



Analysis on Periodic Fluctuation of Economy at County Level

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Abstract: On most occasions, economic development is embodied with periodic characteristics. Comprehensive understanding of the economic cycle is of great significance to guiding the formulation of macroeconomic policies and maintaining stable economic growth. Since the reform and opening up, Tengzhou's economy has maintained a momentum of rapid growth, which, however, is characterized by obvious periodic fluctuations. This paper makes an in-depth analysis of the characteristics and causes of economic periodic fluctuation in Tengzhou, in order to have a comprehensive understanding of the economic cycle, and the economic law is adopted to take corresponding economic growth measures in different periods of economic development, thus achieving high-quality economic development. In this paper, the study of county economic cycle is not subject to economic theory, rather the study is conducted with a large number of historical background and local economic development characteristics. The economy of Tengzhou City, since the reform and opening up, is divided into five cycles. The conclusion is drawn that the county economic cycle is affected by macroeconomic fluctuations, industrial structure adjustment, investment and consumption fluctuations and other factors. We put forward targeted suggestions on using the economic cycle to promote high-quality economic development.

Keywords: economic cycle, regional characteristics, industrial structure, investment effect

1. Overview of business cycle based theory

Economic cycle refers to the cyclical phenomenon of economic expansion and contraction alternating and reciprocating in economic operation. There are two representative viewpoints in business cycle theory. One holds that the economic system itself is stable and the economic fluctuations are the result of the integrated effects of various shocks such as technology, preference, macroeconomic policy (monetary policy and fiscal policy), consumption and investment. The representative theories are the real business cycle and the New Keynes dynamic stochastic general equilibrium model. The other regards the economic fluctuation as the deterministic dynamic result formed by itself in the economic system, and the representative theory is the endogenous business cycle theory. Currently, research on domestic business cycle is given top priority on the division of business cycle, influencing factors, inter-regional synergy and other empirical research. As for the division of economic cycles, the main view is that since 1978, China has mainly experienced three to four economic cycles, and the economic growth of China presents a cycle law of low growth - moderate growth - high growth - moderate growth - low growth. As for the influencing factors of business cycle, the main research focuses on monetary policy, industrial structure change, investment, technological progress and so on. As for the research on the synergy of business cycles, the main point of view is that the synchronicity of business cycles between regions in China is gradually increasing, and the synchronicity of business cycle stages between provinces is consistent in 60%—70% of the time.

Based on the above research, this paper carries out an empirical analysis on the cyclical changes of the economy at county level. For the division of county economic cycles, this paper divides the period from 1978 to 2018 into five economic cycles. For the analysis of the causes of the cyclical fluctuations, this paper is intentionally conducted for research of the actual business cycle theory, holding that the periodic fluctuations of county economy are mainly affected by changes of industrial structure, investment, consumption and other factors besides the macroeconomic cycle fluctuations. As for the research on the synchronicity of economic cycle, this paper holds that the fluctuation of economic cycle in county region is influenced by the fluctuation of national and provincial economic cycle and has synchronicity.

2. Characteristics of periodic fluctuation of economy at county level

2.1 The periodic fluctuation of Tengzhou's economic growth since the reform and opening up

Although county economy is subordinated to regional economy, its operation also presents obvious cyclical characteristics. According to the existing economic cycle theory, analysis of the macroeconomic background, as well as the national, the province's economic cycle fluctuation characteristic and actual county economic development, the "trough

to trough" methods, namely, from a trough to the next trough for a cycle are adopted to divide the economic operation of Tengzhou City since 1978, which can be roughly divided into five cycles.

Table 1. Periodic fluctuation of Tengzhou's economy since 1978

Economic cycle	Year	Time span	Peak of wave	Trough of wave	Average speed of growth	Volatility (Percentage)
The first cycle	1978-1983	6 years	13%	5.1%	8.6%	7.9
The second cycle	1984-1990	7 years	19%	3.6%	9.0%	15.4
The third cycle	1991-2000	10 years	24.5%	9.6%	13.6%	20.9
The fourth cycle	2001-2011	11 years	21.5%	14.3%	16.1%	11.9
The fifth cycle	2012-2018	7 years	11.3%	4.8%	8.1%	6.5

Note: Volatility refers to the difference between the highest growth rate and the lowest growth rate in a period.

2.1.1 The first cycle: 1978—1983

This period refers to the initial stage of reform and opening up. The Third Plenary Session of the 11th Central Committee of the Chinese Communist Party made a strategic decision to shift the focus of the work of the Party and the state to socialist modernization and to carry out reform and opening up, and put forward a decision to concentrate on developing social productive forces. As a result, social production gradually recovered and the economy achieved steady growth. However, due to the period of transformation and social and economic instability, the duration of this cycle experienced a relatively short duration.

2.1.2 The second cycle: 1984—1990

This was a period with frequent reforms. The establishment of the Household Contract Responsibility System has changed the rural management system with the emancipation of the productive forces in rural areas, and agricultural production was restored and received development in a rapid manner. The Third Plenary Session of the 12th CPC Central Committee adopted the Decision of the CPC Central Committee on the Reform of the Economic System, which proposed the "commodity economy based on plans", creating advantages for breaking the planned economy. In 1986, The State Council issued several Provisions on Deepening Enterprise Reform and Enhancing Enterprise Vitality, which launched the reform of enterprises owned by the whole people and enhanced enterprise vitality. The Thirteenth National Congress preliminarily developed the theory of the primary stage of Chinese socialism and put forward the basic line of "one central task and two basic points". In 1988, he put forward the conclusion that "science and technology is the primary productive force". These reforms led to rapid growth before it fell back for historical reasons.

2.1.3 The third cycle: 1991—2000

During this period, there was a risk of economic overheating, but with the promotion of national macro-control and reform, the economy achieved a "Soft Landing". In early 1992, Comrade Deng Xiaoping's southern tour speech greatly emancipated the mind, set off a new round of reform and opening up boom, the economy recovered quickly with the appearance of overheating phenomenon. In 1993, the Central Committee of the Communist Party of China and the State Council issued the Opinions on the Current Economic Situation and Strengthening Macro-control and adopted 16 measures combining economic and administrative measures, such as controlling currency issuance, raising interest rates and strictly controlling credit scale, to alleviate the pressure of economic overheating. The Third Plenary Session of the 14th CPC Central Committee adopted the Resolution of the CPC Central Committee on the Establishment of a Socialist Market Economy, which laid out an overall plan for building a socialist market economy and a number of major reforms. The Asian financial crisis broke out in 1997. In 1998, China implemented proactive fiscal policy and prudent monetary policy, and the economy slowed down steadily and reached the bottom.

2.1.4 The fourth cycle: 2001—2011

During this period, the state intensified macro-control and adopted different monetary and fiscal policies to regulate the economy. At the beginning of the cycle, monetary policy is preferably adopted to increase the money supply because of deflationary pressures. From 2003 to 2007, in order to control excessive economic growth, monetary policy was initially stipulated to appropriately tighten monetary policy. In June 2007, the State Council held an executive meeting and the monetary policy began to be conducted to "tighten economy in moderate and proper manner". At the end of 2007, the Central Economic Work Conference defined the primary tasks of macroeconomic control in 2008 as "Two Controls", namely, preventing fast economic growth from becoming overheated and preventing structural price increases from becoming

significant inflation, requiring a tight monetary policy. In September 2008, after the international financial crisis broke out, China's economic growth slowed down rapidly and confronted the risk of a hard landing. To address this crisis, we introduced ten measures to further expand domestic demand and promote steady and rapid economic growth, and adopted a proactive fiscal policy and a moderately easy monetary policy. The business cycle eventually level off with a few wobbles.

2.1.5 The fifth cycle: 2012—2018

During this period, China's economy gradually entered a new normal, which was characterized by a shift from high speed to medium-high speed, from extensive growth based on scale and speed to intensive growth based on quality and efficiency, and from investment driven by factors of production to innovation-driven growth. In 2018, China's economy entered a new stage of "new normal" in an all-round way, and the downward pressure on the economy needs to be alleviated by a new round of all-round reform and opening-up and a new round of supply-side structural reform. After a slight increase in economic growth in Tengzhou City in 2012, presenting a slow downward state.

2.2 The periodic trajectory is basically consistent with that of the whole country and the province

As can be clearly seen from the economic growth cycle chart of the whole country, the whole province and Tengzhou City that the economic growth cycle of Tengzhou City seriously lagged behind that of other cities before 1988. Tengzhou usually reached the trough or peak 2-3 years after the trough or peak is reached in the whole country or the whole province. However, after 1988, the economic running track of Tengzhou, the whole country and the whole province basically kept the same level, the cycle span of fluctuation was basically the same, and the trough and peak appeared in the same year or one year apart.

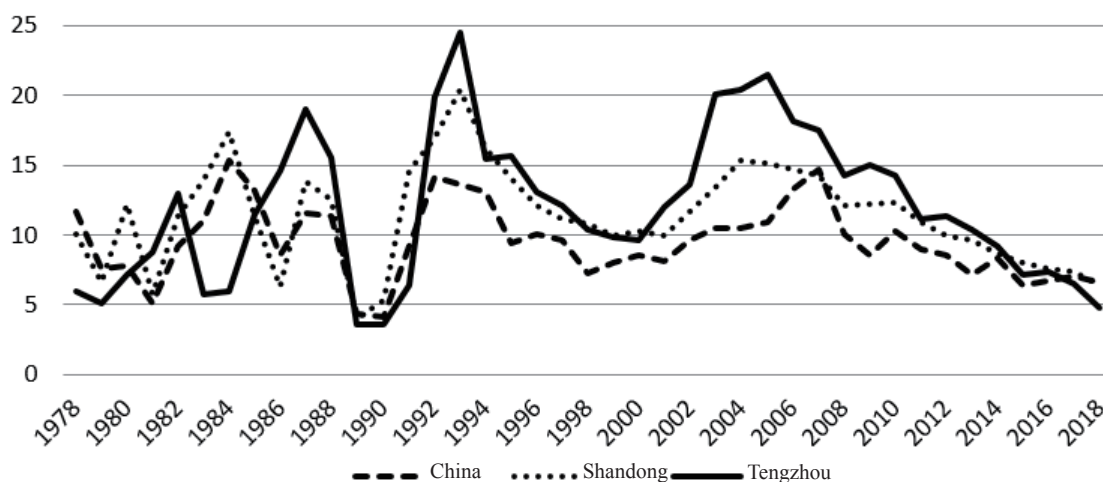


Figure 1. GDP growth rate of China, Shandong and Tengzhou since 1978

2.3 Apparent characteristics of periodic fluctuations at regional level

Although the economic growth cycle of Tengzhou is basically consistent with the whole country and the whole province, it also presents significant regional characteristics.

First of all, fluctuation of Tengzhou's economy is significantly greater than the whole country, the province. From the perspective of economic fluctuation coefficient, it reflects the relative degree of deviation from the mean of real economic growth fluctuation. According to historical data calculation, from 1978 to 2018, the economic fluctuation coefficient of Tengzhou was 44.2%, higher than 28.2% of the whole country and 31.2% of the whole province.

Secondly, the expansion period of Tengzhou's economic cycle is significantly shorter than the recession period, especially in the third and fifth economic cycles. In these two economic cycles, it usually takes only 2-3 years to reach the peak from the trough, and then the economic growth gradually falls back to the trough, lasting about 6-7 years.

3. Analysis of reasons for periodic fluctuations of county economy

3.1 Influence of fluctuation of economy at national and provincial level

The correlation coefficients between the economic growth time series of Tengzhou and the whole country and the province were 0.60 and 0.68, respectively. The correlation coefficient was tested for significance with a sample size reaching 41. At the 95% confidence level, the correlation coefficient could pass the significance test, that is, the economic growth

fluctuation of Tengzhou was significantly correlated with that of the whole country and the whole province.

3.2 Impact of changes of industrial structure

Different industries made different contributions to GDP, and different industry portfolio naturally lead to different economic cycle fluctuations. According to Schumpeter's innovation business cycle theory, technological innovation was firstly developed in technologically advanced sectors. With the continuous diffusion of innovation, emerging industrial sectors emerge and develop gradually, while old industrial sectors decline and are replaced, which causes fluctuations in business cycles.

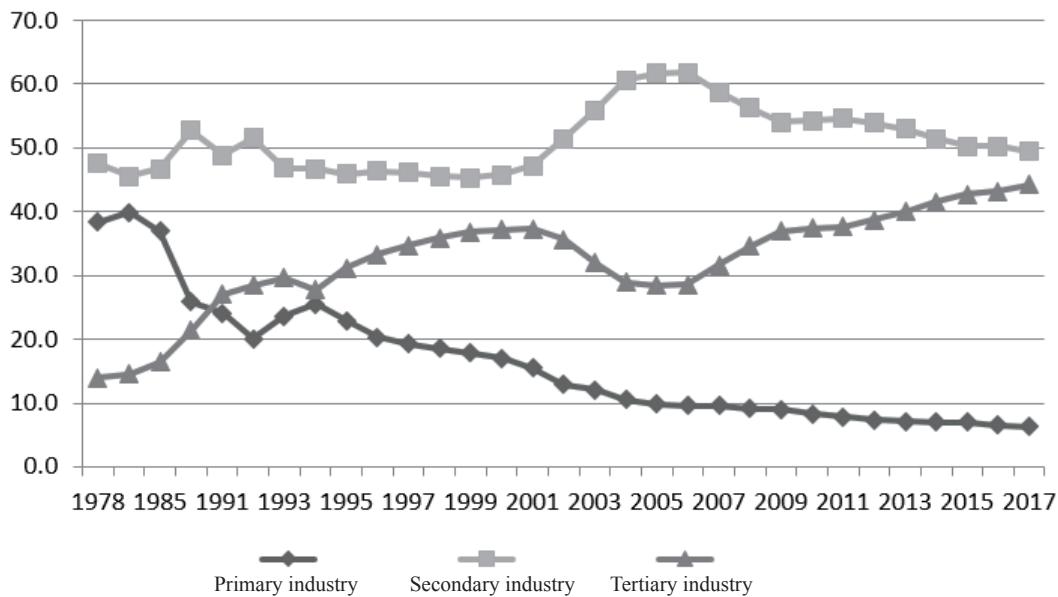


Figure 2. Changes of industrial structure in Tengzhou City since 1978

The development of industrial structure tends to be a smooth mechanism of economic cycle fluctuation. The rational and standardized development of industrial system will cause the reduction of economic fluctuation. The result of sustained economic development is that standardized enterprise organizations become the main economic participants, and mature enterprise organizations and standardized business model have stronger ability to resist risks, increasing the internal stability of the economic system, and thus reducing the range of economic fluctuations. The changing trend of industrial structure is that the proportion of service industry increases. Because the fluctuation of service output is less than that of manufacturing output, the increase of the proportion of service industry restrains the cyclical fluctuation of economy. In addition, due to the improvement of technological progress and management level, the fluctuation of manufacturing output is obviously moderated, which also plays a role in smoothing the cyclical fluctuations of the economy.

3.2.1 Early stage of reform and opening up

Tengzhou's primary industry accounts for a relatively high proportion, while the tertiary industry has not been given full priority. Although the secondary industry accounts for the highest proportion, the development of industry and construction is not sufficiently developed to support stable economic growth. Due to the low level of agricultural mechanization and greatly affected by natural conditions, the industry has not formed a perfect system, the planned economy is still in dominant position. This is mainly reflected in the great fluctuation of the economic growth rate in the first and second round of economic cycle, and the obvious lag of the national and provincial economic cycle, and even in some years, the opposite economic trend of the national and provincial economic cycle.

3.2.2 Early 1990s

Tengzhou City has determined the first industrial product structure plan: "Based on agriculture, first develop the light and textile industry; focus on resource development to accelerate the development of coal and building materials industries; take export-earning products as the fist to support the development of machinery and chemical industries; Use municipal enterprises as the link to drive the development of township and village enterprises." It also established a strategic research institution to clarify the overall strategic goal of the city's social and economic development, namely, based on the two major resource advantages of local coal and agricultural and sideline products, and take the development path of coal coke chemical industry as the leading output. The light textile industry was developed in the early stage, which created conditions

for accumulating funds for the development of coal and coke chemical industry; in the later stage, the coal chemical industry, building materials, machinery and other industries were vigorously developed, so as to realize the shift of the industrial structure from light yarn to coal chemical. In the mid and late 1990s, Tengzhou City deepened reforms, implemented the strategy of large groups, enhanced the anti-risk capability of the industrial economy, grasped the backbone, implemented the pillar industry expansion project, and established the six pillars of coal coking, electromechanical equipment, construction, building materials, textiles, and food. industry. During this period, Tengzhou City was exploring a suitable road for industrial development. The industrial economy gradually matured and its role in stimulating economic growth became increasingly prominent.

In terms of service industry, it mainly takes advantage of transportation location to develop transportation and trade circulation. The big market is beginning to take shape, and the total commercial sales volume of Guo-he commerce always ranks first among counties (cities) in the province, and the market is developed. In the third round of economic cycle, Tengzhou's service industry developed rapidly, and the proportion of the tertiary industry increased from 21.4% in 1990 to 37.2% in 2000, an increase of 15.8 percentage points, which is the period of the fastest increase in the proportion of the five rounds of economic cycle.

3.2.3 After 2000

Tengzhou City gradually attaches importance to technological innovation and technological transformation, and speeds up the pace of grafting and transformation of traditional industries with high and new technologies to realize the upgrading of traditional industries. As early as 2003, Tengzhou established the strategy of "strengthening the city by industry", vigorously developing high-tech industries, cultivating and expanding six pillar industries such as energy, chemical industry, machinery and electronics, food and medicine, building materials and textiles, and characteristic industries such as cold food, standard parts and baby strollers. The quality and benefits of industrial economic operation have been significantly improved. During this period, enterprise reform and asset restructuring made breakthroughs, and enterprises regained vitality. We launched the "Year of Key Projects" campaign to strengthen the idea that "to focus on the economy is to focus on projects and concentrate on big projects". At the same time, a group of private enterprises have become a backbone of Tengzhou's economic development. The idea of industrial economic development is becoming increasingly clear, and gradually forming an industrial system with many industries, a complete range of categories, and a certain level of technology and production capacity. During this period, Tengzhou witnessed rapid industrial and economic development, which also led the city's economic growth to the second highest point since 1978, namely, the economic growth rate of Tengzhou reached 21.5% in 2005.

In terms of the service industry, the traditional service industry still led the development during this period. The traditional advantageous industries such as wholesale and retail, transportation and other industries played a major role in supporting the growth of the service industry, while the development of other services was relatively slow. Due to the rapid development of industry, proportion, proportion of the tertiary industry industry formed a certain degree of crowding, the period of the service industry proportion fell, but the role of steady growth began to gradually appear, in the process of economic growth from peak to trough fall back, compared with the previous economic cycles fell back quickly, the cycle trend slow down, The stability of economic growth has gradually improved.

3.2.4 Since 2011

Tengzhou adheres to the strategy of "strengthening the city with industry and establishing the city with industry". In order to promote industrial transformation and upgrading, Tengzhou strives to build two industrial clusters worth 100 billion yuan, six plates worth 10 billion yuan and five enterprise aircraft carriers worth 10 billion yuan. Promote coal chemical industry, machinery manufacturing industry to fine chemical and high-end precision CNC direction development. To create six characteristic industrial sectors of glass deep processing, stainless steel products, auto accessories, bio-medicine, home decoration and food processing, and focus on cultivating five enterprises whose main business income is over ten billion yuan. Through listing and financing, capital and share increases, joint mergers and acquisitions, we have encouraged enterprises to grow bigger and stronger, and gradually enhanced the stability and resilience of industrial enterprises. Old and the new kinetic energy conversion major projects, Tengzhou is committed to the transformation and upgrading, promote the innovation and development, chemical new materials technology innovation and industrialization of the Chinese alliance, transformation of scientific and technological industrialization of scientific and technological achievements transfer network alliance center of Chinese Academy of Sciences, north southern Shandong institute of technology, buaa machine innovation institute innovation platform to accelerate development. Big data industrial parks are in operation, improving the quality and efficiency of the industrial economy, and enhancing its role in stabilizing growth.

In terms of service industry, in 2011, Tengzhou was identified as the provincial service comprehensive reform pilot area

for the first time, the development of service industry as a way to turn the structure important breakthrough that promote upgrading, service industry specialization strategy, establish the "big tourism, commerce, logistics, big market" development train of thought, promote service industry to develop in the direction of modernization, specialization, branding, Focus on building a regional central city in southern Shandong, improve the scale, influence and radiation of the development of the service industry. During this period, the proportion of the service sector has gradually increased and its contribution to economic growth has also gradually increased. Especially in recent years, under the background of increasing downward pressure on the economy, the service sector has fully played the role of "stabilizer" and played an important role in maintaining medium-high economic growth.

3.3 Impact of fluctuations in investment and consumption

As the endogenous driving force of economic growth, investment and consumption play an important role in sustaining economic growth. Moreover, in different periods, the driving role of investment and consumption changes constantly, and the fluctuation between them plays a role in promoting the change of the economic cycle.

From the perspective of Tengzhou City's economic cycle fluctuations, the emergence of economic cycle peaks is mostly accompanied by the rapid growth of fixed asset investment, and the emergence of economic recession is also mostly related to the decline of investment growth. Take the third and fourth economic cycles for example, their fluctuations are obviously influenced by investment. From the perspective of endogenous driving force of economic growth, the peaks of these two cycles are both driven by the rapid growth of investment. The driving effect of investment on economy can also be well reflected from the effect coefficient of fixed asset investment. Because of the lag of investment, the investment effect coefficient can better reflect the effect of investment on economic growth. In the early days of reform and opening up, various undertakings were in ruins and the investment results were very obvious.

In the economic growth cycle, the role of consumption can not be ignored. When investment growth is high and consumption is strong, the economy tends to show stronger growth momentum. The reason why the third round of economic cycle can achieve high economic growth is inseparable from the driving effect of consumption in this period.

In order to more accurately reflect the impact of investment and consumption fluctuations on the economic cycle, Johansen co-integration test analysis method is adopted to analyze whether there is a co-integration relationship between investment, consumption and economic growth. If there is a cointegration relationship, the vector error correction model is used to analyze the dynamic changes among investment, consumption and economic growth.

GDP (Y), investment (T) and consumption (X) were analyzed as time series after logarithmic processing. Firstly, Eviews software was used to conduct ADF unit root test on $\ln Y$, $\ln T$ and $\ln X$, which had been logarithmized. The test results were shown in Table 2.

Table 2. ADF test results

Variable	ADF test value	Test form (c, t, k)	P value	marginal value (5%)	conclusion
$\ln Y$	-1.352065	(c, 0, 1)	0.1843	-2.9339	Non-stationary
$\Delta \ln Y$	-3.094517	(c, 0, 1)	0.0037	-2.9358	Stable performance
$\ln T$	-1.423641	(c, 0, 1)	0.1627	-2.9339	Non-stationary
$\Delta \ln T$	-4.167144	(c, 0, 1)	0.0002	-2.9358	Stable performance
$\ln X$	-1.891791	(c, 0, 1)	0.8547	-2.9339	Non-stationary
$\Delta \ln X$	-4.616052	(c, 0, 1)	0.0000	-2.9339	Stable performance

Note: C stands for constant term; T stands for trend term; K stands for lag order; Δ refers to the first order difference of related variables; Stable performance means passing the ADF stationary test at a significance level of 5%.

As can be seen from Table 2, at the significance level of 5%, the logarithmic sequences of variables GDP (Y), investment (T) and consumption (X) are non-stationary. After the first-order difference, the sequences are stationary at the confidence level of 5%, which are all first-order integration sequences. Therefore, co-integration analysis can be conducted to test the co-integration relationship between the three variables.

The Johansen test method is used to carry out the co-integration test for the co-integration relationship between multiple variables. Table 3 co-integration test results show that, at the 5% significance level, there are three co-integration relationships among $\ln Y$, $\ln T$ and $\ln X$ variables.

Table 3. Test results of Johansen co-integration relationship

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.335489	32.88665	29.68	35.65	None *
0.214912	16.94722	15.41	20.04	At most 1 *
0.175175	7.510781	3.76	6.65	At most 2 **

OLS regression was performed with $\ln Y$, $\ln T$ and $\ln X$ to obtain the equation:

$$\ln Y = 0.88 + 0.063 \ln T + 0.975 \ln X$$

$$(0.085) \quad (0.073)$$

It can be seen from the formula that there is a cointegration relationship between economic growth, investment and consumption. Among them, the number in parentheses below the formula represents the standard error, indicating that in the co-integration test, the relationship between variables is significant. According to the formula, there is a positive correlation between investment, consumption and GDP. If investment increases by 1%, GDP will increase by about 0.063%. A 1% increase in consumption would increase GDP by about 0.975%.

4. Periodic fluctuations for promotion of high-quality economic development

Economic periodic fluctuation is the inherent law of economic development. Natural adaptation to the economic development cycle will do far more harm than good, and the impact of factors that undermine economic development will force the economy into inevitable reverse. On the one hand, we need to respect the law of economic cycle development. On the other hand, we need to take effective measures to avoid possible risks and sharp ups and downs in the economy. This is the only way to ensure high-quality economic development. Tengzhou is at the beginning of a new economic upswing this year. In the long run, the fluctuation of economic growth is continuous and happening constantly. Therefore, it is of great practical significance to make full use of the characteristics of economic cycle fluctuations to promote the steady rise of the economy in the short term and to smooth the economic fluctuations and promote high-quality economic development in the long term.

4.1 Expanding the scale of county economy is the basis of improving the ability of economy to resist risks

Tengzhou covers an area of 1,495 square kilometers and has a permanent population of 1,574, 600. We will continue to strengthen, improve and expand the manufacturing industry and the real economy, promote the high-quality development of the city's economy and lay a solid foundation for a modern economic system. We will make full use of supportive policies at all levels, implement them in earnest, let enterprises see real results, and accelerate the formation of a regular and long-term mechanism for supporting their development. Reengineering the organizational model should be carried out to promote the rational flow and optimal allocation of factors of production, with key enterprises as the leader and assets as the link, so as to create a sound environment in which large enterprise groups lead and small and medium-sized enterprises compete for growth, and improve the overall economy's ability to cope with cyclical fluctuations.

4.2 Optimization of industrial structure and increasing cluster effect is an important means to prevent economic ossification and keep vitality forever

We should formulate a scientific and thorough industrial development plan, based on tengzhou's existing industrial base and competitive industrial fields, expand and strengthen six advanced manufacturing industries, including high-end equipment and high-end chemical industry, and upgrade three traditional competitive industries, including coal and electricity, building materials and food. We will formulate and implement systematic, targeted, and individualized industrial development policies, with emphasis on rewarding and assisting enterprises in terms of scale, efficiency, growth rate, technological innovation capacity, financial contribution capacity, and brand management capacity. We will integrate preferential policies such as land price subsidies, matching funds, and government discount interest rates, and encourage large projects to flourish and good ones to form a cluster effect by attracting foreign investment and fostering small businesses within China.

4.3 Strengthening leading enterprises to form scale effect is the key to promote economic growth

While unswervingly implementing investment attraction, we should fully support and promote the development of local enterprises. Establish a scientific leading enterprise cultivation and detection system, with backbone leading enterprises,

high-quality and high-growth enterprises, backup enterprises and other three levels of training echelon, forming a model before, after the formation of a good atmosphere to catch up with each other. Centering on characteristic leading industries, we will form a number of large enterprise groups with strong competitiveness through various forms, such as mergers and alliances, to create new economic support points.

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