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Research on the Impact of Bank Credit on China's Dual Economic Transformation

Dissertation Submitted to

The University of Geneva

in partial fulfillment of the requirement

for the professional degree of

**Doctorate of Advanced Professional Studies in Applied
Finance, with Specialization in Wealth Management**

by

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January, 2023

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Abstract

The structural contradiction of China's dual economy is a key problem restricting economic development. How to effectively promote the smooth transformation of the dual economy has become an important task for the sustainable development of China's economy. Bank credit plays a vital role in China's economic development. However, the existing theories have not done in-depth and systematic research on bank credit under the background of dual economic transformation (DET). Therefore, it is of great theoretical and practical significance to systematically study the impact of bank credit on China's DET.

This paper builds a theoretical analysis framework for the internal relationship between bank credit and DET, and explores the mechanism and theoretical model of the impact of bank credit on DET. Under the background of the dual economic structure, taking the relationship between bank credit and DET as the research object, analyzing the evolution characteristics of China's bank credit and DET, empirically testing the influence and characteristics of bank credit on China's DET from the provincial level, and proposing optimization policy suggestions for bank credit to promote DET.

The study found that the strength of China's dual economic structure has weakened in recent years. While the economic development has grown significantly, the scale of bank credit and the proportion of credit in the agricultural sector have increased, but the efficiency of financial institutions in converting deposits into loans has declined. From a national view, by increasing the scale of bank credit and the economic growth rate, as well as increasing the efficiency of converting bank deposits into investment, will weaken the dual economic structure, but increasing the proportion of credit in the agricultural sector lead the opposite way. From the region view, bank credit in Beijing has a significant role in promoting DET, while the central, western and northeastern regions have the opposite effect. Judging from the influencing factors of bank credit, the credit scale, credit structure, and credit efficiency of some regions can significantly improve the DET, but some regions have a significant negative impact on the DET.

This paper puts forward several countermeasures to optimize bank credit and promote DET, such as rational allocation of credit scale, continuous optimization of credit structure, improvement of credit fund allocation efficiency, establishment of credit rating system, improvement of credit system in rural areas, improvement of financial technology level and establishment of new financial institutions.

Key words: Bank Credit; Dual Economic Structure; Dual Economic Transformation (DET); Influence Effect

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Research on the Impact of Bank Credit on China's Dual Economic Transformation (DET)

1. Introduction

1.1. Research Background and Significance

1.1.1. Research Background

The history of world economic development shows that the dual economic structure in which the traditional agricultural sector and the modern industrial sector coexist, the former reflects the "sector dual economic structure". (Lewis, 1954), the latter reflects the "geographic dual economic structure" (Myrdal, 1957). As an important content of development economics, the theory of dual economic structure holds that the transition from a heterogeneous dual economic structure to a homogeneous unified economic structure is an important process that developing countries must go through in the process of economic development. Therefore, *Dual Economic Transformation (DET)* has become the core issue of economic development in developing countries.

As the largest developing country in the world, China is also facing the problem of DET. China's DET process lags behind the industrialization process significantly, the process of meta-economic transformation has caused a series of negative problems such as unbalanced urban-rural development, insufficient agricultural and rural development, rural labor force transfer and urbanization lagging behind. To some extent, the dual economic structure has become the bottleneck factor affecting the sustainable development of Chinese economy.

The slow process of DET is the result of the interweaving and interaction of various factors in China. As the core of modern economy, finance is the most active and sensitive variable in macroeconomic operation, and the most direct factor causing macroeconomic fluctuations (Zhang Jie, 2011). At present, China's financial system dominated by bank indirect financing determines that credit is the main source of investment funds. Therefore, bank credit plays a vital role in China's economic development (Xie Chaohua et al., 2020). However, the existing theories have not conducted in-depth and systematic research on bank credit issues under the background of DET: (1) The traditional economic development theory and the new economic growth theory equate economic development with economic growth, ignoring the structural effects of the economy (Zhou Zhenhua, 2005); (2) Financial development theory focuses on the relationship between bank credit and economic growth, but economic growth is not equal to DET, so the relationship

between bank credit and DET has not been paid enough attention (3) Although the dual economic structure theory and empirical research demonstrated that the DET has a significant economic growth effect (Gao Fan, 2007), it did not systematically include bank credit in the research category, nor deeply analyzed bank credit's impact on DET. At the same time, the unbalanced economic development between regions in China has also led to the obvious regional distribution of bank credit.

1.1.2. Research Significance

This paper starts from the perspective of bank credit to carry out the research on Chinese DET. By summarizing and analyzing the experience of China's bank credit in promoting the transformation of the dual economy, it can not only enrich the relevant theories, but also better guide the dual economy of other developing countries. therefore, this research has important theoretical research implications.

At present, the lag of DET is still a difficult problem restricting the sustainable development of China's economy. Nowadays, China is in a critical stage of DET and deepening financial system reform, how to actively and steadily promote financial market-oriented reforms and give full play to the role of bank credit in economic development, it has become an important issue to realize the sustainable development of China's economy. This paper studies the impact of bank credit on the transition of the dual economy, explores the path of DET in line with China's national conditions, and proposes countermeasures to optimize bank credit to promote the transition of the dual economy, which will help promote the reform of China's financial system and build a more scientific credit system.

1.2. Literature Review

1.2.1. Research on Dual Economic Structure

1.2.1.1. Foreign Research Progress

The idea of a dual economy can be traced back to the Physiocrats, but it was the Dutch economist Boeke (1953) who clearly proposed and used the term. The earliest scholar who fully put forward the theory of dual economic structure was the American economist and Nobel laureate Lewis (1954). Lewis' dual economic theory model of China's national economic problems, and thus started a research boom in the academic circles on the dual economic structure. American economists Fei and Ranis (1961) improved Lewis theory along the paradigm of classical economics on the premise of accepting the assumption of Lewis theory. Fei and Ranis took Lewis' theory a step further, and later people collectively called it the Lewis-Fei Jinghan-Ranis model. The famous American economist Jorgenson (1961) questioned the assumption of the transfer of rural surplus labor force in the Lewis-Fei Jinghan-Lanis model and constructed the famous Jorgensen

DET model. Harris & Torado (1970) focused on how to solve the urban unemployment problem in the process of DET.

Sachs et al. (2000) proposed on the basis of rethinking the traditional dual economic structure theory that the Lewis-Fei Jinghan-Lanis model could not explain the emergence of the dual economic structure well because of ignoring the spontaneous evolution of the division of labor. Murata (2002) analyzed the DET of developing countries from the perspective of interdependence between industry and agriculture. Bhadri & Skarstein (2003) studied the effective demand and terms of trade in the dual economic structure of developing countries by comprehensively converting agricultural surplus into the actual purchasing power of industrial products. Gu & Yabuuchi (2006) found that wage subsidies in the industrial sector increased national income and exacerbated urban unemployment, while wages in the agricultural sector reduce national income and urban unemployment.

Swedish economist Myrdal (1957) put forward the theory of "geographical dual economic structure using dynamic and structural analysis methods, this theory further enriches the theory of dual economic structure from the perspective of geography. On the basis of Myrdal, Hirschman (1958) believed that there will be polarization effects and trickle-down effects in the process of economic development: the polarization effects will cause the economic gap between developed regions and backward regions to widen, while the trickle-down effects will help narrow the gap between the two. Friedman (1966) proposed the "core-periphery" model, which became the most well-known representative model in the theory of geographical dual economic structure.

1.2.1.2. Domestic Research Progress

China has typical characteristics of dual economic structure and began to pay attention to the research on the dual economic structure in the 1980s. The relevant research results can be summarized as follows.

1.2.1.2.1. Research on the Economic Structure

Domestic scholars have launched a series of discussions on the division of China's economic structure when studying the issue of dual economic structure. The main viewpoints include dual economic structure theory, ternary economic structure theory and quaternary economic structure theory.

Most domestic studies (Chen Xiaobing, 1999; Wang Jianguo, 2002; Wu Weidong et al., 1988) analyze China's economic structure on the basis of the Lewis-Fei Jinghan-Lanis model and believe that China has a dual economic structure. Lin Gang and Huang Taiyan (2007) demonstrated China's ternary economic development model and found that the Chinese economy presents a ternary structure in which knowledge economy, agricultural

economy and industrial economy coexist. Hu Angang and Ma Wei (2012) believe that China has gradually formed a four-element economic and social structure consisting of the agricultural sector, township enterprise sector, urban formal sector and urban informal sector. However, Xiang Renkang (2013) objected that both rural industry and the informal sector in cities can be regarded as transitional forms of the transformation of the dual economic structure and cannot be regarded as components that coexist with traditional and modern sectors.

1.2.1.2.2. Research on the Transfer of Agricultural Surplus Labor Force as the Main Line

At the end of the last century, many domestic scholars studied the transformation of China's dual economy (Cai Fang, 1990, 1995; Chen Jiyuan, 1991; Li Yujiang and Wu Yulin, 1999). Then, Lin, Wang & Zhao. (2004) calculated the per capita income indicators of various regions of urban and rural areas in the census data and found that from 1985 to 2000, the gap between urban and rural areas, and between coastal and inland areas in China gradually widened, and this gap also increased, leading to the continuous transfer of rural labor force from rural areas to cities. Liu Liming and Zheng Ping (2005) believed that due to the geographical imbalance of China's economic development level, three major agricultural labor force transfer areas with different characteristics have been formed: the east, the middle, and the west.

1.2.1.2.3. Multi-dimensional Analysis Related to Economic System

Since the beginning of the new century, scholars have combined economic system transformation with DET (Zhang Guiwen, 2001; Xia Geng, 2005; Guo Shaoxin, 2006). Then, Gao Fan (2007) studied the transition of dual economy from the perspective of the evolution of division of labor, he took transaction cost and transaction efficiency as the intermediary links connecting the evolution of division of labor and transition of dual economy, and introduced them into the institutional environment. Zhang Guiwen (2011) comprehensively used the theoretical analysis framework of new political economics, development economics and mathematical economics, combined the historical evolution of China's DET with institutional analysis and the choice of economic subjects.

1.2.1.2.4. Discussion on the Turning Point of Lewis

In 2004, scholars have conducted heated discussions on whether the supply of rural surplus labor has reached the "Lewis turning point", triggering an upsurge of research on labor shortages. Cai Fang (2008) found China's dual economy has already shown it is an obvious sign of entering the Lewis turning point. Zhang Zheng (2011) found there was still a large amount of surplus labor with low labor productivity in rural areas. Zhang Guiwen

(2012) defined the interval between "short shortcomings" and "commercialization points" as the Lewis turning interval.

More scholars hold objections to China's entry into the Lewis turning point. Song Shifang (2009) discussed the determination and change of wages in China's agricultural system and tested the Lewis turning point in China. Mao Xuefeng and Liu Jing's (2011) empirical research found that although the marginal output of agricultural labor in China has increased significantly, the inflection point of the "commercialization" of the labor market within the sample range has not arrived.

1.2.2. Research on the Relationship between Bank Credit and Economic Growth

1.2.2.1. Foreign Research Progress

There is not much works on the relationship between bank credit and economic growth in foreign related literature, and the relevant discussions are mainly included in the research on the relationship between financial development and economic growth. American economists Gurley and Shaw (1955, 1956) published works to expound the relationship between finance and economy, and the role of financial intermediaries in the savings-investment process. Goldsmith (1969) was the first to conduct empirical research on the relationship between financial development and economic growth. Economists McKinnon (1973) and Shaw (1973) demonstrated the relationship with financial development from the perspectives of financial repression and financial deepening, and believed that financial deepening can promote economic development through employment effects. King and Plosser (1984) found through empirical analysis that the expansion of the scale of financial intermediaries and the improvement of their functions can promote capital formation, which in turn has a stimulating effect on the improvement of total factor productivity and long-term economic growth. Levine and Zervos (1998) found that bank credit can independently and positively affect capital accumulation and economic development. Rhaguram and Zingales (1998) proved that there is a Granger causal relationship between financial development and economic growth, and financial development can promote economic growth by reducing the financial cost of external financing for enterprises. Fink et al. (2006) concluded through an empirical analysis of empirical data in some developed countries that credit growth, bond market development, and stock market development are important reasons for their economic growth. Mishkin (2007) found that an effective credit system can reduce the information asymmetry between borrowers and lenders, thereby alleviating the external financing constraints that inhibit credit expansion. Adu et al. (2013) examined the relationship between financial development and economic growth using indicators such as the ratio of private credit to

GDP and total domestic credit and found that financial development has a positive effect on economic growth. Swamy & Dharani (2018) took developed countries as the research object and found that there is a negative correlation between financial development and economic growth.

1.2.2.2. Domestic Research Progress

Domestic scholars have conducted research on the relationship between credit scale and economic growth and have formed two completely different views. Some scholars (Chen Fei et al., 2002; Xia Bin et al., 2003; Jiang Lin, 2006; Pan Juan, 2008; Pan Min and Miao Haibin, 2010). Then, Zhang Yan et al. (2013) found in an empirical study that a short-term increase in total credit can promote economic growth, while a long-term increase will stimulate the economy and cause inflation. Huang Lu (2016) used time series data to conduct an empirical analysis on the efficiency of bank credit and economic growth at the overall and regional levels. Liu Weijiang and Wang Hubang (2017) used the spatial Durbin model to study the role of social financing structure on the development of the real economy and concluded that bank credit across the country and the eastern, central, and western regions has greatly promoted the development of the real economy.

Another group of scholars (Li Guangzhong & Chen Ping, 2002; Sun Minghua, 2004; Zhang Jun, 2006) believe that there is little or even a negative correlation between the growth of credit scale and economic growth. Then, Tian Chengshi (2010) found that the expansion of credit scale does not necessarily promote economic growth. Shan Keqiang (2011) found that there is no two-way Granger causality between credit growth and economic growth.

In recent years, some scholars (He Xiaohai, 2008; Huang Jidan, 2013; Jiang Wenjun and Liu Huaixu, 2019) in China have begun to pay attention to the research on the relationship between credit structure and economic growth. Sun Handong (2019) analyzed the impact of different bank credit flows on economic growth in China and believed that the unbalanced flow of bank credit resources will lead to insufficient and effective use of credit resources, which will hinder China's economic growth. Chen Lu (2021) empirically tested the impact of bank credit on the growth of the real economy in Inner Mongolia from the aspects of credit scale, structure, and efficiency.

Some scholars (Li Qingyuan et al., 2013; Shen Jun and Bai Qinxian, 2013; Cao Fengqi and Yang Le, 2014) have studied the relationship between credit efficiency and economic growth. After that, Liu Jia (2017) empirically analyzed the impact of credit resource allocation on China's economic growth and found that there is a certain "credit discrimination" in China's credit market, state-owned enterprises can obtain relatively more

credit resources, and the efficiency and rationality of resource allocation in the credit market is lower.

1.2.3. Research on the Relationship between Financial Development and Dual Economy

1.2.3.1. Foreign Research Progress

The earliest economist to study the relationship between financial development and dual economy was Mackinnon, one of the founders of financial development theory. In 1973, he made an in-depth analysis of the dual economic structure of developing countries in his monograph and believed financial repression will lead to the creation of a dual economic structure. Shaw's (1973) study believed that developing countries' adoption of low interest rates, policy-based loans, and financial subsidies to finance modern industrial sectors is essentially a financial repression, which will inevitably lead to insufficient saving capacity in traditional agricultural sectors. The lack of financial capital and the inefficiency of capital allocation in the industrial sector, and this duality of financing will inevitably lead to a duality in the economic structure.

Galbis (1977) built a dual financial model closer to the real economy based on Mackinnon's research. The model assumes that the economy is composed of two sectors: a relatively backward low-efficiency sector and a modern technological progress sector. Rakshit (1982) introduced Keynesian theory into the framework of dual economic development and constructed a two-sector model consisting of agricultural and non-agricultural sectors. Japanese economist Shigeru Ishikawa (1967) analyzed the transition of dual economic structures in Japan, China, India, and Taiwan from the perspective of differences in financial development and found that financial development has a greater impact on the transition of dual economic structures.

1.2.3.2. Domestic Research Progress

Wang Shaoguo is an early domestic scholar who studies the relationship between financial development and dual economy. Wang Shaoguo (2003) built a two-sector financial development model for the transformation of the dual economic structure based on the Galbis model and studied the role of financial development in the dual economic structure. Wang Shaoguo (2005) believes that the significance of Mackinnon's financial development theory points out that financial repression will have an impact on the dual economic structure of developing countries, but he denies Mackinnon's view on the relationship between financial repression and dual economic structure.

Wang Yang (2005) believed that the classic dual economic structure models are physical models, which cannot leave room for research on the monetary and financial

systems. Zhou Zhen et al. (2008) found that the financial development of developing countries can increase the capital stock and capital accumulation speed of various industrial sectors. Wang Xiuhua (2011) built an analytical framework for the internal mechanism of financial structure to promote the transformation of dual economic structure from a functional perspective, and discussed how financial structure affects capital accumulation, technological progress, and financial resource allocation among departments through the exertion of financial functions. Zhai Wenjie (2014) elaborated the role of finance in the Lewis-Fei Jinghan-Lanis dual economic theory, and sorted out and summarized the latest theories of financial development promoting DET from the perspectives of financial repression, unbalanced development, and functional views, deeply explored the dynamic mechanism of financial development promoting the transition of dual economy.

In addition to theoretical discussions, many scholars have also tested the relationship between financial development and dual economic structure from an empirical perspective. Wen Tao et al. (2005) found through empirical research that China's financial development not only failed to increase farmers' income, but inhibited the growth of farmers' income, which further led to the widening of the urban-rural income gap and the strengthening of the dual economic structure in China. Wang Xiuhua and Gu Na (2008) conducted an empirical analysis on the relationship between China's financial development and DET by using the binary comparison weighted variation coefficient and the financial correlation rate weighted variation coefficient, and found that there is a significant positive correlation between the differences in regional financial development and the regional DET. Sun Lijun (2009) used provincial data to empirically study the impact of China's financial development on the transformation of the dual economic structure. Shen Hongli et al. (2012) found there is a long-term stable positive correlation between China's financial structure and dual economy. Xu Yueli and Zhang Zhonggen (2013) found the development of financial markets can facilitate dual transformation growth. Wang Zhiqiang and Meng Lisha (2014) found that the balanced allocation of urban and rural financial resources in China and the coordinated development of urban and rural economies are Granger causality, appropriate financial resources in the agricultural and rural areas and reducing the restraint on rural finance can be conducive to the benign transformation of the dual economic structure. Cheng Yinghui and Wang Jian (2015) studied the interactive effect of financial development and dual economic structure through empirical analysis on the basis of proposing the mechanism of financial development on the dual economic structure. Gu Shen and Ma Chenchen (2019) found that financial development can effectively promote

the transformation of the dual economic structure. The larger the scale of financial assets and the more reasonable the allocation of urban and rural financial resources, the faster the transformation of the dual economic structure.

1.2.4. Research Review

Scholars at home and abroad have studied the dual economic structure and its transformation in developing countries from multiple angles and formed much research results. However, judging from the actual situation of China's DET, the above theoretical research is still insufficient, specifically reflected in:

First, there are few studies on the internal mechanism of bank credit's impact on DET. Studies have rarely been reported. Scholars at home and abroad have mostly discussed this issue from the perspective of the impact of credit scale on economic growth but have not paid enough attention to the relationship between bank credit and DET from the perspective of scale, structure, and efficiency, and lack of systematic and comprehensive integration. Analysis and theoretical research are slightly insufficient.

Second, there is a lack of analysis of the impact of bank credit on the transformation of the dual economy from the perspective of dynamic evolution. When scholars study the relationship between financial development and DET, most of them focus on the impact of financial support or financial repression on DET, but few scholars combine bank credit with the characteristics of different stages of DET while ignoring the long-term dynamic impact of regional differences in bank credit on DET.

Third, there is a lack of more fine-grained empirical analysis of the impact of bank credit on DET. At present, there are many research results on the impact of financial development on the transformation of dual economy, but most of the studies often ignore the effect of bank credit on the transformation of dual economy when constructing empirical models of dual economy transformation. Some useful explorations have been made on the DET model of the factors, but the relevant research results are relatively scattered and mostly carried out at the national level, and need to be supplemented and improved in light of the actual situation of the DET. At the same time, since the theory of financial development and the theory of dual economy are not based on the experience of China, in view of the realistic background of the unbalanced financial development among regions in China, it is necessary to further analyze the impact of bank credit on the transformation of dual economy from a more fine-grained empirical perspective. carry out.

1.3. Research Ideas and Content

1.3.1. Research Ideas

This paper focuses on the following specific questions: (1) What is the mechanism of

bank credit's impact on DET? (2) How to quantify and evaluate the impact of bank credit on DET? (3) What impact does China's bank credit have on the transformation of the dual economy? (4) How to choose the policy path of optimizing bank credit to promote DET?

In order to study the above issues, this paper follows the train of thought of “theoretical research—status analysis—empirical analysis—policy suggestion” (as shown in Figure 1).

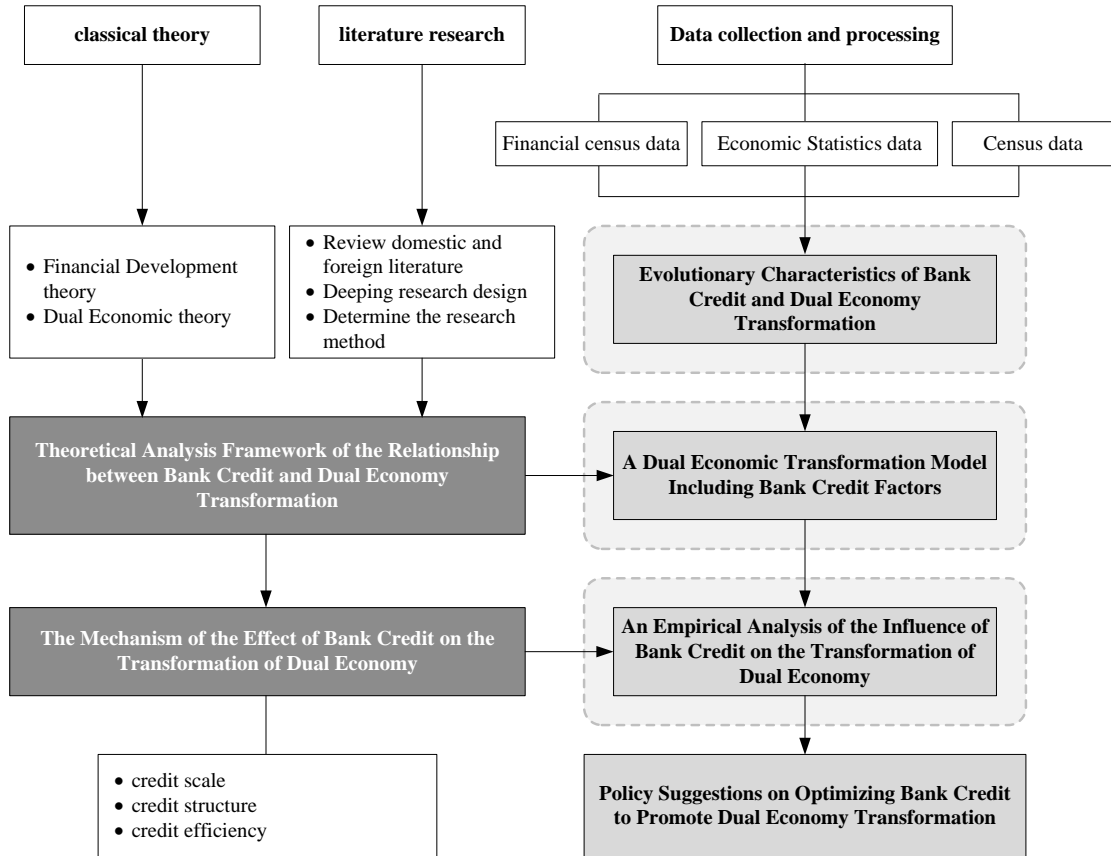


Figure 1: Logical Road Map of Research

(1) Theoretical research. On the basis of classical theoretical research and literature research, construct a theoretical analysis framework for the internal relationship between bank credit and DET, and theoretically explore the bank credit factors that may affect the DET and their mechanism of action, and build a theoretical model of DET framework that includes bank credit factors.

(2) Analysis of current situation. Under the realistic background of China's unbalanced financial development and DET, this paper selects reasonable evaluation indicators of bank credit and DET, and conducts statistical analysis on the evolution characteristics of China's bank credit and DET.

(3) Empirical analysis. Construct an econometric model of bank credit's impact on DET, and use inter-provincial panel data to empirically analyze the effect and characteristics of China's bank credit on DET.

(4) Policy suggestions. On the basis of theoretical research and empirical analysis, combined with the current characteristics of China's bank credit and DET, from the perspective of optimizing the path of China's bank credit reform, put forward policy suggestions to promote DET.

1.3.2. Research Purpose

The purpose of this research can be summarized in the following four aspects:

First, scientifically define the connotation of bank credit and DET. On the basis of summarizing and referring to classic literature, combined with the latest research results of financial development theory and dual economic structure theory, it analyzes the connotation and characteristics of bank credit and DET, making the concept definition of bank credit and DET more clear and research content more specific.

Second, explore the mechanism and theoretical model of the effect of bank credit on the transition of dual economy. First of all, the bank credit factor is included in the theoretical analysis framework of the DET, based on the dual economic structure theory, the impact of bank credit changes on the relevant factors of the DET is analyzed, and the relationship between bank credit and economic growth and the path of bank credit to promote DET, and analyze the direction, intensity and mechanism of bank credit on DET from the perspective of credit scale, credit structure, credit efficiency and other factors; and then, construct a DET that includes bank credit factors theoretical model of DET, which clarifies the mathematical expression and economic explanation of bank credit's impact on DET.

Third, deeply analyze the impact of China's bank credit on the transition of the dual economy. Under the realistic background of China's unbalanced financial development and DET, select reasonable evaluation indicators of bank credit and DET, and build an econometric model of bank credit's impact on DET. On the basis of statistical analysis of the characteristics of the evolution of economic transformation, this paper empirically analyzes the impact of China's bank credit on the DET from the provincial level, in order to provide data support and empirical ideas for optimizing bank credit.

Fourth, put forward the policy goal of optimizing bank credit to promote DET. On the basis of theoretical analysis and empirical analysis, summarize the laws and characteristics of China's bank credit affecting the DET, and explore the optimization path of the bank credit on the basis of China's specific national conditions in view of the current situation and characteristics of China's bank credit, and put forward the policy direction to promote the transformation of dual economy.

1.3.3. Research Content

According to the purpose of the research and the arrangement of the research ideas, the research content of this paper mainly includes:

First, research on the mechanism and theoretical model of the impact of bank credit on the transformation of the dual economy. On the basis of the dual economic structure theory, the bank credit factor is included in the theoretical analysis framework of the DET and based on the internal mechanism of financial development promoting economic growth, the impact of changes in bank credit on the DET factors is theoretically analyzed. Explore the mechanism of bank credit's impact on DET from the scale, structure, efficiency, and other paths, and build a theoretical model of DET that includes bank credit factors.

Second, research on the measurement and evaluation of bank credit and DET. Combined with the latest research progress, the concept of bank credit and DET is defined and expanded, and based on this, an evaluation index system for bank credit and DET is constructed. Conduct statistical analysis and in-depth mining of empirical data, and comprehensively evaluate the evolution laws and characteristics of China's bank credit and DET.

Third, the empirical research on the influence of bank credit on the transition of dual economy. Based on the characteristic facts of the transition of the dual economy in developing countries, taking the status quo of China's bank credit and DET as the research object, an econometric analysis model is constructed, and the panel data is used to empirically analyze the impact of China's bank credit on the dual economy from the provincial level.

Fourth, research on the choice of policy path for bank credit to promote DET. Based on the theoretical and empirical analysis of the impact of bank credit on DET, combined with the current situation and characteristics of China's bank credit and DET, this paper explores the optimal path of bank credit to promote China's DET, and puts forward corresponding policy suggestions.

2. Theoretical Analysis

2.1. Concept Definition

2.1.1. Bank Credit

Bank credit can be defined as an economic activity in which a bank is used as a credit intermediary to lend funds raised by means of deposits to individuals or enterprises and institutions, and the borrower is required to pay interest in return and agree on a time for interest collection. The concept of credit defined in this article only refers to the credit intermediary of banks, which includes activities such as bank deposits and loan issuance, and does not include private lending between individuals, consumer credit between consumers and businesses, and does not include commercial credit between the two countries, national credit for financial bond issuance, not to mention usury.

2.1.2. Dual Economic Transformation (DET)

Based on previous literature review, it is not difficult to see that although the academic circles have not given a clear definition of DET, scholars generally believe that the existence of dual economic structure restricts the coordinated development of economy and society to a large extent. The transformation of economic structure to a homogeneous unitary economic structure is an important process that developing countries must go through in the process of economic development, and the transformation of dual economy has become the core issue of economic development in developing countries. Therefore, the process of dual economy transformation is a process of continuously promoting the transformation and upgrading of the economic structure through the gradual reduction of the proportion of the traditional agricultural sector or backward areas, and the gradual expansion of the proportion of the modern industrial sector or developed areas, and finally the formation of a unified economy. Based on this, this paper will also inherit the above-mentioned definition of DET to carry out related research.

2.2. Mechanism of Bank Credit Affecting DET

Most scholars believe that there is a close relationship between financial development and economic growth. As for how financial development can promote economic growth, Pagano (1993) found on the basis of neoclassical economic growth theory that a society's savings rate, savings-to-investment conversion rate, and investment efficiency are important indicators that affect economic growth, and these three indicators are related to the financial system, both reflect the quality of financial development. Levine et al. (2000) expounded that financial development affects economic growth through capital accumulation and technological progress from a functional perspective.

In order to investigate the mechanism of bank credit on DET, it is necessary to analyze the impact of bank credit on these factors through financial development on the basis of clarifying the main factors affecting DET. Fei and Ranis (1961) believed that for labor surplus developing countries, capital accumulation and technological progress are the key factors affecting the transformation of their dual economy. In addition, the allocation of financial resources among different departments and regions is also an important factor affecting the transformation of dual economy. If the allocation of financial resources is reasonable, it will have a promotion effect, otherwise it will have an inhibitory effect (Bai Qinxian, 2005). Based on this, combined with the previous analysis of the connotation and evaluation factors of bank credit, this paper improves the model of Levine et al. (2000) to construct an analytical framework for bank credit to promote DET, as shown in Figure 2. Bank credit can affect the performance of various functions of the financial system through credit scale, credit structure and credit efficiency, and the function of the financial system affects the process of DET through capital accumulation, technological progress and financial resource allocation.

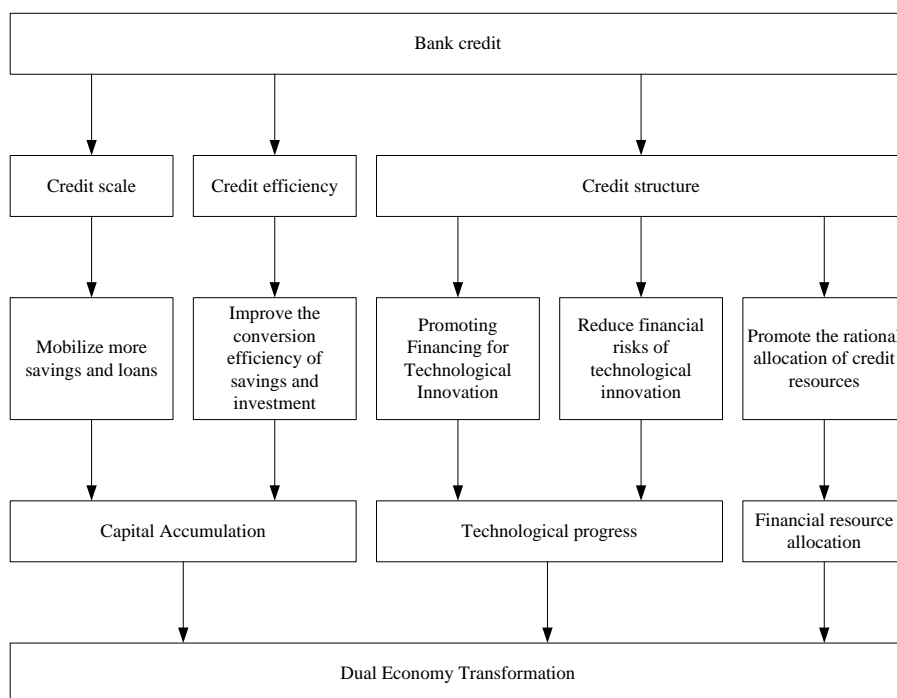


Figure 2:The Path of Bank Credit Affecting the Transformation of Dual Economy

2.2.1. Affecting DET through Credit Scale

Credit scale is the most direct manifestation of bank credit. Social idle funds are more easily converted into productive capital in a financial system with a high degree of marketization. Banks can affect the following financial functions through the expansion of credit scale, thereby promoting capital accumulation, and then Affect the transformation of dual economy. First, it affects capital accumulation through savings mobilization. The

process of savings mobilization is the process of aggregating scattered savings into capital and converting them into loans. In this process, there are transaction costs for accumulating savings from owners and information asymmetry costs for savers to give up control over savings. Banks can reduce transaction costs and information costs, mobilize more savings and loans, and promote capital accumulation. Second, Banks and financial markets can promote capital accumulation through risk management, reduce the liquidity risk of investors and lenders through risk internalization, thereby providing security for capital accumulation.

2.2.2. Affecting DET through Credit Structure

Bank credit structure affects technological progress and innovation through the following financial functions, and then affects the transformation of dual economy. First, through credit structure adjustment, banks bring together scattered personal funds and direct them to large-scale inseparable investment projects, thereby improving the allocation of financial resources and promoting technological progress and innovation. Second, technological innovation has the characteristics of long investment cycle and high risk of failure, which makes technological innovation investment accompanied by high liquidity risk and high rate of return risk. Therefore, investors are more inclined to invest projects with low returns, low risks, high liquidity and low degree of specialization. Banks can facilitate the rapid realization of investors through the adjustment of credit structure, and diversify the risk of return rate through asset portfolio optimization, thereby promoting enterprises to choose new technologies with a high degree of specialization, and driving technological progress and innovation. At the same time, the allocation of credit resources among different sectors will have an important impact on the transition of the dual economy, and a reasonable allocation of credit resources will promote the transition of the dual economy.

2.2.3. Affecting DET through Credit Efficiency

Banks promote the accumulation of capital by improving the conversion efficiency of savings to investment, thereby affecting the transformation of the dual economy. First, as a credit intermediary, banks can reduce the search cost of transferring funds from the supply side to the demand side, improve the efficiency of converting deposits into loans, and indirectly play a positive role in promoting the optimization of the dual economic structure. Second, certain financial tools are needed to complete the conversion of savings into investment, well-developed financial tools can provide diversified and complex investment conversion functions and promote the conversion of savings into investment while promoting the relationship between credit capital and industrial capital which in turn

has a positive impact on capital accumulation.

2.3. Mathematical Expression of Bank Credit's Impact on DET

Based on Galbis (1977) financial intermediary two-sector model, this paper expands the model by introducing bank credit factors to study the impact of bank credit on the transformation of the dual economy. This paper use Pagano (1993) to add financial factors to the AK model Method to analyze the theoretical model of bank credit impact on dual economy, and provide a detailed description of the two-sector and theoretical models of financial intermediation in Appendix A.

1.The Two-sector Model

In part one of Appendix A, we get the two-sector model.

$$\lambda = (y_{t1} - l_{t1}) - (y_{t2} - l_{t2})$$

Among them, $y_{t1} = \left(\frac{dY_{t1}}{dt}\right) / Y_{t1}$ and $y_{t2} = \left(\frac{dY_{t2}}{dt}\right) / Y_{t2}$ denote the output growth rate of the two sectors relative to time t, $l_{t1} = \left(\frac{dL_{t1}}{dt}\right) / L_{t1}$ and $l_{t2} = \left(\frac{dL_{t2}}{dt}\right) / L_{t2}$ denote the labor force growth rate of the two sectors relative to time t.

2. The Output Growth Rate of Sector I

In part two of Appendix A, we get the output growth rate of sector I.

$$y_{t1} = a_{t1} + k_{t1}h_{t1} + w_{t1}l_{t1}n_{t1}$$

Among them, a_{t1} represents the growth rate of technological progress, n_{t1} represents the ratio of output to labor.

3.The Output Growth Rate of Sector II

In part two of Appendix A, we get the output growth rate of sector II.

$$y_{t2} = a_{t2} + k_{t2}(1 + \beta)f(\theta, \eta)s_{t2}(\sigma) + w_{t2}l_{t2}n_{t2}$$

Among them, a_{t2} represents the growth rate of technological progress, n_{t2} represents the ratio of output to labor.

4. Mathematical Formula of Dual Economic Transformation

Through the analysis of the two-sector model and the theoretical model, this paper substitutes the output growth rate formulas of Sector I and Sector II into the formula of the degree of transformation of the dual economy, and it can get:

$$\begin{aligned} \lambda &= (a_{t1} + k_{t1}h_{t1} + w_{t1}l_{t1}n_{t1} - l_{t1}) - [a_{t2} + k_{t2}(1 + \beta)f(\theta, \eta)s_{t2}(\sigma) + w_{t2}l_{t2}n_{t2} - l_{t2}] \\ &= (a_{t1} - a_{t2}) + [l_{t1}(w_{t1}n_{t1} - 1) - l_{t2}(w_{t2}n_{t2} - 1)] \\ &\quad + [k_{t1}h_{t1} - k_{t2}(1 + \beta)f(\theta, \eta)s_{t2}(\sigma)] \end{aligned}$$

In the above formula, λ it represents the transformation degree of dual economy.

It is not difficult to see from the above formula that the transformation of the dual economy has been affected by many factors. The savings rate of the two sectors, the conversion efficiency of savings to investment, capital accumulation and the flow of financial resources between the two sectors are all important factors affecting the transformation of dual economy. These factors promote the transformation of the dual economy by affecting the transfer of surplus agricultural labor to the modern industrial sector. Therefore, when examining the impact of bank credit on the transformation of the dual economy, it is necessary to analyze the impact of changes in bank credit scale, credit structure, and credit efficiency.

3. Research Methods

3.1. Analysis Method

In order to comprehensively examine the impact of bank credit on China's DET, this paper takes the relationship between bank credit and DET in various regions of China as the research object, based on the theoretical model, select indicators that affect the transformation of the dual economy from the scale of bank credit, credit structure, credit at the level of efficiency, and use the data of 31 provinces and cities in China from 1978 to 2019 to construct panel data models at the national and provincial levels. First, analyze the evolution characteristics of China's bank credit and DET. Secondly, through the unit root test and descriptive statistics, it is proved that bank credit has a long-term correlation with the DET, and the fixed effect model is used to test the influence effects and characteristics of the impact coefficient of bank credit on China's DET, and the influence of the DET in each region. Thirdly, the variable coefficient model is used to test the influence of bank credit factors on the transition of dual economy when the factors of bank credit change with regional changes. The measurement analysis software used in this paper is EViews 10.0.

3.2. Evaluation Indicators

This paper mainly selects the deposit and loan data of financial institutions to construct the evaluation index of bank credit. In order to investigate the degree of dualization of the economic structure, this paper chooses the common index of binary contrast coefficient. This paper describes in detail the bank credit indicator and the DET indicator in Appendix B.

3.3. Data Source

The data used in this paper come from "Compilation of Statistical Data for 60 Years of New China", "China Statistical Yearbook", "China Financial Yearbook", local statistical yearbooks of provinces (cities) across the country, the official website of the National Bureau of Statistics, and large state-owned financial institutions. Various economic and financial data have been processed through software tools to eliminate the impact of price changes on the official website of the institution. The time span of the sample data is from 1978 to 2019, this paper selects 31 provinces (cities) other than Hong Kong, Macao, and Taiwan as the research area, and performs fitting processing for missing data in some areas. Due to the large amount of data in all provinces (cities) across the country and limited by the length, this paper only list the relevant data at the national level in Appendix C.

4. Evolutionary Characteristics of Bank Credit and DET

4.1. Evolution Characteristics of Chinese Bank Credit

Through the calculation of the credit ratio of China's financial institutions, the proportion of credit in the agricultural sector, and the financial deposit-loan ratio, the changes are shown in Figures 3 and 4. See Appendix C for detailed data.

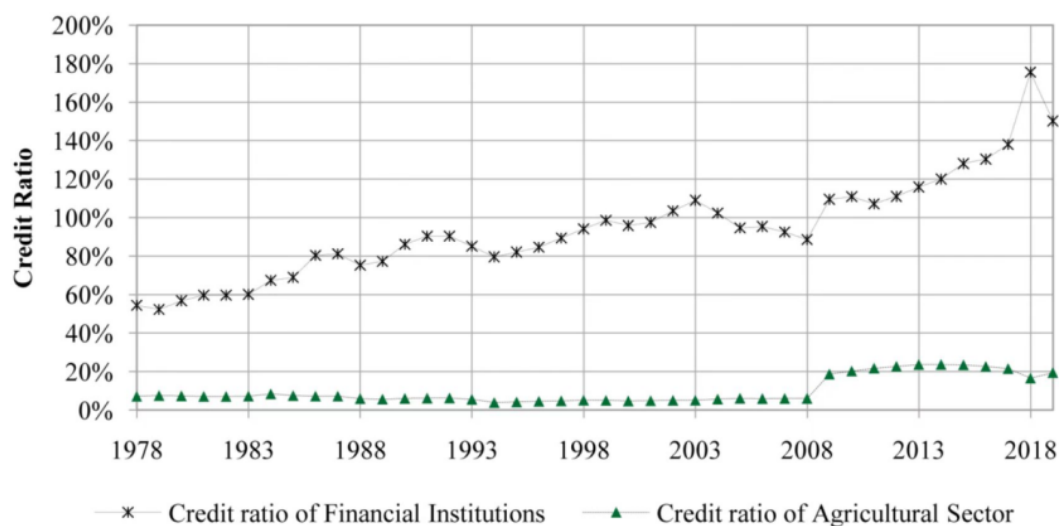


Figure 3: Changes in China's Bank Credit Related Ratios

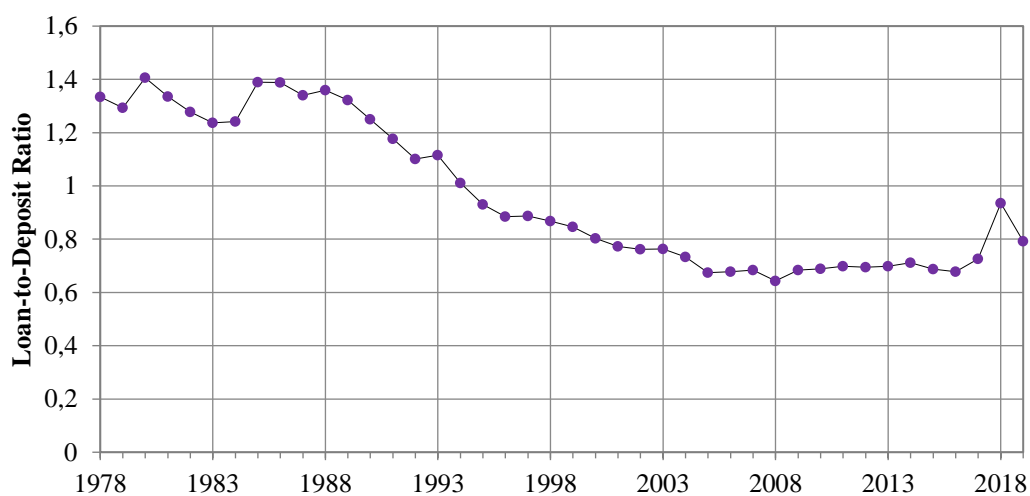


Figure 4: Changes in China's Financial Loan-to-deposit Ratio

The results show that since the reform and opening up, the credit ratio of China's financial institutions has shown a continuous dynamic upward trend, the proportion of credit in the agricultural sector has increased, and the financial deposit-loan ratio has shown a dynamic decline, stabilized and then rose slightly. Among them, the credit ratio of financial institutions has been greater than 100% since 2002, and reached a peak of 175.5% in 2018, an increase of 2.35 times compared with 52.4% in 1979, indicating that the proportion of China's financial institution loans in the economic structure is constantly increasing. It has been continuously expanding, and since 2002, the scale of bank credit in

China has exceeded the total national economy. The country has continuously improved the financial system's support for economic development through continuous financial structural reforms. From 1978 to 2008, the proportion of credit in the agricultural sector remained below 10%. From 2009 to 2019, the proportion of credit in the agricultural sector in China increased to about 20%. This shows that after the adjustment of the bank credit structure in the past ten years, China's credit to the agricultural sector support has been greatly improved. China's financial deposit-to-loan ratio reached its highest value of 140.6% in 1980 and reached its lowest value of 64.3% in 2008, with a difference of more than double the extreme value. From the perspective of its specific change trend, the financial loan-to-deposit ratio declined dynamically from 1978 to 1988 but stabilized overall, but it showed a continuous downward trend from 1989 to 2008, and then remained relatively stable from 2009 to 2016, and then remained relatively stable in 2017. There will be a certain slight increase in 2019. This shows that since the reform and opening up, the efficiency of China's financial system to convert deposits into loans has declined. Although this situation has improved in recent years, the overall ability to utilize financial resources has declined. From the specific numerical point of view, since 1995, the financial deposit-loan ratio has been less than 100%, that is, China's financial resources have been in a state of net outflow after 1995, indicating that China's bank credit has insufficient support for the transformation of the dual economy.

In the context of China's DET, based on the reality of China's economic system reform and policy adjustment, combined with the above analysis, the evolution process of China's bank credit can be divided into the following four stages.

The first stage is 1978-1983. This stage is not only the period when China carries out the fundamental reform of the rural economic system, but also the period when China begins to restructure the agricultural financial support system. In 1979, the Agricultural Bank of China was reestablished. Beginning in 1981, the head office of the Agricultural Bank of China reformed the system of rural credit cooperatives and tried to operate business offices and credit cooperatives in joint offices and joint operations. In 1982, the State Council made major adjustments to agricultural insurance, and the People's Insurance Company of China began to resume agricultural production insurance business. Affected by the lag of the national economic system before the reform and opening up, the proportion of China's bank credit in the national economy and the situation of converting deposits into loans to support economic development were relatively stable during this period, which is consistent with the previous analysis results.

The second stage is 1984-1997. During this period, China began to reform its

financial system, and initially formed a financial system including the central bank, commercial banks, and non-bank financial institutions. At the same time, it established a securities market and an insurance market. The financial industry developed rapidly during this period. Companies and insurance companies continue to be established, and financial institutions continue to expand in size. However, at this stage, China's financial system provided relatively insufficient support to the agricultural sector. The "Decision on the Reform of the Rural Financial System" promulgated in 1996 led to the commercialization of rural credit cooperatives, and the subsequent reform of the Agricultural Development Bank was forced to borrow from the central bank, which leads to the central bank's additional currency issuance, which directly causes inflation. The strengthening of the financial system's support to the industrial sector and the lack of support to the agricultural sector have deepened the dual financial structure between rural finance and urban finance to a large extent.

The third stage is 1998-2008. During this period, China began to deepen the reform of the financial system and formed a central bank system and a foreign exchange management system. Affected by the international financial market turmoil and economic recession in 1998, China continued to deepen the domestic market economic system through the reform of the commercial bank system. because of the cost, profit and risk considerations, China's financial support began to tilt towards the urban industrial sector, implementing measures to condense banking outlets in rural areas, absorb funds from rural areas to transfer to urban areas, restrict private finance, and compress policy-based financial credit, etc. This is consistent with the reality that the credit ratio of China's financial institutions has declined from 1998 to 2008.

The fourth stage is from 2009 to the present. With the continuous deepening of various economic system reforms in China, the financial system of the urban industrial sector has developed relatively well, and the degree to which China's financial system supports the development of the agricultural sector has been strengthened. During this period, the state proposed to carry out institutional innovations in rural finance. By relaxing financial access conditions, combining commercial, cooperative, and policy-oriented finance, using monetary policy and fiscal and taxation tools, and implementing tax and fee preferential policies, financial resources and social capital allocation to the agricultural sector, and then establish a comprehensive rural financial support system with complete functions and services. This is consistent with the fact that the proportion of credit in China's agricultural sector has increased significantly since 2009.

4.2. The Evolutionary Characteristics of China's DET

Through the calculation of China's binary contrast coefficient and GDP growth rate, the changes are shown in Figure 5 and Figure 6 respectively. See Appendix C for detailed data.

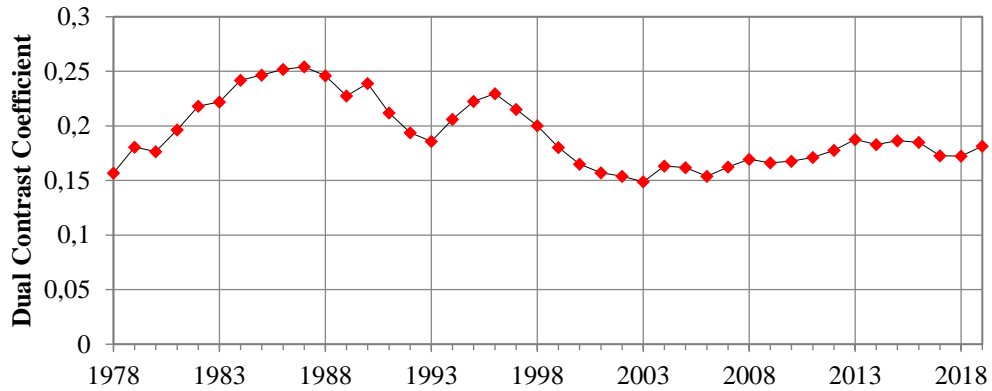


Figure 5: Changes in the Binary Contrast Coefficient in China

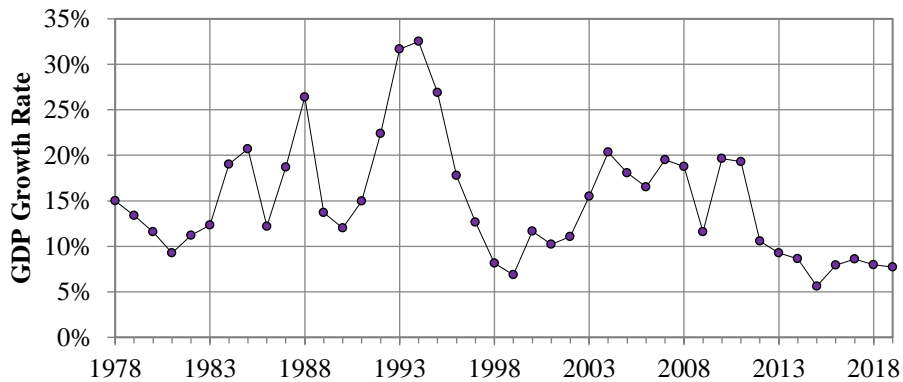


Figure 6: Changes in China's GDP Growth Rate

The results show that China's dual contrast coefficient in 2019 is 0.181, a slight increase from 0.157 in 1978, which shows that although China's dual economic structure has weakened in recent years, the dual economic structure has not been well developed. There are still imbalances in economic development between traditional agricultural sectors and modern industrial sectors, economically developed areas, and backward areas.

On the whole, since the reform and opening up, China's binary contrast coefficient has shown a trend of repeated fluctuations, and can be divided into three stages: the first stage is 1978-1987, this stage is the dual economy from solidification to weakening transfer stage, it can be seen from Figure 4-3 that the binary contrast coefficient in China rose from 0.157 to 0.254 from 1978 to 1987, indicating that compared with the modern industrial sector, the traditional agricultural sector developed faster; The second stage is from 1988 to 2003. This stage is a stage in which the dual economic structure is continuously strengthened. After 16 years of fluctuations and declines, by 2003, China's dual contrast coefficient has dropped to 0.149, which is lower than that of the previous

period in 1978. The lowest point in 2009 shows that the modern industrial sector has developed rapidly with the support of policies and resources, while the traditional agricultural sector has developed slowly, the gap between the development speeds of the two sectors has been widening, and the dual economic structure has been continuously strengthened; The third stage is from 2004 to the present. Although the binary contrast coefficient has shown a rising trend, it has remained low and slowly rising. This shows that under the control of national policies, the development of the traditional agricultural sector has increased in this period by increasing the support of the agricultural sector.

From the perspective of changes in the GDP growth rate, the growth rate in 2019 was 0.077, a slight drop from 0.150 in 1978. Overall, since the reform and opening up, China's GDP growth rate has shown a trend from large fluctuations to small fluctuations: before 2000, the maximum fluctuation range of GDP growth rate was 25.6%, but after 2000, the fluctuation range decreased significantly. Among them, during the period from 1978 to 1994, the GDP growth rate dynamically increased from 0.150 to the highest value of 0.325; then dropped to 0.069 in 1999, and then dynamically increased to 0.196 in 2010, and has been in a dynamic decline since then. This shows that after the reform and opening up and the adjustment of the economic structure, China's economic development has grown significantly, but it is also more susceptible to dynamic fluctuations due to the influence of various factors, which has led to the intensification of the contradictions in the dual economic structure and the dual economic system of urban and rural areas. Reform lagged behind and caused a series of negative problems such as uneven development between urban and rural areas, insufficient agricultural and rural development, transfer of rural labor force, and serious lag in urbanization.

5. Empirical Analysis

5.1. Unit Root Test

For panel data, commonly used unit root test methods mainly include LLC test (Levin et al, 2002), Breitung test (Breitung, 2000), IPS test (Im, Pesaran& Shin, 2003), ADF-Fisher test and PP -Fisher test (Maddala& Wu, 1999), the test results obtained by using the above methods are shown in Table 1.

Table 1. Panel Data Unit Root Test Results

Variable	LLC Test	Breitung Test	IPS Test	ADF-Fisher Test	PP-Fisher Test	smooth
DCC	-2.17232 (0.0149)**	-2.16243 (0.0153)**	-4.54331 (0.0000)***	134.591 (0.0000)***	100.929 (0.0013)***	Yes
FCR	4.38663 (1.0000)	4.75233 (1.0000)	2.11581 (0.9828)	76.9063 (0.0963)*	50.1485 (0.8599)	No
D(FCR)	-21.2419 (0.0000)***	-6.97937 (0.0004)***	-21.9111 (0.0000)***	586.657 (0.0000)***	584.256 (0.0000)***	Yes
ACR	0.10618 (0.5423)	1.02395 (0.8471)	2.66936 (0.9962)	31.8885 (0.9995)	33.6392 (0.9988)	No
D(ACR)	-27.8210 (0.0000)***	-20.6083 (0.0000)***	-24.9283 (0.0000)***	569.810 (0.0000)***	590.918 (0.0000)***	Yes
LDR	2.95076 (0.8984)	5.48486 (0.7958)	4.36044 (0.7915)	36.3000 (0.6963)	68.7770 (0.2588)	No
D(LDR)	-23.5001 (0.0000)***	-11.7289 (0.0000)***	-24.7862 (0.0000)***	678.079 (0.0000)***	1027.11 (0.0000)***	Yes
GDPGR	-26.5821 (0.0000)***	-12.9600 (0.0000)***	-32.2169 (0.0000)***	874.684 (0.0000)***	2276.34 (0.0000)***	Yes

Note: *** means $p < 0.01$, ** means $p < 0.05$, * means $p < 0.1$.

The unit root test results show that the credit ratio of financial institutions, the proportion of credit in the agricultural sector, and the financial deposit-loan ratio in each province are not stable in the original order but stable in the first order, and the binary comparison coefficient and GDP growth rate are stable in the original order. In order to avoid the "spurious regression" problem when estimating the model, this paper will perform differential processing on the credit ratio of financial institutions, the proportion of credit in the agricultural sector, and the financial loan-to-deposit ratio, that is, use their differential sequence instead of the original sequence for model analysis.

5.2. Descriptive Statistics

In order to intuitively reflect the relationship between the main explanatory variables and the DET (dual contrast coefficient), Figure 7 shows the statistical description of the relationship between the variables.

The results show that there is a negative correlation between the binary contrast coefficient and the proportion of credit in the agricultural sector, that is, the lower the

proportion of credit in the agricultural sector, the larger the binary contrast coefficient, and vice versa. The binary contrast coefficient shows a positive correlation with the credit ratio of financial institutions, financial deposit-loan ratio, and GDP growth rate, that is, the higher the financial institution credit ratio, financial deposit-loan ratio, and GDP growth rate, the larger the binary contrast coefficient, on the contrary, and vice versa.

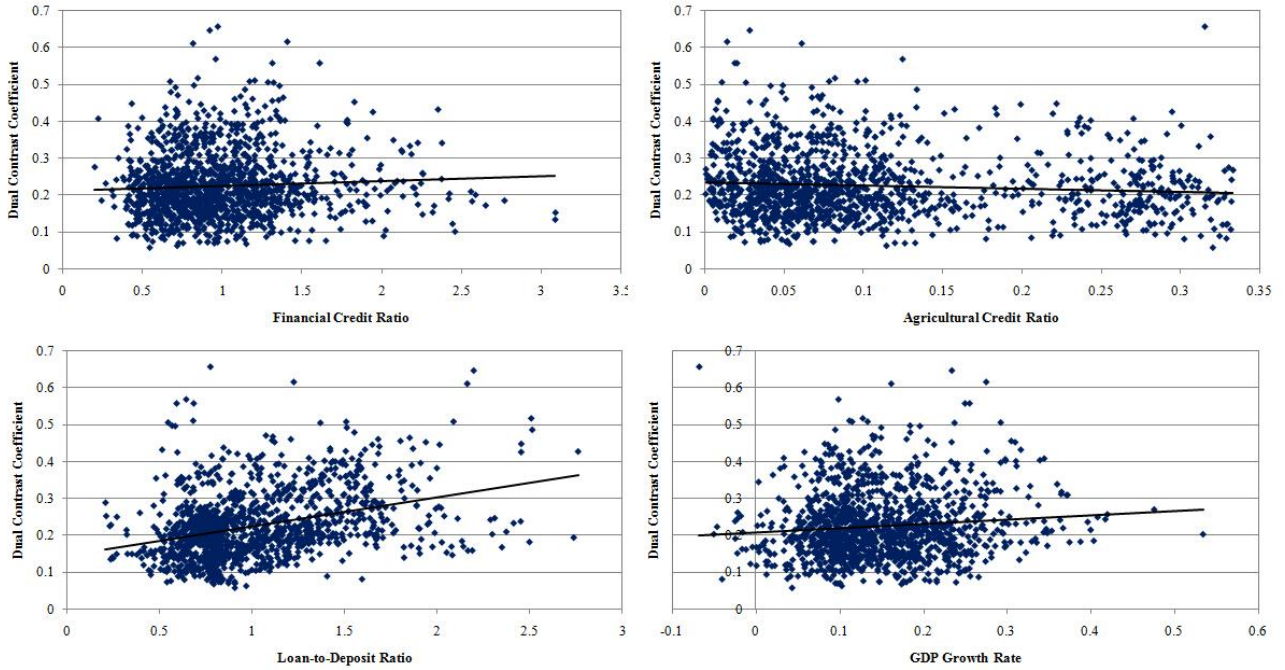


Figure 7: Plot of Explanatory Variables vs. Bivariate Contrast Coefficients

The above conclusions provide empirical support and preliminary judgment for the analysis of the relationship between bank credit and DET. In order to obtain more reliable conclusions, further analysis of the relationship between the two needs to be carried out using econometric models.

5.3. Analysis of Fixed Effect Model

5.3.1. Model Setting

Since the transformation of the dual economy is restricted by many factors, it is necessary to control the influence of other factors when conducting panel data analysis. therefore, it is more reasonable to choose the fixed effect model for empirical analysis. This paper regards the fixed effect as a dummy variable and regards it as other influencing factors between provinces besides explanatory variables. This paper build the model as follows:

$$DCC_{it} = C + a_i + \beta_1 D(FCR_{it}) + \beta_2 D(ACR_{it}) + \beta_3 D(LDR_{it}) + \beta_4 GDPGR_{it} + \varepsilon_{it}$$

Among them, DCC_{it} represents the binary comparison coefficient of province i in year t ; $D(FCR_{it})$ represents the difference value of the credit ratio of financial institutions;

$D(ACR_{it})$ represents the difference value of the credit ratio of the agricultural sector; $D(LDR_{it})$ represents the difference value of the financial deposit-loan ratio; $GDPGR_{it}$ represents the GDP growth rate; a_i represents the fixed effect of province i , that is, other factors that affect the transformation of the dual economy except explanatory variables; β_i is the coefficient of each explanatory variable; C is a constant, ε_{it} is a random error item.

5.3.2. Model Estimation Results

In order to solve the heteroscedasticity problem of different cross-sectional series when performing fixed-effect model analysis, the method of cross-section weights was selected when setting the weights. The model estimation results are shown in Table 2.

Table 2. Fixed-Effects Model Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.215254	0.002977	72.31117	0.0000***
D(FCR?)	0.045893	0.015994	2.869331	0.0042***
D(ACR?)	-0.127164	0.043339	-2.934195	0.0034***
D(LDR?)	0.133799	0.053162	6.201591	0.0298**
GDPGR?	0.072740	0.017025	4.272527	0.0000***
R-squared	0.595800			
Adjusted R-squared	0.584681			
F-statistic	53.58507			
Prob(F-statistic)	0.000000***			

Note: *** means $p < 0.01$, ** means $p < 0.05$, * means $p < 0.1$.

According to the model estimation results, the estimation equation is obtained:

$$DCC_{it} = 0.215254 + a_i + 0.045893D(FCR_{it}) - 0.127164D(ACR_{it}) + 0.133799D(LDR_{it}) + 0.072740GDPGR_{it}$$

From the estimation results of the model, it can be seen that the credit ratio of financial institutions (FCR) is significantly positive at the 1% level, which can be explained as that every percentage point increase in the credit ratio of financial institutions can increase the binary contrast coefficient by 0.215254 percentage points, indicating that the scale of bank credit has a significant positive impact on the transformation of the dual economy; the proportion of credit in the agricultural sector (ACR) is significantly negative at the level of 1%, indicating that increasing bank credit support in the agricultural sector will have a significant negative impact on the transformation of the dual economy impact, every percentage point increase in bank credit support for the agricultural sector will lead to a decrease in the binary contrast coefficient by 0.127164 percentage points; the financial

loan-to-deposit ratio (LDR) is significantly positive at the 5% level, and its coefficient is 0.133799, indicating that by improving the efficiency of financial institutions, promoting the transformation of deposits into loans can have a significant positive impact on China's DET; the economic growth rate (GDPGR) is significantly positive at the level of 1%, indicating that the increase in economic growth rate has a significant positive effect on China's dual economy transformation. The above conclusions are consistent with the results of descriptive statistics.

5.3.3. Fixed Effects Analysis

Fixed effects a_i represent factors other than explanatory variables that affect the transformation of the dual economy, such as the level of financial technology, urbanization rate, and industrial and agricultural development in each province. An in-depth analysis of the fixed effects will help to study the effects and characteristics of bank credit in different provinces on the transition to a dual economy. Table 3 is obtained through the statistical analysis of the fixed effect values of each province and the classification according to the seven major geographical regions of China¹.

Table 3. Estimation Results of the Fixed Effect Model of Seven Major Regions in China

Area	Mean fixed effect	Province	Fixed effect
Eastern China	0.028952	Shanghai	0.078747
		Jiangsu	0.012578
		Zhejiang	0.066778
		Anhui	0.008355
		Fujian	0.033983
		Jiangxi	0.048395
		Shandong	-0.046170
North China	0.005682	Beijing	0.086847
		Tianjin	0.015858
		Hebei	-0.014381
		Shanxi	-0.065190
		Inner Mongolia	0.005275
Central China	-0.0076	Henan	-0.048719
		Hubei	0.020470
		Hunan	0.005447

¹The basis for the division of China's seven major geographical regions is firstly the research results of many authoritative experts in China's natural geographical division for many years, secondly is the "Physical Geography of China" textbook commonly used in colleges and universities. Thirdly is based on the consensus formed in the compilation of the middle school geography textbook "Chinese Geography".

		Guangdong	0.021085
South China	0.009082	Guangxi	-0.036904
		Hainan	0.043066
		Chongqing	-0.038866
South West China	-0.04678	Sichuan	-0.004091
		Guizhou	-0.087551
		Yunnan	-0.094307
		Tibet	-0.009070
		Shaanxi	-0.064407
Northwest China	-0.04035	Gansu	-0.088307
		Qinghai	-0.038184
		Ningxia	-0.061823
		Xinjiang	0.050952
		Heilongjiang	-0.081485
Northeast China	-0.073266	Jilin	-0.090305
		Liaoning	-0.048008

From the average of the fixed effects of China's seven major geographical regions, there are both positive and negative numbers. When the fixed effect is positive, it means that the economic foundation or resource endowment of the region can accelerate the transformation of the dual economy, and vice versa. According to the average value of the fixed effect, we can divide China's seven major geographical regions into three categories: (1) East China, where the average value of the fixed effect is relatively large, it has a value of 0.028952, which is consistent with the high level of urbanization and the difference between urban and rural areas in this region. (2) The average fixed effect was positive which in North China and South China are 0.005682 and 0.009082 respectively, the industrial and agricultural productivity in North China is generally higher, and the comparative labor productivity gap between agricultural and non-agricultural is small, so accelerated the transformation of the dual economy. South China belongs to private enterprises, township enterprises and areas with a high level of reform and opening up. The level of rural economic development is high, and the difference between urban and rural areas is relatively small, which is more conducive to the transformation of the dual economy; (3) The average fixed effect was negative which are: Fixed Central China (-0.0076), Southwest (-0.04678), Northwest (-0.04035) and Northeast (-0.073266). Among them, Northeast China is a traditional heavy industry base in China, with large economic differences between urban and rural areas. There is a large gap in agricultural comparative labor productivity, so it is the most unfavorable area for China's DET. In the other three regions, due to their large agricultural population base, low level of agricultural

development, and a certain level of development of non-agricultural industries, their dual economic structure tends to strengthen.

Further, from the fixed effect value of each province, there are large differences in the impact of bank credit in different provinces on their DET. Among them, the largest fixed effect is Beijing (0.086847), and the smallest is Yunnan (-0.094307), indicating that the regional economic base or resource endowment has a greater impact on its DET. Combined with the analysis results in Table 3, this paper divide each province into three categories: (1) provinces and cities headed by Beijing, Shanghai, and Zhejiang, whose regional bank credit can better promote the transformation of the dual economy; (2) The fixed effect values of provinces such as Yunnan, Sichuan, Inner Mongolia and Tibet are relatively close to 0, and their bank credit has no significant effect on the transition of the dual economy; (3) The bank credit of provinces such as Yunnan, Jilin, and Gansu has a significant effect on the transition of the dual economy, therefore, it is still a difficult task to complete the DET of these provinces.

5.4. Analysis of Variable Coefficient Model

5.4.1. Model Setting

When performing econometric analysis using the fixed-effects model, it is assumed that the cross-sectional membership is fixed. However, in the process of economic development, changes in bank credit may lead to changes in its influencing factors. In order to consider the impact of changes in bank credit factors on the DET as the cross-sectional individual (that is, different provinces) changes, A variable coefficient model will be introduced for econometric analysis in this paper. The basic idea is when examining the different effects of a certain bank credit variable on various provinces, other variables are regarded as common coefficients, and this variable is regarded as a cross-section variable cross-section specific.

When examining the impact of the credit ratio of financial institutions on the DET of different provinces, the variable coefficient model 1 is:

$$DCC_{it} = C + \beta_1 D(FCR_{it}) + \beta_2 D(ACR_{it}) + \beta_3 D(LDR_{it}) + \beta_4 GDPGR_{it} + \varepsilon_{it}$$

When examining the impact of the proportion of credit in the agricultural sector on the DET in different provinces, the variable coefficient model 2 is:

$$DCC_{it} = C + \beta_1 D(FCR_{it}) + \beta_{12} D(ACR_{it}) + \beta_3 D(LDR_{it}) + \beta_4 GDPGR_{it} + \varepsilon_{it}$$

When examining the impact of the financial loan-to-deposit ratio on the DET in different provinces, the variable coefficient model 3 is:

$$DCC_{it} = C + \beta_1 D(FCR_{it}) + \beta_2 D(ACR_{it}) + \beta_{13} D(LDR_{it}) + \beta_4 GDPGR_{it} + \varepsilon_{it}$$

5.4.2. Model Estimation Results

The estimated results of the variable coefficient model are shown in Table 4.

Table 4. Estimated Results of Variable Coefficient Model

Variable	Model 1		Model 2		Model 3	
	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
C	0.196490	0.0000***				
D(ACR?)	-0.208915	0.0005***				
D(LDR?)	0.013212	0.0261**				
GDPGR?	0.138882	0.0000***				
C			0.203321	0.0000***		
D(FCR?)			0.048709	0.0333**		
D(LDR?)			0.010629	0.0611*		
GDPGR?			0.096172	0.0001***		
C					0.202722	0.0000***
D(FCR?)					0.050119	0.0359**
D(ACR?)					-0.107968	0.0610*
GDPGR?					0.087800	0.0002***
Beijing	0.005064	0.9718	-1.491527	0.7349	-0.140246	0.7643
Tianjin	0.027041	0.7887	0.35165	0.7196	0.222219	0.0468**
Hebei	0.279434	0.0003***	-0.018622	0.9256	0.123374	0.108
Shanxi	-0.050629	0.7329	0.306242	0.0097***	0.154415	0.3182
Inner Mongolia	0.141765	0.5099	-1.150818	0.0377**	0.354239	0.0396**
Liaoning	0.273916	0.0103**	0.659543	0.5079	0.529973	0.0000***
Jilin	0.310792	0.1017	-0.2542	0.8352	0.453551	0.0166**
Heilongjiang	0.435703	0.0056***	0.532634	0.0336**	0.023715	0.8691
Shanghai	-0.218412	0.0074***	3.133213	0.421	-0.082024	0.2871
Jiangsu	0.352483	0.1476	-0.013498	0.9574	-0.135954	0.3968
Zhejiang	-0.279753	0.0125**	0.050297	0.8732	-0.785962	0.0098***
Anhui	0.330093	0.0011***	0.458461	0.0468**	-0.006608	0.9183
Fujian	0.494343	0.0003***	0.0592	0.7921	0.05183	0.716
Jiangxi	0.486913	0.1875	0.511407	0.3376	0.328697	0.0396**
Shandong	-0.121759	0.0341**	-0.084843	0.7092	-0.046716	0.4892
Henan	0.22686	0.0308**	0.003644	0.9873	0.040965	0.5481
Hubei	0.350241	0.0425**	-1.067921	0.1063	-0.036892	0.648
Hunan	0.08236	0.6199	-0.154814	0.6594	0.146178	0.0874*
Guangdong	-0.008635	0.923	-0.976071	0.2283	-0.141311	0.1319
Guangxi	-0.017778	0.8596	0.149505	0.0457**	0.094446	0.1091
Hainan	0.090991	0.3862	-0.164331	0.8313	0.039149	0.8279
Chongqing	-0.000892	0.9933	-0.574542	0.1491	-0.00337	0.4561
Sichuan	0.045663	0.2804	-0.096593	0.3688	-0.024274	0.6203
Guizhou	0.43268	0.1196	-0.979939	0.029**	0.129803	0.5724

Yunnan	-0.303065	0.1391	-0.777147	0.2811	0.222962	0.4488
Tibet	-0.076364	0.102	-0.272904	0.4488	-0.096252	0.2464
Shaanxi	-0.076273	0.6304	0.774458	0.0307**	0.250287	0.1505
Gansu	-0.268873	0.0347**	-0.468763	0.3627	-0.086122	0.7038
Qinghai	-0.029252	0.6966	-0.429952	0.1104	0.069893	0.3718
Ningxia	-0.174528	0.2426	-0.603253	0.1734	0.062148	0.7076
Xinjiang	0.476777	0.0001***	-0.043544	0.8409	0.351893	0.0418**
R-squared	0.080076		0.037011		0.066177	
Adjusted R-squared	0.054771		0.010521		0.040489	
F-statistic	3.164408		1.397172		2.576219	
Prob(F-statistic)	0.000000***		0.065438*		0.000002***	

Note: *** means $p < 0.01$, ** means $p < 0.05$, * means $p < 0.1$.

According to the estimated results, the estimated equation of model 1 is obtained as:

$$DCC_{it} = 0.196490 + \beta_1 D(FCR_{it}) - 0.208915 D(ACR_{it}) + 0.013212 D(LDR_{it}) + 0.138882 GDPGR_{it}$$

The estimation equation for Model 2 is:

$$DCC_{it} = 0.203321 + 0.048709 D(FCR_{it}) + \beta_2 D(ACR_{it}) + 0.010629 D(LDR_{it}) + 0.096172 GDPGR_{it}$$

The estimation equation for Model 3 is:

$$DCC_{it} = 0.202722 + 0.050119 D(FCR_{it}) - 0.107968 D(ACR_{it}) + \beta_3 D(LDR_{it}) + 0.087800 GDPGR_{it}$$

The results show that the financial institution credit ratio (FCR) in different provinces has both positive and negative effects on the binary contrast coefficient. From the perspective of provinces with relatively significant impact coefficients, represented by Shanghai, Zhejiang, Shandong, and Gansu, the coefficients of the credit ratio of financial institutions are significantly negative, indicating that the expansion of bank credit in these provinces and cities will actually strengthen their dual economic structure. For Shanghai and Zhejiang, due to their relatively developed urban and rural finance, when the total amount of bank credit increases, on the one hand, it mainly flows to urban areas, resulting in less credit resources in rural areas; on the other hand, due to the active rural private finance. The increase in the total amount of bank credit will have a "crowding out effect" on its private finance, which will have a negative impact on the output of its agricultural sector, which is not conducive to its DET. Shandong, Gansu and other provinces are affected by the uneven distribution of financial resources, when the total amount of bank credit increases, it will be inclined to urban areas and non-agricultural sectors, thus widening the gap between urban and rural areas and intensifying the dual economic structure. Represented by Hebei, Heilongjiang, Anhui, Fujian, and Xinjiang, the

coefficients of the credit ratio of financial institutions in these provinces are significantly positive, indicating that the expansion of bank credit scale is more conducive to the transformation of the dual economy, for these provinces, the increased Bank credit resources can be better used in the agricultural sector, thereby promoting the transformation of the dual economy. Therefore, when improving bank credit to promote DET, it is necessary to formulate financial development strategies according to local conditions in light of the actual conditions of different provinces in China.

Judging from the estimation results of the variable coefficient model of agricultural sector credit ratio (ACR), the proportion of agricultural sector credit in Shanxi, Heilongjiang, Anhui, Guangxi, Shaanxi and other provinces has a significant positive impact on the binary contrast coefficient, indicating that these provinces can continuously improve the credit support for the agricultural sector through the adjustment of bank credit structure, and effectively promote the transformation of the dual economy. As for Inner Mongolia and Guizhou, the dual economic structure will be strengthened by increasing bank credit support to the agricultural sector. The reason may be that the economic development level of these provinces is not high, and the accelerated development of agriculture will actually inhibit the overall economic development of these provinces.

Judging from the model estimation results of the loan-to-deposit ratio (LDR) in different provinces, the provinces and cities represented by Tianjin, Inner Mongolia, Liaoning, Jilin, Jiangxi, Hunan, Xinjiang, etc. have a significant positive impact on the binary contrast coefficient, indicating that these provinces and cities can effectively promote the transformation of the dual economy by improving the efficiency of transforming deposits into loans. But for Zhejiang, increasing the financial deposit-to-loan ratio will have a significant negative impact on the transformation of the dual economy. According to the previous analysis, due to the relatively high level of economic development in Zhejiang and other eastern coastal areas, urban and rural finance are relatively developed. When the conversion rate of bank deposits to loans is increased, it will accelerate the flow of financial resources to urban areas, which is not conducive to the development of the agricultural sector, thereby intensifying the dual economic structure.

6. Conclusion and Discussion

6.1. Conclusion

The conclusions of this study are as follows:

(1) Since the reform and opening up, the strength of the dual economic structure has weakened, but there are still negative problems such as contradictions in the dual economic structure and lagging behind in the reform of the dual economic system between urban and rural areas. During this process, the proportion of bank credit in the national economy has shown a continuous and dynamic upward trend, and the proportion of financial institutions' credit to the agricultural sector has increased, and financial institutions have transformed the deposits they absorb into loans to support economic development. The situation shows a dynamic trend of decreasing, stabilizing and then rising slightly.

(2) Improving the credit support of the agricultural sector has a significant negative impact on China's dual economy transformation. The proportion of bank credit in the national economy, the efficiency of banks converting savings into investment, and economic growth rate have a significant positive impact on China's dual economy transformation.

(3) There are large differences in the effect of bank credit on DET in different provinces. For Beijing and other regions, bank credit has a significant role in promoting the transformation of the dual economy, but some provinces in China cannot effectively promote the transformation of the dual economy by relying on their own financial development, especially in the central, western, and northeastern regions of China. Due to the insufficiency of its economic foundation or financial resources, its dual economic structure tends to strengthen.

(4) In the national economy of each province, the proportion of bank credit is different, and its role in promoting the transformation of dual economy is quite different. For Hebei, Heilongjiang, Anhui, Fujian, Xinjiang and other provinces, the expansion of bank credit scale can significantly promote the transformation of the dual economy, but the opposite is true for Shanghai, Zhejiang, Shandong, Gansu and other provinces, the expansion of bank credit scale has a significant negative impact, that is, strengthening its dual economic structure.

(5) The effect of the credit ratio of the agricultural sector in each province on the DET shows different characteristics. For Shanxi, Heilongjiang, Anhui, Guangxi, Shaanxi and other provinces, it can significantly promote the transformation of the dual economy by increasing credit support to the agricultural sector. However, increasing credit support to the agricultural sector in Inner Mongolia and Guizhou will strengthen the dual economic

structure.

(6) Some provinces can effectively promote the transformation of the dual economy by improving the efficiency of bank deposits into loans. Among them, Tianjin, Inner Mongolia, Liaoning, Jilin, Jiangxi, Hunan, Xinjiang and other provinces have more significant effects, but for some provinces, improving the efficiency of transforming bank deposits into loans will have a significant negative impact on the transformation of the dual economy, such as Zhejiang.

6.2. Policy Recommendations

This paper puts forward the following policy recommendations.

(1) Reasonable Allocation of Credit Scale

While maintaining a reasonable and effective growth of credit scale, it is necessary to take into account the balance of credit scale among regions. While maintaining the same overall credit scale, adjust and optimize the spatial structure and layout of credit resources, and moderately tilt the credit scale to the central, western, and northeastern regions, which will help rationalize the allocation of credit resources and effectively promote the dual economy transformation. Adopt regionally differentiated credit development strategies, strengthen the supervision of regions with fast-growing financial industries, pay attention to the scale and speed of investment in financial assets of real enterprises, and adopt macro-control measures for regions with slow-developing financial industries, and use technologies to guide the flow of credit resources.

(2) Continuously Optimize Credit Structure

To improve the credit structure, we must not only solve the current problem of unreasonable distribution of credit industries, but also solve the problem of unreasonable regional allocation of credit resources, and even solve the problem of low overall quality of credit customers. By strengthening credit product research and development capabilities, providing diversified credit products for economic development, establishing a multi-level bank credit system, increasing credit support for agriculture and local small and medium-sized enterprises, accelerating economic development in rural areas, and accelerating the transfer of rural surplus labor, thus weakening the duality of China's industrial economy and regional economy. In the composition of China's financial institutions, by increasing support for non-state bank financial institutions, especially small and medium-sized banks in economically underdeveloped areas, it can better absorb surplus funds in rural areas and reduce the outflow of rural surplus funds.

(3) Improve the Allocation Efficiency of Credit Fund

In order to make bank credit use of promoting the transformation of the dual

economy, it is necessary to improve the allocation efficiency of credit funds. In this process, the rationalization of the behavior of economic entities and the marketization of interest rates are important prerequisites for ensuring the efficiency of credit fund allocation. On the one hand, increasing the credit allocation to non-state-owned economic entities can the efficiency of credit fund allocation be better improved. On the other hand, market-oriented interest rates can more truly reflect the supply and demand of credit funds. At the same time, it is necessary to formulate financial development strategies according to local conditions.

(4) Establish a Credit Rating System

In China's modern industrial sector, it is more difficult for non-state-owned enterprises and small or medium-sized enterprises to obtain bank credit than large-scale state-owned enterprises, this requires starting from solving information asymmetry and integrity, establishing a unified corporate credit evaluation system by establishing a legal framework for financial credit, cultivating credit intermediaries, building a financial credit information database, and improving the bank's internal credit reporting system.

(5) Improving the Credit System in Rural Areas

For areas with a relatively backward agricultural sector, it is necessary to continuously increase credit support for the agricultural sector, promote the overall development of the local economy, and then better play the role of bank credit in the economic development of the agricultural sector and rural areas. As for areas where all departments are lagging behind, priority should be given to increasing bank credit support to the modern industrial sector and thereby driving the development of the agricultural sector.

(6) Raise the Level of Fintech

First, using technological means to improve bank service capabilities can improve the efficiency of bank credit decision-making and gradually reduce corporate credit costs; second, the development of new technologies can better promote banks to allocate low-cost credit funds to new manufacturing, new productive services and other fields promoting the sound development of the real economy; third, financial technology can provide a fairer, more open and reasonable financial market for the supply side and demand side of credit funds, and help to improve the configuration efficiency of credit funds.

(7) Create a New Type of Financial Institution

It is necessary to innovate the banking business model. First of all, new financial institutions and non-financial institutions should be promoted to innovate their business

models, improve operational efficiency, and deepen cooperation with traditional financial institutions, especially focusing on the use of modern information technology for business expansion and continuous improvement of competitiveness. Second, attach importance to the innovation of supply chain financing models, actively explore new financing channels, strengthen the cooperation between local banks and industrial clusters, and promote the interaction between banks and other industries.

6.3. Discussion

The innovations of this paper are mainly reflected in the following aspects:

(1) Based on the existing research, this paper constructs a theoretical analysis framework for the internal relationship between bank credit and DET and analyzes the internal mechanism of bank credit on DET from the aspects of credit scale, credit structure, and credit efficiency. The integration of dual economic theory and financial development theory not only broadens the research scope of dual economic theory, but also further enriches financial development theory, reflecting certain theoretical innovations.

(2) When analyzing the financial problems during the transition of dual economy, the existing studies focus more on the impact of financial support or financial repression on the transition of dual economy, while the relevant DET models often ignore the impact of bank credit on the transition of dual economy, reduces the reliability of the research conclusions on the relationship between financial development and DET. Based on the DET model, this paper tries to introduce bank credit factors into the model, so as to construct a DET theoretical model including bank credit factors, and uses mathematical analysis methods to study the role of bank credit in DET. The analysis conclusion of logical deduction is modeled, which reflects the innovation of research ideas.

(3) This paper constructs a reasonable evaluation index system for bank credit and DET, and measures and compares the evolution characteristics of China's bank credit and DET since the reform and opening up; secondly, build an econometric model of bank credit's impact on DET, and consider the reality of China's unbalanced provincial economic development, this paper uses panel data to empirically analyze the impact of China's bank credit on DET from the provincial level and characteristics, making up for the lack of existing studies analyzing the problem from the national level. The evaluation index design, empirical data caliber, and time span selection are all more comprehensive and systematic than previous studies, reflecting the innovation of research content.

Since the transition of the dual economy is a complicated process, studying the impact of bank credit on China's DET from the perspective of financial development involves many levels and data. Due to the limitation of research level and time, the choice

of bank credit data in this paper focused on the official statistical data, and did not involve financial innovation, private lending, and other fields, so there will inevitably be some limitations in the empirical data, which affects the comprehensiveness of the research to a certain extent, and more systematic and perfect research needs to be further developed.

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Appendix A: A Model of Bank Credit Affecting the DET

1. Two Sector Model

According to the Galbis (1977) financial intermediary two-sector model, it is assumed that an economy consists of two sectors. Sector I is a backward and inefficient agricultural sector with a large surplus of labor. Sector II is an advanced modern industrial sector with a Lots of capital but a shortage of labor. At any time t, assuming that the outputs of the two sectors are Y_{t1} and Y_{t2} , the labor supply are L_{t1} and L_{t2} , the comparative labor productivity are δ_1 and δ_2 , the binary contrast coefficient is DCC_t , then

$$\text{The sum of the output of the two sectors is: } Y_t = Y_{t1} + Y_{t2}$$

$$\text{The sum of the labor force in the two sectors is: } L_t = L_{t1} + L_{t2}$$

$$\text{The comparative labor productivity of the two sectors are : } \delta_1 = Y_{t1}/L_{t1}, \\ \delta_2 = Y_{t2}/L_{t2}$$

The binary contrast coefficient is:

$$DCC_t = \delta_1 / \delta_2 = \frac{(Y_{t1}/Y_t)}{(L_{t1}/L_t)} / \frac{(Y_{t2}/Y_t)}{(L_{t2}/L_t)} = (Y_{t1}/L_{t1}) / (Y_{t2}/L_{t2})$$

Taking the logarithm on both sides of the above formula, we can get:

$$\ln DCC_t = (\ln Y_{t1} - \ln L_{t1}) - (\ln Y_{t2} - \ln L_{t2})$$

Deriving the time t in the above formula, we can get:

$$\left(\frac{dDCC_t}{dt} \right) / DCC_t = \left[\left(\frac{dY_{t1}}{dt} \right) / Y_{t1} - \left(\frac{dL_{t1}}{dt} \right) / L_{t1} \right] \\ - \left[\left(\frac{dY_{t2}}{dt} \right) / Y_{t2} - \left(\frac{dL_{t2}}{dt} \right) / L_{t2} \right]$$

Among them, let $\lambda = \left(\frac{dDCC_t}{dt} \right) / DCC_t$ denote the transition rate of the dual economy, $y_{t1} = \left(\frac{dY_{t1}}{dt} \right) / Y_{t1}$ and $y_{t2} = \left(\frac{dY_{t2}}{dt} \right) / Y_{t2}$ denote the output growth rate of the two sectors relative to time t, $l_{t1} = \left(\frac{dL_{t1}}{dt} \right) / L_{t1}$ and $l_{t2} = \left(\frac{dL_{t2}}{dt} \right) / L_{t2}$ denote the labor force growth rate of the two sectors relative to time t. Substituting the above equations, we get:

$$\lambda = (y_{t1} - l_{t1}) - (y_{t2} - l_{t2})$$

In the above formula, λ it represents the transformation degree of dual economy. When λ is positive, When it is positive, it means that the difference between the output growth rate and the labor force growth rate of sector I is greater than the difference between the output growth rate and the labor force growth rate of sector II. At this time, the duality of the economy is weakened, the larger λ is, The faster the transformation of the dual economy and the shorter the time required.。 when λ is negative, it means that the duality of the economy has been strengthened , the smaller λ is , the slower the transformation of the dual economy and the longer it takes.

2.Theoretical Model

We use Pagano's (1993) method of adding financial factors into the AK model to analyze the mechanism of bank credit affecting the dual economy.

The previous analysis shows that bank credit is the main source of investment funds. We assume that the production functions of the two sectors at any time t are:

$$Y_{t1} = A_{t1} F_{t1}(L_{t1}, K_{t1})$$

$$Y_{t2} = A_{t2} F_{t2}(L_{t2}, K_{t2})$$

Among them, A_{t1} and A_{t2} represent the technical level of the two sectors at time t, L_{t1} and L_{t2} represent the labor supply level of the two sectors at time t, K_{t1} and K_{t2} represent the capital stock of the two sectors at time t. Assuming that the prices of production factors are equal to their marginal productivity, the capital prices of the two sectors can be expressed by the capital rate of return r_{t1} and r_{t2} , the labor price can be expressed by the wage level w_{t1} and w_{t2} , that is:

$$r_{t1} = \frac{\partial Y_{t1}}{\partial K_{t1}}, \quad r_{t2} = \frac{\partial Y_{t2}}{\partial K_{t2}}, \quad w_{t1} = \frac{\partial Y_{t1}}{\partial L_{t1}}, \quad w_{t2} = \frac{\partial Y_{t2}}{\partial L_{t2}}$$

Sector II has advanced production technology and its productivity is higher than that of Sector I, so it can lead to higher return on capital and wages, that is $r_{t1} < r_{t2}$, $w_{t1} < w_{t2}$ 。 The difference in the rate of return on capital and wages between the two sectors caused by the level of technology determines the transfer of capital and labor from the agricultural sector to the modern industrial sector. Based on the above production function, assuming that all factors of production are fully utilized, the overall income of the economy is: :

$$Y = Y_{t1} + Y_{t2} = r_{t1} K_{t1} + w_{t1} L_{t1} + r_{t2} K_{t2} + w_{t2} L_{t2}$$

Under the assumption that all factors of production are fully utilized, at any time t has $K = K_{t1} + K_{t2}$. Therefore, when the total amount of capital stock remains unchanged,

an increase or decrease in the capital stock of one sector will inevitably cause a change in the capital stock of another sector. Since the rate of return on capital in Sector II is higher than in Sector I, when K_{t1} decrease and K_{t2} increase, then Y increase. This shows that under certain social resource conditions, by improving the resource allocation mechanism of financial intermediaries, the transfer of social resources from the agricultural sector with low production efficiency to the modern industrial sector with high production efficiency can be accelerated, thereby promoting the overall economic development.

In the process of dual economy transformation, for the agricultural sector, the agricultural surplus it provides to the modern industrial sector is the main source of capital accumulation, so it is an important factor affecting the transition of the dual economy. The reduction of agricultural surplus may hinder the process of economic transformation. In the initial stage of dual economy transformation, the savings of sector I is higher than its capital investment, so it is a net saver; the investment of sector II is much greater than the amount of savings, and the difference between its investment and savings is formed by the net savings of other sectors, so are net investors. Based on this principle, we analyze the investment and saving behaviors of the two sectors and explain the transformation of the two sectors.

(1) Investing and Saving Behavior in Sector I

For sector I, its saving is greater than investment, that is $S_{t1} > I_{t1}$, ,the productive investment of this sector comes from saving. Its investment function is:

$$I_{t1} = h_{t1}(k_{t1}, d - p)Y_{t1}$$

$$\frac{\partial h_{t1}}{\partial k_{t1}} > 0, \frac{\partial h_{t1}}{\partial (d - p)} < 0$$

Among them, the investment propensity of sector I is h_{t1} , d represents the nominal deposit rate of financial intermediaries, p is the inflation rate in period t, so the real interest rate of deposits is $d - p$. From the investment function, we can see that when the rate of return on capital rises or the real interest rate on deposits falls, the productive investment in sector I will expand; and when the rate of return on capital falls or the real interest rate on deposits rises, the productive investment in sector I will shrink. When the rate of return on capital remains constant, investment in sector I is determined by the real interest rate on deposits. If the actual interest rate of deposits is too low, the balance of deposits in sector I will decrease and the actual investment at low interest rates will increase, which will hinder the transfer of savings in sector I to sector II and affect the

expansion of reinvestment in sector II, thereby negatively affecting the transformation of the dual economy influences. For financial intermediaries, it is necessary to mobilize savings in sector I by setting a reasonable deposit rate, appropriately restrict its investment in itself, and at the same time promote capital investment in sector II with high efficiency.

The saving function of sector I can be expressed as:

$$S_{t1} = I_{t1} + d(M_{t1}/p)/d_t$$

Among them, $d(M_{t1}/p)/d_t$ is the increment of the actual balance of financial intermediary deposits. Combined with the investment function, the net saving level is obtained:

$$NS_{t1} = S_{t1} - I_{t1} = d(M_{t1}/p)/d_t$$

Taking the logarithm on both sides of the above formula, and deriving it with respect to time t, we can get:

$$\begin{aligned} \frac{dY_{t1}}{dt} / Y_{t1} &= \left(\frac{dA_{t1}}{dt} \right) / A_{t1} + \left(\frac{\partial Y_{t1}}{\partial K_{t1}} \right) \left[\frac{dK_{t1}}{dt} / Y_{t1} \right] \\ &+ \left(\frac{\partial Y_{t1}}{\partial L_{t1}} \right) \left[\frac{dL_{t1}}{dt} / Y_{t1} \right] \end{aligned}$$

Combine the above formula with the previous formula to get the output growth rate of sector I:

$$y_{t1} = a_{t1} + k_{t1}h_{t1} + w_{t1}l_{t1}n_{t1}$$

Among them, a_{t1} represents the growth rate of technological progress, n_{t1} represents the ratio of output to labor.

(2) Investing and Saving Behavior in Sector II

For sector II, its saving is S_{t2} less than investment I_{t2} , that is $S_{t2} < I_{t2}$, the financial assets available for this sector include deposits, stocks and bonds. The investment in sector II mainly comes from the net savings of sector I and the savings of the sector, and its savings function is:

$$S_{t2} = s_2(\sigma)Y_{t2}$$

Among them, $s_2(\sigma)$ is the savings rate, σ means various factors that affect the savings rate, such as the rate of return on productive investment and the rate of return on financial assets.

As net borrowers, financial intermediaries charge a fee for providing financial services to Sector II. Assuming here that a proportion of θ savings in sector II can be converted into effective investment, then the funds available for investment in sector II are:

$$I_{t2}^s = f(\theta, \eta) \left[S_{t2} + d(M_{t2}/p)/d_t \right]$$

Among them, η is the conversion efficiency of financial intermediary capital allocation, $f(\theta, \eta)$ is a function of financial intermediary switching efficiency and service costs, and $\partial I_{t2}^s / \partial \theta > 0, \partial I_{t2}^s / \partial \eta > 0$.

$d(M_{t2}/p)/d_t = \beta S_{t2}$, the above formula can be simplified to:

$$I_{t2}^s = (1 + \beta) f(\theta, \eta) S_{t2}$$

The investment function of sector II can be expressed as:

$$I_{t2}^d = h_{t2}(k_{t2}, c - p) Y_{t2}$$

Among them, c is the nominal interest rate of the loan, $c - p$ indicating the actual interest rate of the loan. According to the investment function of sector II, when the rate of return on capital rises or the real interest rate of loans falls, the investment demand will increase, and vice versa, the investment demand will decrease. Affected by the scarcity of capital, the demand for investment resources will be significantly greater than the supply, that is, $I_{t2}^d > I_{t2}^s$, Sector II can thus fully utilize investment resources. Combining the investment function and saving function of sector II, its output growth rate can be obtained:

$$y_{t2} = a_{t2} + k_{t2}(1 + \beta) f(\theta, \eta) s_{t2}(\sigma) + w_{t2} l_{t2} n_{t2}$$

Among them, a_{t2} represents the growth rate of technological progress, n_{t2} represents the ratio of output to labor.

Appendix B: Evaluation Indicators of Bank Credit and DET

1. Bank Credit Indicators

The results of theoretical model analysis show that changes in bank credit scale, credit structure, and credit efficiency will have an impact on the transformation of the dual economy. This paper selects the credit ratio of financial institutions, the proportion of credit in the agricultural sector, and the ratio of financial deposits and loans as the measurement indicators of bank credit.

(1) Credit ratio of financial institutions. It reflects the scale of bank credit and capital accumulation in a region, and reflects the degree of support of bank credit to economic development. The calculation formula is:

$$FCR_t = Loan_t / GDP_t$$

Among them, t is the year, FCR_t is the credit ratio of financial institutions, $Loan_t$ is the loan balance of financial institutions, GDP_t is the gross national product.

(2) Proportion of credit in the agricultural sector. It reflects the support of bank credit to the agricultural sector in a region, and the allocation of bank credit among different sectors will have an important impact on the transformation of the dual economy, reflecting the bank credit structure to a large extent. The calculation formula is:

$$ACR_t = AgrLoan_t / Loan_t$$

Among them, t is the year, ACR_t is the credit ratio of the agricultural sector, $AgrLoan_t$ is the loan balance of financial institutions to the agricultural sector, $Loan_t$ is the loan balance of financial institutions.

(3) Financial loan-to-deposit ratio. It reflects the situation that a financial institution in a region converts the deposits it absorbs into loans to support its economic development, reflects the efficiency of transforming savings into investment, and is an effective indicator to measure the efficiency of bank credit. The calculation formula is:

$$LDR_t = Loan_t / Deposit_t$$

Among them, t is the year, LDR_t is the financial loan-to-deposit ratio, $Deposit_t$ and $Loan_t$ are the deposit balance of financial institutions and the loan balance of financial institutions, respectively.

2. DET Indicators

When studying the dual economy transformation, scholars usually use the dual contrast coefficient to measure the strength of the dual economic structure. The binary

contrast coefficient is equal to the ratio of the comparative labor productivity of the agricultural sector to the comparative labor productivity of the non-agricultural sector, represented by DCC. Among them, comparative labor productivity refers to the ratio of the proportion of output value (or income proportion) of a certain sector to the proportion of labor force, which is used to measure the percentage of added value of output created by every 1% increase in labor force. The changing trend of the binary contrast coefficient is: the smaller the binary contrast coefficient, the greater the difference between the two departments, that is, the stronger the duality, and vice versa, the weaker the duality. The theoretical maximum value of the binary contrast coefficient is 1. As a country or region transforms from a dual economy to a single economy, its binary contrast coefficient gradually approaches 1. For the specific division of the dual economic structure, this paper follows the three-industry division method commonly used in the world. In the economic structure, the primary industry is used as a substitute for the traditional agricultural sector, and the secondary and tertiary industries are used as a substitute for the modern industrial sector. The calculation formula is:

$$DCC_t = \delta_1 / \delta_2 = (Y_{t1} / L_{t1}) / (Y_{t2} / L_{t2})$$

Among them, t is the year, DCC_t is the binary contrast coefficient, Y_{t1} and Y_{t2} is the output value of the agricultural sector and the modern industrial sector in a region respectively, and its labor supply is L_{t1} and L_{t2} , the comparative labor productivity is δ_1 and δ_2 , then $\delta_1 = Y_{t1} / L_{t1}$, $\delta_2 = Y_{t2} / L_{t2}$.

Since the transformation of the dual economy is closely related to the overall economic growth, this paper also considers the GDP growth rate index, which is represented by GDPGR.

Appendix C: National Level Indicator Data

1. Bank Credit Data

We collected bank credit data and dual economy-related data from 31 provinces (cities) across the country from 1978 to 2019 from multiple data sources and regarded the primary industry as the traditional agricultural sector, and the secondary and tertiary industries as for the modern industrial sector. According to the bank credit indicators in Appendix B, the financial institution credit ratio (FCR), agricultural sector credit ratio (ACR), and financial loan-to-deposit ratio (LDR) were calculated respectively. The results are shown in Table C1. According to the DET indicators in Appendix B, the dual contrast coefficient (DCC) and GDP growth rate (GDPGR) were calculated respectively, and the results are shown in Table C2.

Table C1. Bank Credit Data (National)

Year	Deposit balance of financial institutions (100 million yuan)	Loan balance of financial institutions (100 million yuan)	Balance of loans to the agricultural sector (100 million yuan)	FCR	ACR	LDR
1978	1418.124	1892.761	135.594	0.545	0.072	1.335
1979	1594.741	2061.883	155.456	0.524	0.075	1.293
1980	1776.981	2498.228	184.777	0.569	0.074	1.406
1981	2145.564	2865.860	204.016	0.597	0.071	1.336
1982	2495.233	3188.051	225.743	0.597	0.071	1.278
1983	2914.418	3605.248	261.572	0.601	0.073	1.237
1984	3879.394	4814.791	406.206	0.675	0.084	1.241
1985	4278.701	5942.488	447.255	0.690	0.075	1.389
1986	5600.043	7773.782	564.666	0.804	0.073	1.388
1987	6954.417	9323.789	675.346	0.813	0.072	1.341
1988	8041.868	10929.784	650.901	0.754	0.060	1.359
1989	9646.023	12751.174	724.521	0.773	0.057	1.322
1990	12722.693	15908.335	968.028	0.861	0.061	1.250
1991	16322.097	19206.024	1197.870	0.904	0.062	1.177
1992	21336.574	23488.852	1484.580	0.904	0.063	1.101
1993	26144.480	29158.011	1632.095	0.852	0.056	1.115
1994	35743.949	36115.536	1429.252	0.796	0.040	1.010
1995	50762.103	47243.619	1996.585	0.821	0.042	0.931
1996	64841.046	57341.719	2635.890	0.846	0.046	0.884
1997	76883.812	68234.571	3286.448	0.894	0.048	0.888
1998	89592.583	77769.043	4017.274	0.942	0.052	0.868

1999	102837.719	87016.336	4411.929	0.986	0.051	0.846
2000	117688.223	94488.183	4516.486	0.959	0.048	0.803
2001	137090.632	105870.523	5153.586	0.975	0.049	0.772
2002	163684.742	124785.767	6343.966	1.035	0.051	0.762
2003	198783.912	151820.948	7784.228	1.090	0.051	0.764
2004	234193.457	171627.621	9838.426	1.024	0.057	0.733
2005	278107.280	187405.634	11528.772	0.947	0.062	0.674
2006	324289.910	219989.853	13186.831	0.954	0.060	0.678
2007	372758.967	255140.137	15397.910	0.926	0.060	0.684
2008	450868.779	290062.992	17625.583	0.886	0.061	0.643
2009	584474.550	400033.210	74709.320	1.095	0.187	0.684
2010	703926.990	484583.410	98168.437	1.109	0.203	0.688
2011	799551.520	558625.290	121645.512	1.071	0.218	0.699
2012	921313.130	640117.980	145228.454	1.110	0.227	0.695
2013	1046354.050	730217.000	172821.880	1.159	0.237	0.698
2014	1155217.360	821345.920	194265.005	1.200	0.237	0.711
2015	1345422.530	925530.090	217090.778	1.281	0.235	0.688
2016	1500299.990	1016896.640	230000.840	1.304	0.226	0.678
2017	1609290.810	1168660.030	251190.580	1.380	0.215	0.726
2018	1717931.960	1605497.750	266159.000	1.755	0.166	0.935
2019	1868388.976	1480029.479	288147.000	1.502	0.195	0.792

Table C2.DET Data (National)

Year	Primary industry GDP (100 million yuan)	GDP of secondary and tertiary industries (100 million yuan)	Employed persons in the primary industry (10,000 people)	Employed persons in the secondary and tertiary industries (10,000 people)	Binary Contrast Coefficient	GDP growth rate
1978	1011.884	2460.037	29066.895	11084.865	0.157	0.150
1979	1243.193	2693.314	29504.682	11540.588	0.181	0.134
1980	1330.165	3062.024	30119.750	12240.700	0.177	0.116
1981	1543.640	3255.245	30918.369	12807.051	0.196	0.093
1982	1784.751	3551.953	31586.192	13708.808	0.218	0.112
1983	2003.492	3991.532	32723.909	14473.851	0.222	0.123
1984	2308.659	4826.756	32008.476	16188.664	0.242	0.190
1985	2558.533	6055.031	31349.910	18290.850	0.247	0.207
1986	2798.762	6865.948	31542.540	19488.510	0.252	0.122
1987	3216.107	8257.028	31794.450	20737.840	0.254	0.187
1988	3901.488	10602.421	32361.380	21631.580	0.246	0.264

1989	4282.722	12208.414	33341.380	21616.960	0.227	0.137
1990	5068.910	13401.458	35317.980	22320.530	0.239	0.120
1991	5292.414	15942.168	36180.740	23102.400	0.212	0.150
1992	5780.868	20208.257	36023.640	24408.070	0.194	0.224
1993	6826.416	27393.066	35262.800	26277.950	0.186	0.317
1994	9217.086	36128.101	34486.530	27850.780	0.206	0.325
1995	11809.825	45725.416	34333.460	29570.520	0.222	0.269
1996	13678.510	54085.625	33859.560	30734.110	0.230	0.178
1997	14463.486	61875.870	33988.130	31266.620	0.215	0.127
1998	14811.660	67746.731	34255.320	31349.030	0.200	0.081
1999	14588.517	73636.185	34470.970	31365.960	0.180	0.069
2000	14825.889	83678.363	34663.860	32265.110	0.165	0.117
2001	15503.335	93063.783	34682.820	32735.750	0.157	0.102
2002	16193.572	104395.346	34204.620	33954.460	0.154	0.111
2003	17150.887	122129.905	33539.860	35531.160	0.149	0.155
2004	20893.550	146714.324	32886.800	37694.150	0.163	0.203
2005	22988.106	174918.255	32227.200	39648.890	0.162	0.181
2006	24232.901	206378.106	31647.700	41509.280	0.154	0.165
2007	28565.227	247061.008	31008.360	43579.640	0.162	0.195
2008	33947.940	293389.020	30749.910	45007.620	0.169	0.188
2009	35229.550	330074.140	29904.619	46546.619	0.166	0.116
2010	40532.830	396509.160	29445.368	48292.497	0.168	0.196
2011	47448.030	473993.080	29214.177	49983.959	0.171	0.193
2012	52373.580	524178.265	28652.496	50961.880	0.178	0.106
2013	56956.940	573052.400	28096.747	53016.455	0.188	0.093
2014	58336.140	626013.280	27705.340	54341.134	0.183	0.086
2015	60854.600	661913.270	27242.354	55207.266	0.186	0.056
2016	63665.540	716404.530	26942.802	56054.400	0.185	0.079
2017	62099.510	785040.190	26288.581	57343.089	0.173	0.086
2018	64734.160	849973.300	25500.342	57714.887	0.172	0.080
2019	70467.000	914865.870	24657.717	58095.449	0.181	0.077