

The Impacts of the Growth of the Three Industries and Industrial Price Structural Changes on China's Economic Growth between 1952 and 2019

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This paper focuses on the impacts and effects of China's growth of the three industries and price structural change on the real GDP growth rate. First of all, it presents a new accounting method for decomposing growth rates on the basis of existing accounting method for decomposing growth rates. By using this method, we can identify the impacts and effects of structural changes on the growth rate. The paper uses a new decomposition method to recalculate China's industry-based real GDP growth rates between 1952 and 2019, focuses on the driving effect of growth of the three industries on the real GDP growth, and the impacts of price structural change on GDP growth rate and the contribution of the growth of the three industries on GDP growth rate. By analysis, this paper shows that between 1952 and 2019 China's economic growth was mainly driven by the secondary industry, which had contributed to the economic growth by over 50%, the role of the tertiary industry in driving economic growth rose, but that of the secondary industry declined over the time; in the short run, the overall effect of the price structural changes of the three industries has a little impact on the economic growth, but the price change of each industry has strong effects, and the price structural change has significantly changed the effect of the growth of the three industries on the real economic growth; in the long term, the price structural change plays a relatively big hindering effect on economic growth due to the Baumol's cost disease.

Keywords: economic growth, three industries, price structural change, decomposition of economic growth rate

1. Introduction

In accordance with the data of *China Statistical Yearbook*, between 1952 and 2019, China's real GDP grew 185.37 times, with an average annual growth rate 8.35%. The high-speed economic growth benefits mainly from the rapid growth of the three

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industries, but the growth rates of the three industries vary. According to Figure 1, between 1953 and 2019, the growth rates of China's secondary industry and tertiary industry were much faster than that of the primary industry, and the growth rates of the secondary industry and the tertiary industry varied greatly in different periods. The unbalanced growth of the three industries has made the structures of the three industries change significantly. According to Figure 2, in 1952, the output value of the primary industry accounted for 50% of GDP, that of the secondary industry accounted for 21% of GDP, and that of the tertiary industry accounted for 29%; in 2019, the proportion of the output value of the tertiary industry to GDP increased to 54%, while those of the primary industry and the secondary industry declined to 7% and 39%, respectively. Economic growth is essentially driven by the growth of different industries, and different industrial growth rates and characteristics lead to industrial structural changes in the process of economic growth. In the process of the long-term economic growth between 1952 and 2019, what was the difference of the growth of the three industries? What were the contributions of different industrial growth rates on the actual economic growth? This is one of the main issues to be addressed in this paper.

As Baumol (1967) has pointed out, the different technical progresses of different industries would result in changes of relative price and the price of industries with rapid technical progress would relatively rise. As is seen in Figure 3, between 1953 and 2019, the increase rates of product prices of China's three industries varied greatly. Specifically, the prices of the primary and tertiary industries rose much faster than the price of the secondary industry. The product price changes of the three industries caused changes of the price structure and the proportions of the output values of the three industries in the real GDP in different periods. Therefore, relative price structural change can affect the growth rate of the real GDP. In the process of China's economic growth, what impacts will the price structural changes of the three industries make on the real GDP growth? How will relative price structural change affect the contribution of the growth of the three industries to the actual economic growth? This is another important issue to be discussed in this paper.

Existing documents have also analyzed the contributions of the growth of the three industries to China's economic growth, however, as the impacts of price structural change are not considered, these documents have defects in the following aspects. On the one hand, because the impacts of price structural change on the growth of the three industries have not been removed, existing researches underestimate the contribution of the secondary industry on the economic growth but overestimate that of the primary industry and the tertiary industry. On the other hand, due to the limitations of the decomposition method, it is impossible for existing documents to analyze the impacts of price structural change on economic growth. Compared with existing documents, this paper mainly has the following innovations. First, theoretically, this paper puts forward a new method for decomposing the factors of the real GDP growth rate, and

the method is of great significance to analyze the impacts of structural changes on economic growth. Second, as for understanding of China's real economic growth, this paper uses a new accounting method to estimate the percentage points of the growth of the three industries driving China's real GDP growth and the contribution rate between 1952 and 2019, and analyzes the impacts of price changes of the three industries on the economic growth rate as well as the impacts of the growth of the three industries on the real GDP growth.

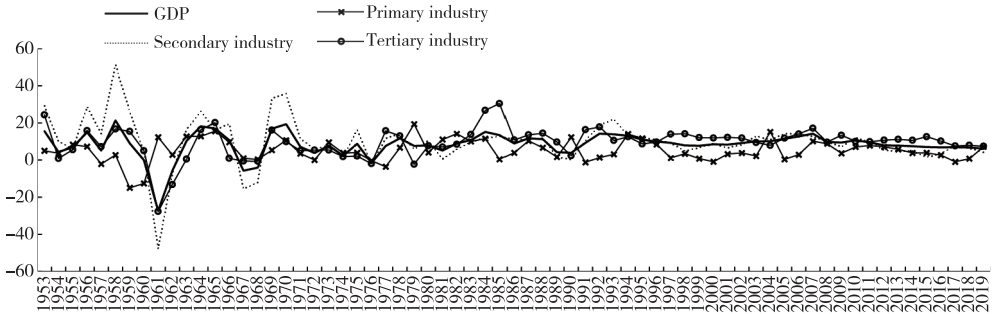


Figure 1. China's Real GDP Growth Rate and the Growth Rates of the Real Output Values of the Three Industries, 1953–2019

Note: The real growth rates of the three industries are adjusted in accordance the GDP deflator.

Source: CEIC database.

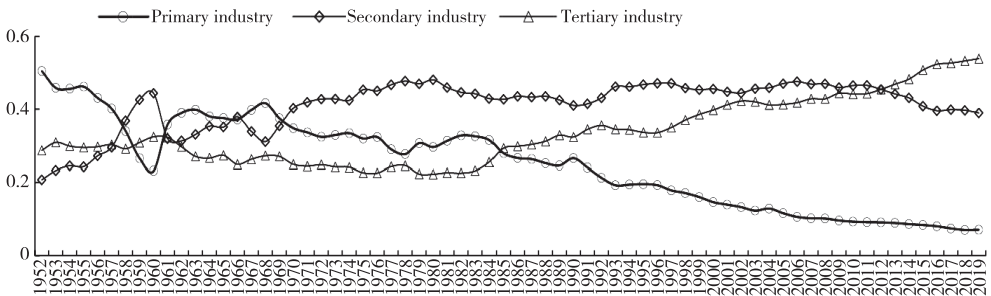


Figure 2. The Changes of the Output Value Share of China's Three Industries in GDP, 1952–2019

Source: CEIC database.

The structure of this paper is as follows: the second section is a literature review; the third section analyzes China's three industries and the real GDP growth between 1952 and 2019, as well as the change tendency of the relative prices of the three industries; the fourth section presents a new method for decomposing the factors of real GDP growth rate; the fifth section decomposes China's real GDP growth rates based on industry, and discusses the contributions of the growth of the three industries and price structural change to China's economic growth; the sixth section is the conclusions and review.

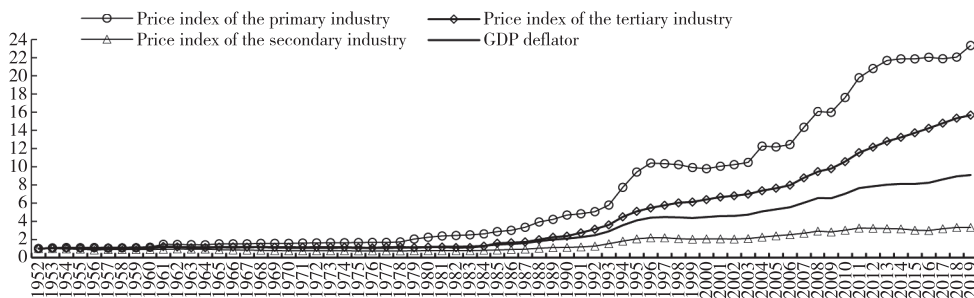


Figure 3. The Change Tendency of China's GDP Deflator and the Price Index of the Three Industries, 1952–2019

Source: Calculated by the author in accordance with the original data of the CEIC.

2. Literature Review

This paper is mainly related to the following three types of documents: The first type is related to industrial structure changes, and such researches started from Fisher (1939) and Clark (1940). Kuznets (1973), for the first time, presented the characteristics of the economic structural transformation by systematically studying the process of the modern economic growth of different countries. Afterwards, many scholars including Baumol (1967), Kongsamut *et al.* (2001), Ngai and Pissarides (2007), Acemoglu and Guerrieri (2008), Foellmi and Zweimuller (2008) and Boppart (2014), strictly demonstrated the above characteristics by using a theoretical model, explaining the structural changes of different industries in terms of the differences of supply (technological progress or factor intensity) and/or demand (preference or income elasticity of demand). Some other documents studied the Baumol phenomenon, which is related to the product price changes of different industries/sectors. According to these researches, the growth rate of the production efficiency of the manufacturing industry is higher than that of the service industry, causing that the relative cost of the service industry keeps rising. Meanwhile, the rise of the overall production efficiency increases the income, improving the retained wages of workers who have given up leisure for work reason, and increasing the absolute costs of service products which mainly use labor factors. The combination of the two effects above makes the costs and prices of the service industry rise compared with those of the manufacturing industry. Baumol (1967) considered the situation in the case of single labor production factor. Ngai and Pissarides (2007) indicated that even if capital accumulation is considered, the different technical advances of different sectors still make it possible that the Baumol effect exists in the economy. Acemoglu and Guerrieri (2008) have further proved that the differences of factor intensity used in different industrial sectors may also cause changes of relative prices of products. Some other documents studied the impacts of the Engel's income effect on industrial structure changes. Existing theories

have proved that, under the assumptions of Stone-Geary preferences (Kongsamut *et al.*, 2001), hierarchical preferences (Foellmi and Zweimueller, 2008), price-independent generalized linearity preferences (Boppart, 2014), non-homothetic CES preferences (Comin *et al.*, 2019), as well as intertemporally aggregable preferences (Alder *et al.*, 2019), demand curves in line with the Engel's law will be generated, and the Engel effects causing industrial structural changes can emerge. Guo *et al.* (2017) and Yan *et al.* (2018) have measured China's Engel effects and Baumol effect, proving that these effects exist in China's economic growth.

The second type is related to the effects of the three industries on China's economic growth. There are quite a lot of such documents, of which the most influential ones are documents written by Liu and Li (2002), who have found that though the tertiary industry is one of the main drivers of China's economic growth, the expansion of the tertiary industry may reduce the positive effect of the scale economy in the primary industry and the secondary industry. Only by raising the efficiency of the primary industry and the secondary industry can we maintain long-term economic growth. Some other researchers have an opposite opinion on this. For example, Pang and Deng (2014) believed that in China, the production efficiency of the service industry is higher than that of the industry and the TFP growth of the former has exceeded that of the latter in recent years. Tang *et al.* (2018) also believed that China's sustained economic growth should be driven by the development of the producer services in the tertiary industry. From above we can see that it remains controversial in existing documents about whether China's high-speed economic growth is driven by the secondary industry or the tertiary industry. Different from the econometrical methods in existing documents, this paper mainly uses an industry-based method for decomposing economic growth rates to analyze the impacts of the three industries on China's economic growth.

The third type is related to researches on how the industrial structure influences the economic growth. By using a theoretical model, Syrquin and Chenery (1989), Matsuyama (1992) and Caselli (2005) have proved that industrial structure plays an important role in the economic growth of a country and the difference in economic structure is one of the important reasons for different income increases in different countries. Empirically, Sachs and Woo (1994) made a comparative study on China and Eastern European countries and the Soviet Union and discovered that the key driver for China's high-speed economic growth is the change of industrial structure. Temin (1999) and Temple (2001) believed that structural transformation is one of the main reasons for the high-speed growth of western countries after World War II (1950–1973). Other relevant overseas researches include the comparative analyses made by Peneder (2003) on OECD countries, the survey made by Ding and Knight (2009) on the miracle of China's economic growth, as well as the comparative studies made by Cimoli *et al.* (2011) on the economic growth of China, Brazil, India and South Korea. Domestically,

Zheng *et al.* (2010) showed that industrial structural adjustments had obvious short- and long-term effects on China's economic growth in the 30 years before China introduced the policy on reform and opening up. Dai and Mao (2015) discovered that the industrial structural improvement is of great significance to narrowing the interregional differences of China's economic growth. As shown from the above literature review, most existing researches study industrial structure by means of the absolute output value of three industries and their proportional relationship, while this paper focuses on the impacts of price structural changes on economic growth. In addition, this paper, for the first time, includes the characteristics of the price changes of each of the three industries.

3. The Growth and Relative Product Price Changes of China's Three Industries

3.1. Output Value Growth and Structural Changes of the Three Industries

In accordance with data in *China Statistical Yearbook* (as shown in Table 1) and calculated according to constant price of the GDP deflator in 1952, China's real GDP increased 185.37 times, with an average annual real growth rate of 8.35%. Specifically, the average annual growth rates of the primary, secondary and tertiary industries were 5.17%, 9.94%, and 9.48%, respectively. Obviously, the growth rates of the three industries varied greatly during the period. In fact, between 1952 and 2019, except for in some specific years, the primary industry was basically the industry with the slowest growth, and its average annual growth rate was far less than GDP growth. The secondary industry was the fastest-growing one among the three industries, and the tertiary industry had a relatively high annual growth rate, and its annual geometric average growth rate (9.14%) was even higher than that of the secondary industry (9.13%). Before and after China introduced the policy of reform and opening up, the growth of China's real GDP and the real output value of the three industries had different characteristics. As shown in Table 1, compared with the growth rate of the secondary industry before the adoption of the policy of reform and opening up, it declined slightly after that, but the growth rates of the primary and tertiary industries increased significantly, twice that before the adoption of the policy of reform and opening up.

The unbalanced growth of the three industries definitely led to changes of the industrial structure, as shown in Figure 2. In 1952, agriculture played a leading role in China's industrial structure, and the proportions of the primary, secondary and tertiary industries in GDP accounted for 50.5%, 21.8% and 28.7%, respectively. In 1978, the secondary industry began to take a leading role in China's industrial structure, and the output values of the primary, secondary and tertiary industry accounted for 27.7%, 47.7%, and 24.6% of GDP, respectively. After the adoption of the policy of reform and

opening up, due to the industrial structural changes in China's economic growth, the proportion of the primary industry in GDP continuously declined, that of the tertiary industry in GDP kept rising, while that of the secondary industry in GDP experienced an inverted U-shaped change. In 2019, the proportions of China's primary, secondary and tertiary industries in GDP were 7.1%, 39.0%, and 53.9%, respectively.

Table 1. The Growth Multiplier and Average Annual Growth Rate of China's Real GDP and the Real Output Value of the Three Industries, 1952–2019

Period	Price adjusted in accordance with the GDP deflator				Calculated in accordance with the constant price of the industries in the previous year		
	GDP	Primary industry	Secondary industry	Tertiary industry	Primary industry	Secondary industry	Tertiary industry
Total growth multiplier (unit: times)							
1952–2019	185.37	25.25	348.57	348.76	8.73	898.46	222.61
1952–1978	3.74	1.60	9.89	3.06	0.70	14.24	2.94
1978–2019	38.29	9.09	31.10	85.10	4.73	58.02	55.77
1978–2002	7.99	3.32	7.37	14.43	1.90	11.79	10.68
2002–2012	1.73	0.87	1.79	1.93	0.54	2.00	1.82
2012–2019	0.60	0.25	0.38	0.90	0.29	0.54	0.72
Annual arithmetic average growth rate (unit: %)							
1953–2019	8.35	5.17	9.94	9.48	3.57	11.44	8.65
1952–1978	6.70	3.99	11.55	6.13	2.29	12.85	5.88
1979–2019	9.40	5.91	8.92	11.60	4.38	10.54	10.40
1979–2002	9.62	6.43	9.37	12.26	4.58	11.31	10.84
2003–2012	10.56	6.53	10.82	11.39	4.39	11.63	10.95
2013–2019	6.98	3.29	4.68	9.64	3.65	6.34	8.09

Note: The annual geometric average growth rate may be calculated on the basis of the total growth multiplier, and its value is different from the annual arithmetic average growth rate. To save space, the annual geometric average growth rate is not provided here.

3.2. The Unbalanced Growth and the Changes of Relative Product Prices of the Three Industries

Due to the unbalanced growth of the three industries, the increase of product prices of China's three industries varies greatly. The prices of the primary and tertiary industries rise much faster than those of the secondary industry, causing changes of the relative price of the three industries. According to Figure 3 and Table 2, between 1952 and 2019, the price of China's primary industry rose most rapidly (22.3 times), with an annual arithmetic average increase rate of 5.05%; the price of the tertiary

industry rose about 14.7 times, with an average annual increase rate of 4.37%, and the average annual increase rates of the primary and tertiary industries were higher than the increase rate of the GDP deflator (3.47%). In the same period, the price of the secondary industry rose only 2.32 times, with an average annual increase rate of 1.94%. In addition, the price increase speed of the different industries varied greatly before and after the adoption of the policy of reform and opening up. Basically, the overall price level did not change much before the adoption of the policy of reform and opening up. Between 1952 and 1978, the GDP deflator rose merely by 13%, with an average annual growth rate of 0.33%. Specifically, the average annual growth rate of prices of the primary, secondary and tertiary industries was 2.24%, -1.13%, and 0.67%, respectively. The growth rate of the overall price level after the adoption of the policy of reform and opening up was obviously higher than that before the adoption of the policy. Between 1978 and 2019, the GDP deflator rose 7.32 times, with an average annual growth rate of 5.32%. Specifically, the average annual growth rates of the prices of the primary, secondary and tertiary industries were 6.72%, 3.76% and 6.57%, respectively. No matter before and after the adoption of the policy of reform and opening up, the price of the primary industry grew most rapidly while that of the secondary industry grew most slowly; the growth rate of the prices of the primary and tertiary industries was faster than the GDP deflator, and that of the price of the secondary industry was slower than the GDP deflator.

Table 2. China's GDP Deflator and the Increase of the Price Indexes of the Three Industries: 1952–2019

Period	Multiplier of price index (unit: times)				Annual arithmetic average inflation rate (unit: %)			
	GDP	Primary industry	Secondary industry	Tertiary industry	GDP	Primary industry	Secondary industry	Tertiary industry
1952–2019	8.09	22.3	2.32	14.7	3.47	5.05	1.94	4.37
1952–1978	0.09	0.74	-0.25	0.18	0.33	2.24	-1.13	0.67
1979–2019	7.32	12.4	3.44	12.3	5.33	6.72	3.76	6.57
1979–2002	3.21	4.88	1.73	4.79	6.37	8.05	4.51	7.83
2003–2012	0.71	1.03	0.58	0.79	5.36	7.20	4.72	5.68
2013–2019	0.16	0.12	0.03	0.29	2.17	2.11	0.31	3.90

As the prices of the primary and tertiary industries rose much faster than those of the secondary industry between 1952 and 2019, if the real growth rates of the output values of the industries are calculated in accordance with GDP deflator excluding price rise, the real growth rate of the secondary industry is substantially underestimated, while the real growth rates of the primary and tertiary industries are overestimated. As shown in Table 1, between 1952 and 2019, the real output value of the secondary

industry calculated in accordance with the constant price of the industry in previous year grew by 898.5 times, which is 2.58 times the results calculated in accordance with the GDP deflator excluding price rise (348.6 times); the average annual real growth rate of the secondary industry was 11.4% in accordance with the constant price of the industry, 1.46 percentage points higher than the annual growth rate calculated in accordance with the GDP deflator excluding price rise. During the same period, the real growth rate of the primary industry in accordance with the constant price of the industry in previous year was 8.73 times, which was merely 35% of the results calculated in accordance with the GDP deflator excluding price rise (25.25 times). The average annual real growth rate of the primary industry calculated in accordance with the former method is 1.6 percentage points lower than result calculated in accordance with the latter method. During the period, the real output value of the tertiary industry increased 222.6 times (calculated in accordance with the constant price of the industry in previous year), 63.8% of the results calculated in accordance with the GDP deflator excluding price rise (348.76 times). The average annual real growth rate of the tertiary industry calculated in accordance with the former method is 0.75 percentage points lower than that calculated in accordance with the latter. The analysis of the differences between the real growth rates of the three industries calculated in accordance with the two different methods is of great significance to understanding the contributions of the growth of the three industries to China's economic growth. At present, in all documents, the percentage points and contribution rates of the three industries driving the real GDP growth are estimated and measured by the growth of the real output value of the industries, which are calculated in accordance with the GDP deflator excluding price rise. It can cause severe deviation to use the above method to evaluate the effects and contributes of the three industries to real economic growth. The following analyses in this paper indicate that this type of traditional accounting method may excessively overestimate the effects and contributions of the primary and tertiary industries to economic growth, but underestimate the effect and contribution of the secondary industry.

4. How to Calculate the Contributions of Industrial Growth and Industrial Price Structural Change to Economic Growth: Theoretical Analyses

The principle of the traditional method for calculating the contributions of the growth of the three industries to economic growth is shown below: assuming that there are m industries in the economy,

$$Y_t = \sum_{i=1}^m X_{it} \quad (1)$$

wherein, Y represents real GDP, X_i represents the real output value of industry i . Therefore,

$$g_t = \sum_{i=1}^m \alpha_{it-1} g_{X_{it}} \quad (2)$$

wherein, g represents real GDP growth rate, g_{xi} represents the growth rate of the real output value of industry i , α_i represents the proportion of the output value of industry i in GDP, t represents time. Therefore, the growth point g^{iY} of industry i driving the real GDP and its contribution rate R^i to the growth rate of GDP are shown below:

$$g_t^{iY} = \alpha_{it-1} g_{X_{it}} = (X_{it} - X_{it-1})/Y_{t-1}, \quad (3)$$

$$R_t^i = g_t^{iY} / g_t = \alpha_{it-1} g_{X_{it}} / g_t, \quad i = 1, 2, 3 \quad (4)$$

It proves that this method implies the assumption that the relative price structures of different industries remain unchanged.

In consideration of the general condition of relative price changes, we assume that

$$P_t Y_t = \sum_{i=1}^m P_{it} x_{it} \quad (5)$$

where P represents GDP price index (namely GDP deflator), x_i represents the real output value of industry i calculated on the basis of the constant price, and P_i represents price index of industry i . The following can be derived from formula (5),

$$(P_t Y_t) / (P_{t-1} Y_{t-1}) = \sum_{i=1}^m (P_{it} x_{it}) / (P_{it-1} x_{it-1}) \quad (6)$$

$\pi_t = (P_t - P_{t-1}) / P_{t-1}$ represents the inflation rate of GDP price index, $\pi_{it} = (P_{it} - P_{it-1}) / P_{it-1}$ represents the inflation rate of the price index of industry i , $g_t = (Y_t - Y_{t-1}) / Y_{t-1}$ represents real GDP growth rate, $g_{it} = (x_{it} - x_{it-1}) / x_{it-1}$ represents the growth rate of x_i . The following can be derived from formula (6),

$$\begin{aligned} g_t &= \sum_{i=1}^m \alpha_{it-1} g_{it} + \sum_{i=1}^m \alpha_{it-1} (\pi_{it} - \pi_t) + \sum_{i=1}^m \alpha_{it-1} (\pi_{it} g_{it} - \pi_t g_t) \\ &= \sum_{i=1}^m [\alpha_{it-1} g_{it} + \alpha_{it-1} (\pi_{it} - \pi_t) + \alpha_{it-1} (\pi_{it} g_{it} - \pi_t g_t)] \end{aligned} \quad (7)$$

The first equation in formula (7) indicates that the real GDP growth rate can be decomposed into the following three parts: the first part ($\sum_{i=1}^m \alpha_{it-1} g_{it}$) is the real GDP

growth driven by the growth of the real output value. In order to investigate its meaning of economics, we assume that the relative prices of different industries remain unchanged (namely $\beta_i = P_{it}/P_t$ remains unchanged) and the real output value of all industries rise.

$$Y_t = \sum_{i=1}^m (P_{it}/P_t) x_{it} = \sum_{i=1}^m \beta_i x_{it}$$

where $\beta_i = P_{it}/P_t$ represents the relative price coefficient of industry i . Therefore,

$$g_{Yt} = \sum_{i=1}^m (\Delta x_{it}/x_{it-1}) (x_{it-1} \beta_i / Y_{t-1}) = \sum_{i=1}^m \alpha_{it-1} g_{it} \quad (8)$$

It indicates that the decomposition result is the same as that worked out by using the traditional method if the relative prices of different industries remain unchanged. In the text below, $\alpha_{it-1} g_{it}$ is called the effect of the growth of the real output value of industry i on the real GDP growth (hereinafter referred to as the effect of the growth of industry i), and $\sum_{i=1}^m \alpha_{it-1} g_{it}$ is called overall effect of industrial growth.

The second part ($\sum_{i=1}^m \alpha_{it-1} (\pi_{it} - \pi_t)$) is the real GDP changes caused by relative price changes of different industries as a result of different price change rates of the industries. It can be proved that this part is only related to relative price changes of the industries. In the text below, $\sum_{i=1}^m \alpha_{it-1} (\pi_{it} - \pi_t)$ is called the growth effect of price structural change on the real GDP (hereinafter referred to as price structural change effect). The price structural change effects caused by relative price changes of products of different industries can also be decomposed into different industries (as shown in the second equation of formula (7)). Specifically, the relative price change effect of industry i is $\alpha_{it-1} (\pi_{it} - \pi_t)$. It indicates that, if the growth rate of the industry i is higher than the total growth rate of price, the price changes of the industry will increase the GDP of the whole economy, and the percentage point of its real growth is equal to the result of the difference between the price increase rate of the industry and the inflation rate of the whole economy ($\pi_{it} - \pi_t$) multiplying the proportion of the previous output value of the nominal value of the industry α_{it-1} . In the text below, $\alpha_{it-1} (\pi_{it} - \pi_t)$ is called relative price change effect of the industry i .

The third part ($\sum_{i=1}^m \alpha_{it-1} (\pi_{it} g_{it} - \pi_t g_t)$) is the real GDP growth resulting from the

interactions between the changes of the price structural change and real output value of all industries in the whole economy (hereinafter referred to as the crossover effects of industrial growth and price structural change on economic growth, that is, growth price crossover effect, $\alpha_{it-1}(\pi_{it}g_{it} - \pi_tg_t)$ is the growth price crossover effect of industry i . Through observations, we know that, as long as the price change rate or the output value growth rate of an industry is 0, the growth price crossover effect of the industry is equal to 0. If the growth rates of the output value of all industries in the whole economy are 0 or the change rate of the relative price coefficient is 0, the total growth price crossover effect of the whole economy is 0. Through simple analyses, it can be proved that the growth price crossover effect is 0 if the price structure effect is 0 (namely

$\sum_{i=1}^m \alpha_{it-1}(\pi_{it} - \pi_t) = 0$). When calculating the annual economic growth rate, the last item

(namely $\sum_{i=1}^m \alpha_{it-1}(\pi_{it}g_{it} - \pi_tg_t)$) of the first equation of formula (7) is a higher order infinitesimal related to the above two items. Therefore, when calculating the annual real GDP growth rate, the following equation can be derived by omitting higher-order terms:

$$g_t = \sum_{i=1}^m \alpha_{it-1}(\pi_{it} - \pi_t) + \sum_{i=1}^m \alpha_{it-1}g_{it} \quad (9)$$

Just like the traditional method, this method uses formula (7) to calculate the contribution rate of the real output value growth of industry i to the real GDP growth (R^i) and the contribution rate of the price structural change to the real GDP growth (R^C):

$$R_t^i = g_t^{iY} / g_t^Y = \alpha_{t-1}^i g_t^i / g_t^Y, \quad R_t^C = \sum_{i=1}^m \alpha_{it-1}(\pi_{it} - \pi_t) / g_t^Y \quad (10)$$

At last, if the price structure effect and growth price crossover effect are decomposed into different industries, we can theoretically discuss the relationship between the two decomposition methods. In accordance with the second equation of formula (7), industrial growth effect, price change effect and growth price crossover effect can be decomposed into different industries. Therefore, the overall effect of industry i can be expressed below by using the new decomposition method:

$$g_t^{iY} = \alpha_{it-1}g_{it} + \alpha_{it-1}(\pi_{it} - \pi_t) + \alpha_{it-1}(\pi_{it}g_{it} - \pi_tg_t) \quad (11)$$

By comparing the decomposition method and the traditional method, it is not difficult to prove that the difference between the overall effects of industry i is shown below:

$$g_t^{iY} - g_t^{iY} = \alpha_{it-1} \pi_t (g_{X_{it}} - g_t) \quad (12)$$

5. The Contributions of the Growth of the Three Industries and Industrial Price Structural Change to China's Real GDP Growth

The data in this paper are mainly from the *China Statistical Yearbooks*, the *Comprehensive Statistical Data and Materials on 50 Years of New China* and the CEIC database. First, from the CEIC database, we can obtain data of China's nominal GDP and the nominal output value of the three industries between 1952 and 2019, based on which the data of the proportions of the output values of the three industries in GDP between 1952 and 2019 (α_{it}) can be calculated, as shown in Figure 2. From the *China Statistical Yearbooks* and the *Comprehensive Statistical Data and Materials on 50 Years of New China*, we can obtain data of the real growth rate (g_t) of China's GDP between 1952 and 2019. By using the real growth rate (g_t) of GDP between 1952 and 2019 and the data of the nominal GDP of 1952, we can calculate China's real GDP (Y_t) between 1952 and 2019. By using the proportions of each industry to GDP, we can calculate the real output value data (X_{it}) of each industry (the price rise has been eliminated through the GDP deflator). By using the real GDP (Y_t) and the real output values (X_{it}) of the three industries, we can work out the real growth rate ($g_{X_{it}}$) of the output value of China's three industries between 1952 and 2019, as shown in Figure 1. Second, from the *China Statistical Yearbooks* and the *Comprehensive Statistical Data and Materials on 50 Years of New China*, we can obtain the real growth rate (g_t) of China's GDP and the real output value growth rate (g_{it}) of the three industries between 1952 and 2019 (calculated in accordance with the constant price of each industry in the previous year, based on which the GDP deflator (π_t) and the price inflation rate (π_{it}) of the three industries between 1953 and 2019 can be worked out, as shown in Figure 3.

5.1. The Contributions of the Growth of the Three Industries to Real GDP Growth Rate (by Using the Traditional Accounting Method without Considering Price Structural Change)

This section uses formulas (3) and (4) to decompose China's real GDP annual growth rate based on industry. Figure 4 and Figure 5 show the percentage points and contribute rates of the three industries driving the real annual GDP growth between 1953 and 2019, respectively. From Figure 4 and Figure 5 we can see that, in most years of the period, the rates of contribution of the secondary industry to GDP are larger than those of the primary industry; before the adoption of the policy of reform and opening up, the contribution rate of the tertiary industry was less than that of the secondary industry and the primary industry; after the adoption of the policy of reform and opening up, the contribution rate of the tertiary industry was greater than that of the primary industry, and even greater than that of the secondary industry after

1997; in recent years, the growth and contribution rate of the secondary industry were declining, but those of the tertiary industry enhanced significantly.

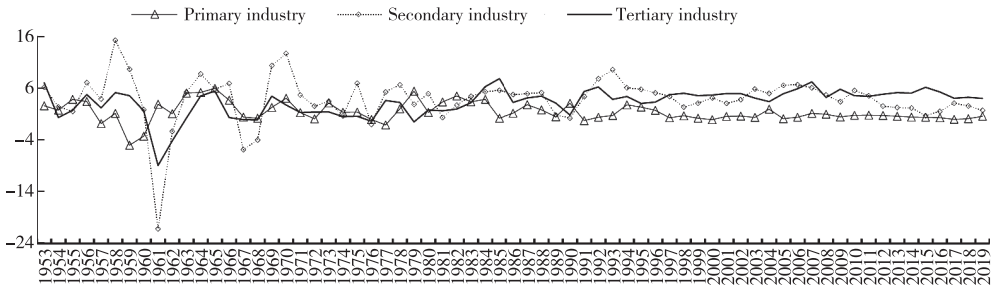


Figure 4. Real Annual GDP Growth Rate Contributed by the Growth of the Three Industries (Calculated by Using the Traditional Method), 1953–2019

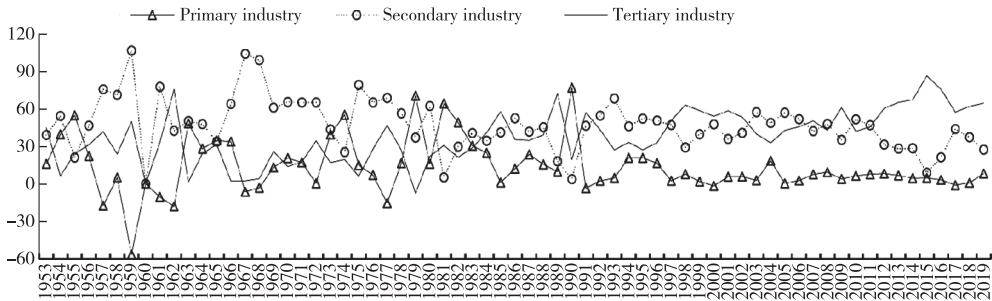


Figure 5. The Rate of Contributions of the Growth of the Three Industries to the Annual GDP Growth Rate (Calculated by Using the Traditional Method), 1953–2019

Note: In 1960, China's economic growth rate was very low, which results in the fact that some growth percentage points of the contributions of the three industries were positive, and some were negative, making that some contribution rates have very large values. In order to not affect the overall effect of the view, the contribution rates of all items in 1960 are set as 0.

Source: Calculated by the author.

Table 3 shows the total multiplier and the average annual growth rate of the growth of the three industries driving the real GDP. As shown in Table 3, between 1952 and 2019, the primary industry drove the real GDP growth by 12.75 times, with a contribution rate of 6.88%; the secondary industry drove the real GDP growth by 72.72 times, with a contribution rate of 39.07%, the tertiary industry drove GDP growth by 100.19 times, with a contribution rate of 54.05%. Based on the calculation results of the traditional method, between 1952 and 2019, the contribution rate of the tertiary industry was the highest, that of the secondary industry took the second place, and that of the primary industry was less than 10%. However, the method used for calculating the total multiplier only considers the impacts of industrial structural changes on the two periods of “Beginning of the Period” and “End of the Period”,

rather than considering the impacts of the intermediate process and reflecting the impacts and effects of economic fluctuations on economic growth. Table 3 further shows the calculation results of the three industries driving the annual arithmetic average growth rate of the real GDP. As shown in Table 3, during the period the primary industry drove the average annual growth rate of the real GDP by 1.33%, with a contribution rate of 13.62%; the secondary industry drove the average annual growth rate of the real GDP by 3.81%, with a contribution rate of 47.17%; the average annual growth rate the tertiary industry drove GDP by 3.21%, with a contribution rate of 37.71%. Therefore, if the impacts of short-term economic fluctuations are considered, the contribution rate of the tertiary industry declined, while that of the primary and the secondary industries increased. It was mainly due to the different positive and negative correlations of the growth rate of the three industries and that of GDP. In a word, by using the traditional accounting method, in terms of the annual growth rate, the secondary industry is still the key driver for the annual growth of China's real GDP. Nevertheless, the tertiary industry was one of the most important drivers of China's annual growth after the adoption of the policy of reform and opening up and had gradually has become the largest contributor to China's economic growth since 1997.

Table 3. The Facts and the Contribution Rates of All Industries Driving China's Annual GDP Growth (Price Structural Changes Are Not Considered)

Period	GDP	Primary industry	Secondary industry	Tertiary industry	GDP	Primary industry	Secondary industry	Tertiary industry
Multiplier of industrial growth driving GDP growth (unit: times)					Contribution rate of industrial growth driving multiplier of GDP growth (unit: %)			
1952–2019	185.37	12.75	72.42	100.19	100	6.88	39.07	54.05
1952–1978	3.74	0.81	2.06	0.88	100	21.59	54.91	23.50
1978–2019	38.29	2.52	14.84	20.94	100	6.57	38.74	54.68
1978–2002	7.99	0.92	3.52	3.55	100	11.50	44.04	44.46
2002–2012	1.73	0.12	0.79	0.82	100	6.69	45.99	47.33
2012–2019	0.60	0.02	0.17	0.41	100	3.80	28.29	67.91
Annual arithmetic average growth rate of GDP contributed by industrial growth (unit: %)					Contribution rate of industrial growth driving annual growth rate of GDP (unit: %)			
1953–2019	8.35	1.33	3.81	3.21	100	13.62	47.17	37.71
1953–1978	6.70	1.57	3.53	1.60	100	13.08	58.73	24.34
1979–2019	9.40	1.18	3.99	4.22	100	13.97	39.85	46.18
1978–2002	9.62	1.65	4.17	3.80	100	19.90	40.39	39.71
2003–2012	10.56	0.70	5.01	4.85	100	6.77	46.96	46.27
2013–2019	6.98	0.27	1.94	4.77	100	3.90	27.85	68.25

Note: The difference between the contribution rate of multiplier and that of the average annual growth rate is mainly caused by the difference between the annual geometric average growth rate and the annual arithmetic average growth rate.

Source: Calculated in accordance with the original data.

5.2. How Do Price Structural Changes Influence the Contributions of the Growth of the Three Industries to the Real GDP Growth Rate

In this sub-section, formulas (7) and (10) are used to decompose economic growth rates. Figure 6 and Figure 7 show respectively the growth effect, price structural change effect and growth price crossover effect of the three industries driving China's real GDP growth and the contribution rate between 1952 and 2019. Table 4 show the effects driving China's real GDP growth in different periods.

5.2.1. Various Effects Driving China's Real GDP Growth

From Figure 6 and figure 7 we can see that, in consideration of the price structural change effect, between 1952 and 2019, the growth effects of the secondary and the tertiary industries were still the key driver for the China's GDP growth, while the growth effect, price structural change effect and growth price crossover effect of the primary industry were very small. Meanwhile, according to the predictions of theoretical analyses, the annual growth price crossover effects were very small and nearly all of them were close to 0. In addition, through the price structural change effect is not big, but considering price structural change has a significant impact on calculating the contribution rate of the growth of the three industries for China's real GDP growth. Specifically, first, between 1953 and 2019, the annual arithmetic average growth rate of China's real GDP was 8.35%. The growth effect of the secondary industry was 4.42%, with a contribution rate of 53.0%; that of the tertiary industry was 2.91%, with a contribution rate of 34.8%, the total contribution rate of the growth effects of the secondary and the tertiary industries was 87.8%; the growth effect of the primary industry was 0.91%, with a contribution rate of 10.9%. The contributions of different industries have changed after the adoption of the policy of reform and opening up. Before the adoption of the policy of reform and opening up, the secondary industry made a greater contribution, accounting for 59.1%, the contribution rate of the tertiary industry was 23.1%, and the total contribution of the secondary and the tertiary industries was 82.2%, while that of the primary industry was merely 14.7%; after the adoption of the policy of reform and opening up, the contribution rate of the secondary industry was 50.2%, that of the tertiary industry was 40.1%, the total contribution rate of the secondary and the tertiary industries was 90%, and that of the primary industry was 9.1%. By comparing the contribution rates of the four periods (namely 1953–1978, 1979–2002, 2003–2012 and 2013–2019), the contribution rates of the secondary industry and the primary industry declined while that of the tertiary industry rose over the time. Second, the price structural change effect itself has a very small impact on economic growth. Between 1953 and 2019, the annual growth rate of the price structural change effect driving the real GDP was 0.10%, with a contribution rate of merely 1.16%

for the annual growth rate of GDP, and in most years of the period the price structural change effects were positive. Third, the average annual growth rate of the growth price crossover effect driving the real GDP was merely 0.02%, with a contribution rate of 0.22%. Therefore, as for the short-term impacts of the average annual growth rate, the relative price changes of the three industries facilitated economic growth rather than hindering it, though it has a very little effect. However, the result is mainly caused by the price behaviors before the adoption of the policy of reform and opening up. In the end, it is noteworthy that in the four periods stated in Table 4, the price structural change effects were basically positive in the first three periods and showed a declining tendency, and turned negative between 2013 and 2019; the growth price crossover effect was positive before the adoption of the policy of reform and opening up, and negative in the whole period after the adoption of the policy of reform and opening up as well as in the first two sub-periods, and turned positive between 2013 and 2019.

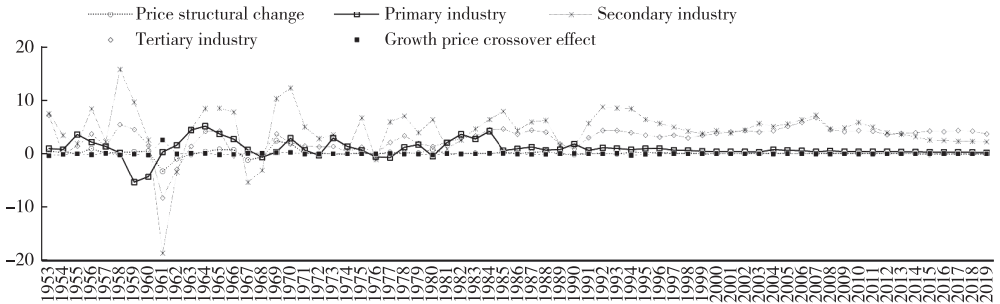


Figure 6. GDP Growth Rate Contributed by Each Effect, 1953–2019

Source: The original data are from *China Statistical Yearbook* and CEIC database. The data here are calculated by the author in accordance with the original data.

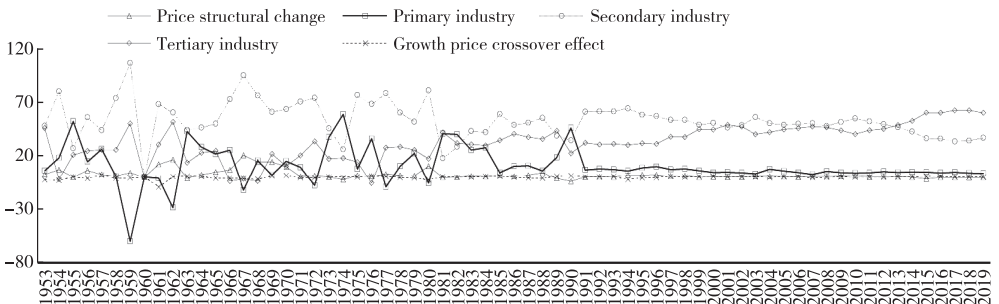


Figure 7. Contribution Rates of Each Effect for Annual GDP Growth Rate (Price Structural Changes Are Considered), 1953–2019

Note: In 1960, China's economic growth rate was very low, which results in the fact that some growth points of the contributions of the three industries were positive, and some were negative, making that some contribution rates of the year have very large values. In order to not affect the overall viewing effect, in this figure the contribution rates of all items in 1960 are set as 0.

Source: Calculated by the author.

Table 4. China's Average Annual GDP Growth Rates Contributed by Each Effect and the Contribution Rates, 1953–2019

Period	The growth effect of the primary industry	The growth effect of the secondary industry	The growth effect of the tertiary industry	Price structural change effect	Growth price crossover effect	Total: GDP
Average annual GDP growth rates contributed by each effect (unit: %)						
1953–2019	0.91	4.42	2.91	0.10	0.02	8.35
1953–1978	0.99	3.96	1.55	0.14	0.07	6.70
1979–2019	0.86	4.72	3.77	0.07	−0.01	9.40
1979–2002	1.17	5.04	3.32	0.11	−0.02	9.62
2003–2012	0.48	5.39	4.66	0.04	−0.01	10.56
2013–2019	0.30	2.67	4.03	−0.03	0.01	6.98
The average contribution rates of each effect for GDP growth (unit: %)						
1953–2019	10.85	52.97	34.80	1.16	0.22	100
1953–1978	14.71	59.07	23.13	2.05	1.04	100
1979–2019	9.11	50.21	40.07	0.76	−0.15	100
1979–2002	12.21	52.36	34.48	1.17	−0.22	100
2003–2012	4.54	51.05	44.10	0.42	−0.11	100
2013–2019	4.33	38.21	57.77	−0.44	0.14	100

5.2.2. The Driving Effect of Price Changes of the Three Industries on China's Real GDP Growth

Figure 8 decomposes price structural change effects into respective relative price change effects of the three industries. Table 5 shows the specific information on relative price change effect of each industry on the annual growth of the real GDP in different periods. As shown in Figure 8 and Table 5, first, the price change effect of the secondary industry are basically negative. Between 1953 and 2019, due to the price change of the secondary industry, the average annual real GDP growth rate decline by 0.61 percentage points. Specifically, it declined GDP growth rate by 0.47 percentage points before the adoption of the policy of reform and opening up, and by 0.69 percentage

points after the adoption of the policy of reform and opening up. In the periods of 1978–2002, 2003–2012 and 2013–2019, it dropped GDP growth rate by 0.83, 0.36 and 0.68 percentage points, respectively. Second, the price change effect of the primary industry was basically positive. Between 1953 and 1919, due to the price change of the primary industry, the average annual real GDP growth rate increased by 0.43 percentage points. Specifically, it increased GDP growth rate by 0.59 percentage points before the adoption of the policy of reform and opening up, and by 0.33 percentage points after the adoption of the policy of reform and opening up. In the period of 1978–2002 and the period of 2003–2012, it increased GDP growth rate by 0.49 percentage points and 0.22 percentage points, respectively. In the period of 2013–2019, it dropped GDP growth rate by 0.03 percentage points. In the end, the price change effects of the three industries were positive and changed greatly before and after the adoption of the policy of reform and opening-up. Between 1953 and 2019, due to the price change of the tertiary industry, the average annual GDP growth rate increased by 0.27 percentage points. Specifically, it increased GDP growth rate by merely 0.02 percentage points before the adoption of the policy of reform and opening up, and by 0.43 percentage points after the adoption of the policy of reform and opening up. In the periods of 1978–2002, 2003–2012 and 2013–2019, it increased GDP growth rate by 0.46 percentage points, 0.18 percentage points and 0.68 percentage points, respectively. Due to the Baumol effect, the relative price change effects of the primary and tertiary industries were positive, while that of the secondary industry was negative. In the process of China's economic development, the technological progress of the secondary industry is the fastest, while those of the primary and tertiary industries are relatively slow. Therefore, the analyses in this paper have once again proved that there is Baumol phenomenon in China.

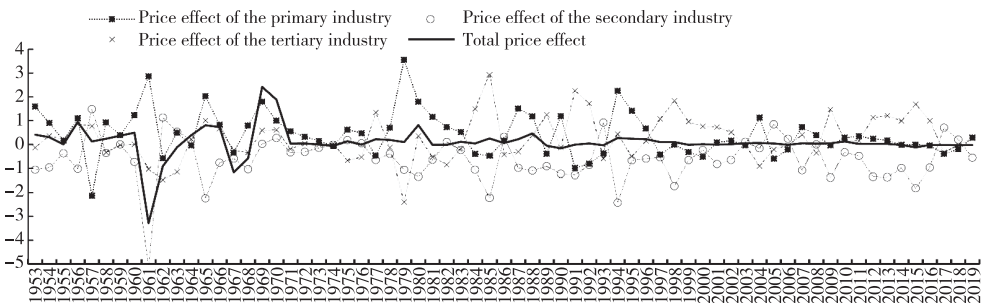


Figure 8. GDP Growth Rate Contributed by Price Change Effects of the Three Industries, 1953–2019

Table 5. The Relative Price Change Effects of the Three Industries in Different Periods

Period	Average annual real GDP growth rates driven by price changes (unit: %)			
	Overall effect	Primary industry	Secondary industry	Tertiary industry
1953–2019	0.097	0.433	−0.605	0.269
1953–1978	0.137	0.589	−0.471	0.019
1979–2019	0.072	0.334	−0.690	0.427
1979–2002	0.113	0.487	−0.830	0.456
2003–2012	0.045	0.224	−0.358	0.179
2013–2019	−0.0310	−0.0311	−0.6841	0.6842

5.2.3. How Does Price Structural Change Affect the Driving Effect of the Growth of the Three Industries on China's Real GDP Growth

Table 6 further shows the driving effects of the growth of the three industries on the real GDP growth by using the two methods for decomposing economic growth. As shown in Table 6, first, compared with the traditional decomposition method in which price changes are not considered, if the new decomposition method considering price structural changes is used, the growth points of the secondary industry driving real GDP growth and the contribution rate obviously increased, while those of the primary and tertiary industries driving real GDP growth and the contribution rate obviously declined. Between 1953 and 2019, by using the traditional accounting method, the average annual growth rate of the secondary industry driving the real GDP growth was 3.81%. By using the new accounting method, the growth points of the secondary industry driving the real GDP growth was 4.42%. Ignoring the effects of price structural changes causes that the growth effect of the secondary industry is underestimated by 0.61 percentage points, and the growth effects of the primary and tertiary industries are overestimated by 0.43 percentage points and 0.30 percentage points, respectively. Second, the impact of the price structural change on the growth effects of the secondary and the tertiary industries after the adoption of the policy of reform and opening up was much greater than that before the adoption of the policy of reform and opening up, while the impacts of the price structural change on the growth effects of the primary industry were relatively big and remained basically stable. If the effects of the price structural change are overlooked, before the adoption of the policy of reform and opening up, the growth effect of the secondary industry was underestimated by 0.43 percentage points, while that of the primary industry and the tertiary industry were overestimated by 0.58 percentage points and 0.05 percentage points, respectively; after the adoption of the policy of reform and opening up, the growth effect of the secondary industry was underestimated by 0.73 percentage points,

and that of the primary and tertiary industries were overestimated by 0.33 percentage points and 0.46 percentage points, respectively. Third, compared with the change tendency of price change effects of the three industries, the impact of relative price changes on the growth effect of the primary industry gradually declined, and that on the growth effect of the tertiary industry kept rising, and the impact on the growth effect of the secondary industry experienced an inverted U-shaped change. At last, though the price structural change effect itself is not great, if the impacts of relative price changes are overlooked, the growth effect of the secondary industry may be severely underestimated, while those of the primary and tertiary industries may be overestimated.

Table 6. The Impacts of Price Structural Changes on the Growth of the Three Industries Driving Average Annual Real GDP Growth Rates (unit: %)

Period	Price changes are not considered			Price changes are considered			High valuation (price changes are not considered)		
	Primary industry	Secondary industry	Tertiary industry	Primary industry	Secondary industry	Tertiary industry	Primary industry	Secondary industry	Tertiary industry
1953–2019	1.33	3.81	3.21	0.91	4.42	2.91	0.43	−0.61	0.30
1953–1978	1.57	3.53	1.60	0.99	3.96	1.55	0.58	−0.43	0.05
1979–2019	1.18	3.99	4.22	0.86	4.72	3.77	0.33	−0.73	0.46
1978–2002	1.65	4.17	3.80	1.17	5.04	3.32	0.48	−0.87	0.49
2003–2012	0.70	5.01	4.85	0.48	5.39	4.66	0.22	−0.38	0.20
2013–2019	0.27	1.94	4.77	0.30	2.67	4.03	−0.03	−0.73	0.74

5.2.4. The Long-Term Impacts of Various Effects on China's Economic Growth in Different Periods

In order to analyze the impacts of the cumulative effects of growth and economic fluctuations on various effects, this sub-section uses formula (7) and formula (9) to calculate the decompositions of the multipliers of the real GDP growth between 1953 and 2019 and in different periods. As shown in Table 7.

Various effects driving economic growth varied in different periods. First, before the adoption of the policy of reform and opening up, China's real GDP growth was mainly driven by the secondary industry, while the contribution rate of the tertiary industry was not small. In the three periods after the adoption of the policy of reform and opening up (1978–2002, 2002–2012, and 2012–2019), the contribution rates of the primary and the secondary industries declined, while that of the tertiary industry rose. After the adoption of the policy of reform and opening up, the impacts of the price structural change effect and the growth price crossover effect on economic growth dropped.

Table 7. The Contribution Rates of Various Effects for GDP Growth, 1952–2019

Period	The growth effect of the primary industry	The growth effect of the secondary industry	The growth effect of the tertiary industry	Price structural change effect	Price growth crossover effect	GDP
The contribution rates of various effects for GDP growth (unit: %)						
1952–2019	2.4	100.7	34.5	3.8	−41.4	100.0
1952–1978	9.4	79.0	22.6	6.7	−17.7	100.0
1978–2019	3.4	72.3	35.8	2.2	−13.7	100.0
1978–2002	6.6	70.4	32.9	2.3	−12.2	100.0
2002–2012	4.1	51.5	44.5	1.3	−1.5	100.0
2012–2019	4.3	40.5	54.5	−0.6	1.3	100.0

6. Main Conclusions and Contributions

This paper mainly studies the following issues. First, this paper theoretically studies how to analyze the contributions of price structural change on economic growth. For this, it presents a new method for decomposition of economic growth rate, by which we can separate the impacts of price structural change on economic growth and test the hindering effect of the Baumol’s cost disease on long-term economic growth. Second, this paper, by using a new method for economic growth decomposition, decomposes the China’s real GDP growth rates between 1952 and 2019 based on industry, and discusses the effects of different factors on economic growth. This research shows that the secondary industry was always the key driver for China’s economic growth between 1952 and 2019. However, for driving the real economic growth, the secondary industry’s function has been declining, while that of the tertiary industry keeps rising. In recent years, the tertiary industry even exceeded the secondary industry in this regard. Third, this paper focuses on the impacts of the price structural change of the three industries on China’s economic growth as well as the functions of the three industries driving economic growth. The results of this research show that the price structural change has a little impact on the arithmetic average annual economic growth rate of China’s economic growth, and such price structural change effect is dwindling. Between 1952 and 2019, the arithmetic average annual growth rate of the price structural change effect driving China’s real GDP growth was 0.10%, with a contribution rate of 1.16%. However, if the accumulative time effect is considered, the impact of price structural change on long-term economic growth is great, and geometric average annual growth point it contributed to was 3.15 percentage points, with a contribution rate of 3.8% for long-term economic growth. The impacts of the growth price crossover effect on the arithmetic average annual economic growth rate were relatively small, and the annual

arithmetic growth point it contributed to was merely 0.02%, with a contribution rate of 0.22%. Just as what Baumol (1967) has predicted, the growth price crossover effect has a very big impact on long-term economic growth through time accumulation. Between 1952 and 2019, the growth price crossover effect made China's real GDP declined 76.66 times, with an annual geometric average growth rate of -6.71% and a contribution rate of -41.1% . It indicates that the effect of Baumol's cost disease of price changes really exists in China. At last, this paper indicates that the impacts of price change effects and price structural changes of the three industries on the growth effect of China's three industries are changing. Specifically, the impact of the price change effect and the price structural change of the primary industry on the growth effect of the primary industry was declining, that of the tertiary industry on the growth effect of the tertiary industry was rising, while that of the secondary industry experienced an inverted U-shaped change. In addition, the research results of this paper show that new characteristics have emerged in China's economic growth since 2013: as all the growth rates of the three industries are declining, particularly, the real growth rate of the secondary industry saw a historically significant decline. It is even lower than the growth before the adoption of the policy of reform and opening up, which led to rapid decline of China's economic growth; after 2013, price increases mainly concentrated in the tertiary industry, making the price structural change effect negative and the growth price crossover effect positive, which was opposite to the previous price change effects; the price changes and the increase of the proportion of the tertiary industry to GDP have delayed the decline of the overall economic growth to a certain extent. However, it is predictable that the economic growth rate may continue to decline without the rapid growth of the secondary industry. Therefore, maintaining a high-speed growth rate of the secondary industry is perhaps the essential condition for China's long-term economic growth.

The main contributions of this paper are shown below. First, this paper presents a new method for decomposing real GDP growth rates. The decomposition method can not only analyze the impacts of the price structural changes of the three industries on the real economic growth rate, but also decompose the two impact mechanisms of the real output value, which are the growth effect and the price structural change effect in the impacts of the growth of the three industries on the real economic growth. It is helpful for further understanding and analyzing the mechanism of the growth of the three industries driving economic growth, and studying whether the Baumol's cost disease of price structural change can hinder economic growth. In addition, the new accounting method has extensive application value. It can not only be used to analyze the impacts of various economic structures (including price structural changes) on the economic growth rate (such as the impact of the employment structure and demand structure on the economic growth rate), but also used to analyze the impacts of regional, industrial and even corporate structural changes on GDP growth rate. Second,

this paper analyzes for the first time the impacts of price structural change on China's real economic growth rate, and is helpful for advancing the researches on the relations between structural changes and growth of China's economy. The analyses in this paper show that China's economic growth has been mainly driven by the secondary industry since 1952, but the real growth rate of the secondary industry has hit a record low since 2013; meanwhile, China's economic growth has been declining since 2013, and the price structural change effect has turned historically from positive to negative in this period. In addition, the price rise of the tertiary industry has historically exceeded that of the primary industry, which is a new phenomenon. Whether there are intrinsic correlations among these phenomena and whether all of them are the results of the decline of the growth speed of the secondary industry, are remained unknown and need to be solved in the future.

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