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Research on Economic Growth of County Economy in Daqing under the New Normal

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ABSTRACT. *The economic characteristics of counties in Daqing are different. In order to fully reflect the economic growth characteristics of counties in Daqing, Lindian was selected as the main research object. From Solow model, this study can analyze the influence of factors such as the growth of exhaustible resources and government expenditure on economic growth. Under the path of balanced growth, technological progress can make up for the shortage of exhaustible resources. Government spending can compensate for the economic growth dilemma caused by insufficient exhaustible resources and lower rate of technological progress. Suggestions are given to effectively promote the sustainable and stable development of county economy in Daqing.*

KEYWORDS: *county economy, economic growth, new normal, agricultural modernization*

1. Introduction

There are five districts, four counties and a national high-tech industrial development zone in Daqing, namely Sartu District, Honggang District, Ranghu Road District, Longfeng District, Datong District; Lindian County, Durbert Mongolian Autonomous County , Zhaozhou County, Zhaoyuan County; National High-tech Industrial Development Zone refers to Daqing High-tech Industrial Development Zone. Due to different resource endowments of different districts and counties, different geographical advantages, and different coverage of transportation roads and bridges, the economic development of different districts and counties is various. In recent years, national economic growth rate decreased gradually, which has also affected the economic development of counties. All districts and counties in Daqing try to break through the bottleneck of economic growth by taking advantage of their own advantages. For example, Lindian County and Durbert Mongolian Autonomous County both vigorously develop tourism and attract a large number of domestic and foreign tourists with their unique advantages of hot spring resources, which not only highlights the characteristics of county economic development, but also provides a guarantee for county financial income.

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

Therefore, this study takes the county economic development of Daqing as the research object, and discusses the development characteristics and growth problems of county economic development of Daqing city under the new normal. This research selects the typical county to key research, such as Lindian County, Lindian County not only teems with main crops, but also develops the tourism economy with its advantage of hot spring resources. The development of tourism economy escorts its economic growth. However, hot spring resources are exhaustible resources. Therefore, how can Lindian County solve its economic growth problem under the constraint of exhaustible resources, which is typical and meaningful.

2. Literature Review

Economic growth is not only one of the important theories of western economics, but also of great practical significance to the study of regional and national economic development. Scholars have done many researches on economic growth, focusing not only on the dynamic economic growth model, but also on the factors affecting economic growth. Classic economic growth studies go through the following processes. Firstly, a dynamic economic growth model is with an unstable "knife-edge" economic growth path established by Harrod (1939). Subsequently, Solow (1956) introduced the neoclassical production function which assumed population growth rate, rate of technological progress and savings rate, formed the neoclassical growth theory and concluded that the rate of exogenous technological progress, then the result was that the only determinant output growth was per capita. Therefore, the pessimistic argument of Harrod (1939) was changed. Due to the Solow model's non-optimization problem, Cass (1965) and Koopman (1965), based on Ramsey (1928) 's research, built an RCK model by using the savings rate and introducing representative households for analysis. However, it does not change the conclusion of Solow (1956), and reaffirms the conclusion that economic growth in Solow's model only depends on technological progress. This is also in line with the idea of "mass innovation and mass entrepreneurship" which is encouraged by China, because innovation is the concrete manifestation of technological progress.

As an important branch of economic growth, county economic growth was researched from two main directions. One is to analyze the factors affecting county economic growth; the other is to explain the reasons for the difference of county economic growth. Douglass C.North(1959) believed that regional economic development should integrate local industry and agriculture into an organic whole to conduct trade with other regions, so as to achieve sustainable growth of regional economy. C.W.D. Peeare and H.T. Homas (1968) made a detailed study of regional economic growth and showed that the level of supply and demand had a significant impact on regional economic growth. In particular, stimulating the supply of industrial sectors can drive employment and regional economic growth. Scholars in China also analyzed the influencing factors of county economic growth. According to the county panel data of Liaoning Province, Wang Zhenhua and Li Xu (2015) concluded that capital had a profound impact on county economic growth. That is, the investment of capital, the rational use of capital and the optimization of capital

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

allocation will promote the upgrading of industrial structure at the same time, drive the county economic growth. Through slow model analysis, Liu Guobin and Du Yunhao (2015) showed that with the deepening of aging in the county, it would have a negative impact on its labor, capital and savings rate, and thus affect the development of the county economy.

On the other hand, Chinese scholars also analyze the differences in the development of county economy in China. The research methods mainly use. The Sky coefficient, the imbalance index and the spatial difference function analysis. Based on the analysis of different scholars, it is concluded that the main reason for the difference of economic growth in county areas in China is the development of the secondary industry. Zhang Yi (2008) concluded that the contribution of the primary industry to county economic growth declined year by year, while the contribution of the secondary industry to county economic growth increased year by year. Liu Liping (2010) studied the economy of 61 counties in Anhui province, and indicated that the difference of county economy in Anhui province was due to the development of its industrial structure, especially whether the structure of the secondary industry was reasonable. Huang Yong and Yi Fahai (2014) also reached a similar conclusion. Taking Hubei Province as an example, they explained that the economic difference of counties in Hubei province mainly came from the effect of the secondary industry. Therefore, it is necessary to actively promote the industrialization of agriculture in Hubei Province to gradually narrow the economic gap between counties.

Through literature review, it is easy to find that domestic and foreign scholars have analyzed and discussed the economic problems of county regions in detail, but there are still some problems to be solved urgently. First of all, foreign scholars did not study the classification of county economy in detail, but put the county economy under the direction of regional economy. This is also the product of research under different national conditions, so county economic research is more suitable for China. However, when domestic scholars analyzed the factors affecting county economy, they combined the Solow model and panel data more and assumed that technological progress was exogenous. However, under the environment of emphasizing technological innovation, the research model of county economy needs to be adjusted moderately. Meanwhile, when analyzing the differences of county economic growth, domestic scholars explain from the macro level, ignoring the resource problem which hided the economic growth of each county. Therefore, how to add resources, especially exhaustible resources, to the economic growth of county is also a breakthrough of this project in combining theory with practice.

3. Economic growth model with resource constraints

The production function is changed by adding exhaustible resources and government purchasing into the neoclassical production function model. The corresponding function becomes $Y = F(K, AL, R, G)$, where R represents exhaustible resources, which can be assumed to be petroleum, coal, or other mineral

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

resources; G represents government spending. Time T is not directly included in the production function. The function is mainly affected by R, G, K, L, A.If the production function is assumed to be Cobb-Douglas type, the following hypothesis can be like this,

3.1 Basic assumptions of the model

Hypothesis 1: Production function $Y = K^{\alpha}(AL)^{\beta}R^{\gamma}$, where $\alpha + \beta + \gamma = 1$ represents constant returns to scale.

In the above assumptions, $\alpha > 0$, $\beta > 0$, and $\gamma > 0$ represent the output elasticity of capital, effective labor, and exhaustible resources, respectively. The constant return to scale means that the capital-output ratio does not change.

Assumption 2: The growth rate of consumable resources is $\frac{\dot{R}}{R} = \theta$, $\theta < 0$

This assumption indicates that the amount of exhaustible resources is being reduced. This is also consistent with the basic feature of non-renewable exhaustible resources.

Hypothesis 3: The technological progress rate and population growth rate are known as: $\frac{\dot{A}}{A} = g$; $\frac{\dot{L}}{L} = n$

Hypothesis 4: The production function $Y = F(K, AL, R)$ is a neoclassical production function that satisfies the marginal diminishing rate and Inada conditions, in order to ensure that the equilibrium point can be solved, but does not satisfy the homogeneous characteristics.

Hypothesis 5: The savings rate s is exogenous constant.

This assumption shows that income can be divided into savings and consumption according to a fixed ratio, and there is no need to choose the corresponding ratio.

3.2 Balanced growth path under the constraint of exhaustible resources

Based on the above assumptions, further analysis is on whether this economic system achieves a stable and balanced growth path, that is, the economic growth rate remains unchanged. Since the growth rates of A, L, and R are known constants, the growth of the output of capital K and Y is mainly analyzed growth speed, it is expressed by r_Y and r_K respectively:

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

$$\dot{K} = sY - \delta K$$
$$r_K = \frac{\dot{K}}{K} = s\frac{Y}{K} - \delta \quad (1)$$

Derivation of time t in the production function equation yields the growth rate of output as:

$$r_Y = \frac{\dot{Y}}{Y} = \alpha\frac{\dot{K}}{K} + \beta(\frac{\dot{A}}{A} + \frac{\dot{L}}{L}) - \gamma\frac{\dot{R}}{R} = \alpha r_K + \beta(g+n) - \gamma\theta \quad (2)$$

If r_K converges to a certain constant, then there is $\dot{r}_K = 0$. Then further collating equations (1) and (2) can be obtained:

$$\dot{r}_K = s\frac{Y}{K}(r_Y - r_K) = (r_K + \delta)(r_Y - r_K) = 0 \quad (3)$$

Then $r_K = -\delta$, or $r_K = \beta(g+n) - \gamma\theta/1-\alpha$

According to the formula $\alpha + \beta + \gamma = 1$ of the elastic coefficient, we can get: $1 - \alpha = \beta + \gamma$

$$r_K^* = \frac{\beta(g+n) - \gamma\theta}{\beta + \gamma} \quad (4)$$

Since $r_K = -\delta$ is not a steady-state point, r_K^* is the only growth rate of capital on a balanced growth path. According to formula (3), the growth rate of output is equal to the growth rate of capital. So theorem 1 can be made:

Theorem 1: The growth rates R of technology A, population L, and exhaustible resources R are g, n, and e, respectively. Based on the above basic assumptions, the economic system has the only stable balanced growth path, and the output growth rate and capital growth The rate is the same $r_K = r_Y = \left[\beta(g+n) - \gamma\theta\right]/\beta + \gamma$

3.2.1. Output growth rate per capital

Since the per capital output growth rate is more used in actual analysis, the per capital-output growth rate r_y continues to be calculated according to the balanced growth path obtained above:

$$y = \frac{Y}{L}$$

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

$$r_y = \frac{\dot{Y}}{Y} - \frac{\dot{L}}{L} = r_Y - n = \frac{\beta g - \gamma(n+\theta)}{\beta + \gamma} \quad (5)$$

According to formula (4) and the constraint of exhaustible resources, when $\beta g - \gamma(n+\theta) > 0$, the economic system can continue to grow at a stable growth rate. When $\beta g - \gamma(n+\theta) = 0$, the per capital output rate is stable. When $\beta g - \gamma(n+\theta) < 0$, the per capital output showed a downward trend. Therefore, it can be concluded from the above analysis that in order to maintain the continuous growth of per capital output under the constraint of exhaustible resources, it is necessary to meet the technological progress rate $g > r(n+\theta)/\beta$ .. But according to assumption 2, we can know $\theta < 0$. With the assumption of $r > 0, \beta > 0$, the technological progress rate is maintained greater than 0. Then $n + \theta > 0$, $\theta > -n$, it can reduce the exhaustible of resources more than the reduction in population growth rate. Thus, Theorem 2 is:

Theorem 2: Under the constraint of exhaustible resources, the conditions for sustained economic growth of the economic system are: $g \geq r(n+\theta)/\beta$, that is, the technological progress rate gis higher, the exhaustible resource growth rate θ is lower. The output elasticity γ of exhaustible resources is lower, the output elasticity β of the population is higher,the growth of per capital output r_y is faster. Further analysis of the relationship between per capital output and elasticity, taking the output elasticity of exhaustible resources as an example, it is easy to obtain:

$$\frac{\partial r_y}{\partial \gamma} = -\frac{(1+\beta)(n+\theta+g)}{(\beta+\gamma)^2} < 0 \quad (6)$$

Therefore, with the constraints of exhaustible resources, although the reserves of exhaustible resources are definitely decreasing, as long as the technological progress is large enough, the per capital output can continue to grow, and the analysis process of other exogenous variables is the same.

3.2.2. Growth rate of exhaustible resources

Due to the decaying nature of the exhaustible resource reserves, in hypothesis 2 the rate of exhaustible resource growth $\theta < 0$. In the balanced growth path of this economic system, according to equation (4) can be solved: $\theta \leq \beta g/(\gamma - n)$.Thus assuming 2 constraints is: $g \leq rn/\beta$. It can be seen that under the condition of continuous increase in per capital output, the technological progress rate g is smaller than the population growth factor, and β and γ are the output elasticity of technology and exhaustible resources. When β is constant, γ is greater, the technological progress rate is faster, that is, the output elasticity of exhaustible

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

resources have influence on the technological progress growth rate.

3.3 Solow growth model including government

The government plays a vital role in economic growth. Under the constraints of exhaustible resources, how government spending affects the balanced growth path of the economic system will be discussed in detail in Section III:

3.3.1. Government expenditure growth rate assumption

Hypothesis 5: The form of the production function changes from Hypothesis 1 to $Y = K^{\alpha}(AL)^{\beta}R^{\gamma}G^{\eta}$, G represents government expenditure, and government expenditure growth rate $\frac{\dot{G}}{G} = \varphi$, $\varphi > 0$ is a constant. $\alpha + \beta + \gamma + \eta = 1$, the economic system is still constant returns to scale.

Hypothesis 6: The tax rate is t, the government's balance of payments is: $G = tY$

3.3.2. Balanced growth path

The new economic system contains the variable of government expenditure G, its balanced growth path changes accordingly. The new capital movement formula is:

$$\dot{K} = sY - \delta K - G = sY - \delta K - tY = (s-t)Y - \delta K \quad (7)$$

According to formula (7), the capital growth rate can be obtained

$$r_K = \frac{\dot{K}}{K} = \frac{(s-t)Y}{K} - \delta \quad (8)$$

When $\dot{r}_K = 0$, formula (7) and formula (8) are:

$$\dot{r}_K = (r_K + \delta)(r_Y - r_K) = 0 \quad (9)$$

Therefore, the same formula (3) can be obtained as $r_K = -\delta$ or $r_K = r_Y$. Obviously, when $r_K = -\delta$, the economic system cannot reach the steady state. There is only one stable point $r_K = r_Y$. With the new production function assumption:

$$r_Y = \frac{\dot{Y}}{Y} = \alpha\frac{\dot{K}}{K} + \beta(\frac{\dot{A}}{A} + \frac{\dot{L}}{L}) - \gamma\frac{\dot{R}}{R} + \eta\frac{\dot{G}}{G} = \alpha r_K + \beta(g+n) - \gamma\theta + \eta\varphi \quad (10)$$

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

On the balanced growth path of the new economic system, the output growth rate is the same as the capital growth rate:

$$r_K^* = r_Y = \frac{\beta(n+g) - \gamma\theta + \eta\varphi}{1-\alpha} = \frac{\beta(n+g) - \gamma\theta + \eta\varphi}{\beta + \eta + \gamma} \quad (11)$$

The per capital output growth rate is obtained from equation (8):

$$r_y = \frac{\beta g - \gamma(\theta + n) + \eta(\varphi - n)}{\beta + \eta + \gamma} \quad (12)$$

The condition of per capital output growth rate $r_y \geq 0$ is $\beta g - \gamma(\theta + n) + \eta(\varphi - n) \geq 0$. With this constraint, the economic system can continue to increase per capital output growth rate on a new balanced growth path to achieve economic growth. Through the above constraints, there is the government expenditure growth rate $\varphi \geq \left[(\eta + \gamma)n + \gamma\theta - \beta g\right]/\eta$, so the government expenditure growth rate can ensure the increase of the population growth rate, the reduction of exhaustible resources, and the reduction of the rate of technological progress. It can be get Theorem 3.

Theorem 3: When the growth rate of government expenditure satisfies $\varphi \geq \left[(\eta + \gamma)n + \gamma\theta - \beta g\right]/\eta$, the economic system can maintain the reduction of the growth rate of exhaustible resources θ and the rate of technological progress g , so as to achieve continuous growth of output r_y per capital.

3.3.3. Role of the government

From above analysis, it can be got that the role of the government with the constraints of exhaustible resources should not be underestimated, the government should deal with the relationship between exhaustible resources and economic growth. First of all, the government should effectively promote technological progress through government spending and other means. Meanwhile, the government should strengthen the support for resource-depleting enterprises, encourage them to develop new technology research and development, and guide them to carry out independent innovation. Preferential policies, such as subsidies and tax cuts, have been introduced for enterprises developing new energy to stimulate their greater creativity.

4. Problems existing in county economy in Daqing

4.1 The reserves of hot spring resources decrease year by year

Based on the above theories, this study breaks through the traditional conclusion

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

that exhaustible resources hinder economic growth, and takes them as one of the driving forces of economic growth. However, exhaustible resources are non-renewable. How to make use of exhaustible resources is the primary problem facing resource-based counties represented by county in Daqing. Combined with the actual situation of Lindian County, the county's hot spring resources are not only for the use of tourists, the local tourism economy has become a hot consumption. In addition, the hot spring has covered about 70% of the newly-built communities in Lindian County. Although this makes life more convenient for residents, it also leads to the high consumption of hot spring resources in Lindian County.

4.2 Unreasonable industrial structure

Some counties are as national poverty counties, their economic development level are not high. Constrained by resource constraints, investment environment and policy support, the industrial structure of county in Daqing is not reasonable. This is mainly reflected the fact that the current industry in county of Daqing is dominated by agriculture. Animal husbandry and planting industry are the main components of the industrial structure. That is, counties of Daqingare still in the industrial structure mode that mainly relies on the primary industry with low added value. There is not a complete secondary industry in some counties of Daqing. However, due to the fact that tourism relies on exhaustible resources, the advantage of the tertiary industry tends to weaken in the early years. Therefore, how to adjust the industrial structure to make it scientific and reasonable is the key factor of economic growth in counties of Daqing.

4.3 Insufficient technological innovation

According to the above theoretical description, technological innovation can make up for the economic growth dilemma under the constraint of exhaustible resources. According to the theoretical explanation, although exhaustible resources can promote economic growth, economic growth slows down with its exhaustion. And technological innovation is the vital to solve this problem. At present, Counties of Daqing actively responds to the policy requirements of "public innovation and entrepreneurship", which has established its own incubation center. But it still lacks a mature technology industry. Therefore, the current rate of technological progress is far less than the rate of resources consumption. In the long run, there will be an economic recession with insufficient exhaustible resources. Therefore, how to encourage technological innovation is not only to comply with the background and policy, but also an important way to promote economic growth.

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

5. Policy Suggestions for county economic growth

5.1 Transformation strategy of resource-based county economy

In view of resource-based counties, especially those with exhaustible resources, the economic growth pattern should be changed in time. In particular, it is important to move away from growth driven by exhaustible resources as soon as possible. The county economy represented by Lindian county should break through the growth constraint of exhaustible resources and fully develop and utilize the characteristic resources in the county. Lindian should adjust measures and structure mode to local conditions and characteristic development. Although lindian mainly depends on the low added value of agriculture as major industry, it should identify the situation of development, such as greenhouses and other characteristics, which improve product added value. Also, some counties in Daqing could choose to product and supply green and organic food. On the other hand, the county economy industry is labor-intensive industries. As the local population flows outward and labor costs increase, labor-intensive industries advantages are gradually weakened. In order to realize the transition from labor-intensive industries to capital-intensive industries, counties in Daqing should complete the upgrading of industrial structure transformation.

5.2 The government shall attract effective investment

Taking Lindian County as an example, in recent years, Lindian has paid attention to modify city appearance, such as painting the old building area. But the county sanitation and other problems are still existing, such as" dirty, poor" and other poor sanitation phenomenon. However, the reason was found that are lack of government funds, less investment, lower wages of sanitation workers. In conclusion, the effective improvement of urban sanitation in Lindian county lies in its effective investment in sanitation projects. Therefore, a positive and proper solution to the county sanitation environment will not only benefit the residents in the county, but also create a good tourism environment. It is better to attract a large number of tourists, develop tourism economy, promote the economic growth of the county.

5.3 Introduce technological innovation to boost county economy

According to analysis, technological innovation is the main driving force and source of economic growth. For county economy, technological innovation should also include the transformation of traditional agriculture. Taking Lindian County as an example, agriculture, rural areas and agricultural population are all important factors affecting the economic development of the county. Thus, the reformation of traditional agriculture should introduce new technology, realize agricultural modernization and improve the technical content of agriculture. through the introduction of technological innovation, the government should enable farmers to find new products and technologies suitable for their own development, so as to

ISSN 2616-5902 Vol. 2, Issue 4: 29-40, DOI: 10.25236/AJBM.2020.020404

achieve the goal of getting rich and effectively solve the problem of the loss of rural working-age population.

6. Conclusion

The economic development of Daqing county is typical. On the one hand, there are resource-based counties represented by Lindian and Durbert Mongolian Autonomous. On the other hand, there are counties represented by Zhaoyuan with rich natural resources. Therefore, different counties of Daqing should choose various policies to boost economic growth, such as how to encourage technology innovation, plan to develop resources and develop tourist economy.

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