Economic Development and Financial Support for Coal Resource Cities
— A Panel Data Analysis

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Abstract—This paper uses measurement methods and selects relevant indicators from both quantitative and structural aspects, empirically analyses the relationship between financial development and economic development of 2000-2008 in more than 18 coal-resourced cities in China. The results show that financial development takes a significant role in the economic development of coal-resourced cities. However, the high industry concentration of financial resources leads to a decline in financial resource allocation efficiency.

Index Terms—Resource-based city; Economic development; Financial support

I. INTRODUCTION

Coal City is an important component of the urban system in China. According to the survey, there are 68 coal cities nationwide, accounting for 38.2% of the total number of mining cities, 10.3% of the total number of cities; supplying for 93.6% of the coal to national economic construction [1]. Relying on coal resources, coal cities make huge contributions in national urbanization process, in promoting national economic development, and expansion of social employment. Meanwhile, a group of highly coal-related cities formed accordingly. With the depletion and reduction of resources, coal cities, like many other mining cities, will face with the "mine dry up, city fall" threat. Finance is the core of modern economy. Between financial development and economic development, there is an inherent mechanism. Coal-based cities can’t develop sustainably without effective financial support. Many scholars at home and abroad used empirical analysis methods, verified the quite significant relationship between financial development and economic development. For instance, Goldsmith (1969), who started the earliest quantitative research on financial and economic relations, found out simultaneous development of finance and economy, a period of rapid economic growth always went along with the ultra level financial development [2]. After introducing other factors that affect economic development, King and Levine studied the relevant data during 1960-1989 of 80 countries. It shows that the financial development and economic growth in a positive correlation [3]. Han Tingchun uses causality tests on the relevant data of 1981-2002 in China. It shows that from 1981 to 1991 financial development and economic growth causality is not obvious, however, during 1992-2002, financial development is the direct cause of economic growth [4]. Tan Ruyong, after studied by OLS on the quater data of China in 1993-1998, concluded that China’s financial intermediary development and economic growth have a significant positive correlation between each other [5]. Cao Tingqiu and Wang Xihang studied the panel data of 1995-2001 in each region in Shandong, among sample area, both finance and economy growth in an obvious trend, the relations among areas certain difference[6]. The above studies objects are mainly nations and provinces. According to the data that the author has, as now, coal-based city development is also limited to the capital, labor, technology integration and other traditional elements [7]. Coal-based urban development studies which put into the relationship between financial development and economic development are mostly qualitative and case studies, empirical research literature are still few. Therefore, the empirical study of economic development of coal...
resources city's financial support issues, has certain practical and theoretical significance.

This assay will target on 18 prefecture-level coal-based cities¹, select panel data of these cities in 2000-2008, use Eviews5.0 software, empirically analyze quantitative and structural support issues in the economic development of coal cities, to provide some ideas for exploring financial support for the sustainable development of coal resource cities.

The research data come mainly from China's economic statistical databases and related city government statistics website.

II. EMPIRICAL ANALYSIS OF FINANCIAL SUPPORT TO COAL-BASED URBAN ECONOMIC DEVELOPMENT

A regional financial development matching with local economic development includes two aspects. In quantitative aspect, financial element input adjust to regional economic development requirement, push the arise of gross regional economy. In structural aspect, internal economic factor delivery structure is compatible with regional economic structure, which promotes the adjustment of economic structure optimizing and upgrading. Therefore, this paper will be about empirical analysis on the relationship between financial development and economic development of coal resource cities from quantitative and structural support aspects.

A. Quantitative support analysis (quantity effect)

a. Theoretical model construction and variable description

Economic development is inseparable from human, finance and material. Production function is the most common used model in the quantitative study about economic development. Traditional production function mainly inspect on the relationship between production element labor and material input and output variables among each other. The above literatures have proved the close relationship between financial development and economic growth and the regional financial resource increase can push regional economic development. This paper uses Cobb-Douglas production function as the basic model, through the introduction of variable financial scale which influences economic development, to study the quantitative match relationship between financial development and economic expansion:

\[ Q = A K^\alpha L^\beta F^\gamma \]  

(1)

Take on both sides of the model number:

\[ LNQ = \alpha LNK + \beta LNL + \gamma LNF \]  

(2)

Here, Q for economic development: as the economic development indicators, the existing papers have chosen GDP, GDP growth rate or per capita GDP, this article chose GDP as economic growth rate indicator variables, and the unit is ten thousand Yuan.

A for integrated function coefficient.

\[ K \] for material input: indicate as fixed assets investment amount in current year with reference to previous research, the unit is ten thousand Yuan.

\[ L \] for labor input: taking into account "the number of unit employees" statistical coverage limitations and data sources availability, this paper replaces it by district population at the end of year, unit is ten thousand people.

\[ F \] for the financial investment: taking into account data availability, this paper replaces it by the loan balance of regional financial institutions; the unit is ten thousand Yuan.

\[ \alpha, \beta \text{ and } \gamma \] each represent the output elasticity of capital, labor output elasticity of output and financial flexibility.

b. Econometric model analysis

For the study of the overall characteristics and differences between cities in coal resources city between financial development and economic development, this paper takes use of Eviews5.0 to establish following econometric model.

i. Mixed estimated model

Most of the coal resource cities passed a similar development path, therefore they should have the same characteristic of economic and financial relations. By ordering software outputs from Eviews5.0, draw the conclusion:

\[ LNQ = 0.739 + 0.396 LNK + 0.177 LNL + 0.46 LNF \]  

(3)

R² = 0.9998, F = 324320, P = 0.000, DW = 0.58

See from the related indicators of output equation, the estimated model fit good(R²), the overall equation is significant(passed the F test), the T value tests of single parameters are satisfactory, the estimate results are reliable and reasonable from the economic sense. From the elasticity of each variable, during the sample interval 2000 -2008, financial development played a much more important role, and contributed more to the economic development of coal resource cities. The overall financial development adapted to the urban economic development. As the level of the financial scale increased 1%, the total regional economy will increase 0.46%.

ii. Phased mix estimated model

Due to the impact by external policy, economic environment changes and changes in the city’s own stage, coal resource cities may show different relationship between economic and financial development in different phases. Use Eviews5.0 to analyze phases and organize available:

2000-2001:

\[ LNQ = 1.838 + 0.11 LNK + 0.35 LNL + 0.46 LNF \]  

(4)

R² = 0.9998, F = 266630, P = 0.000, DW = 0.56

2002-2003:

\[ LNQ = 1.426 + 0.21 LNK + 0.3 LN K + 0.46 LNF \]  

(5)

R² = 0.9999, F = 156612, P = 0.000, DW = 0.54

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¹ It refers to Chifeng, Datong, Huaihai, Hegang, Hebi, Huainan, Jincheng, Jixi, Jiaozuo, Pingdingshan, Qitahe, Shuangyashan, Shuozhou, Wuhai, Xianyang, Yulin, Yangquan, Zaozhuang.
2004-2005:
\[ LNQ = 1.178 + 0.357 LNK + 0.30 LN L + 0.38 LN F \] (6)
\[ \begin{align*} 
R^2 &= 0.9998 \quad R = 0.9998 \quad F = 74307 \quad P = 0.000 \\
R^2 &= 0.9999 \quad R^2 = 0.9999 \quad F = 192508 \quad P = 0.000 \\
\end{align*} \]

In various stages, hybrid estimation model fitness, the overall equation satisfaction and T value test are both fine. Comparing the above-mentioned equation elements overall equation satisfaction and T value test are both fine. Firstly, coal resources cities, as investment-driven cities, whose overall features are increasingly strengthen. Fixed assets investment output elasticity coefficient α increased in the sample time interval from 0.11 to 0.42, investment in the development of coal resources cities is getting increasingly important; secondly, input-output elasticity coefficient of labor β negatively developed, the growing role of regional economic development reduced. It is more in line with the reality that in recent years, cities step up modernization of coal mine construction, mine reduced capital investment and the actual labor; thirdly, financial output elasticity coefficient γ fell to 0.32 from 0.46, indicating that financial development of coal resources based on the contribution of urban economic development is declining, the output effect of credit funds is gradually decreased.

iii. Variable coefficient estimation model

In order to find out the difference between coal resource cities of financial development and economic development, this paper establishes vary coefficient estimation model for financial development variable. Relevant output situation ordered by Eviews5.0 is as Table 1.

<table>
<thead>
<tr>
<th>Variable Coefficient Std. Error t-Statistic Prob.</th>
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<tbody>
<tr>
<td>LNA</td>
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<tr>
<td>LNK?</td>
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<td>Yq</td>
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<td>Zz</td>
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\[ R^2 = 0.9997 \quad F = 31790 \quad P = 0.000 \quad DW = 1.01 \]

B. Structural support (structural effect)

The transformation of resource-based cities is essentially a process of economic restructuring, namely, an industrial restructuring process. The study result of quantitative effect between financial development and economic development reflects that financial development has become an important factor in the development of coal resources cities, but in different years or different cities there are some differences in this role, that is, the same financial development can not produce the same total amount of economic success, the financial input-output affects differently. This difference should be a structural difference, that is, the fit issues between financial development and economic development structure.

a. Two phases comparison and analysis

Compare the financial output elasticity coefficient with industrial structure changes in two stages (2000-2003, 2004-2008) (see Table 2) in coal-resourced cities, known: during 2004-2008, among the sample cities, the average proportion of secondary industries in other cities except Jixi, Wuhai has increased compared with 2000-2003. But along with the increase in the proportion of secondary industry, the financial outputs are not synchronized grow, the overall trend of both is always on reverse, the proportion of changes in the opposite direction was 94.4%.

<table>
<thead>
<tr>
<th>CF</th>
<th>Dt</th>
<th>Hb</th>
<th>Hg</th>
<th>Hn</th>
<th>Jc</th>
<th>Jx</th>
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<tbody>
<tr>
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<td>0.35</td>
<td>0.34</td>
<td>0.31</td>
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<td>0.36</td>
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<td>0.18</td>
<td>0.19</td>
<td>0.22</td>
<td>0.25</td>
<td>0.18</td>
<td>0.20</td>
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<td>CF</td>
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<td>43.1</td>
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<tr>
<td>Dt</td>
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<tr>
<td>Hb</td>
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<td>59.9</td>
<td>60.5</td>
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<tr>
<td>Hn</td>
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<td>48.4</td>
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<tr>
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<td>55.2</td>
<td>55.2</td>
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<tr>
<td>Jx</td>
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<tr>
<td>Zz</td>
<td>0.17</td>
<td>52.7</td>
<td>63.7</td>
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Table 1: Coal-based city financial input-output coefficient situation

Table 2: Financial output coefficient and industrial structure diversification in coal resource cities
### b. Allocation efficiency of financial industry

For further analysis of reverse problems between financial development and economic growth in coal resource cities, and also take the data availability into consideration, this paper selects Huainan2 City as the typical case to study financial structure and economic structure relationship, and establishes panel analysis model based on regional industrial structure and credit structure in 2000-2008 as a substitute for economic and financial structure.

#### i. Development of industrial and credit structure

In recent years, Huainan City, increasing credit funds from financial institutions increasingly focused on coal-based secondary industry whose proportion of loans increased from 70.7% in 2000 to 79.2% in 2008. Industrial and customer concentration of financial institution loans is quite high; meanwhile, the status of the second pillar industry is consolidated continuously, and the proportion of the added value of the secondary industry accounting for the regional GDP rose to 61.1% in 2008 from 46.6% in 2000. Regional industrial structure adjustment pressure increased.

#### ii. Panel data estimation

The results of the Evie ws5.0 output of coal cities reached the relationship between credit structure and industrial structure as the following (Table 3).

![Figure 1: The added value of industries and the loan balance in recent years in Huainan City](image)

Unit: Ten thousand yuan

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The relevant data in Table 3 show that with the financial development, the credit loan output effect in each industry changed: firstly, the credit loan elasticity coefficient in primary and secondary industries respectively declined 0.038 and 0.515, in which the decline degree of credit loan elasticity coefficient of tertiary industry obviously exceeds the growth rate of tertiary industry. In three industrial credit loan configuration efficiency, secondary funds configuration efficiency has been the highest in 2000-2003 dropped to the second highest in 2004-2008. The decline in the fund allocation efficiency and the increasing concentration of credit loans to coal-based secondary industry, co-led the...
overall decreasing efficiency of the allocation of credit funds.

C. Overall conclusion

The research which analyzes the coal city’s financial support for economic development from two perspective—"quantity" and "structure" shows: Under the circumstance that investment boosts growth is still the growth mode of coal resource cities, financial development has clear effect and high contribution to economic development, generally adapted to the economic development need, but the contribution to economic presents falling trend. Coal resource city's economic structure and credit structure show a trend of mutual strengthening. Credit funds are increasingly concentrating to coal-based secondary industry; financial support for primary and tertiary industries is weakening. The high industry-concentration and high customer-concentration features of credit loans finally lead to the financial assets allocation efficiency decline in coal resources cities.

III. STRATEGIES FOR PROMOTING FINANCIAL SUPPOTT FOR COAL-BASED CITTIES SUSTAINABLE DEVELOPMENT

A. Promoting financial development

Establish a sound financing system for city transformation, vigorously develop local financial institutions, and actively introduce joint-stock commercial banks, strengthen the financial viability of coal resources city; develop direct financing and give full play to support resource-based capital market in the role of urban transformation, to encourage support of large coal companies using short-term financing bills, bonds and notes, reducing large-scale enterprises, enterprises with financial dependence on bank credit and small and medium private enterprises of the credit squeeze effect; strengthen the economic and financial information exchange, and promote political bank-enterprise communication and collaboration; strengthen the credit system building, create a favorable sustainable development of coal resources city a good financial environment.

B. Optimize credit loan structure

In the meantime of actively supporting local characteristic industries and pillar industries, financial institutions should also increase effective credit loan release focusing on funds need of resource-based economy transformation follow-up industries. Financial institutions should reasonably allocate credit resources, improve the fund input intensity for tertiary industry and other high credit fund allocation efficiency industries, improve credit fund application efficiency; increase the support intensity for recycling economy, bio-medical and other high-tech industries, avoid further solidity of coal-resource cities economy and financial structure result from excessive credit concentration, and more difficulties in resource cities transformation; enhance risk assessment and monitoring, strengthen and improve the awareness of energy financial risks, to effectively protect credit fund security in urban transformation.

C. Adjust investment structure

Single industrial structure is a major issue which resource cities will face in its development, for which resource cities are inevitably face "resource-curse". "Today's investment structure is tomorrow's industrial structure." An effective program for the curse is to reduce dependence on resource sectors, that is, the implementation of industrial diversification. Relevant government departments should encourage coal companies "based on coal," as well as make "extended coal" article, stimulate large-scale coal enterprises achieve diversification business and development methods transfer, actively guide the private capital to increase investment to non-coal tertiary industries, do a good "surpass coal" article, particularly increase investment to high-tech industries which have major breakthrough and stimulates effect to economic growth, provide new credit carrier for financial sectors, eventually through "incremental" tune "deposit quantity "approach to achieve industrial structure optimization and upgrading of coal resource cities .

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