibet	Hainan	Shanxi	Hainan	Jiangxi	Hainan
	Gap	2.46	2.46	53.12	2.32	2.40	4.08	3.97	3.49
2010	Highest region	Shanghai	Shanghai	Zhejiang	Shanghai	Shanghai	Inner Mongolia	Beijing	Shanghai
	Lowest region	Gansu	Heilongjiang	Gansu	Qinghai	Shanxi	Hainan	Tibet	Tibet
	Gap	2.50	2.61	20.35	2.41	2.55	3.46	3.44	7.04

Source: State Statistical Bureau of China: China Statistical Yearbook, 2001 and 2011

Table 4.5 presents the regional income and consumption disparities in urban areas from 2000 to 2010. Overall, the regions on the eastern coast of China have higher levels of income and consumption than western regions. The first column indicates the highest income or consumption region, and the lowest region and the gap between them, in 2000, 2005 and 2010 respectively. In terms of total income, Shanghai is the highest region in every featured year, with the lowest regions being Shanxi in 2000, Guizhou in 2005 and Gansu in 2010. The total income gap between the highest region and lowest region almost kept at the same level from 2000 to 2010, at 2.49, 2.46 and 2.5 in 2000, 2005 and 2010 respectively. Simultaneously, the gap between income from wages and business rose slightly from 2.53 to 2.61. Shanghai still had the highest income from wages in 2000, 2005 and 2010. Contrastingly, the province with lowest income from wages varied from Heilongjiang in 2000 to Qinghai in 2005, and later to Heilongjiang in 2010

In the terms of income from properties³⁹, the gap decreased significantly from 91.67 times in 2000 to 53.12 times in 2005, and later to 20.35 times in 2010. This indicates that the provincial gap in properties' income reduced significantly over the last ten years under study. This trend appears to be caused by the rapid rise housing prices in urban areas; the second-tier cities had lower housing prices in 2000, but a faster growth rate between 2000 and 2010. However, the reduction of the income differential from properties had no effect on the total income difference between 2000 and 2010.

Table 4.5 also illustrates the gaps of expenditure regarding urban households. It features the gaps between total consumption expenditure, food expenditure, clothing expenditure, health care and medical services expenditure, and education and culture expenditure. In general, the regions that have higher incomes will have higher spending, such as Shanghai, Beijing and Zhejiang. We can see that Shanghai has the highest total expenditure and food expenditure in 2000, 2005 and 2010, and the highest educational and cultural spending in 2005 and 2010. Beijing has the highest healthcare spending in 2000, 2005 and 2010 and the highest educational and cultural spending in 2000. The gaps among consumption spending, food, clothing and healthcare spending have narrowed. Conversely, the gap between education and cultural spending increased from 3.15 in 2000 to 7.04 in 2010. This indicates that the educational inequality between Chinese provinces

³⁹ Income from properties includes the both income on capital stock, such as savings, bonds and stocks, and real estate.

increased over the last ten featured years.

Inequality in rural areas

China's economic transition began in the agricultural sector, with each rural household being given a long term lease of land in return for meeting tax and quota obligations (Das, 2007). The rural reforms promoted agricultural production and poverty reduction in the rural areas, while increasing rural inequality at the beginning of the economic reforms. The rapid growth of regional income inequality in rural areas was primarily caused by the rural areas' non-agricultural activities. Rural collective enterprises boosted rural economic growth differently, while those regions with more rural enterprises experienced faster income growth. Moreover, the profits of rural enterprises are distributed unevenly in rural areas. The owner retains most of the profits because of the low labour costs in these rural areas. The workers receive only the minimum wage, compared with urban workers. On the other hand, the extremely poor rural residents receive income only from agricultural output, which is even less than the worker in rural enterprises because of the low price of agricultural products in China.

The Table 4.6 shows the ranking of the per capita annual income and expenditure of rural households by region from 2000 to 2010. As with the ranking in urban areas, Shanghai has the highest total income and consumption per household in rural areas. In general, the provinces with the highest net income and consumption expenditure are all located on the east coast of China. This indicates that those regions endowed with better infrastructure, resources and a good geographic location will enjoy a higher level of economic development. Compared with the ranking in urban areas, the income and consumption gap is larger in rural areas. For example, the total urban households' income gap between the highest, Shanghai, and the lowest, Gansu, is 2.5; contrastingly, the total rural households' income gap was 4.08 in 2010. In the first column, the gaps in net income rose from 4.21 to 4.39 between 2000 and 2005, and later fell to 4.08 from 2005 to 2010. The gap between wage and operations declined dramatically from 4.51 in 2000 to 3.39 in 2010. However, the gap of income from assets increased from 25.96 in 2000 to 39.66 in 2010. This indicates that households in Beijing, Shanghai or Zhejiang had more savings or real estate than households in Guizhou, Hubei or Guangxi.

Table 4.6: Rural households' annual income and the consumption disparities between regions

Year	Indicator	Net Income	Income from Wages & Operations	Income from properties	Total Consumption Expenditure	Food Expenditure	Clothing Expenditure	Health care Expenditure	Education and Cultural Expenditure
2000	Highest region	Shanghai	Shanghai	Zhejiang	Shanghai	Shanghai	Beijing	Tianjin	Shanghai
	Lowest region	Tibet	Tibet	Guizhou	Tibet	Gansu	Guangxi	Tibet	Tibet
	Gap	4.21	4.51	25.96	7.90	6.79	4.77	16.86	50.33
2005	Highest region	Shanghai	Shanghai	Beijing	Shanghai	Shanghai	Beijing	Shanghai	Shanghai
	Lowest region	Guizhou	Xinjiang	Hubei	Guizhou	Xinjiang	Hainan	Tibet	Tibet
	Gap	4.39	4.89	34.98	4.69	3.34	5.71	12.64	33.21
2010	Highest region	Shanghai	Shanghai	Beijing	Shanghai	Shanghai	Beijing	Beijing	Shanghai
	Lowest region	Gansu	Guizhou	Guangxi	Tibet	Shaanxi	Guangxi	Tibet	Tibet
	Gap	4.08	3.39	39.66	3.83	2.93	6.33	11.81	19.54

Source: State Statistical Bureau of China: China Statistical Yearbook, 2001 and 2011

On the expenditure side, there was a significant narrowing in the gap of total consumption expenditure, from 7.9 in 2000 to 3.8 in 2010, as well as a reduction in the gaps on food, health care and education. Only the gap regarding clothing expenditure increased in the final studied decade. Conclusively, households in the eastern coast of China have greater income expenditure than those in other parts of China. The income and consumption gaps are larger in rural areas, although the gap in total consumption expenditure declined in rural areas during the final decade studied.

4.5 Redistributive public spending in China

Compared with the public capital investment spending, redistributive⁴⁰ public spending provides a more important role in economic development. Kelly (2005) states that any specific government spending that affects the income of individuals received and spent in the markets can influence distributional outcomes. Social expenditure is the spending on basic needs such as housing, health and education. Investment in human resources contributes to the enlargement of productive capacity by improving the quality of the labour force. For example, education spending can influence the characteristics of individuals. Public spending provides opportunities for human capital development that would not be affordable to some individuals in a privately-funded system. A debate exists as to whether public spending programmes do actually have their intended effects, but nevertheless they would be expected to equalize income distribution. If distributional outcomes are the central goal of government, then we should expect the government to use public spending as a tool to influence income inequality.

This section will mainly focus on public expenditure on the social sectors, which includes education, health and social protection (also known as the social security net) spending. Understanding the trends of public spending in industrial economies is a useful method for analyzing public spending in China. Although there are different levels of economic development across different countries and their public spending varies, the overall size of public spending in developed countries is larger than that of developing countries. Social

⁴⁰ Redistributive public spending, also known as social spending, includes spending on education, health and social protection. Elsewhere, it is also referred to as social sector or social welfare public spending.

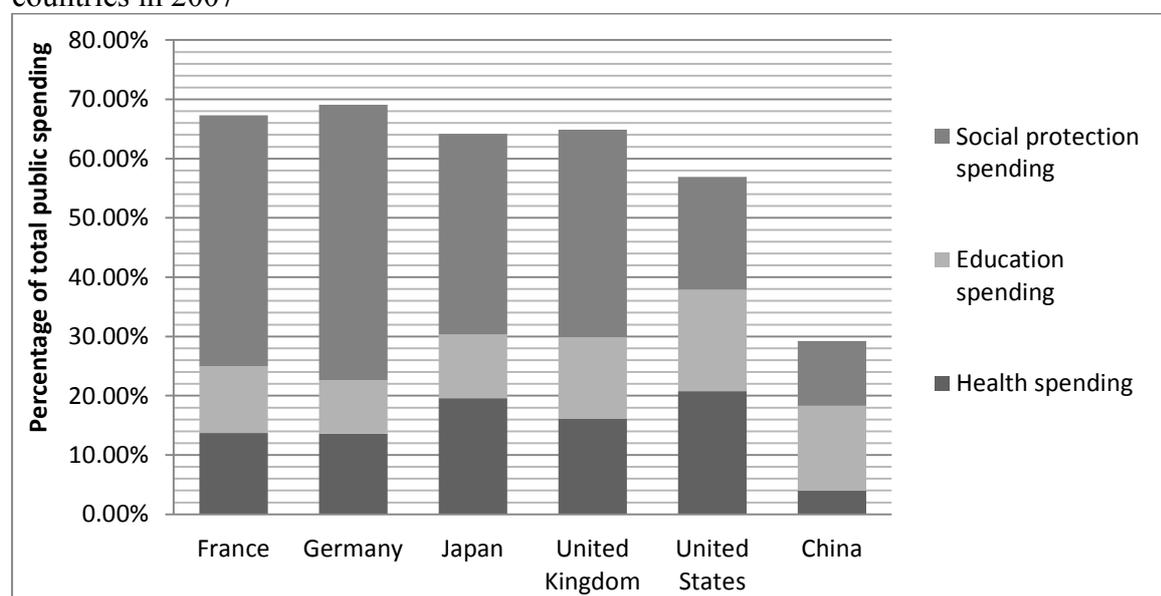
spending constitutes the largest proportion of public expenditure in the most-developed countries. Social spending programmes also have a redistributive component. At the inception of social security programmes in the western economies in the 1930s, their redistributive aspects were common political arguments in their favour (Glomm and Kaganovich, 2003).

Table 4.7: The share of public spending of GDP in various countries, 1990-2000

Year	France	Germany	Japan	United Kingdom	United States	China
1990	50%	45%	31%	40%	33%	21%
1995	54%	50%	36%	43%	33%	13%
2000	51%	43%	38%	38%	29%	17%
2005	54%	47%	34%	41%	36%	19%
2010	56%	47%	40%	47%	41%	23%

Source: World Bank World Development Report 1988, IFM World Economic Outlook 2011

Figure 4.7: The share of public spending on social sectors of total public spending in various countries in 2007



Source: IMF, General Government Finance Statistics, 2008

Table 4.7 shows the size of government, which is measured by public spending as a share of national income. We can see that European economies had a higher share of government expenditure of GDP than the United States and Japan from 1990 to 2010. On the other hand, China had the lowest level of public spending - only 23 per cent of its GDP. Hence, compared with the developed economies, China's level of public spending was very low, which

significantly affected public welfare. The middle and low income countries are at the beginning stages of economic development, so public spending projects play an important role in increasing demand and supply, which may have less of a crowding-out effect (Li, 2013).

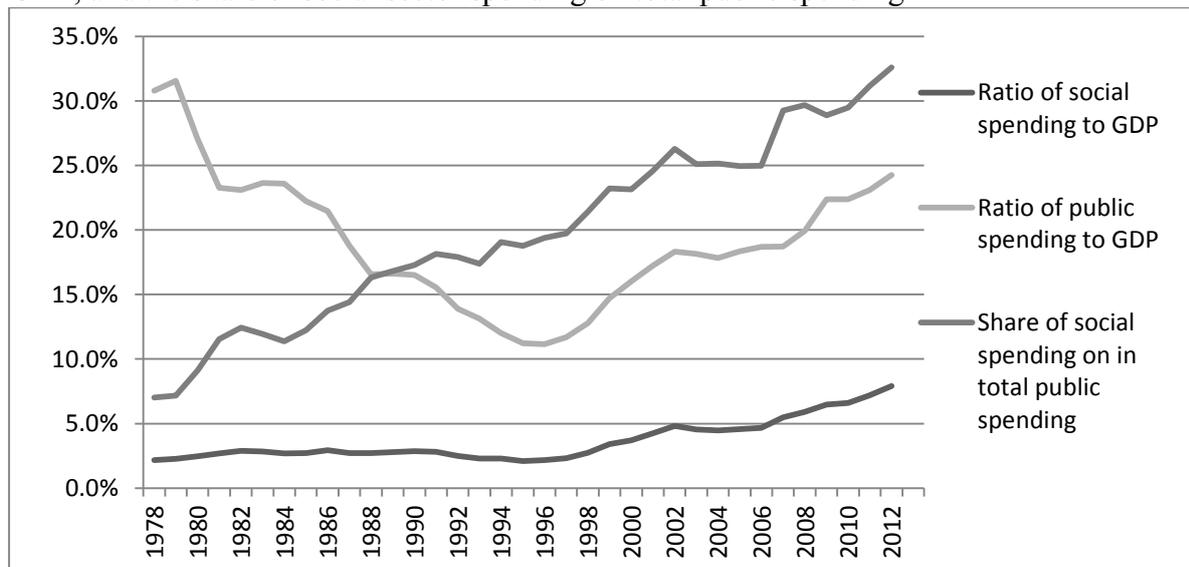
Figure 4.7 compares the share of social welfare spending in various developed countries with China. It includes the shares of health spending, education spending, social protection spending and the sum of them, which we call total social welfare spending. The table shows that countries at higher levels of economic development have a higher level of governmental spending on social sectors such as education, health and social protection. For example, Germany has the highest level of total social welfare spending, which accounts for 69 per cent of total public spending. Contrastingly, China only directed 30 per cent of public spending towards social welfare in 2007. Compared with the spending on health and social protection, education spending in China is similar to that of other developed countries, which was 15 per cent of total public spending in 2007. Hence, we can see that the Chinese government has paid more attention to education than to health and social protection.

Providing better education as a fundamental role of government spending is universally accepted by economists. The literature on economic growth has highlighted the role of education in reducing inequalities that prevail in many developing societies. In recent economic literature, such as Lucas (1988), Benhabib and Spiegel (1994), Bils and Klenow (1999), human capital is regarded as a major determinant of differences in productivity, although the appropriate method of including the human capital variable is still not agreed upon. However, there is a general consensus on the importance of education to promote economic development.

Foster and Rosenzweig (1996) found that there is a pattern of increasing expenditure on basic education to cater to the increase of income in developed countries. Furthermore, Sen (1999) states that education spending is not only for the individual, but also for the society as a whole. It provides benefits directly to those who receive it, which in turn affect the individual's future income stream. At the aggregate level, a better-educated workforce is thought to increase the stock of 'human capital' in the economy and to increase its productivity. Considering the externalities in education, it is widely accepted that the government has an

important role in ensuring the equitable distribution of education to the public. From a microeconomic perspective, a higher level of education raises the individual's wage rate in the labour market. Concurrently, empirical analyses regarding the contribution of human capital has explained the divergence in the rates of growth across countries of the world (Barro and Lee, 1993).

Figure 4.8: The trend of total public spending and social sector spending in terms of share of GDP, and the share of social sector spending on total public spending



Source: NBS of China: China Statistical Yearbook, 2000 and 2007-2013

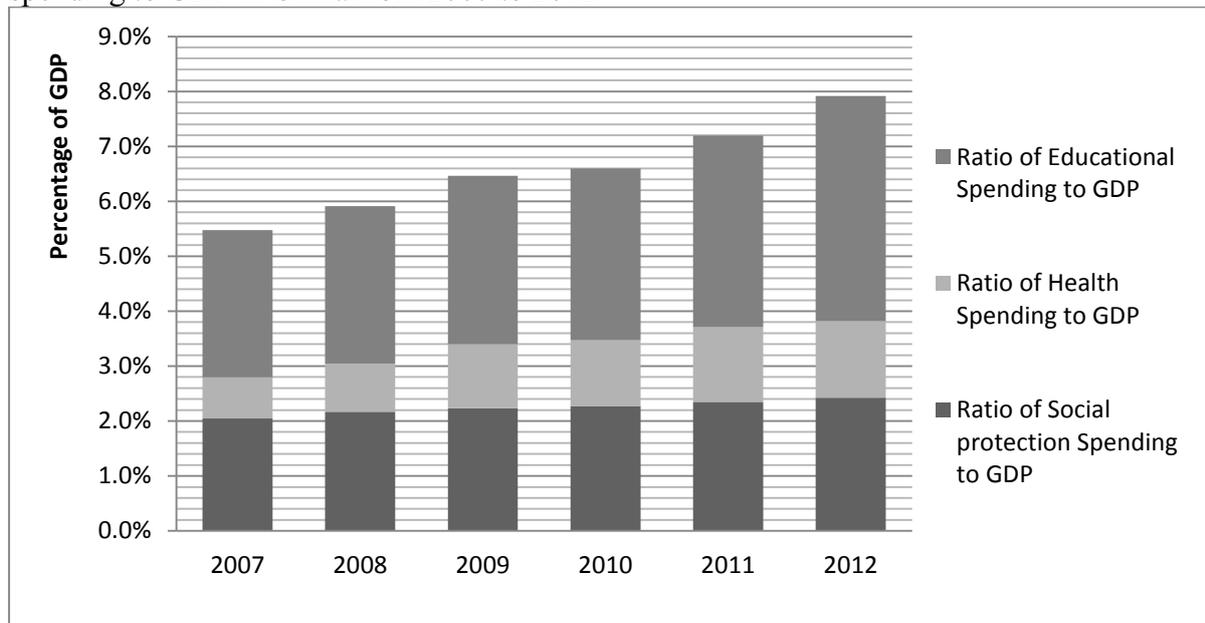
Figure 4.8 shows the share of people's well-being spending⁴¹ in total public spending (top blue line), the ratio of total public spending to GDP (middle red line) and the ratio of people's well-being spending to GDP (bottom line). We can see that the share of people's well-being spending has increased dramatically from 7 per cent of total public spending in 1978 to about 33 per cent in 2012. However, its share of total public spending in China is still less than in most developed countries' level. This also suggests that past Chinese public spending has had a growth-oriented nature. The ratio of total public spending has shown two different trends in the past thirty-years: it fell from 31 per cent of GDP in 1978 to 11 per cent of GDP in 1994, and then later rose to about 25 per cent of GDP in 2012. In 1994, the tax reforms significantly increased the taxation capacity of China's central government, which led to greater public spending after 1994. The share of people's well-being spending to GDP maintained a constant level of less than 5 per cent GDP until 2002, but it was not affected by the reduction of the

⁴¹ People's well-being spending, as well as social welfare spending, is the sum of education, health and social protection spending in China. This name is taken from the government report of the State Council in 2012.

share of total public from 1979 to 1994. When the 'Building a Harmonious Society' national campaign in 2006 was first implemented, public spending on social welfare rose significantly in terms of both share of GDP and total public spending.

Figure 4.9 shows public spending as a percentage of GDP on education, healthcare and social protection from 2007 to 2012. The share of public spending on education, health and social protection in GDP increased during this period, and was less than 8 per cent of GDP in 2012. For example, health spending only constituted about 1 per cent of GDP during this period, with social protection and education spending taking about 2 and 3 per cent of GDP, respectively.

Figure 4.9: The ratio of national educational spending, health spending and social protection spending to GDP in China from 2007 to 2012



Source: NBS of China: China Statistical Yearbook from 2008 to 2013

Although China's public spending on social sectors has significantly risen over the last three decades, its share of GDP and total public spending are relatively smaller than most developed countries, accounting for less than 8 per cent of GDP and 30 per cent of total public spending in 2012. Spending on social sectors is important because it tends to benefit the poorer population more than the rich. Moreover, it increases the human capital of the economy, which can produce direct growth effects and indirect spillover benefits for the rest of the economy (Baqir, 2002). Some Chinese economists argue that China's low level of social welfare spending has failed to provide a basic safety net for Chinese citizens during the

economic reforms, and that this has inevitably compromised domestic consumption (Lou, 2008). Hence, China needs to promote greater public spending on the social sectors, which would smooth the social problems experienced thus far in the process of economic development and promote sustained economic growth and greater equality.

4.6 Conclusion

During the first period of fiscal decentralization (the fiscal contract system), both the revenue share and expenditure share of sub-national governments dramatically increased, which can be viewed as a period of fast decentralization. In the second fiscal reform period (the tax reforms of 1994), the central government re-centralized fiscal revenue through taking a larger share of the total fiscal revenues via tax assignment. Simultaneously, almost 80 per cent of total public expenditure was still the responsibility of sub-national governments. Hence, China's fiscal reforms increased the self-reliance of sub-national governments in dealing with expenditure, which may have led to greater inequality in the provision of public goods and services across regions. The uneven decentralization of expenditure responsibilities has led to marked divergences in spending per capita across regions, and has generated adverse incentives in carrying out spending by local governments. Provincial governments with a limited amount of fiscal revenue are unable to meet social needs such as education and health (OECD, 2006).

Economic development and social stability require the government to have adequate revenue for the provision of essential public goods and services. China's rapid economic growth has contributed to a huge increase in fiscal revenue, which theoretically would provide the opportunity to solve the social problems during the period of fast economic growth. Economic decentralization in the reform period has undoubtedly helped to prompt China's growth. Nevertheless, regional disparities have widened significantly. Therefore, the matter of how to balance economic growth and income becomes a delicate task for policymakers (Zhang, 2006). Improving the effectiveness of the public finance system is the key to promote economic development. In order to have better fiscal policies, China needs to improve its public finance system and to increase public spending on social welfare continually in order

to achieve more effectiveness in its economy development. Moreover, section 4.4 has focused on the income inequality between urban and rural areas, and between coastal and inland provinces. The fight against poverty and income disparities is the main task of the Chinese government; it is crucial to use appropriate fiscal policies as a tool to achieve the 'harmonious society' goal of the Chinese government. Section 4.5 has analyzed China's public spending on social sectors, such as education, health and social protection. There is an increasing trend towards social public spending; however, less than 30 per cent of public spending goes on social sectors, and it only constituted less than 8 per cent of GDP in 2012. The low level of social spending has failed to provide a basic safety net for Chinese citizens during the past economic reforms, and this has inevitably compromised domestic consumption. Given the increasing self-reliance on local public financing, a close relationship between local revenue and expenditure suggested that richer regions can spend more, and the poorer regions spend less. Therefore, continuing to improve public spending on social welfare in lagging areas is crucial for sustainable economic growth and equitable distribution in the long term.

China has now entered the 'second transition' toward a welfare state after the rapid economic development of the last three decades. With the huge increase in its fiscal revenues, the Chinese government now has the ability to provide a social welfare framework for the public. Wang et al., (2010) state that the Chinese government should increase the funds it allocates to the poorer regions and people, which needs to introduce more comprehensive package of transfer, which includes reforms in the pension system, the social insurance system and the employment system in order to protect the low income population in the less developing areas. In recent years, the Chinese government appears to have paid more attention to the issues of income equality, reducing corruption and providing greater market liberalization to foster a more balanced economic development. Crucially, this view was reinforced by a former President of China (*Hu Jintao*) who pursued a 'harmonious society' policy agenda that emphasized equitable growth. China has implemented a wide range of policies designed to reduce wealth disparity, such as agricultural support policies, social welfare transfers, local minimum wage increases, targeted tax reductions and poverty alleviation. In order to achieve its goal, the Chinese government needs to promote greater public spending on the social sectors, which could alleviate the problems experienced during its previous economic development, and promote sustained economic growth and greater equality.

Chapter 5: Methodology and Data Analysis

5.1 Introduction

This dissertation mainly adopts quantitative approach because of the nature of the research. The selection of research methods is based on a careful consideration of the hypotheses and others possible research methods. The hypotheses are focused on a statistical analysis of numerical data, although some observations and interpretation of data are required in the analysis of the whole process of China's economic development⁴².

Before the econometric test, we provide a descriptive background of China's overall economic and fiscal trends in the context of market transformation. This chapter provides a description of the data and the empirical methodology used in the analysis. This chapter also indicates the advantages and limitations of the selected research methods.

The research contributes to the literature in a number of ways. In terms of methodology, it improves previous empirical studies by applying panel data analysis. One important advantage of VAR analysis is that it incorporates the endogenous variable in the same model, which has been a major flaw in previous studies. The PVAR applies Generalized Method of Moments (GMM) dynamic panel techniques to address the potential endogeneity of government expenditure in the endogenous growth model.

Based on China's National Bureau of Statistics (NBS) data, we employ an updated data set from a broad cross-section of provinces over a long time span. The econometric analysis contains national level data from 1978-2012, and a subnational level data from 24 provinces over the period 1995-2010. Most importantly, these data sources offer a more comprehensive measure of government spending by using total government expenditure and specific public spending items, such as agricultural spending, educational spending and social welfare and security spending. The decomposition of government spending allows us to isolate both the productive and unproductive elements of

⁴² The observation and interpretation data, whilst qualitative in nature, are nevertheless also based on numerical data.

government spending from the total. This enables us to additionally explore, in broad terms, the different effects attributable to the composition of public spending. This chapter proceeds as follows. Section 5.2 outlines the hypotheses and tests in econometric analysis. Section 5.3 discusses the VAR and PVAR models in the econometric analysis. Section 5.4 presents a description of the data in the regression analysis. Section 5.5 investigates the relationship between inequality and economic growth at the provincial level. Finally, section 5.6 provides a conclusion to this chapter.

5.2 Hypotheses and Tests

The fundamental aim of the study is to investigate the effects of public spending⁴³ on the economic growth and inequality in, China. The study uses annual data at the national level between 1978 and 2012, and provincial panel data from 24 provinces from 1995 to 2010. Focusing on the issues surrounding public spending in the literature review, this research posits four hypotheses. We examine these hypotheses at both the national and provincial levels of data according to different econometric models. This dissertation investigates the anticipated effect of public spending⁴⁴ on the basis of three hypotheses focusing on the relationships between public spending, economic growth and inequality in China.

Hypothesis 1: there are positive relationship between economic growth and national and provincial public spending and their share of social spending in China.

Hypothesis 2: there are negative relationship between income inequality and national and provincial public spending and their share of social spending in China.

Hypothesis 3: There is a negative relationship between economic development and inequality in China.

⁴³ For the purposes of this thesis, the 4 types of public spending [total national public spending, total provincial public spending, share of social spending in total national spending, and share of social spending in total provincial spending] shall be referred to collectively as ‘public spending’.

⁴⁴ The role of public spending includes faster economic growth, reducing of income inequality and balancing efficiency and equity during economic development (OECD, 2006).

Notes for Hypotheses 1 to 3: Since late 1978, China has adopted market-oriented economic reforms and fiscal decentralization, with the intention of improving efficiency through economic liberalization and the provision of local public services (Tsui and Wang, 2004). Since the economic opening up, China's government has set economic growth as the priority of economic development. Chinese economic growth was strongly influenced by public investment or investment by SOEs. The rapid growth of GDP has created a large capacity for public spending.

Conversely, inequality has increased dramatically during China's period of economic growth. This suggests requirement growing need for higher public spending to meet the citizens' social welfare and security needs. After the tax reforms of 2004, China's public spending increased from 12 per cent of GDP in 1994 to 23 per cent in 2010, with an average of annual growth rate of around 20 per cent. Simultaneously, provincial public spending accounted for 85 per cent of national public spending in 2010. Thus, provincial public spending has played a significant role of China's total public spending.

The role of the government in economic development encompasses both economic growth and income redistribution through public spending. Hence, assuming China's public spending includes a welfare policy designed to achieve a more egalitarian income distribution, government spending should therefore have a positive effect on income equality.

Social spending is the sum of public spending on education, health and social protection, and it has the greatest direct effect on income redistribution. Hence, it has a more significant distributional effect than total public spending. Furthermore, income inequality has risen significantly during China's economic development. Hence, the last hypothesis investigates whether economic growth has a positive relationship with income inequality.

In response to the major deficiency in the current literature on the empirical analysis of public spending, we examine the effects of public spending at both the national and provincial levels. Hence, apart from the VAR model adopted in the national level analysis from 1978 to 2012, this dissertation also applies the PVAR method to explore the effects of provincial public spending on growth and inequality in China. This thesis presents an empirical analysis of the provincial macroeconomic effects of public spending in China,

based on panel datasets of 24 Chinese regions over a 16-year period from 1995-2010. Before the hypotheses are formally tested, we provide a descriptive analysis of the data, which neither directly confirms nor rejects the hypotheses; it serves only to capture the country's overall economic development and trends in public spending in the context of China's market transformation.

5.3 The VAR and PVAR models

The VAR model is a multivariate, time-series specification developed as a generalization of the univariate autoregressive (AR) model. It was initially proposed by Sims (1980) to avoid the 'incredible identification restrictions' of (large-scale) structural econometric models, and it has subsequently become a vital tool in empirical econometrics. The VAR model is a reliable framework that has been widely used in the Economics literature. It is an n-equation, n-variable linear model in which each variable is in turn explained by its own lagged values, plus the current and past values of the remaining n - 1 variables. This simple framework provides a systematic way to capture rich dynamics in multiple time series. In addition, the statistical toolkit that came with VARs was easy to use and to interpret (Stock and Watson, 2001).

In the usual unrestricted VAR specification, there is one equation for each and every variable. Therefore, all variables are assumed to be endogenous, which avoids unnecessary *a priori* distinctions between endogenous and exogenous variables. Any assumptions regarding endogenous and causal effects can be tested. Moreover, for each endogenous variable there is a set of explanatory variables that comprise its own lags and the lags of all the other variables in the model, allowing for rich dynamic effects to be captured. If there are only two variables, the VAR model will be:

$$y_t = a_1 y_{t-1} + \dots + a_k y_{t-k} + a_{k+1} x_{t-1} + \dots + a_{k+1+n} x_{t-n} + e_t^y$$

$$x_t = b_1 y_{t-1} + \dots + b_k y_{t-k} + b_{k+1} x_{t-1} + \dots + b_{k+1+n} x_{t-n} + e_t^x$$

Consider the following reduced form of the vector autoregressive model with p variables

$$Y_t = A_1 Y_{t-1} + \dots + A_p Y_{t-p} + \varepsilon_t$$

Where, Y_t is the vector of endogenous variables, p is the lag length. We employ Akaike's Information Criterion (AIC) to determine the appropriate lag length. The VAR model is linear in the parameters and assumes that these are constant over time. Moreover, we assume that the error terms are identically and independently distributed, i.e. they are serially uncorrelated ($E(\varepsilon_t, \varepsilon_{t-k}) = 0$ for $k \neq 0$), have a zero mean ($E(\varepsilon_t) = 0$), and have a time-invariant positive definite covariance matrix ($E(\varepsilon_t, \varepsilon_t') = \Omega$). Hence, the error terms follow a Gaussian (normal) distribution (or white-noise process): $\varepsilon_t \sim \text{iid } N_p(0, \Omega)$. The residual covariance matrix (Ω) has dimensions $p \times p$, and contains information about possible contemporaneous effects (Martins, 2010).

If the process is found to contain non-stationary behaviour (i.e. at least one variable is non-stationary), then any inference based on the VAR may be invalid, and the relationships among the variables spurious. In this case, it will be more appropriate to analyze the data within a co-integration framework. Following Engle and Granger's (1987) work on the non-stationary behavior of variables, a study which has dramatically shaped modern time-series econometrics, Johansen and Juselius (1992) extended the VAR model by applying the concepts of co-integration and error-correction to analyze long term relations amongst non-stationary variables. Johansen (1995) states that if all variables in the system are not level stationary $I(0)$, it is possible to examine the existence of possible long run relationships between the variables in the VAR system. For this purpose, the VAR can be re-written in the general Vector Error Correction Model (VECM ($k-1$)) form:

$$\Delta Y_t = \alpha_1 Y_{t-1} + D_1 \Delta Y_{t-1} + \dots + D_{p-1} \Delta Y_{t-p+1} + \varepsilon_t$$

The error-correction terms ($\alpha_1 Y_{t-1}$) measures the disequilibrium, which represents stochastic shock in the dependent variables. Specifically, they represent the proportion by which the long term disequilibrium in the dependent variables is corrected in each short term period. The coefficients of the error-correction term are expected to be negative and statistically significant and they reflect the speed of adjustment in the elimination of disequilibrium (Loizides and Vamvoukas, 2005).

In the unrestricted VAR specification, all variables are assumed to be endogenous (there is one equation for each and every variable), avoiding unnecessary distinctions between endogenous and exogenous variables. The fact that it does not assume an *a priori* direction of causality among the variables is particularly useful for fiscal variables, which are often jointly determined. Instead, the framework allows a number of hypotheses to be tested within the specified model. This framework is often used to help the formulation of realistic models, uncovering facts and describing the characteristics of the data (Martins, 2010). Hence, using the VAR model can be better fitted the theoretical framework of the endogenous growth model.

The VECM model enables easy dealing with non-stationary time series variables in the regression analysis, as compared with the OLS model. Moreover, Vector autoregressive models are particularly appropriate for estimating the medium and long term impacts of public policy for at least three reasons. Firstly, they take due account of the dynamic feedback between variables, as well as their effect on other variables in both the short and long term. This is of primary importance when the delay between a policy change and its implementation and posterior impact is not negligible, as is usually the case with fiscal policy. Moreover, the short term and long term effects may differ in magnitude and sign. Secondly, VAR models are especially suitable when the variables of interest are endogenous, as is the case here, where output, public expenditure and inequality are interrelated. Finally, VAR models are not too demanding on data, which has surely contributed to the recent proliferation of empirical research on the macroeconomic effects of fiscal policy (Ramos and Roca-Sagales, 2008).

VAR techniques have been used mostly to analyze macroeconomic time series data. Furthermore, over the past two decades, important advances have been made in the study of dynamic PVAR models (Binder et al., 2005). Hence, the PVAR is quite a common technique in contemporary econometric analysis. Our approach is to use a PVAR methodology which was employed by Holtz-Eakin et al., (1988). This technique combines the traditional VAR approach, which treats all the variables in the system as endogenous, with estimation techniques for panel data, which allows for unobserved individual heterogeneity. Numerous macro studies have estimated PVARs using existing techniques for single-equation dynamic panel data models. In such models, it is well known that the simple, Least-Squares Dummy Variable (LSDV) estimator is not

consistent for a finite time dimension T , even when the cross-sectional dimension N becomes large (Juessen and Linnemann, 2010).

In this thesis we do not use the LSDV estimator of PVAR model of Holtz-Eakin et al., (1988), which has bias in panels that include lagged endogenous variables. This bias is particularly severe if the time dimension (T) is small (Assenmacher-Wesche and Gerlach, 2008). Therefore, we use the GMM to overcome the bias, because our sample period is relatively short. Arellano and Bond (1991) propose a first-differenced generalized method of moments (GMM) estimator in the first difference, which includes the lagged dependent variable and its built-in correlation with the combined error term. This method employs valid instruments for the lagged endogenous variables. It is called the ‘standard moment condition’, and is widely used in empirical estimations.

The PVAR model in the GMM is provided by (Love and Zicchino, 2006), who developed a technique in Stata to work on the PVAR model. This thesis will follow their model and technique to test variables among Chinese provinces, which are economic growth rate, ratio of total public spending in GDP, income inequality, social public spending in GDP, non-social public spending in GDP, SOEs investment in GDP and employment rate.

$$E(y_{i,t-\rho} \Delta u_{i,t}) = 0 \text{ For all } \rho=2, \dots, t-1.$$

The resulting instrument matrix for the past values of the endogenous variable can then be written as:

$$Z_i^{\Delta, (y)} = \begin{pmatrix} y_{i0} & 0 & \dots & \dots & 0 & \dots & 0 \\ 0 & y_{i0} & y_{i1} & 0 & 0 & \dots & 0 \\ 0 & \dots & & \vdots & \vdots & \dots & 0 \\ 0 & \dots & 0 & 0 & y_{i0} & \dots & y_{iT-2} \end{pmatrix}$$

And analogously for the set of strictly exogenous explanatory variables (X_{it-1}):

$$Z_i^{\Delta,(x)} = \begin{pmatrix} x'_{i0} & \cdots & x'_{iT-1} & 0 & \cdots & \cdots & 0 & \cdots & 0 \\ 0 & \cdots & 0 & x'_{i0} & \cdots & x'_{iT} & 0 & \cdots & 0 \\ 0 & \cdots & & & \cdots & 0 & \cdots & & 0 \\ 0 & \cdots & \cdots & & \cdots & 0 & x'_{i0} & \cdots & x'_{iT-1} \end{pmatrix}$$

And the full set of the first difference transformed model Z_i^{Δ} is given by:

$$Z_i^{\Delta} = \left(Z_i^{\Delta,(y)}, \quad Z_i^{\Delta,(x)} \right)$$

It can be written in matrix form as:

$$z_{i,t} = \Gamma_0 + \Gamma_1 z_{i,t-1} + e_{i,t}$$

Where $z_{i,t}$ is an $m \times 1$ vector in the PVAR model, Γ_1 is an $m \times m$ matrix of slope coefficient and $e_{i,t}$ is an $m \times 1$ vector of the composed error term. The PVAR model is thus a straightforward generalization of the univariate dynamic panel data model.

5.4 Data collection and analysis

This section focuses on the data of economic growth, total public spending and social spending, private and SOE investment, the total employed population and income inequality. The data of the variables employed in the national level analysis are time series data from 1978 to 2012. The provincial level data are panel data from 24 provinces from 1995 to 2010.

We use the real GDP per capita to measure economic growth at the national level due to the selected VECM methods. The Gini coefficient is used as a measure of income inequality. The national Gini coefficient is collected from Chen et al., (2010), and the provincial Gini coefficients from 1995 to 2010 are obtained from Tian (2012), where the Gini coefficients are calculated with the same data source and method. All the other data have been collected from the 'China's Statistical Yearbook' by the National Bureau of Statistics (NBS) and the 'Finance Yearbook of China' by the Ministry of Finance of China

over various years.

5.4.1 Measurement of the Gini coefficient

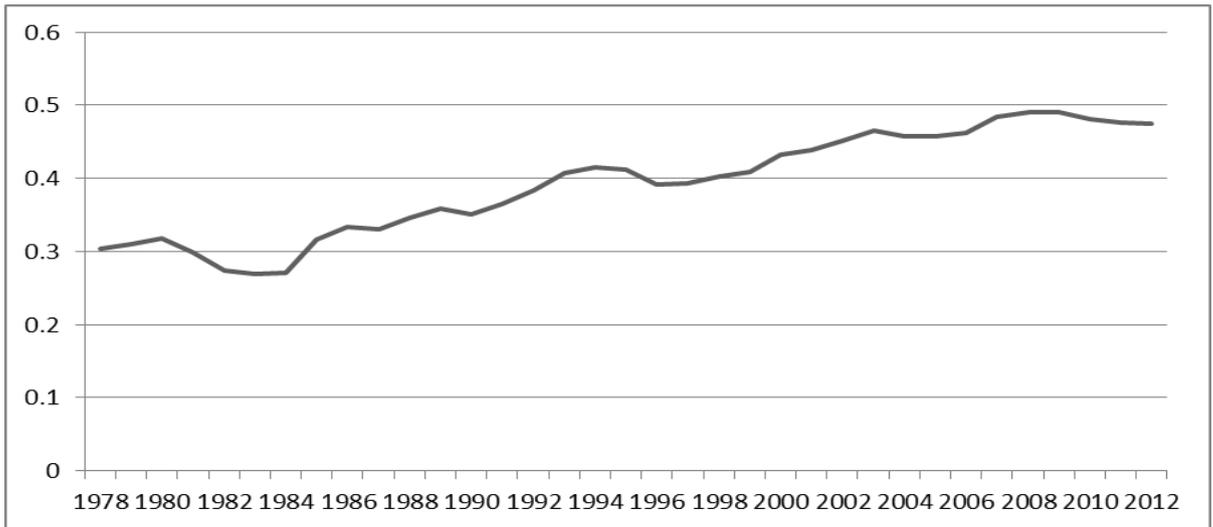
There are two main data sources regarding income inequality in China: the annual household income and expenditure surveys of the NBS, and the periodic national household surveys of the China Household Income Project (CHIP). The NBS surveys contain numerous observations from 1978 onwards, but feature only a limited number of questions. The CHIP surveys relate to the years 1988, 1995, 2002 and 2007, and they feature more comprehensive questions and definitions as regards income comparisons between rural and urban areas (Knight et al., 2013). Since 2007, the China Family Panel Studies (CFPS) dataset has launched independent research into public policy and family income, provided by Beijing University. Kanbur and Zhang (1999) used the CHIP survey to examine the Gini coefficient in the sub-period 1988-1995. Longer term studies adopted the NBS micro data to obtain the Gini coefficient, such as those studies by Ravallion and Chen (2007), Fan and Sun (2008) and Chen et al., (2010). The annual household income survey of NBS is the most important data source to calculate the Chinese Gini coefficient, yet it does possess some limitations. For example, the statistical data in the yearbook has ignored the income disparity within each group, and it is generally not sufficiently accurate.

Based on their knowledge and understanding of the limitations of Chinese data, some scholars have implemented their own adjustments to the Chinese data to obtain a more accurate Gini coefficient. Ravallion and Chen (2007) adopted the cost of living (COL)⁴⁵ adjustments to measure the inequality between rural and urban areas. Chen et al., (2010) used a decomposition method⁴⁶ to obtain the national Gini coefficient. In the decomposition model, the Gini coefficient (G) of the whole country can be divided into three parts: the intra-rural Gini ratio (G_r), the intra-urban Gini ratio (G_u) and the Gini ratio between urban and rural areas (G_{ur}).

⁴⁵ They state that COL adjustments are not ideal, in that a common deflator is applied to all levels of income.

⁴⁶ The decomposition method is the most common method to calculate the aggregated Chinese Gini coefficient. It can be written as $G = G_{ur} + \delta G_u + \beta G_r$, where δ and β stand for the results of the population proportion of urban and rural areas (Chen et al., 2010).

Figure 5.1: China's overall Gini coefficient from 1978 to 2012



Source: data from 1978 to 2006, collected from Chen et al., 2010, and the 2007-2012 from the NBS of China.

Figure 5.1 shows China's overall Gini coefficient from 1978 to 2012. There is no continued data for China's overall Gini coefficient for the period 1978 to 2012 by NBS. Numerous studies have sought to measure China's Gini coefficient during the economic reform period, such as those of Chen and Fleisher (1996), Kanbur and Zhang (2005), Ravallion and Chen (2007), Fan and Sun (2008) and Chen et al., (2010). However, we cannot find a single study which encompasses the period from 1978 to 2012. In addition, the NBS has the Gini coefficient only after the year 2003. Therefore, we chose the data from Chen et al., (2010) and the NBS of China, because these two measurements of the Gini coefficient are consistent with both the data sample and calculation methods. For example, they have the same level of Gini coefficient for 2003 to 2006, which NBS and Chen (2010) both included. The overall Gini coefficient is calculated based on both the urban and rural Gini coefficients, which suggests that the urban-rural income gap plays an important role in China's inequality.

From Figure 5.1 we can see that the overall Gini coefficient increased significantly from about 0.3 to 0.5. At the beginning of the period of economic reforms, the overall Gini dropped slightly, then increased to about 0.4 in 1994, then it levelled off at around 0.4 until 2000, and increased to about 0.5 in 2008. The most common explanation for this growth in inequality was the reform of SOEs in the mid-1990s. As a result of this reform, thousands of workers lost their jobs from the former SOEs. Hence, the SOEs' reform

played an important role in the rise of inequality in the 1990s. The abolition of agriculture tax in 2004 benefitted all rural households, especially the poorer households who relied solely on agricultural output. In 2006, the social protection in urban areas improved significantly. Hence, the Gini coefficient fell after 2008, possibly as a consequence of the world economic crisis, as well as the rise in public spending on social welfare, which rose significantly. Furthermore, the decline may even suggest that the inflection point of Kuznets' inverted U-curve had been reached.

Similarly, in the decomposition model, Tian (2012) calculated the provincial Gini coefficient in Urban and Rural respectively. The equation is:

$$G = 1 - \frac{1}{PW} \sum_{i=1}^n (W_i + W_{i-1}) \times P_i$$

Where P is total population, W is total income and W_i is the income accumulated to group i. Then, he used the urban and rural Gini coefficient from the above equation and, following the 'Grouping weighting method' by Sundrum (1990), calculated the overall Gini coefficient at the provincial level. The Grouping weighting method is as follows:

$$G = P_c^2 \frac{u_c}{u} G_c + P_r^2 \frac{u_r}{u} G_r + P_c P_r \frac{u_c - u_r}{u}$$

Where G is the overall Gini in each province, G_c is the urban Gini and G_r is the rural Gini. As same as the population ratio P_c and P_r , u_c is the per-capita income in urban areas, u_r is the per-capita income in rural areas and u is the per-capita income in each province.

The following Figure 5.2 presents the inequality map of China, with different colours in the provinces and municipalities, which are divided in terms of the Gini coefficient value of resident income in 2010. Figure 5.2 indicates strong regional characteristics in the provincial Gini coefficient, which shows a trend of Gini coefficient increasing progressively with regions from the coast to inland, east to west. The three direct-controlled municipalities, Beijing, Tianjin and Shanghai, have a relatively high level of urbanization (around 80 per cent in 2010). Therefore, the gap in resident income between rural and urban areas does not make an obvious contribution to the overall resident income gap. The overall Gini coefficient of resident income in the three cities is below

0.3 per cent in each case, and the income distribution is reasonable. Compared with Beijing, Shanghai and Tianjin, the urbanization of Chongqing is much lower (53.02 per cent in 2010), therefore the gap between rural and urban resident income makes a huge contribution to the overall resident income gap. The numeral value of the Chongqing Gini coefficient is above the international warning line, and presents a fluctuating, rising trend since 2002. In 2002 it reached maximum peak of 0.4474, and in 2010 it was 0.4003.

Figure 5.2: The China's provincial inequality map in year 2010



Source: Data collected from (Tian, 2012), diagram by the author

As regards the provinces of Hebei, Liaoning, Heilongjiang, Jiangsu, Zhejiang, Anhui, Fujian, Jiangxi, Henan and Hubei, we can see from Figure 5.2 that the Gini coefficient ranges from 0.3 to 0.4, which indicates that the income distribution is comparatively reasonable. In contrast, in the other ten provinces of Shanxi, Inner Mongolia Autonomous Region, Hunan, Guangdong, Guangxi, Chongqing, Yunnan, Shaanxi, Ningxia and Xinjiang the Gini coefficient of resident income all exceed the warning line (0.4, according to the NBS). This illustrates a wider gap of resident income in these inland regions. Although the Gini coefficient of Sichuan resident income presents below 0.4, this

numeral value is nevertheless quite close to the international warning line, as the Gini coefficient of resident income reached 0.3931 in 2010.

The Gini coefficient of resident income of the provinces of Guizhou, Gansu and Qinghai exceed 0.45, which indicates a markedly imbalanced income distribution in the three provinces. In 2010, the Gini coefficient in these provinces was 0.4756, 0.4901 and 0.4735, respectively. In addition, their historically highest points were 0.4907, 0.4901 and 0.4735, respectively. It is not difficult to account for this. As a consequence of the complicated geographic environment, agriculture production depends more on natural factors, which causes the Gini coefficient of rural resident income to be markedly higher than those of other provincial areas. In the meantime, the gap in resident income between rural and urban areas is clearly wider than other provincial areas. The ratio of national urban to rural resident income is 3.23, the specific values being 4.07, 3.85 and 3.59, respectively, for the three provinces. Thus, the gap in resident income between rural and urban areas makes a greater contribution to the overall Gini coefficient than elsewhere in the country.

5.4.2 Summary of statistics at the national level

The national level analysis covers 35 years from 1978 to 2012, the period of China's whole economic liberalization, in which the Chinese economy experienced rapid growth, accompanied by a huge increase in public spending and investment. Moreover, inequality rose significantly at this time. In this thesis, two kinds of econometrics models are established to investigate the relationship between public spending, economic growth and inequality. This thesis mainly focuses on the public expenditure on social sectors, which include education, health and social protection (also called social security) spending. Kelly (2005) states that distributional outcomes can be influenced by any specific government spending that affects the income that individuals receive and spend in the markets. Social expenditure consists of spending on people's basic needs and well-being, such as social protection, health and education. Investment in human resources contributes to the enlargement of productive capacity by improving the quality of the labour force. For example, public spending provides opportunities for human capital development that would not be affordable to some individuals in a privately-funded

system. A debate exists as to whether public spending programmes do have their intended effects, but these programmes would be expected to equalize income distribution. If distributional outcome is the central objective of governments, then we should expect the government to use public spending as a tool to influence income inequality.

In its econometric analysis, this thesis uses the constant price values based on 1978. Firstly, we use the real GDP index from the NBS of China to obtain the real GDP for each year. Secondly, we calculate the GDP deflator for each year. Then, all other nominal economic variables are divided by the GDP deflator in order to remove the impact of price inflation. Moreover, this dissertation uses real GDP per capita to measure economic growth. The share of social welfare indicates the sum of education, health and social protection spending in total national public spending. Private investment is calculated by total investment minus investment of SOEs. The ratio of employed labour to total population measures the size of the working population. All the above data is from the Statistical Yearbook of the NBS of China. The overall Gini coefficient is obtained from Chen et al., (2010) for 1978-2003 and NBS of China for 2004-2012.

Table 5.1: Summary of statistics of national level data from 1978 -2012

Variable	Obs.	Mean	Std. Dev.	Min	Max
Ln (real GDP per capita)	35	7.309	0.869	5.943	8.785
Ratio of national public spending to GDP	35	0.190	0.052	0.112	0.316
Ratio of Social spending to GDP	35	0.037	0.016	0.021	0.079
Ratio of non-social spending to GDP	35	0.154	0.051	0.090	0.293
Overall Gini coefficient	35	0.392	0.070	0.269	0.491
Ratio of employed population	35	0.529	0.06	0.417	0.571
Ratio of total investment to GDP	33	0.375	0.141	0.196	0.722
Ratio of private investment to GDP	32	0.178	0.140	0.005	0.500
Ratio of SOE investment to GDP	33	0.174	0.021	0.136	0.224

Source: NBS, China Statistical Yearbook, and Chen et al., (2010) for Gini coefficient from 1978 to 2003

The summary statistics are reported in Table 5.1, and Appendix B shows the trend of each variable from 1978 to 2012. There are some missing values for private and SOE investment in the years 1978, 1979 and 1980 respectively. Hence, they have fewer observations than other variables. Real GDP per capita growth increased four-fold, from 381.2 Chinese Yuan in 1978 to 6538.3 Chinese Yuan in 2012, with an average growth rate of real GDP per capita of 8.8 per cent annually. Therefore, the ln (GDP per capita) increased from 5.943 to 8.785 during the last 35 years. For the entire Chinese economic

reform period (1978-2012), the average ratio of total public spending was 19 per cent of GDP, with a minimum value of 11.2 per cent of GDP and a maximum value 31.6 per cent of GDP. However, there was a significant decline between 1978 and 1994 during the first part of the process of fiscal reforms. After the TSR in 1994, the size of total public spending in GDP doubled from 11 per cent in 1995 to 24 per cent in 2012. Moreover, there has been an upward trend for the Gini coefficient over the last 35 years, which increased from 0.3 in 1978 to 0.47 in 2012. The Gini coefficient had a minimum value of 0.26 in 1983, and a maximum value of 0.49 in 2008.

Social spending and private spending experienced a similar upward trend over the recorded 35 years. The ratio of social welfare spending in GDP increased from 3.7 per cent in 1978 to 7.9 per cent in 2012, and the ratio of other spending also increased from 15.4 per cent of GDP to 29.3 percent of GDP. At the same time, the ratio of private investment to GDP increased from 0.5 per cent in 1981 to 50 per cent in 2012. However, the ratio of SOE investment fluctuated during those 35 years, with a relatively high level in the 1980s and early 1990s, then falling in the late 1990s with advent of privatization, before increasing significantly along with the huge economic stimulation plan of 2009. The ratio of employed labour to total population experienced a significant growth between 1978 and 1989. However, there was a positive shock on the number of employed people in 1990 compared with 1989. Therefore, there was a dramatic jump in 1990, and then it maintained a similar level of around 57 per cent of the total population.

5.4.3 Summary statistics at the provincial level

Data at the province level were obtained from the Statistical Yearbook of China (1995-2011), the NBS of China. This thesis includes the real growth rate of provincial GDP per capita, the real growth rate of provincial public spending and its share of GDP, the share of social spending⁴⁷ in total public spending, the Gini coefficient, labour growth rate, SOE investment and private investment. Table 4.2 provides a summary of the statistics of all the provincial level panel data from 1995 to 2010. Table 4.3 shows a summary of statistics of means of variables used in provincial level analysis. The first column shows

⁴⁷ It is called '*Min Sheng*' spending or spending on people's well-being in China, which can directly affect people's welfare and standard of living.

the means of real GDP growth rate from 1995 to 2010 for each province. The real GDP per capita is based on the price levels in the year 2000. The overall summary of statistics is reported in Table 4.2 for the post-tax reform period. The mean of variables is reported in Table 4.3, and the standard deviation, minimum and maximum are reported in Appendix B. From the analysis of the provincial level data, we can see that the average provincial growth rate of real GDP per capita is 10.1 per cent annually, with a maximum growth rate of 32.3 per cent in Guizhou and a minimum growth rate of a negative 6 per cent in Shanghai.

Table 5.2: Summary of statistics of provincial level data from 1995 to 2010

Variable	Obs.	Mean	Std. Dev.	Min	Max
Real GDP growth (pc)	384	0.101	0.041	-0.064	0.323
Public spending as share of GDP	384	0.150	0.070	0.049	0.550
Ratio of social spending to GDP	382	0.335	0.070	0.009	0.796
Ratio of non-social spending to GDP	382	0.099	0.043	0.030	0.320
The growth rate of employees	384	0.014	0.030	-0.266	0.269
Ratio of private investment to GDP	32	0.223	0.123	0.032	0.656
Ratio of SOEs' investment to GDP	382	0.225	0.074	0.078	0.471
Overall Gini coefficient	384	0.379	0.058	0.228	0.491

Source: NBS, China Statistical Yearbook (1995-2010)

Table 5.3: Means of variables in provincial level data from 1995 to 2010

	Growth rate of GDP	Public spending in GDP	Social spending share	Gini	private investment in GDP	SOEs' investment in GDP	Growth rate of labour	GDP pc rank	location
Shanghai	0.072	0.155	0.236	0.278	0.231	0.233	0.013	1	East
Beijing	0.088	0.147	0.301	0.267	0.215	0.215	0.046	2	East
ZheJiang	0.100	0.083	0.313	0.353	0.294	0.202	0.024	3	East
GuangDong	0.088	0.102	0.283	0.393	0.202	0.141	0.03	4	East
JiangSu	0.108	0.081	0.327	0.337	0.28	0.184	0.015	5	East
LiaoNing	0.092	0.132	0.341	0.345	0.277	0.189	0.007	6	East
FuJian	0.096	0.092	0.356	0.371	0.219	0.159	0.022	7	East
NeiMengGu	0.144	0.169	0.284	0.391	0.218	0.239	0.009	8	Central
Heilongjiang	0.079	0.142	0.33	0.346	0.146	0.186	0.009	9	East
Hebei	0.099	0.094	0.366	0.335	0.284	0.22	0.008	10	East
Xinjiang	0.083	0.193	0.351	0.435	0.168	0.29	0.018	11	West
HuBei	0.11	0.117	0.353	0.362	0.199	0.227	0.01	12	Central
ShanXi	0.109	0.147	0.378	0.39	0.177	0.225	0.009	13	Central
ChongQing	0.112	0.138	0.363	0.42	0.301	0.207	0.006	14	West
HeNan	0.11	0.102	0.367	0.37	0.252	0.174	0.017	15	Central

ShaanXi	0.122	0.16	0.355	0.439	0.174	0.28	0.007	16	West
Qinghai	0.100	0.306	0.385	0.451	0.169	0.359	0.018	17	West
NingXia	0.109	0.236	0.303	0.415	0.26	0.32	0.021	18	West
Sichuan	0.108	0.146	0.343	0.378	0.249	0.232	-0.012	19	West
JiangXi	0.104	0.136	0.348	0.348	0.247	0.197	0.01	20	West
AnHui	0.103	0.134	0.356	0.378	0.272	0.193	0.013	21	Central
Guangxi	0.094	0.145	0.332	0.419	0.212	0.176	0.015	22	West
Gansu	0.102	0.217	0.356	0.443	0.126	0.289	0.015	23	West
Guizhou	0.103	0.234	0.327	0.429	0.175	0.265	0.016	24	West
Total	0.101	0.150	0.336	0.379	0.223	0.225	0.014		

Notes: Expect in the case of location, values are the means over the period (1995-2010). The GDP per capita rank is based on the mean of real GDP per capita.

Source: NBS, China Statistical Yearbook (1995-2010)

In Table 4.3, we can see the regional disparity in economic development. All of the nine eastern (coastal) provinces are in the top ten ranking of GDP per capita. In addition, most western provinces are at the bottom of the ranking of GDP per capita. Contrastingly, the western provinces show a higher growth rate than the eastern provinces from 1995 to 2010. For example, Shanghai had the highest GDP per capita, yet the lowest growth rate of only 7.2 per cent between 1995 and 2010. The average share of provincial public spending took 15 per cent of GDP, with a 0.07 standard deviation. Its minimum value was 4.9 per cent of GDP in Jiangsu and the maximum value was 55 per cent of GDP in Qinghai. In Table 4.3, provincial public spending also experienced a strong regional disparity. We can see that the richer provinces have more public spending per capita, but this constitutes a smaller share of GDP than the poorer provinces. For example, the average total provincial public spending was only 8.1 per cent of GDP in Jiangsu, but 30.6 per cent of GDP in Qinghai province between 1995 and 2010. This also indicates that the richer eastern provinces had a lower level of public spending in GDP than the poorer provinces in the west. Moreover, the average social spending occupied 33.5 per cent of overall provincial level public spending.

Social welfare spending is the sum of the spending on education, health and social protection. The richest province, Shanghai, had a 23.6 per cent share of the total social spending share between 1995 and 2010, but the western province Qinghai had 38.5 per cent of total social spending. This suggests that the richer provinces have little interest in the welfare spending, despite their higher level of income. The eastern provinces also have a higher growth rate of numbers of employees than the western provinces, which

suggests that rural migrants migrated to the eastern provinces to find work between 1995 and 2010. The average share of private investment and SOE investment was 22.3 per cent and 22.5 per cent of GDP in the provinces overall. From Table 4.3, we can see that SOE investment had a higher share of GDP in the western provinces, and private investment had a higher share of GDP in the eastern provinces. This was also the case with the Gini coefficient, with the rich eastern provinces having relatively lower levels of inequality than the poorer western provinces.

5.5 The relationship between inequality and income levels in Chinese provinces

Income level is a crucial factor influencing the distribution of residents' income in both 'Kuznets inverted U curve' (1955) hypothesis and Barro's (2000) 'nonlinear relationship' between income levels and inequality. Although their points of view differ, the level of economic development plays an important role in the variation of the Gini coefficient. Therefore, in order to further investigate the shifting characteristic of the provincial Gini coefficient as regards income levels, we carried out an analysis of the relationship between the level of economic development and the provincial Gini coefficient in 24 Chinese provinces in 1995 and 2010.

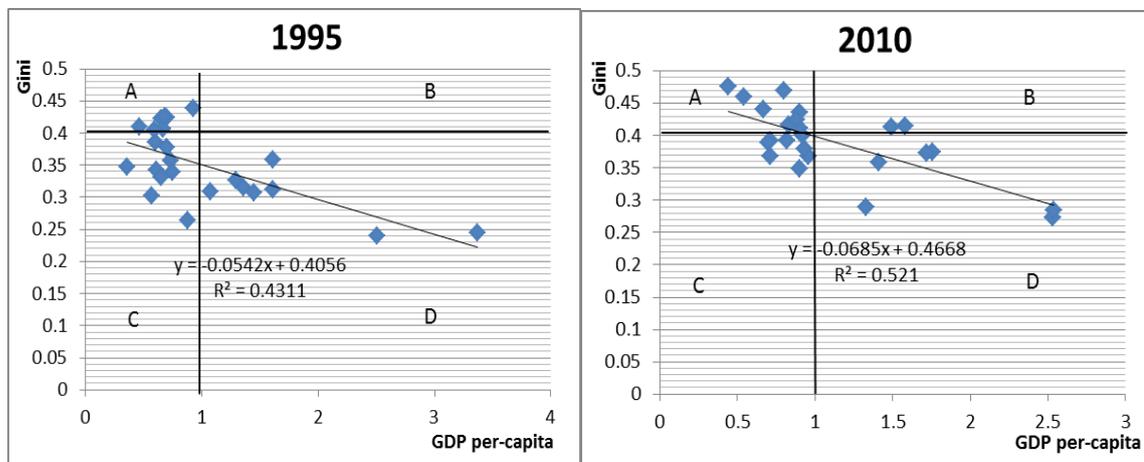
The Table 5.4 and Figure 5.3 reflect the degree of the overall provincial Gini coefficient and regional income levels. Table 5.4 includes China's 24 provinces and their GDP per capita level and Gini coefficient in 1995 and 2010. To standardize the income levels, we use the ratio of provincial regional GDP per capita to the national GDP per capita. Figure 5.3 features the distribution chart of income levels and the overall Gini coefficient at the provincial level in 1995 and 2010. The vertical axis is the Gini coefficient, and the horizontal axis is the relative provincial level GDP per capita. In addition, Figure 5.3 has been divided into four quadrants (districts A to D) according to the provincial income and inequality level. The horizontal-straight line presents the Gini coefficient that is equivalent to the warning line of the Gini coefficient (0.4), and the vertical-straight line indicates relative income level that is equal to one, which connotes that regional GDP per capita is equivalent to the national average level of GDP per capita.

Table 5.4: Analysis of the provincial Gini Coefficient and income levels in 1995 and 2010

Provinces	Year 1995			Year 2010		
	GDP	Gini	Position	GDP	Gini	Position
Beijing	2.51	0.24	D	2.53	0.27	D
Liaoning	1.36	0.32	D	1.41	0.36	D
Shanghai	3.37	0.24	D	2.54	0.28	D
Jiangsu	1.45	0.31	D	1.76	0.37	D
Zhejiang	1.61	0.31	D	1.72	0.37	D
Fujian	1.29	0.33	D	1.33	0.29	D
Hebei	0.88	0.26	C	0.96	0.37	C
Jiangxi	0.57	0.30	C	0.71	0.37	C
Hubei	0.73	0.36	C	0.93	0.38	C
Sichuan	0.6	0.39	C	0.71	0.39	C
Heilongjiang	1.07	0.31	D	0.9	0.35	C
Anhui	0.61	0.34	C	0.7	0.39	C
Henan	0.65	0.33	C	0.82	0.39	C
Guangdong	1.61	0.36	C	1.49	0.41	B
Inner Mongolia	0.75	0.34	C	1.58	0.42	B
Guangxi	0.65	0.42	A	0.67	0.44	A
Chongqing	0.67	0.41	A	0.92	0.40	A
Shaanxi	0.59	0.41	A	0.9	0.41	A
Gansu	0.46	0.41	A	0.54	0.46	A
Qinghai	0.7	0.42	A	0.8	0.47	A
Ningxia	0.68	0.43	A	0.9	0.44	A
Xinjiang	0.93	0.44	A	0.83	0.42	A
Shanxi	0.7	0.38	C	0.88	0.43	A
Guizhou	0.36	0.35	C	0.44	0.48	A

Source: Gini index from Tian (2012), GDP from China Statistical Yearbook from 1996 and 2011

Figure 5.3: The distribution of provincial income level and Gini coefficient in 1995 and 2010



Source: Gini coefficient from Tian (2012), and GDP from China Statistical Yearbook, 1996 and 2011

The economic meaning of each of the four quadrants is different. District A contains low income and high inequality provinces, which means the GDP per-capita is lower than the national average, and that the residents' income distribution is highly unequal. District B is for those provinces with both a high level of income and inequality. District C is for those provinces with low levels of income and inequality. District D includes those provinces with a high income level and low inequality, which is the objective of economic development.

Because the social preference is for low inequality and high income, therefore those provinces in District D perform better than the provinces in Districts A, B and C. Conversely, those provinces in District A have the lowest social objective function. If we treat inequality as being equally important as economic growth, then this suggests that those provinces in Districts B and C have the same social welfare objectives. However, most Chinese economists considered economic growth to be more important than income distribution in the period of economic reforms. According to division of the four quadrants, we can draw a regional judgment of income levels and income distribution in the years of 1995 and 2010 for each province; these results are shown in Table 5.8. In 2005, seven provinces or municipalities (Beijing, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian and Heilongjiang) appear in District D. This indicates that these seven provinces occupy the best position in terms of economic development with higher levels of income and lower levels of inequality. Heilongjiang province slipped into the District C in 2010, which indicates the slow economic growth of Heilongjiang from 1995 to 2010.

Ten provinces were located in District C in 1995, signifying a lower income level than the national average and low inequality as well. However, three of these provinces were moved to other positions. For example, Guangdong and Inner Mongolia shifted to District B by virtue of their fast growth of income and inequality. Shanxi and Guizhou dropped to District A, signifying low levels of income and a high level of inequality. Moreover, seven provinces occupied the worst position, district A, in 1995, and they remained there with both low levels of income and equality in 2010. Hence, provincial development did not mean a higher level of economic welfare from 1995 to 2010. Two provinces dropped to the lowest position A from a better position C, one province dropped to position C from the highest position D, and two provinces shifted from position C to B with higher level of income at the cost of higher inequality.

Furthermore, from Figure 5.10, we can see the negative relationship between the level of income and inequality in both 1995 and 2010. Compared with the figure for 1995, the negative relationship is more significant in 2010, indicated by the higher coefficient. From Table 5.9, we can see that the regional development characteristics conform to this division of eastern-western regions. All the provinces with the best economic development, in position D, are located in eastern coastal China. Conversely, all the provinces in position A, with lower levels of income and higher level inequality, are located in the western part of China. This shows a strong regional aspect in the levels of income and inequality, which basically identifies the eastern-western regional division as regards economic development.

5.6 Conclusion

This chapter has provided an econometric method and data analysis to investigate the effects of public spending on economic growth and inequality in China. Three research hypotheses have been found, and these hypotheses will be tested by different methods and data in Chapter 6. This chapter has explored two econometric methods, which are VECM estimation and the PVAR model. The Chinese data includes both a national sample from 1978 to 2012, and a provincial sample of 24 Chinese provinces from 1995 to 2010. The national analysis includes three main variables: real GDP per capita, the Gini coefficient and the ratio of total public spending to GDP in the basic model, then the share of social spending in total spending, the ratio of private investment and SOE investment and the ratio of employed people to the total population in the further developed models.

The provincial level analysis includes the real GDP per capita growth rate, the Gini coefficient, the size of total public spending or social public spending, private and SOE investment and the growth rate of the employed population at the provincial level through PVAR and panel data models. There are some major conclusions regarding the data analysis. Firstly, there was a significant growth of GDP per capita, private investment and social spending during the 35 years under analysis. However, the Gini coefficient rose dramatically. Secondly, the regional economic disparities are significant in the 24 provinces. For example, the eastern provinces had a higher GDP per capita, higher private

investment and growth rate of employees, but a lower growth rate and share of public spending. Moreover, the eastern provinces had a lower level of inequality than the western provinces. Conversely, the western provinces had a higher level of public spending and social spending, and a higher growth rate.

Nevertheless, the research in this paper still has shortcomings. Due to the lack of statistical resources, the calculation of the Gini coefficient still cannot cover all 31 provincial administrative regions. What is more, this research has not taken the influence of illegal and invisible income into account, nor out-budget public spending. These omissions could both lead to the depreciation of the Gini coefficient and total public spending. Future research may have to focus more on these issues.

Chapter 6: Estimations, Findings and Discussion

6.1 Introduction

The theoretical literature offers support to both the positive and negative effects of government size on economic growth. Governmental provision of public goods is thought to be conducive to growth (Aschauer, 1989; Ram, 1986). This idea has been formalized in the literature on endogenous growth models. In Barro's (1990) model, in which the government's size is relatively small, the economic growth rate rises with the increase in productive government spending as the positive effects of public spending dominate; however, beyond certain specific critical points, the disincentive effects of higher taxes on savings and investment reduce the growth rate. If Barro's nonlinear hypothesis is valid and the effect of government spending on long term economic growth does vary with its size, this will provide a clearer guideline as to the appropriate level of public spending for a particular country. Furthermore, in Barro's model, there exists an optimal size of government to maximize economic growth. Having an indication of this hypothetical optimum, as well as where a country stands relative to it, should be of potential interest to policymakers.

Currently, there is no clear consensus in the empirical growth literature on how government spending affects growth, because the optimal point is likely to differ in each country, and various factors may affect the break point. This chapter re-examines the role of public spending during China's economic development, which has featured rapid economic growth along with rising in income inequality. Firstly, this chapter tests the relationship between government spending and economic growth at the Chinese provincial level. Secondly, it examines the relationship between government spending and inequality during the period of fast economic growth. Thirdly, it investigates the relationship between economic growth and inequality. This chapter will investigate the dynamic relationship between public spending and China's economic development, which features both growth and inequality. In Chapter 5, three hypotheses were offered: Hypothesis 1: there are positive relationship between economic growth and national,

provincial public spending and their share of social spending in China. Hypothesis 2: there are negative relationship between income inequality and national, provincial public spending and their share of social spending in China. Hypothesis 3: There is a negative relationship between economic growth and inequality in China.

There are two reasons behind our assumption that public spending has a positive relationship on per capita GDP (Hypothesis 1) and a negative relationship with inequality (Hypothesis 2). Firstly, public spending is likely to have a positive effect in the long run on per capita income in the endogenous growth model, and it can crowd-in private capital in the Keynesian model. Secondly, public spending can counteract market failures and redistribute income between rich and poor people to promote equality in economic development. We also investigate the relationship between economic growth and inequality (Hypothesis 3) to examine whether China's economic growth has caused an increase in the level of inequality, and whether a high level of inequality hampered economic growth. In the national level analysis, we can test all three hypotheses in the VEC models with the annual data from 1978 to 2012. Then, PVAR method is applied to study the impact of public spending on economic growth and income inequality across 24 provinces from 1995 to 2010. This will not only provide a more detailed analysis of China's public spending, but will also provide a robustness check on the national level analysis. Therefore, Section 6.2 explores the trivariate dynamic relationship between public spending, GDP per capita and income inequality via the national level data in the VEC models. Sections 6.3 investigates the dynamic relationship between public spending, GDP per capita and inequality via provincial level data in the PVAR models. Section 6.4 provides a conclusion for this chapter.

6.2 Econometric results of national level analysis on the VECM approach

The aim of this section is to test the effects of total public spending, as well as social welfare spending, on growth and inequality at the national level in the VEC models.

Recall that in the neoclassical theory the aggregate production function serves as the platform on which the empirical model for public spending is built. Most well-known approach in this respect is the Barro (1990) model:

$$Y_i = AL_i^{1-\alpha} \cdot K_i^\alpha \cdot G^{1-\alpha}$$

Where Y denotes the level of output, K denotes the stock of domestic physical capital, G is public spending and L is the labor force. However, in the neoclassical endogenous growth model, there are a number of problematic assumptions. For example, it is assumed that saving determines investment and the capital accumulation process is driven by the saving behavior of households. Demand is assumed to automatically grow with output (Palley, 1996). These assumptions have been criticized by Keynesian scholars. For example, Bhaduri (2006) developed a post-Keynesian endogenous model based on the demand-led growth and income distribution. It helps to overcome the error of ‘omission’ on the effective demand and the error of ‘commission’ on the supply side to the faulty assumption on the capital and labour substitution. Moreover, there is no role in neo-classical approach for income distribution to affect the output growth on the supply side (Onaran, 2011). Therefore, the Keynesian economics, especially the post-Keynesian view, is more relevant for our purposes in this thesis.

The Keynesian aggregate demand can be written as:

$$Y = AD = C + I + G + NX$$

Bhaduri (2006) presents a demand side endogenous growth model where labour productivity is driven by inter-class conflict over income distribution between workers and capitalists and it is adjusted through the gap between the growth rates of real wage and labour productivity. In Bhaduri (2006) model:

$$dg_y/dt = a(g_I - g_S), \quad a > 0, \quad g_I = \eta_y g_y + \eta_x g_x, \quad g_S = \varepsilon_y g_y \quad \text{and} \quad g_y = g_x + g_L$$

Where Y is the output level, X is the labour productivity level, L is the employment level, I is investment, S is saving, and η_y and η_x are positive partial elasticities of investment with respect to output and investment, respectively. Saving is treated as an increasing function of income. In the Bhaduri (2006) growth model, the long run steady-state growth

rate is determined by the growth of labour, investment and saving decisions. This result shows that the endogenous growth of labour productivity provides long run output growth on the supply side. In addition, the income distribution which is measured by the wage share is related in the output growth. For example, an increase in the wage share has positive effect on the private consumption, but a negative effect on investment and export. Therefore, the total effect of changing wage share on aggregate demand depends on the sum of these effects. If an increase in the wage share (reducing inequality) increases aggregate demand and output, it is a wage-led growth; conversely, if it results in a decrease in the aggregate demand and output, it is profit-led growth (Onaran and Galanis, 2013).

In Chapter 5, we have the standard form of VEC model:

$$\Delta Y_t = EC_{t-1} Y_{t-1} + D_1 \Delta Y_{t-1} + \dots + D_{p-1} \Delta Y_{t-p+1} + \varepsilon_t$$

The coefficient of EC_{t-1} is expected to be negative and it shows the eliminating speed of disequilibrium. Drawing on these insights, our empirical models are:

Model one:

$$\ln Y = f[Gini, G, I, L], \quad Gini = f[\ln Y, G, I, L]$$

Where Y indicates the real GDP per-capita, G denotes total public spending, I represents total investment and L is the employment level. Gini coefficient has also been included as an aggregate measure of income distribution which can affect domestic consumption and output.

Model two:

$$\ln Y = f[Gini, G_s, G_{ns}, I_p, I_s, L], \quad Gini = f[\ln Y, G_s, G_{ns}, I_p, I_s, L]$$

Where investment is split into private investment (I_p) and SOEs' investment (I_s), and total public spending is split into social spending (G_s) and other spending (G_{ns}). Specifically, seven variables have been included in VEC model two, which are: the real GDP per-capita (Y_t), the ratio of social spending to GDP ($G_{s,t}$) and non-social spending to GDP ($G_{ns,t}$), the ratio of total investment to GDP (I_t), the ratio of private investment to

GDP (Ip_t), the ratio of SOEs' investment to GDP (Is_t), employed labour in total population (L_t) and the Gini coefficient ($Gini_t$).

The stationary time series plays a key role in econometric analysis. A spurious regression with high R-squared and t-statistics can be misleading when one statistically independent random walk is regressed on another one i.e. with a unit root. Therefore, we first check whether the variables under consideration are stationary (without a unit root). The popular method to check unit roots is the Augmented Dickey-Fuller (ADF) test. The ADF procedure aims to retain the validity of tests by choosing an appropriate lag length by minimizing the use of the Akaike's Information Criterion (AIC). As described by Dickey and Fuller (1981), one can use the statistics analogous to the regression t-statistics for testing the null hypothesis of units' roots. For example, the ADF test is conducted using the regression of the form:

$$\Delta Y_t = \delta Y_{t-1} + \sum_{j=1}^{p-1} \varphi_j \Delta Y_{t-j} + \theta_0 + a_t$$

Where ΔY_t are the first differences of the Series Y, p-1 is the lag order and t stands for time. In the ADF test, the null hypothesis is that the variable has a unit root. The lag order of each variable is determined by the AIC. If the t-statistics are greater than the significant level, we can reject the null hypothesis, which indicates the variable is stationary.

Table 6.1 ADF Test for the unit roots of all national variables in the VAR models

Variables	ADF (t) statistics in levels I(0)		ADF (t) statistics in first difference I(1)	
$(\ln Y_t)$	0.115	Non-stationary	-2.705**	Stationary
$(Gini_t)$	-0.658	Non-stationary	-3.659**	Stationary
(G_t)	-1.072	Non-stationary	-2.864**	Stationary
(Gs_t)	-0.433	Non-stationary	-4.679***	Stationary
(Gns_t)	-1.432	Non-stationary	-4.264***	Stationary
(I_t)	1.014	Non-stationary	-2.553*	Stationary
(Ip_t)	2.199	Non-stationary	-2.635*	Stationary
(Is_t)	-1.616	Non-stationary	-3.980***	Stationary
(L_t)	3.451	Non-stationary	-2.303**	Stationary

Notes: ***indicates a 1 per cent significant level, **indicates a 5 per cent level and * indicates a 10 per cent level

In Table 6.1, we can see all the variables in the levels have a non-significant t-statistic. Hence, we cannot reject the null hypothesis. However, using the differenced data, the computed ADF test suggests that the null hypothesis is rejected for the individual variables with at least 10 per cent significant level. Therefore, they are stationary in the first order I (1). The model is fitted to the first differences of the non-stationary variables, but a lagged error-correction term is added to the relationship, where there is evidence of cointegration between two or more series in the VECM. Having confirmed that the variables are stationary in first differences, we adopt the Johansen Cointegration Test (1988, 1991) to examine whether the variables have common trends. The numbers of cointegrating vectors are shown in the maximum eigenvalues' statistics. In order to check the robustness of the results, we test the cointegrating vectors in the Johansen Cointegration test. The consequences of over-estimation of the order of the VAR is much less serious than under-estimating it (Garratt et al., 2003). The national level VEC models only include 2 year lag lengths because of the small time sample. It is also customary to identify the optimal lags in the VECM models. Cointegration by itself does not indicate the direction of the causal relationship. Granger (1988) proposes a Granger Causality test to study the long term causality relation between variables, which can be captured from the VAR model. However, this requires at least one cointegration relationship between the variables. The general procedure proposed by Johansen (1988) has the advantage of testing all the possible cointegrating relationships.

Table 6.2: Johansen Cointegration Test for VEC model one and two

Ho	H1	Trace statistic(Lag=2)	5% Critical Value
Model one:			
$r = 0$	$r \geq 1$	95.495	68.52
$r \leq 1$	$r \geq 2$	46.955**	47.21
$r \leq 2$	$r \geq 3$	25.034	29.68
Model two:			
$r = 0$	$r \geq 1$	210.925	124.24
$r \leq 1$	$r \geq 2$	10.39	94.15
$r \leq 2$	$r \geq 3$	94.398	68.52
$r \leq 3$	$r \geq 4$	56.902	47.21
$r \leq 4$	$r \geq 5$	32.961**	29.68

$r \leq 5$	$r \geq 6$	11.811	15.41
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Note: VEC model one includes (*Gini, G, I, L*) and VEC model two includes (*Gini, Gs, Gns, Ip, Is, L*). ** denotes rejection of the null hypothesis at the 0.05 level. The number of observations=33, lags=2

The Johansen Cointegration test is reported in Table 6.2. The results of Table 6.2 reject the null hypothesis of no cointegration ($r=0$ and $r \leq 1$) and fail to reject the null hypothesis of at most two cointegrating equation ($r \leq 2$) in VEC model one, and fail to reject the null hypothesis of at most five cointegrating equation ($r \leq 5$) in VEC model two. The trace statistics are statistically significant at the 5 per cent level to reject the null hypothesis of no cointegration in the Lag (2). Therefore, we have confirmed the variables in VEC models one and two are cointegrated, so that we can carry out ECM models based on these variables. The results of the Johansen Cointegration Test show there is at least one cointegrated combination between variables, in which we can investigate the direction of long run causality between the variables in the VEC models.

6.2.1 The growth effects of public spending and inequality

In the standard VAR model, there is one equation for each and every variable. Therefore, all variables are assumed to be endogenous, which avoids unnecessary *a priori* distinctions between endogenous and exogenous variables. Any assumptions regarding endogenous and causal effects can be tested. Hence, we adopted the VEC techniques to investigate the relationship between public spending, economic growth and inequality. Because we only have a short time period consisting of only 35 annual observations and we use the first difference of variables, we decided to use the 2 lag length in the VEC models.

In this section, we use the general-to-specific strategy⁴⁸ to estimate the dynamic trivariate relationship between public spending, economic growth and inequality. VEC model (1) include three variables [(Y_t), ($Gini_t$), (G_t)] and two more control variables (I_t) and (L_t), and VEC model (2) separates (G_t) into (G_s) and (G_{ns}), and (I_t) into (Ip_t) and (Is_t)

⁴⁸ The general-to-specific strategy is a 'progressive research strategy' (Hendry, 2000). It ensures that the space of alternative specifications is fully explored, minimizing the danger that relevant competing specifications are ignored, and ensures that no information is lost relative to the general specification.

respectively. The VEC models (1) and (2) only have two-year lags to conserve degrees of freedom because of the short time period involved. The error-correction terms (Ec_{t-1}) measures the disequilibrium, which represents stochastic shock in the dependent variables. Specifically, they represent the proportion by which the long term disequilibrium in the dependent variables is corrected in each short term period. The coefficients of the error-correction term are expected to be negative and statistically significant (Loizides and Vamvoukas, 2005).

Table 6.3: Estimates of growth effects in VEC models

Model one: dependent variable LnY_t		Model two: dependent variable LnY_t	
variables	coefficients	variables	coefficients
(Ec_{t-1})	-0.004 (-5.35)**	(Ec_{t-1})	-0.0457 (-2.07)**
$(DGini_{t-1})$	-0.501 (-2.77)**	$(DGini_{t-1})$	-1.33 (1.18)
(DG_{t-1})	0.325 (1.58)*	(DGS_{t-1})	-1.535 (-1.68)*
(DI_{t-1})	0.134(1.56)*	$(DGns_{t-1})$	1.013 (2.21)**
(DL_{t-1})	0.678 (2.48)**	(DIp_{t-1})	0.060 (0.33)
		(DIS_{t-1})	0.324 (1.66)*
		(DL_{t-1})	0.026 (0.08)
R^2	0.982	R^2	0.972
LM test (p-value)	0.756	LM test (p-value)	0.716
Long run coefficients			
(Gini)	-11.118 (-4.38)**	(Gini)	-0.407 (0.36)
(G)	15.601 (8.28)**	(Gs)	-10.416(-1.86)**
(I)	2.018 (2.43)**	(Gns)	7.476(3.59)**
(L)	26.667 (8.18)**	(Ip)	3.173(6 .81)**
		(Is)	-5.761(-6.66)**
		(L)	5.964(3.92)**

Notes: ***indicates statistical significance at a 1 per cent level, **indicates a 5 per cent level and * indicates a 10 per cent level. Asymptotic t-statistics are in parentheses. The error-correction term Ec_{t-1} is the residual series from the long run regressions. LM (p-value) is the probability to reject the null hypothesis that there is no autocorrelation lag order. The long run equilibrium relationships are reported at the bottom parts of the table.

Table 6.3 presents the VECM results with both short and long term growth effects. The short run equilibrium relationships are reported at the top parts of the Table 6.3, and the long run

relationships are reported at the bottom part of the Table 6.3. It only reports the impacts of variables on real output fluctuation. The coefficients on the first differences of ($Gini_t$), (G_t), (I_t), (Gs_t), (Gns_t), (Ip_t), (Is_t) and (L_t) are short term impacts on the dependent variables LnY_t . The long term parameters of independent variables on Y_t and the LM tests for the autocorrelation in each VEC models are also reported in Table 6.3.

VEC Models (1) and (2) indicate the impacts of total public spending on economic growth and inequality with different control variables. The essential short run results in VEC Model (1) are: firstly, the error-correction term Ec_{t-1} is negative and statistically significant, which indicates the negative feedback necessary in real GDP to bring the regression back to equilibrium; secondly, $DGini_{t-1}$ has a statistically significant negative impact on DY_t , and thirdly, DG_{t-1} has a statistically positive impact on DY_t . Therefore, we find that total public spending has a positive effect on economic growth, and inequality has a negative impact on economic growth in the short term. This confirms the Keynesian view regarding the growth effect of public spending in the short term. For example, in VEC Model (1), if the size of public spending in GDP increases by 1 per cent, real output will increase by 0.32 per cent in next year. Conversely, increasing the Gini coefficient (inequality) by 1 per cent means real output will decline by 0.5 per cent in the following year. VEC Model (1) also includes total investment and the employed population as the control variables, they have statistically significant positive effect on the real output.

VEC Model (2) divides the total public spending into social spending and non-social spending and the total investment into private investment and SOEs investment, respectively. $DGini_{t-1}$ has a negative effect on the real output fluctuation, but not statistically significant. DGs_{t-1} has a statistically significant negative effect on the real output fluctuation, which suggests that the social spending can reduce real output growth in the short run. On the other hand, $DGns_{t-1}$ has a statistically significant positive effect on the real output fluctuation, which suggests that the non-social spending plays an important role on the real output growth in the short run. Compared with social spending, the non-social spending has a greater effect on the real output during the economic transition period. Similar results have been found by Jin and Gang (2012), Yang (2009) and Zhou (2010). They suggest that the effects of public spending were unevenly distributed between people's welfare and economic construction during China's economic reform. The social spending is too little (less than 10 percent of GDP and 30 percent of total public spending) compared with most of the western economies. During the

economic transition, the private investment has increased significantly. Compared with SOE's investment, private investment is more market based. However, it has no significant short run effect on the real output fluctuation. On the other hand, the SOE's investment has a statistically significant positive effect on the change of real output during China's economic reform. This indicates that the SOE's investment has dominated the China's economic development. The ratio of employed population has no significant short run impact on real output in the VEC Model (2).

The statistically significant negative error-correction terms indicate that total public spending and the Gini coefficient have a long term causal relationship with real GDP per capita in both VEC models (1) and (2). The long term cointegrating coefficient is from the Johansen normalization restriction-imposed equations. Hence, we can explore the long term growth effects of variables on real GDP per capita in VEC models. In the VEC Model (1), the ratio of total public spending to GDP has a statistically significant positive relationship with real GDP per capita in the long term, and the Gini coefficient (inequality) has a statistically significant negative long term relationship with GDP per capita. The coefficients of Ec_{t-1} strongly support that the real GDP per capita is related with total public spending growth, as well as with any increase in income inequality. Hence, public spending has a positive effect in both the short and long term, which supports both the Keynesian view and neoclassical endogenous growth theories. Inequality has a negative impact on real GDP per capita in the long term. It suggests that higher level of inequality will reduce the growth of real output in the long run. Moreover, the total investment and employed labour have a statistically significant positive relationship with real output, which indicates that higher investment or employment will increase the real output in the long run.

Moreover, VEC Model (2) employs the ratio of social welfare spending in GDP and the ratio of non-social spending instead of the total size of public spending. We find that social public spending has a statistically significant negative effect on real GDP per capita in the long term in VEC model two. On the other hand, the non-social spending has a statistically significant positive effect on real GDP per capita. The SOE's investment has a statistically significant negative relationship real GDP per capita in the long term, where it has a positive relationship with real GDP per capita in the short term. Conversely, the private investment has a statistically significant positive relationship with real GDP per

capita in the long term, where it is not statistically significant in the short term. Hence, the SOE's investment plays an important role on real output growth in the short term, but private investment helps the growth of real output in the long term. Moreover, the Gini coefficient is not statistically significant in the short and long term in VEC Model (2).

Therefore, at the national level, total public spending has a positive Granger causal relationship with real GDP per capita in the long and the short term. The same result have been suggested by Dong and Teng (2007), Li and Wu (2009) and Zhou (2010), who have reported a strong Keynesian effect of total public spending on economic growth in China from 1978 to 2006. The results also indicate that social spending has a negative impact on economic growth in the short and long term. The non-social spending has a positive impact on real GDP per capita in the short and long term. The positive impact of total public spending on economic growth has been suggested by macroeconomics theories, especially the Keynesian school of thought. Government spending can accelerate economic growth by increasing non-social spending (e.g. public investment) in the short term or increasing social spending in the long term. The same results have been reported by Guo and Jia (2006) and Xia (2009), who argue that social spending is less efficient compared with capital spending, so social spending may have a negative effect on economic growth in the short term. Hence, we accept the *Hypothesis 1* with respect to total public spending, that is total national public spending has a positive effect on real GDP per capita in both short term and long term. However, social spending has a negative effect on real GDP per capita in both short and long term. The non-social spending has a positive effect on real GDP per capita in the short term and long term.

The total investment has a positive Granger causal relationship with real GDP per capita in the long and the short term. As the non-social public spending, SOE's investment has a positive impact on real GDP per capita in the short term, but a negative impact on real GDP per capita in the long term. The private has a positive impact on real GDP per capita in the long term, but no significant impact on real GDP per capita in the short term. The Gini coefficient has a negative Granger causal relationship with real GDP per capita in the long and the short term in VEC Model (1), but not statistically in VEC Model (2). The employed labour has a positive Granger causal relationship with real GDP per capita in the long and the short term in the VEC Model (1), but only has a significant positive relationship with real output in the VEC Model (2).

6.2.3 The redistributive effects of public spending and economic growth

The previous section investigated the growth effects of public spending in China during the last 35 years. We found the total national public spending has a statistically significant positive effect on economic growth. This section explores the redistributive effects of public spending and the relationship between inequality and economic growth in China. Table 6.4 shows the relationship between independent variables and inequality based on VEC model one and two. It presents the VECM results with both the short and the long term growth effects. The short run equilibrium relationships are reported at the top parts of the Table 6.4, and the long run relationships are reports at the bottom part of the Table 6.4. It only reports the impacts of variables on Gini coefficient, where the first differences of $(DLnY_t)$, (G_t) , (I_t) , (GS_t) , (Gns_t) , (Ip_t) , (Is_t) and (L_t) are short term impacts on the dependent variables $DGini_t$. The long term parameters of independent variables on $Gini_t$ and the LM tests for the autocorrelation in each VEC models are also reported in Table 6.4.

In the VEC Model (1), variable $(DLnY_{t-1})$ has a statistically significant positive effect on dependent variable $DGini_t$ in the short term. This indicates that a rise in GDP per capita by 1 per cent would increase the Gini coefficient by 0.25 per cent in the following year. Variables DG_{t-1} , DI_{t-1} and DL_{t-1} are not statistically significant in the short term. However, the error-correction terms (Ec_{t-1}) are statistically significant with a negative sign. Thus, there is a long term causal relationship in VEC Model (1). There is also a positive long term relationship between the Gini coefficient and real GDP per capita in VEC Model (1), implying that a higher level of GDP will also increase income inequality in China. The total investment has a positive relationship with Gini coefficient in the long term. On the other hand, total public spending and employed labour have a negative relationship with income inequality in the long term, respectively. Therefore, increasing total public spending and employed labour can reduce the income inequality in the long term, but this effect is not statistically significant in the short term. Total investment can increase the income inequality in the long term, but again this is not statistically significant in the short term. Only the real GDP per capita has a statistically significant positive impact on inequality in both of the short term and the long term.

Table 6.4: The estimates of redistributed effects in VEC models

Model one: dependent variable $DGini_t$		Model two: dependent variable $DGini_t$	
variables	coefficients	variables	coefficients
(Ec_{t-1})	-0.174 (-2.51)**	(Ec_{t-1})	-0.005 (-2.36)**
$(DLnY_{t-1})$	0.251 (2.62)**	$(DLnY_{t-1})$	0.278 (2.25)**
(DG_{t-1})	0.096 (0.56)	(DGS_{t-1})	-0.456 (-0.46)
(DI_{t-1})	-0.083(-1.10)	$(DGns_{t-1})$	0.182 (0.58)
(DL_{t-1})	0.111 (0.51)	(DIP_{t-1})	-0.130 (-1.68)*
		(DIS_{t-1})	0.079 (0.58)
		(DL_{t-1})	0.346 (1.66)*
R^2	0.593	R^2	0.485
LM test (p-value)	0.756	LM test (p-value)	0.716
Long run coefficients			
(LnY)	0.009 (2.35)**	(LnY)	2.460 (6.77)**
(G)	-1.403 (-7.68)**	(Gs)	-6.380(-3.43)**
(I)	0.181 (1.87)**	(Gns)	1.318(0.24)
(L)	-2.398 (-8.15)**	(Ip)	-7.805(-5.55)**
		(Is)	14.171(6.58)**
		(L)	-14.646(-4.01)**

Notes: ***indicates statistical significance at a 1 per cent level, **indicates a 5 per cent level and * indicates a 10 per cent level. Asymptotic t-statistics are in parentheses. The error-correction term Ec_{t-1} is the residual series from the long run regressions. LM (p-value) is the probability to reject the null hypothesis that there is no autocorrelation lag order. The long run equilibrium relationships are reported at the bottom parts of the table.

In the Table 6.4, VEC Model (2) divides the total public spending into social spending and non-social spending and the total investment into private investment and SOEs' investment, respectively. In line with VEC Model (1), variable $(DLnY_{t-1})$ has a statistically significant positive effect on dependent variable $DGini_t$ in the short term. It indicates that an increase in GDP per capita by 1 per cent would raise the Gini coefficient by 0.278 per cent in the following year. Variable DIP_{t-1} has a statistically negative impact on $DGini_t$ at the 10 per cent significance level. In the short term, the dynamic relationship between private investment and inequality indicates that a higher level of private investment can reduce the income inequality in the short term. On the other hand, DL_{t-1} has a positive effect on $DGini_t$ at the 10 per cent significant level which implies that a higher level of employment will increase the income inequality in the short term. Moreover, the variables DGS_{t-1} , $DGns_{t-1}$ and DIS_{t-1} do

not have a statistically significant impact on $DGini_t$, which indicates that the social spending, non-social spending and SOE's investment have no short term relationship with Gini coefficient in VEC model (2).

The error-correction terms (Ec_{t-1}) measures the disequilibrium, which represents stochastic shock in the dependent variables. Specifically, they represent the proportion by which the long term disequilibrium in the dependent variables is corrected in each short term period (Loizides and Vamvoukas, 2005). The statistically significant negative error-correction terms indicate that total public spending and the real GDP per capita have a long term causal relationship on Gini coefficient in both VEC Models (1) and (2). The long term co-integration coefficient is from the Johansen normalization restriction-imposed equations. Hence, we can explore the long term growth effects of variables on Gini coefficient in VEC models (1) and (2). In table 6.4, there is a positive long term relationship between the Gini coefficient and real GDP per capita in VEC models one and two. We find that real GDP per capita has a long term, causal relationship with income inequality. Thus, economic growth has a positive trade-off with income inequality, which has suggested by Barro (2000). It indicates that higher level of income has increased the level of income inequality or the economic output and income inequality has risen simultaneously during China's economic growth. Hence, we reject the *Hypothesis 3* at the national level which there is a negative relationship between economic development and income inequality. The positive relationship between inequality and economic growth has been widely accepted by Chinese researchers. Kanbur and Zhang (2005) and Zhu and Wang (2012) have argued that China's economic opening up and fast economic growth contributed to the rapid rise in income inequality between inland-coastal and urban-rural areas.

Moreover, there is a negative long term relationship between the total public spending and Gini coefficient in the VEC Model (1), although it is not statistically significant in the short term. In the VEC Model (2), the social spending also has a negative long term relationship with Gini coefficient, but this is not significant in the short term. This suggests that higher level of total public spending and social spending can help to reduce the income inequality in the long run. On the other hand, the non-social spending such as public investment and administrative spending has no significant effect on Gini coefficient in both of the short term and the long term. Hence, we can accept the

Hypothesis 2 at the national level that total public spending and social spending have a redistributive effect on income inequality in the long term. Conversely, non-social spending, which account for almost 70 per cent of total public spending, has no impact on inequality in the long term. The low level and efficiency of social spending has caused horizontal public spending inequality, resulting in the wealthier regions providing more public goods and services in education, health and social protection than the poorer regions. In turn, this has increased inequality in the Chinese economic transition period (Cai et al., 2002, Zhang 2006, Du et al., 2014).

In summary, we find that total public spending has a positive effect on economic growth in the VEC Model (1), which confirms the Keynesian view of the growth effect of public spending in the short term. Moreover, total public spending shows a long term Granger causality with GDP per capita, which supports the positive growth effect of public spending in the endogenous growth model. Social public spending has a negative effect on real output per capita in both the short term and long term, but it also has a negative impact on income inequality in both of the short term and the long term. Moreover, we find that a higher level of real GDP per capita will increase the level of inequality in both short term and long term, and that a higher level of inequality has a negative effect on real GDP per capita in the long term.

6.3 Results of provincial PVAR analysis

The pervious section investigated the growth effect and redistributive effect of total spending and social public spending at the national level via VEC models. The VEC analysis has a limitation due to data availability which leaves very few degrees of freedom. This limitation in national data has motivated us to use province level data for intuitive reasons as well as methodological reasons as discussed previously. Therefore, this section explores the relationships between public spending, output growth and the Gini coefficient at the provincial level via PVAR models. In the endogenous growth models, the economic growth rate is determined by forces that are internal to the economic system, particularly those forces the opportunities and incentives to create technological progress taken place through innovations. According to Keynesian theory,

public spending can generate sustained per capita income growth in the short term by promoting aggregate demand and crowding in private investment. In Chapter 5, we examined the trends and reforms of public spending over the last three decades. We found that provincial public spending has constituted more than 70 per cent of total public spending after the tax reforms of 1994. Hence, this provincial level analysis is crucial for the study of the effects of public spending in China.

We extend the public spending adjusted endogenous growth model by Bhaduri (2006) to include the cross-sectional dimension in the empirical model for the PVAR models:

$$Y_{it} = F(K_{it}, G_{it}, L_{it}, Gini_{it})$$

Thus, the PAVR models can be written in a matrix form as:

$$z_{i,t} = \Gamma_0 + \Gamma_1 z_{i,t-1} + e_{i,t}$$

Where $z_{i,t}$ is a six-variable vector {RGDP, PS/GDP, GINI, PI/GDP, SOE/GDP and REMP} in PVAR model one, and a seven-variable vector {RGDP, SW/PS, GINI, PI/GDP, SOE/GDP and REMP} in PVAR model two. RGDP is the real GDP per capita growth rate at the provincial level. PS/GDP is the ratio of public spending on GDP at the provincial level. SW/GDP is the share of social spending in GDP, where it includes education, health and social protection spending. NS/GDP is the share of non-social spending in GDP. GINI is the Gini coefficient at the provincial level. PI/GDP is the ratio of private investment in GDP, and SOE/GDP is the ratio of SOEs' investment in GDP. REMP measures the labour factor via the growth rate of employee numbers at the provincial level.

6.3.1 Unit Root test

The aim of this section is to test the relationship between provincial public spending, GDP per capita and inequality in 24 Chinese provinces or municipalities. Before interpreting the econometric results, we need to conduct a stationary test (or unit root test). A spurious regression, which is fitted with high R-squared and t-statistics, can be misleading when one statistically-independent random walk is regressed to another one,

i.e. with a unit root. Therefore, we firstly check whether the variables under consideration are stationary (with no unit root).

The popular methods to check panel unit roots are the Levin-Lin-Chu (LLC) and Harris-Tzavalis tests. Levin, Lin, and Chu (2002) proposed a test involving fitting an ADF regression for each panel, which is usually applied if N is very large (or T very small). In the Levin-Lin-Chu unit-root test, the null hypothesis refers to the series containing unit root, and the alternative indicates a stationary series. The LLC test involves fitting an augmented Dickey–Fuller regression for each panel; we requested that the number of lags to include be selected based on Akaike’s Information Criterion (AIC). A similar test is described by Harris and Tzavalis (1999), which also has a null of unit root versus an alternative with a single stationary value, which is designed to be applied to data sets which cover a relatively short time period.

Table 6.5: Variable definitions and unit-root test by LLC at the provincial level

Abbreviation	Description	t-statistics	p-value
RGDP	Real GDP per capita growth rate	-2.245	0.012
PS/GDP	Ratio of total public spending in GDP	-5.848	0.000
SW/GDP	Ratio of social welfare spending in GDP	-10.26	0.000
NS/GDP	Ratio of non-social spending in GDP	-4.274	0.000
GINI	Gini coefficient at the provincial level	-6.778	0.000
REMP	Growth rate of total number of employees	-2.633	0.004
PI/GDP	Share of private investment in GDP	-4.421	0.000
SOE/GDP	Share of investment by SOEs in GDP	-1.92	0.027

Note: Data is collected from China Statistical Year Book, (1995 to 2011), and the real price level is based on the year 2000. P-value is the probability of obtaining a significant statistic result if the null hypothesis is true. We reject the null hypothesis if the p-value < 0.05.

In the panel unit root test, the null hypothesis is the panels containing a unit root, and the alternative is that the all the panels are stationary. If the p-value is less than 0.05, we can reject the null hypothesis at a 0.05 significant level, which indicates the variable is stationary. In Table 6.5, we can see that each variable has a significant t-statistic and a p-value to reject the null hypothesis for each variable. Hence, we can run the PVAR models with the stationary provincial level data.

6.3.2 Results of PVAR models one and two in GMM estimator

Generalized method of moments (GMM) estimator has been designed for the cases involving a large cross-sectional dimension relative to the time dimension. On the other hand, simple Least Squares Dummy Variable (LSDV) estimator has advantages for the case of large time dimension than cross-sectional dimension. For example, we have 24 provinces and a 15-year time period, which is the case when ‘N’ is greater than ‘T’. Hence, we firstly conduct the PVAR models⁴⁹ in the GMM framework provided by Love and Zicchino (2006), which developed a technique in Stata to work on the PVAR model. This thesis will follow their model and technique to test variables among Chinese provinces. The following Table 6.6 reports the results of PVAR (1) model one with variables {RGDP, PS/GDP, GINI, PI/GDP, SOE/GDP and REMP}. In addition, Table 6.7 shows the results of PVAR model two with variables {RGDP, SW/GDP, NS/GDP, GINI, PI/GDP, SOE/GDP and REMP}. The variables in the first row are the dependent variables, and the variables in the first column are the independent variables with 1 lag.

The estimated results for PVAR (1) models one and two based on the GMM approach are reported in Tables 6.6 and 6.7. The estimated results for the RGDP equation shows the effect of the public spending variable with lag (1) on the growth rate of GDP per capita. The result of the RGDP equation in Table 6.6 suggests that the share of provincial public spending in GDP has no significant impact on the growth rate of GDP per capita. In Table 6.7, the ratios of social spending and non-social spending in GDP have no significant impact on the growth rate of GDP per capita. Hence, we cannot accept the *Hypothesis 1* that provincial public spending has a significant impact on economic growth in the PVAR (1) models. However, the investment of SOEs has a significant growth effect in both PVAR (1) models one and two. This suggests that increasing the share of SOEs’ investment⁵⁰ by 1 per cent will increase growth rate of GDP per capita by 0.2 per cent. Conversely, private investment has no significant effect on per capita GDP growth rate in either PVAR (1) models one and two.

⁴⁹ We focus on the PVAR with a 1 lag model, since longer time lags are difficult to apply given the rather short overall sample period (Lecke et al., 2010).

⁵⁰ Kneller et al., (1999) indicate that industrialized counties have more public consumption than public investment, but public investment has more growth effects. The SOEs’ investment in China partly consists of public investment.

This result is similar with VEC model two, wherein the ratio of private investment in GDP has no significant effect on economic growth at the national level, but the SOE's investment has a positive growth effect. Therefore, the SOEs' investment has more of a growth effect than public spending and private investment in China. Mittnik and Neuman (2001) also find the public investment has a positive effect on GDP, but the positive elasticity does not exceed 0.1 in the PVAR model from six industrialized countries. Furthermore, the Gini coefficient has a significant, positive effect on per capita GDP growth in both models one and two, which suggests that the provinces with higher level of income inequality will have faster economic growth in China during last 15 years. The PI/GDP equation in Table 6.6 and 6.7 shows the response of variables (in lag 1) to the ratio of private investment in GDP. We can see that both PS/GDP (t-1) and SW/GDP (t-1) have a negative effect on the PI/GDP(t). This indicates that total provincial public spending and its share of social spending have a crowding-out effect on private investment the following year. Moreover, economic growth has a positive effect on private investment in both PVAR models. This indicates that higher economic growth will promote a higher level of private investment. Conversely, investment by SOEs has a significant crowding-in effect on private investment in China.

Table 6.6: Results of PVAR model one in GMM estimator

	RGDP(t)	PS/GDP(t)	GINI(t)	PI/GDP(t)	SOE/GDP(t)	REMP(t)
RGDP(t-1)	0.25(4.29)**	0.03(0.92)	-0.02(-0.91)	0.14(2.71)*	0.08(1.70)*	-0.06(-1.30)
PS/GDP(t-1)	0.15(0.87)	0.85(7.87)**	-0.11(-1.81)**	-0.24(-1.64)*	-0.20(-1.16)	-0.08(-0.63)
GINI (t-1)	0.58(2.02)**	0.29(3.68)**	1.03(13.33)**	1.10(5.79)**	-0.05(-0.29)	0.20(1.44)
PI/GDP(t-1)	-0.07(-0.93)	-0.04(-1.03)	0.02(0.95)	0.79(12.23)**	0.09(1.29)	0.06(1.21)
SOE/GDP(t-1)	0.22(3.20)**	0.01(0.47)	-0.03(-1.18)	0.14(2.53)**	0.81(16.34)**	-0.11(-2.24)**
REMP(t-1)	0.08(1.22)	-0.06(-1.91)**	-0.09(-2.23)**	0.03(0.60)	-0.07(-1.50)	0.18(3.17)**

Notes: No. of obs. = 384, No. of province = 24. This PVAR model is estimated by GMM, with variables including RGDP, PS/GDP, GINI, PI/GDP, SOE/GDP and REMP. Reported numbers show the coefficients and t-statistics of variables with one lags to the dependent variables in each column. Heteroskedasticity adjusted t-statistics are in parentheses. **indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

Table 6.7: Results of PVAR model two in GMM estimator

	RGDP(t)	SW/GDP(t)	NS/GDP(t)	GINI(t)	PI/GDP(t)	SOE/GDP(t)	REMP(t)
RGDP (t-1)	0.27(4.54)**	-0.05(-0.67)	0.01(0.31)	-0.02(-0.93)	0.11(2.22)**	0.06(1.28)	-0.06(-1.29)
SW/GDP(t-1)	-0.04(-0.56)	0.44(3.18)**	0.43(1.34)	-0.88(-3.15)**	-0.12(-1.72)*	-0.02(-0.27)	0.03(0.62)
NS/GDP(t-1)	0.73(1.08)	0.27(1.64)*	0.63(2.14)**	-0.17(-1.49)	0.25(0.42)	-0.30(-1.09)	-0.02(-0.09)
GINI(t-1)	0.73(1.87)**	0.30 (2.49)**	0.03(0.16)	0.82(8.88)**	1.18(4.46)**	-0.13(-0.49)	0.11(0.64)
PI/GDP(t-1)	-0.04(-0.51)	-0.02(-0.38)	0.01(0.26)	0.03(1.02)	0.70(16.22)**	0.03(0.56)	0.04(1.18)
SOE/GDP(t-1)	0.20(3.00)**	-0.009(-0.13)	-0.01(-0.31)	-0.03(-1.21)	0.19(3.41)**	0.85(17.05)**	-0.10(-1.70)*
REMP(t-1)	0.04(0.64)	-0.10(-0.80)	0.02(0.56)	-0.08(-2.01)**	0.04(0.85)	-0.04(-0.97)	0.20(3.19)**

Notes: No. of obs. = 384, No. of province = 24. This PVAR model is estimated by GMM, with variables including RGDP, SW/PS, GINI, PI/GDP, SOE/GDP and REMP. Reported numbers show the coefficients and t-statistics of variables with one lags to the dependent variables in each column. Heteroskedasticity adjusted t-statistics are in parentheses. **indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

The traditional view of the government in economic development rests on both economic growth and income redistribution associated with public spending. Hence, if we assume that provincial public spending is designed to achieve a more egalitarian income distribution, provincial government spending should have a negative effect on inequality at the provincial level. *Hypothesis 2* is designed to test whether provincial public spending had a redistributive effect from 1995 to 2010. In the GINI equation, we find provincial total public spending and social spending have a statistically significant negative effect on inequality. This indicates that a higher level of provincial public spending or a higher level of social spending will reduce income inequality. Because social spending includes education, health and social welfare spending, which is directly related to people's wellbeing, a higher share of social public spending in total public spending will benefit the poor population and reduce the income inequality. Moreover, the higher growth rate of employed population can reduce the inequality. This indicates the higher level of employment can promote better social equality rather than economic growth in China. Hence, we accept *Hypothesis 2* in which the provincial public spending and its share of social spending have a redistributive effect on income inequality during 1995 to 2010. Furthermore, the growth rate of GDP per capita has no significant effect on the level of inequality at the provincial level in both PVAR (1) models, while inequality has a significant positive effect on per capita GDP growth. In *Hypothesis 3*, we assume there is a positive relationship between per capita GDP growth and inequality. Hence, we can only accept that inequality has a statistically significant positive effect on economic growth, but economic growth has no significant effect on inequality in the short term. This suggests that there is a one way trade-off⁵¹ between inequality and economic growth in the economic development process. The positive effect of inequality on economic growth at the provincial level can be accounted for by recognizing that those provinces with a higher level of inequality have experienced faster economic growth over the last 15 years. The provincial Gini coefficient has significant regional characteristics, wherein eastern (rich) regions have a lower level of inequality than the western (poor) regions. Thus, a higher level of income will reduce income inequality in China according to the data analysis in Chapter 5.

⁵¹ If there is a positive correlation between inequality and economic growth, there is a trade-off between inequality and growth, in which inequality can be seen as the natural cost of growth (Garcia-Penalosa and Turnovsky, 2007).

In summary, the results of PAVR (1) models one and two suggest that: (1) provincial level public spending and its share of social spending have no significant impact on GDP per capita growth rate; (2) provincial public spending and its share of social spending have a negative effect on inequality; (3) inequality has a positive effect on economic growth. Hence, we cannot accept *Hypothesis 1* that public spending has a growth effect based on the results of the PVAR models. As regards the redistributive effects of public spending, we can accept *Hypothesis 2* that provincial total public spending and its share of social spending have a negative effect on inequality. We also reject the *Hypothesis 3* that there is a negative relationship between economic growth and income inequality.

6.3.3 Robustness check of PVAR models in LSDV estimator

Numerous macroeconomic studies have estimated PVAR models by using the simple Least Squares Dummy Variable (LSDV) estimator, including Alesina et al., (2002), Beetsma et al., (2006). However, the LSDV estimator is not consistent for a finite time dimension (T) even when the cross-sectional dimension (N) gets larger (Juessen, and Linnemann, 2010). This indicates that there is a bias in the panel regressions if the time dimension (T) is small. The GMM estimator has been designed for situations with a small ‘T’ and a large ‘N’, which means few time periods but many cross sectional observations (Roodman, 2006). This means that the GMM estimator can be biased if the N is small. The provincial data used in this thesis covers 24 provinces and 15 years. Hence both of its cross-sectional dimension and time dimension are small. It is suggested that the LSDV estimator can be used as a robustness check for the results in GMM method in situations where both the ‘N’ and ‘T’ are small.

Table 6.8: PVAR results of model one in LSDV estimator

	RGDP(t)	PS/GDP(t)	GINI(t)	PI/GDP(t)	SOE/GDP(t)	REMP(t)
RGDP(t-1)	0.04(0.75)	-0.01(-0.14)	-0.07(-1.19)	0.17(1.04)	0.06(0.71)	-0.05(-1.10)
PS/GDP(t-1)	-0.06(-1.34)	0.56(10.19)**	0.001(0.02)	-0.21(-1.65)*	0.32(5.01)**	0.03(0.89)
GINI(t-1)	0.09(2.02)**	0.04(0.06)	0.66(13.93)**	-0.16(-1.19)	-0.02(-0.36)	-0.05(-1.44)
PI/GDP(t-1)	-0.02(-1.24)	-0.20(-7.92)**	-0.13(-6.33)**	0.11(1.87)**	-0.12(-4.16)**	-0.01(0.52)
SOE/GDP(t-1)	0.05(1.80)**	0.13(3.09)	0.05(1.54)	0.02(0.17)	0.37(7.31)**	0.002(0.09)
REMP(t-1)	-0.07(-1.03)	-0.02(-0.17)	-0.18(-2.37)**	-0.22(1.03)	0.15(1.54)	-0.03(-0.05)

Notes: No. of obs. = 384, No. of province = 24. This PVAR model is estimated by LSDV, with variables including RGDP, PS/GDP, GINI, PI/GDP, SOE/GDP and REMP. Reported numbers show the coefficients and t-statistics of variables with one lags to the dependent variables in each column. Heteroskedasticity adjusted t-statistics are in parentheses. **indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

Table 6.9: PVAR results of model two in LSDV estimator

	RGDP(t)	SW/GDP(t)	NS/GDP(t)	GINI(t)	PI/GDP(t)	SOE/GDP(t)	REMP(t)
RGDP(t-1)	0.27(4.54)**	-0.01(-0.29)	-0.01(-0.26)	-0.08(-1.32)	-0.17(1.01)	0.06(0.67)	-0.05(-1.09)
SW/GDP(t-1)	-0.14(-0.96)	0.16(1.91)**	-0.17(-1.51)	-0.39(-2.57)**	-0.02(-0.72)	0.17(0.80)	0.06(0.57)
NS/GDP(t-1)	-0.01(-0.15)	0.22(4.19)**	0.66(9.73)**	0.22(2.36)**	-0.32(-1.22)	0.40(3.07)**	0.01(0.16)
GINI(t-1)	0.10(2.09)**	0.05(1.63)*	0.03(0.79)	0.71(14.08)**	-0.18(-1.28)	-0.01(-0.08)	-0.05(-1.46)
PI/GDP(t-1)	-0.02(-1.17)	-0.08(-6.65)**	-0.11(-7.50)**	-0.12(-6.07)**	0.11(1.81)*	-0.12(-4.06)**	-0.01(-0.55)
SOE/GDP(t-1)	0.05(1.69)*	0.04(2.13)**	0.09(3.49)**	0.05(1.63)*	0.01(0.17)	0.37(7.31)**	0.002(0.09)
REMP(t-1)	-0.08(-1.09)	-0.02(-0.58)	-0.02(-0.41)	-0.20(-2.67)**	-0.21(-0.98)	0.16(1.47)	-0.001(-0.02)

Notes: No. of obs. = 384, No. of province = 24. This PVAR model is estimated by LSDV, with variables including RGDP, SW/GDP, NS/GDP, GINI, PI/GDP, SOE/GDP and REMP. Reported numbers show the coefficients and t-statistics of variables with one lags to the dependent variables in each column. Heteroskedasticity adjusted t-statistics are in parentheses. **indicates significance at the 5 per cent level and * indicates significance at the 10 per cent level.

The Table 6.8 and Table 6.9 show the results of PVAR models one and two in LSDV estimator. We have chosen the same six-variable vector {RGDP, PS/GDP, GINI, PI/GDP, SOE/GDP and REMP} in PVAR model one and seven-variable vector {RGDP, SW/PS, GINI, PI/GDP, SOE/GDP and REMP} in PVAR Model 2. We only focus on the growth equation and Gini equation in PVAR models by LSDV estimator.

In the Table 6.8 and 6.9, the PVAR models in LSDV estimator show a similar result as the GMM estimators. In the growth equations of PVAR models one and two, only the income inequality and SOE's investment have a positive effect on per capita GDP growth rate. The total public spending, social spending and non-social spending have a negative effect on the per capita growth rate, but all of them are not statistically significant. In the Gini equation of PVAR model one, the total provincial public spending has no significant effect on income inequality, but the private investment shows a significant negative impact on income inequality. Compared with the PVAR results of GMM estimator, the LSDV method has improved the significance of variables in the Model 2. Most variables have a statistically significant effect on Gini coefficient in PVAR Model 2, which is different from the GMM method. For example, the social spending seems to have a negative impact on income inequality unlike the non-social spending which exhibit a positive influence on that variable. This finding suggests that a higher share of social spending in total spending reduced the income inequality at the provincial level in last 15 years. Moreover, the private investment has negative effect on income inequality, but the SOE's investment has a positive effect on the income inequality, implying that private investment can play a more instrumental role in reducing income inequality at the provincial level. In the data analysis in Chapter 5, we find that poor provinces with less private investment are more likely to have a high level of income inequality. Hence, there is a negative relationship between private investment and income inequality.

As regards to the three Hypotheses we have made, the LSDV method shows almost same result with GMM estimator. Firstly, total public spending and its share of social spending have no statistically significant effect on real growth rate. Secondly, the social spending has a significant negative effect on the income inequality, but total public spending has no significant redistributive effect. Thirdly, the income inequality has a positive growth effect, but the real growth rate has no impact on the income inequality. Therefore, we can confirm the robustness of the results at the provincial level, because the

LSDV estimator shows a similar result as the GMM method.

6.4 Conclusion

This chapter presents two empirical studies on the dynamic relationship between public spending, economic growth and inequality. Firstly, we explore the effects of public spending on economic growth and inequality in VEC models at the national level, then use PVAR models to examine the effects of public spending on economic growth and inequality at the provincial level based on the GMM and LSDV estimator, respectively.

The national level analysis focuses on the whole Chinese economic reform period from 1978 to 2012. The ADF unit root tests on the national level data strongly suggest that all the variables are integrated of the same order one (i.e., non-stationary in levels, but stationary in the first difference). Having confirmed that the variables are stationary in the first differences, the results of the Johansen cointegration test show there is at least one cointegrated combination between variables, through which we can investigate the direction of long term causality between the variables in the VEC models. VEC model one investigates the dynamic relationship between total public spending, economic growth and inequality with the two control variables total investment and employed labour. VEC model two divides the total public spending into social spending and non-social spending and the total investment into private investment and SOEs' investment, respectively. In summary, we have confirmed that total public spending has a positive relationship with real GDP per capita in both the long and the short term. Its share of social spending has a negative impact on real GDP per capita while the share of non-social spending has a positive effect on real GDP per capita. Hence, we accept *Hypothesis 1* with respect to total public spending, i.e. total public spending has a positive effect on real output in the both long term and short term. However, social spending and non-social spending have a different effect on real per capita GDP in the both long and short term. Social public spending has a statistically significant negative effect on real output, but the non-social spending has a significant positive effect on real output. Moreover, total public spending and social spending can reduce the level of inequality in the both short term and long term, but the non-social spending is not statistically significant. Therefore, we accept

Hypothesis 2, in that total public spending and its share of social spending have a redistributive effect (a negative relationship with inequality). The relationship between inequality and real GDP per capita is more complicated, where the real per capita GDP has a positive effect on Gini coefficient, but the Gini coefficient has a negative effect on the real per capita GDP. Hence, we cannot accept *Hypothesis 3*, which posits a negative relationship between economic growth and inequality at the national level.

At the provincial level, the PVAR models have re-examined the dynamic relationship between public spending, economic growth and inequality based on the 24 provinces' data from 1995 to 2010. This thesis uses the PVAR (1) models in the GMM framework provided by Love and Zicchino (2006) and the LSDV method as the robustness check. In the PVAR models, the growth effect of provincial public spending and provincial social spending share are not statistically significant. Hence, we cannot accept *Hypothesis 1* that public spending has a growth effect based on the results of the PVAR models. Moreover, PVAR model one shows that total provincial public spending has a crowding-out effect on private investment in the short term. However, the results show that SOEs' investment has a significant positive growth effect at both the national and provincial levels. The results of the PVAR models also suggest that total provincial public spending and social spending has a negative effect on inequality. As for the redistributive role of the public spending, social spending has played an important role on improving equity during the economic transition. Hence, we can accept *Hypothesis 2* that provincial total public spending and its share of social spending have a negative effect on inequality. Furthermore, the Gini coefficient has a positive effect on the per capita growth rate at the provincial level, but the economic growth has no significant impact on the Gini coefficient. Therefore, we reject the *Hypothesis 3* that there is a negative relationship between economic growth and income inequality.

Chapter 7: Conclusion

The aims of this thesis are to assess the role of public spending on economic growth and inequality in China at both the national and provincial levels. The comprehensive literature review of the theoretical and empirical studies regarding the effects of public spending on growth and inequality has provided us with a suitably well-developed lens to analyse public spending throughout the period of fiscal reforms in China. Specifically, we focused on the impact of public spending on economic growth and inequality at both the national and provincial level. This concluding chapter recaps the research background as well as the hypotheses, and then discusses the major research findings, policy implications and limitations of this research. This chapter summarizes the findings of the previous chapters and provides a general conclusion to the thesis. Simultaneously, this chapter reflects on the results regarding the main themes of the effectiveness of public spending in light of the research findings in the previous chapters. The first part of this chapter discusses the research aims and hypotheses, and the second part of this chapter discusses the findings, implications and limitations of this study.

7.1 Summary of research aims and hypotheses

Numerous studies have explored the effectiveness of public spending on economic development by focusing on several countries or a single country. However, there are two gaps in the existing literature. Firstly, most studies focus only on the growth effect of public spending in the process of economic development. Secondly, there are few comprehensive studies of public spending in a single developing country with both national and provincial level-data and with different econometric methods. Compared with the developed countries, the economic growth rate in developing countries has less power to measure the overall economic development, because of poverty, inequality and social uncertainty in economic development process. Hence, this dissertation investigates the impact of public spending on per capita output and income redistribution in China, in order to obtain a comprehensive analysis of the effectiveness of public spending.

The introduction chapter provided the background and motivation for this research. Since it first initiated China's economic opening up, China's government has emphasised economic growth as the priority of economic development. Empirical studies have found a strong, positive relationship between total public spending and economic growth at both the national level and the provincial level in China (Chen, 2012). Currently, China is entering a new stage of economic development with a growing level of per capita GDP. However, new challenges such as high income inequality and limitations in the growth model have been found, which may result in a rise in social instability and the inability to maintain economic growth. This requires public spending to play a key role in the Chinese economy to overcome the limitations during this economic development. Improving the efficiency of public spending can promote better resource allocation and income distribution, which private capital fails to provide. Therefore, the study of the effectiveness of public spending has significant implications for Chinese economic development.

In Chapter 2, four issues were discussed: the role of government spending, the different views on public spending for economic growth and the empirical evidence of government spending and the Chinese literature on public spending. Keynesian theory and endogenous growth theory provided a theoretical framework for the growth effect of government spending. In Keynesian theory, increasing government spending will increase aggregate demand; it will cause an increase in output, and subsequently an increase in income; simultaneously, an initial increase in output leads to an increased demand for money, which then pushes up the real interest rate. The rise in interest rates may reduce private investment, the extent of which depends on the interest elasticity of investment.

With the emergence and popularity of the neoclassical growth theories, the endogenous growth model provides a foundation for productive government spending in fostering long term economic growth. The government's provision of public capital to the production process contributes to growth directly by adding to the existing capital stock, as well as indirectly by raising the marginal productivity of privately supplied factors of production (Barro, 1990). However, while the theory identifies productive government expenditure as having a key role in obtaining a higher steady-state growth rate of the economy, the empirical findings are not consistent with the theoretical suggestions. The empirical review has focused on the impact of government spending, and it has

demonstrated that the relationship with economic growth varies across different compositions and taxation methods. The review on Chinese empirical studies show that China's public spending has a strong Keynesian effect, one in which an increase of public spending (investment) will increase economic output. The majority of the studies indicate that public expenditure on science, economic reconstruction (public investment) and education have a significant growth effect on economic growth, while social welfare and administration expenditure have negative effects on economic growth.

Chapter 3 discussed that public spending is a powerful instrument in income redistribution. However, the budget of public spending is limited. If the government increases public spending on social welfare, public investment on other economic activities will fall. Kneller et al., (1999) indicate that industrialized countries have more public consumption than public investment, where public investment has a greater effect on economic growth and public consumption has a greater effect on income redistribution. Empirical studies on China's public spending show that Chinese public spending has played a limited role in the redistribution of income. Zhang and Fan (2000) argue that public spending has been unequally distributed among regions and citizens, which has caused not only low private consumption, but also unsatisfied public resource needs in poorer areas. They assert that Chinese provincial public spending has a positive relationship with economic growth, but has increased overall inequality.

Furthermore, we have investigated the relationship between economic growth and inequality. Empirical evidence indicates that it can have either a positive or a negative relationship between economic growth and inequality. If there is a positive correlation between inequality and economic growth, then there is a trade-off between inequality and growth. This suggests that inequality can be regarded as the natural cost of growth, and that reducing inequality will hinder economic growth, as argued by Garcia-Penalosa and Turnovsky (2007). Conversely, Barro (2000) investigated the impact of inequality on economic growth in a cross-country analysis. He found that inequality restricts growth in poorer countries, but encourages growth in richer countries. Specifically, economic growth tends to fall with greater inequality when the per capita GDP is below approximately \$2,000 dollars, and rises with inequality when the per capita GDP is above \$2,000 dollars.

Chapter 4 has provided substantial background research on China's public spending decentralization, fiscal reforms and income inequality during the period of economic reforms. Post the tax reforms of 1994, China has increasingly relied on provincial public spending in meeting its spending requirements, which has generated a greater inequality in the provision of public goods and services among regions. This uneven decentralization of expenditure responsibilities has led to marked divergences in spending per-capita among regions and between urban and rural areas, and has generated adverse incentives in carrying out spending by local governments. Local governments have also limited the amount the government has been able to spend on key social needs such as education and health (Wang et al., 2010). Thus, compared with the developed economies, China has a low level of total public spending share of GDP, as well as its social welfare spending.

Therefore, in order to explore the impacts of public spending on economic growth and income inequality in China, we provided three hypotheses in Chapter 5, assuming that public spending has a positive growth effect and redistributive effect on income inequality, and that there is a negative relationship between inequality and economic growth. Chapter 5 also outlines the method and data analysis to investigate the effects of public spending on economic growth and inequality. The limited time-series dimension on national level data has generated a low power on the unit root and long run cointegration test. In order to have reliable results, two econometric methods (VECM and PVAR estimations) are examined, as well as two data samples: the national sample includes 35 years' of observation and the provincial sample includes 24 Chinese provinces from 1995 to 2010.

Three major conclusions regarding the data analysis are presented in Chapter 5. Firstly, the levels of GDP per capita and income inequality have increased significantly during the period of economic reforms. Secondly, the share of China's total public spending and social spending is much smaller than those of most OECD countries (OECD, 2006). Social spending is the sum of public spending on education, health and social protection, and has a direct impact on people's welfare. Thirdly, the regional economic disparities are significant among the Chinese provinces. For example, the eastern provinces have a higher GDP per capita, higher private investment and growth rate of numbers of employees, yet a lower growth rate and share of public spending. Moreover, the eastern provinces have lower levels of inequality than the western provinces. Conversely, the

western provinces have a higher level of public spending and social spending, as well as a higher level of growth rate than the eastern provinces.

Although there is an increasing trend towards social public spending, less than 30 per cent of public spending goes on social sectors, and it constituted less than 8 per cent of GDP in 2012 (NBS, 2013). This low level of social spending has failed to provide a basic safety net for Chinese citizens during the past economic reforms, and this has inevitably compromised domestic consumption (Tian, 2012). This chapter also explored the relationship between income levels and inequality in China's provinces. It was shown that the income Gini coefficient at the provincial level has distinct regional characteristics from coast to inland, east to west. The analysis of income levels and the Gini coefficient also revealed strong regional characteristics in both of them, which essentially identifies a division of the eastern-western regions as regards economic development. In general, the eastern parts of China have a relatively high level of income and low levels of inequality, whereas the western parts have a higher level of inequality and lower levels of income.

7.2 The findings of this research

Although it has been generally accepted that public spending has a positive growth effect through a variety of mechanisms, nevertheless debates persist in the empirical literature. The extended production function approach, based on the AK model with the inclusion of public capital, is the most widely used method of measuring the effects of public spending. In the econometric analysis, we adopted Bhaduri (2006) endogenous growth model as the fundamental framework by including inequality in the regression. As the first step, we examined the dynamic relationship between public spending, economic growth and inequality in the context of time series data at the national level. The stationary and cointegration tests have a relatively low power in small-time observations; however, China has public spending data only for certain decades, and there was a significant policy break in 1978. Kamps (2004) suggests that one way to increase the power of econometric tests is to make use of the cross-sectional dimension of the data in addition to the time series dimension. Therefore, this dissertation also includes provincial analysis based on 24 provinces between 1995 and 2010.

Public spending and economic growth

In Chapter 6, we examined the effects of public spending on economic growth using both national and provincial level data. In the national level analysis, we found that total public spending has a positive effect on real GDP per capita, which confirms the Keynesian view about the growth effect of public spending in the short term. Moreover, total public spending has shown a long term Granger causality with GDP per capita, which supports the notion of the positive growth effect of public spending in the long run endogenous growth model. In the composition of public spending, social spending and non-social spending have a different effect on real per capita GDP at the national level. Social public spending has a statistically significant negative growth effect, but the non-social spending has a significant positive growth effect. The provincial level analysis by PVAR models suggest that total public provincial spending and social spending have no significant effect on economic growth, but a statistically-significant crowding-out of private investment in the short term. Thus, the results indicate that only total national public spending has a growth effect in both the short and long term. Compared with public spending, the State Owned Enterprises (SOEs) investment has a significant, positive growth effect at both the national and provincial level.

The majority of empirical studies on China's public spending have found that total national public spending has a positive effect on economic growth. However, controversy surrounds the growth effect of social spending and provincial public spending. For example, Zhang and Zou (1998) argue that a higher degree of fiscal decentralization is associated with lower economic growth in China. Their results suggested that increasing the share of local government expenditure may cause a decline in income growth, because public spending decentralization undermines the government's ability to redistribute public resources between rich and poor regions. Guo et al., (2003), Wang (2009) and Xia (2009) find that public investment has a negative effect on economic growth. Furthermore, the negative growth effect of social spending is attributable to its low efficiency and uneven distribution. Xue and Xu (2012) examine the relationship between government spending and private consumption. They find that government spending has a positive relationship with urban households' consumption, but a negative relationship with the rural households' consumption. Hence, they suggest that government spending should focus on rural areas in order to enlarge domestic demand and to reduce income

disparity between rural and urban areas. Hence, we can conclude that the total size of public spending has had a positive effect on economic growth during the period of economic reforms and opening up, but that the share of social spending and provincial public spending has a very limited role in terms of economic growth in China.

Public spending and income inequality

Experiencing a government revenue growth rate greater than GDP growth rates has been a common trend in China since the tax reforms of 1994. Although public spending in China has increased rapidly over the last two decades, the distribution of public spending across different regions has been quite unbalanced. Moreover, a large proportion of public spending has gone towards public investment in public infrastructure programmes and public administration. This has inevitably caused the relatively low proportion of public spending on essential social sectors such as the social security system, health, education and other basic public goods and services. Over the last three decades, the inequality index has increased significantly from 0.33 in 1980 to 0.48 in 2010 (China Academy of Sciences, 2012) which may constrain the economic development.

In the VEC models of national data, we have found that public spending has played an important role in income redistribution during the economic transition. For example, increasing the overall volume of total public spending, especially social spending will reduce the level of inequality in both the short term and long term. When compared with social public spending, the non-social spending has less effect on inequality reduction. However, the social spending only accounts for around 30 percent of total public spending, which is too low for it to play any meaningful redistributive role.

Regarding the provincial level data, the results of the PVAR models suggest that provincial public spending and its share of social spending have a negative effect on income inequality. Moreover, the coefficient of social spending is greater than the total provincial public spending. Thus, the social spending had a more important role in inequality reduction between 1995 and 2010. Moreover, the higher growth rate of employed population can reduce the inequality. This indicates the higher level of employment can promote better social equality rather than economic growth in China. Hence, the decentralization of public spending to provincial level governments did not

help to improve economic growth and income distribution after the tax reforms of 1994. McNab (2003) argues that the objectives of income redistribution may be better pursued by the central government because of the mobility of people between regions. Zhang and Fan (2000) state that public spending has been unequally distributed between regions and citizens, and those poorer regions have low private consumption and unsatisfied public resource needs. They indicate that Chinese provincial public spending has increased overall inequality. In general, the government has pursued a coast-biased investment strategy, and this has contributed to the rapid rise in regional inequality. They suggest that, if the government continues to favour coastal regions in its public spending, then regional inequality will widen even further.

Economic growth and income inequality

Since the early 1990s, labour productivity growth has been the most important factor driving China's GDP growth, and this impressive growth of labour productivity was chiefly the result of a massive investment effort. Consequently, the productivity gap between agriculture and the rest of the economy has continued to widen, leading to increased rural–urban income inequality. The current growth pattern would not be sustainable over the long term, because it requires unobtainable, ever-increasing investment. In addition, economic growth would be accompanied by a low growth in urban employment and a further widening of the rural–urban income gap (Kuijs and Wang, 2006). In the Bhaduri's (2006) post-Keynesian endogenous growth model, the growth of labour productivity should increase the real wage, so that the wages share remains constant over the long run. It suggests that inequality should not increase too much to have the equilibrium steady state growth in the long run.

We find that a higher real GDP per capita will increase the level of inequality, and a higher level of inequality has a negative effect on real GDP per capita in the national VEC models. This suggests that economic growth will increase the level of inequality and, in turn, a higher level of inequality will reduce economic growth. Likewise, He (2005) and Tian (2012) examined the relationship between inequality and economic growth in China from 1992 to 2003 and 1985 to 2007, respectively. Both sets of results show that income inequality has a negative impact on the economic growth rate. According to the Keynesian theory, a higher level of inequality will reduce the level of effective demand

and then domestic consumption. However, at the provincial level, inequality has a positive effect on the growth rate of GDP per capita, although economic growth has no statistically significant impact on the level of inequality from 1995 to 2010. This indicates that the provinces with a higher level of inequality have a faster economic growth rate than those provinces with a lower level of inequality. In addition, section 5.5 explored the relationship between income levels and inequality in China's provinces. It showed that the income Gini coefficient at the provincial level has obvious regional characteristics from coast to inland, i.e. east to west. In general, the eastern parts of China have a relatively high level of income and low levels of inequality, whereas the western parts have a higher level of inequality and lower levels of income. We also find that low income provinces have a faster economic growth than high income provinces. Thus, income inequality has a positive relationship with economic growth among Chinese provinces due to the different levels of income.

7.3 Policy implications and limitations of research

The results of the econometric analysis suggest that public spending in China has not met the objectives of public spending in promoting economic growth and income distribution simultaneously during the period of economic reforms, because of the low level of social spending. Particularly after the tax reforms of 1994 and the decentralization of public spending, the overtaking strategy and 'growth-first' strategy were adopted by provincial level governments. This led to income distribution biased toward capital and against labour, an economic structure biased toward investment and against consumption, and government spending biased toward infrastructure and against social welfare (Du et al., 2014). The results suggest that this overreliance on investment in infrastructure and technology-intensive projects has made government spending less focused on the people's welfare, as also argued by Wong (2000), Tsui and Wang (2004) and Shen et al., (2006). In addition, economic growth has raised inequality significantly since the economic reforms. Social public spending has constituted less than 10 per cent of GDP over the last three decades. Hence, there is an urgent task for the Chinese government to improve the structure of public spending, especially at the provincial level, to promote economic development towards economic efficiency and equality.

China's inadequate social welfare protection and the increasingly high cost of private expenditure on health and education have caused a lower level of private consumption in China. During the past thirty years of economic reforms, the ratio of private consumption to GDP dropped from 50 per cent to 37 per cent, and the saving rate increased from 11 per cent to 25 per cent (Baldacci et al., 2010). This low private consumption and high saving rate are the key elements in China's economic development. Moreover, the huge income gaps between urban-rural, coastal and inland areas also play an important role on China's domestic consumption. Xue and Xu (2012) found that China's public spending has a positive relationship with urban households' consumption, but a negative relationship with the rural households' consumption. Hence, they suggest that government spending should focus on rural areas in order to promote domestic demand and to reduce the income disparity between rural and urban areas.

In recent years, the Chinese government has placed an increasing emphasis on stemming the growth in inequality. National strategies such as the 'western development plan', 'providing a social safety net' and 'building a harmonious society' have aimed to reduce the income disparity between urban and rural areas and the east and western regions⁵² (Zhu and Wan, 2012). However, these reforms and strategies of public spending have not improved the income distribution in China. A large proportion of public spending went on public infrastructure programmes and public administration, which inevitably caused a relatively low proportion of public spending on essential social sectors, such as the social security system, health, education and other basic public goods and services. Moreover, social welfare, in terms of pensions, education, health and unemployment subsidies, is more advanced in the urban areas and wealthier provinces. Therefore, further public spending reforms should focus on social spending, as current public spending has failed to promote a balanced regional development.

China's income inequality creates the problem of insufficient consumption. Although its overall household saving rate is rather high, most of the saving is carried out by the rich. Poor households have the incentives to consume, but face liquidity constraints. Therefore, China's public spending needs to pay more attention on the rising inequality during the economic transition which can help China to move from an export and investment-driven

⁵² These strategies are designed to reduce income disparities by agriculture support policies, social welfare transfers, local minimum wage increases, targeted tax reductions and poverty alleviation plans.

economy to a domestic consumption-driven economy (Li, 2013). With exports slowing and fixed investment at an outsized 50 per cent of GDP, China needs to focus on the quality and breadth of its growth, not just the overall magnitude. Importantly, this view was reinforced by the former General Secretary of the Communist Party of China, Hu Jintao, who pursued a ‘harmonious society’ policy agenda that emphasized equitable growth. However, redistributive policies can only do so much in reducing inequality if there are still forces that exacerbate or create new sources of inequality. China’s income disparities reflect the long term consequences of past and current institutions and policies that have created inequality between urban and rural, coastal and inland regions. For example, China recently announced a new policy of accelerated urbanization to reduce urban/rural inequality. However, this new urbanization does not appear to address the factors that underlie urban-rural income disparities. It is possible that the new urbanization program will replace the urban-rural gap with an urban-urban gap (Sicular, 2013).

This study offers a unique understanding of public spending in Chinese economy by combining various perspectives. Firstly, it incorporates VECM and PVAR methods with national and provincial level data to overcome a shortage of data observation at the national level, and the underestimated general effects of public spending at the provincial level. Secondly, it combined Keynesian and neoclassical economic frameworks to overcome the gaps between demand side and supply side theories. Finally, by investigating both income inequality and economic growth, a fuller understanding of economic development during Chinese economic reforms is presented. Therefore, this dissertation makes significant original contributions to the existing Chinese empirical studies through providing a more detailed and reliable analysis of Chinese public spending. The results not only confirm the positive growth effect of public spending on the national level, but also indicate the limited role of social spending on both economic growth and income distribution at national and provincial level. At the same time, the economic growth has increased the level of inequality, and in tune, the higher level of inequality will restrict further economic growth. Therefore, this dissertation has provided importance and direction for the further reform on China’s public spending system in order to achieve the sustained economic development in the long run.

However, the research in this dissertation still has various shortcomings. Due to the lack of statistical resources, the calculation of the Gini coefficient has been unable to cover all 31 provincial administrative regions. The short time period may also have reduced the degree of freedom in the econometric analysis. The newly-developed techniques such as panel units test and the PVAR model have made it possible to investigate the dynamic relationship between public spending, economic growth and inequality at the regional level, but the process requires some restricting assumptions such as cross-sectional independence across units in the panel (Song, 2011). In addition, this research has not taken the influence of illegal and invisible income into account, as well out-budget public spending. Both of these factors may have affected the calculation of Gini coefficient and total public spending.

Moreover, the official Chinese data has suggested that the level of output growth may have been inflated partly because of political pressure. Although the China's statistical bureau has made attempts to adjust the possibly inflated data reported from provincial sources to meet output growth targets, these adjustments might not have eliminated all upward biases. Conversely, income data may be biased downward because some townships and village enterprises may have underestimated their output and because output from the underground economy is missing from the official data. However, these biases in opposite directions cancel each other out to some extent (Chow and Li 2002). Furthermore, the main limitation in the econometric analysis is data availability. China's official data on the structure of public spending changed in 2006, which makes for incoherence in comparing the different types of public spending. The final limitation is the use of the chosen econometric method, as these are various constraints in using the PVAR model provided by Love and Zicchino (2006), and the PVAR method itself is subject to debate amongst econometricists. All of these limitations need to be addressed in future research.

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Appendix A: Categories of government expenditures

Table A1: Categories of government expenditures in China

Category <i>(Translation from Chinese)</i>	Explanation
Economic Construction	This is the largest category according to the Chinese classification by categories. It includes all Capital Expenditure (Capital Construction, Innovation Funds and Science and Technology Promotion Funds) and from Current Expenditure: Economic Services (Geological Protecting, Agriculture, Operating Expenses of Industry, Commerce, and Transport, and Working Capital for State enterprises). Urban Maintenance and Construction Support for Developing Areas, and Policy Subsidies.
Social, Cultural, and Educational Development	These are Current Expenditure items such as Culture, Education, Science, Health, Social Relief, Social Security Subsidies, and Pension for Retired Employees, and Spending of Additional Education Fees.
National Defence	National Defence Spending
Government Administration	Government Administration, Police and Courts, Armed Police, Tax Administration, and Foreign Affairs.
Others	This Category includes External Assistance, Interest on National Debt and other items.

Source: Ministry of Finance (2004); OECD (2006)

Appendix B: Summary statistics at provincial data

Figure B1: The trend of variables in national level analysis

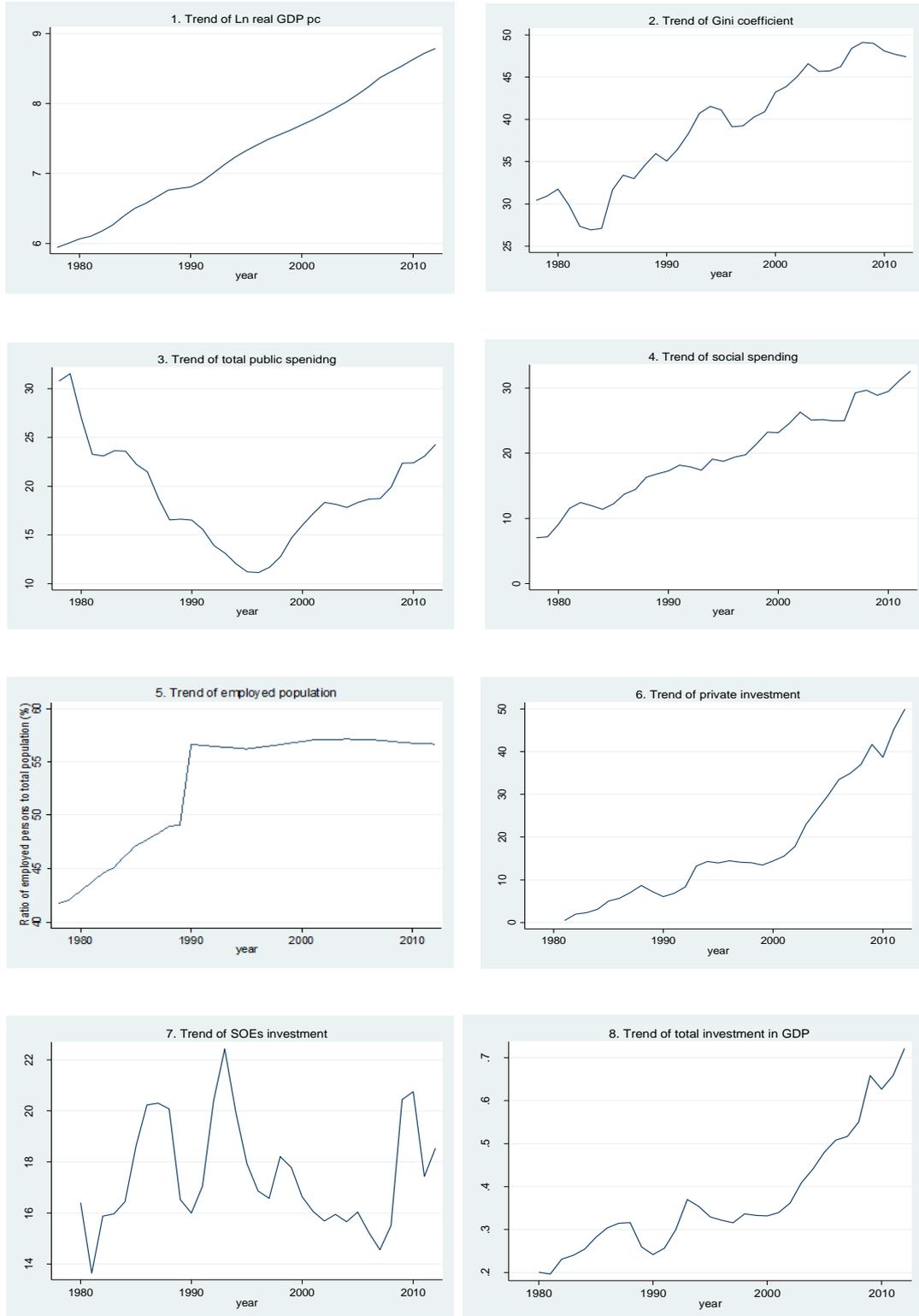


Table B1: The tables of summary statistics at provincial level

a). The standard deviation of provincial level data

	GDP(pc) growth	PS/GDP	social spending/PS	gini	private investment /GDP	SOE investment/GDP	labour growth
AnHui	0.035	0.042	0.057	0.035	0.188	0.029	0.012
Beijing	0.041	0.028	0.043	0.020	0.067	0.097	0.073
ChongQing	0.055	0.048	0.045	0.022	0.142	0.088	0.016
FuJian	0.028	0.012	0.096	0.035	0.057	0.017	0.013
Gansu	0.036	0.074	0.068	0.045	0.056	0.055	0.016
GuangDong	0.026	0.009	0.044	0.036	0.025	0.047	0.026
Guangxi	0.043	0.038	0.050	0.030	0.121	0.025	0.007
Guizhou	0.063	0.071	0.048	0.062	0.082	0.054	0.010
Hebei	0.026	0.023	0.053	0.038	0.127	0.048	0.021
Heilongjiang	0.028	0.042	0.073	0.046	0.093	0.039	0.022
HeNan	0.036	0.026	0.062	0.037	0.166	0.019	0.020
HuBei	0.029	0.027	0.058	0.027	0.085	0.032	0.025
JiangSu	0.028	0.022	0.036	0.037	0.106	0.056	0.026
JiangXi	0.032	0.036	0.056	0.046	0.186	0.045	0.023
LiaoNing	0.033	0.028	0.084	0.035	0.200	0.022	0.037
NeiMengGu	0.058	0.029	0.079	0.037	0.155	0.055	0.019
NingXia	0.045	0.063	0.053	0.032	0.159	0.062	0.024
Qinghai	0.035	0.104	0.129	0.028	0.091	0.056	0.017
ShaanXi	0.043	0.040	0.054	0.037	0.093	0.058	0.017
Shanghai	0.044	0.030	0.038	0.032	0.036	0.117	0.045
ShanXi	0.049	0.039	0.061	0.031	0.101	0.044	0.019
Sichuan	0.032	0.056	0.048	0.014	0.099	0.038	0.069
Xinjiang	0.044	0.063	0.050	0.015	0.080	0.067	0.015
ZheJiang	0.036	0.022	0.028	0.020	0.054	0.065	0.024

b). The minimum value of provincial level data

	real GDPpc growth	PS/GDP	social spending /PS	gini	private investment /GDP	SOEs' investment /GDP	labour growth
AnHui	0.042	0.075	0.228	0.320	0.108	0.154	-0.003
Beijing	0.028	0.102	0.206	0.231	0.109	0.096	-0.055
ChongQing	0.051	0.065	0.224	0.380	0.139	0.000	-0.027
FuJian	0.041	0.078	0.218	0.315	0.167	0.130	0.005
Gansu	0.041	0.126	0.208	0.370	0.059	0.213	-0.009
GuangDong	0.054	0.088	0.184	0.342	0.157	0.078	-0.012
Guangxi	0.026	0.092	0.217	0.365	0.111	0.147	0.004
Guizhou	0.054	0.134	0.214	0.329	0.078	0.185	-0.009
Hebei	0.064	0.067	0.240	0.259	0.169	0.143	-0.483
Heilongjiang	0.039	0.088	0.180	0.262	0.048	0.145	-0.027
HeNan	0.054	0.069	0.229	0.314	0.103	0.137	-0.010
HuBei	0.045	0.077	0.217	0.318	0.115	0.179	-0.034
JiangSu	0.073	0.049	0.268	0.288	0.160	0.091	-0.030
JiangXi	0.055	0.094	0.218	0.268	0.066	0.133	-0.051
LiaoNing	0.038	0.095	0.170	0.277	0.093	0.151	-0.119
NeiMengGu	0.087	0.119	0.009	0.317	0.054	0.174	-0.041
NingXia	0.070	0.131	0.188	0.356	0.065	0.211	-0.018
Qinghai	0.016	0.172	0.190	0.402	0.032	0.261	-0.021
ShaanXi	0.071	0.099	0.233	0.385	0.083	0.194	-0.016
Shanghai	-0.064	0.107	0.166	0.228	0.172	0.112	-0.130
ShanXi	0.007	0.097	0.244	0.336	0.055	0.189	-0.037
Sichuan	0.063	0.085	0.205	0.350	0.120	0.177	-0.266
Xinjiang	0.009	0.118	0.224	0.410	0.041	0.197	-0.018
ZheJiang	0.027	0.051	0.242	0.323	0.211	0.103	-0.018

c). The maximum value of provincial level data

	real GDPpc growth	PS/GDP	social spending/PS	gini	private investment /GDP	SOEs' investment /GDP	labour growth
AnHui	0.194	0.213	0.425	0.417	0.649	0.257	0.043
Beijing	0.161	0.193	0.342	0.296	0.301	0.390	0.269
ChongQing	0.297	0.216	0.401	0.447	0.498	0.313	0.027
FuJian	0.131	0.115	0.660	0.412	0.343	0.189	0.043
Gansu	0.195	0.368	0.437	0.490	0.223	0.423	0.057
GuangDong	0.129	0.118	0.336	0.431	0.236	0.250	0.089
Guangxi	0.182	0.210	0.380	0.456	0.477	0.241	0.029
Guizhou	0.323	0.355	0.383	0.491	0.318	0.350	0.035
Hebei	0.139	0.138	0.435	0.380	0.549	0.295	0.992
Heilongjiang	0.131	0.219	0.405	0.395	0.356	0.268	0.058
HeNan	0.187	0.149	0.438	0.414	0.586	0.211	0.070
HuBei	0.154	0.161	0.416	0.392	0.393	0.273	0.052
JiangSu	0.169	0.119	0.385	0.383	0.455	0.261	0.046
JiangXi	0.168	0.204	0.413	0.403	0.656	0.261	0.046
LiaoNing	0.154	0.176	0.427	0.383	0.649	0.238	0.049
NeiMengGu	0.274	0.213	0.333	0.437	0.446	0.335	0.037
NingXia	0.242	0.330	0.389	0.453	0.527	0.413	0.081
Qinghai	0.162	0.550	0.796	0.486	0.303	0.427	0.047
ShaanXi	0.252	0.225	0.412	0.479	0.346	0.399	0.050
Shanghai	0.130	0.199	0.299	0.318	0.315	0.471	0.073
ShanXi	0.189	0.212	0.450	0.425	0.315	0.341	0.041
Sichuan	0.181	0.254	0.408	0.393	0.425	0.314	0.022
Xinjiang	0.177	0.315	0.400	0.459	0.265	0.412	0.032
ZheJiang	0.174	0.116	0.338	0.376	0.359	0.287	0.064