The Impact of China's Final Demand on GDP Formation and Growth in the Context of Big Data: An Empirical Study based on Input-output Models

Ping Miao
Shanghai university, Shanghai, China

Keywords: Big Data, GDP Growth, Input Output Research, Final Demand.

Abstract: In recent years, with the continuous improvement of China's comprehensive national strength, China's total GDP is also growing continuously. It can be found that the final demand has made outstanding contributions to the formation and growth of GDP. In addition, the arrival of the era of big data has become a new phenomenon of world economic development, which also marks that the world has entered a new stage of economic development, and big data has brought the revolution of intelligence and informatization, but the big data is inseparable from the development of engineering technology. To better serve the society with big data, we must vigorously develop the information technology. The phenomenon of industrial integration has been formed in the context of big data. The intelligence and informatization brought by industrial integration and information technology are essential elements for China to realize economic growth transformation in the era of big data. Only by making full use of the advantages of the era of big data can we give correct guidance to economic growth. Therefore, this paper uses big data technology to obtain corresponding data form the input-output tables in 2012, 2015 and 2017, and through the establishment of mathematical models and the use of information technical software to calculate the contribution of consumption, investment and export to GDP formation and growth. Through big data calculation, we find that the final demand has made a great contribution to the formation and growth of GDP. In terms of promoting GDP growth, investment and consumption play a greater role. Although the role of export is small, its role is increasing. In terms of GDP formation, we found that the contribution rate of consumption and investment to GDP formation continued to rise, while the contribution rate of export to GDP formation decreased.

1 INTRODUCTION

In recent years, China's economy has developed rapidly and its GDP has been growing. From 2012 to 2017, China's total GDP increased from 53732.9 billion yuan to 8313812 billion yuan, with an increase rate of 53.36% and an average annual growth rate of 8.93%. It can be seen that China's economic growth rate is very rapid. Meanwhile, China's consumption expenditure increased from 2717185766 million yuan in 2012 to 4441770001 million yuan in 2017, with an average annual growth rate of 10.33%. In 2012, China's consumption expenditure accounted for 50.57% of the total GDP of that year, and in 2017, China's consumption expenditure accounted for 53.43% of the total GDP of that year. Similarly, China's investment expenditure increased from 24838954 million yuan to 3644602655 million yuan, with an average annual growth rate of 7.97%. The export increased from 1366658526 million yuan to 1638468236 million yuan, with an average annual growth rate of 3.69%. It can be found that the driving effect of the troika of consumption, investment and export on China's GDP growth is very obvious.

In the past, many scholars have made research on the driving effect of final demand on economic growth. They mainly focus on the driving effect of one of the three carriages of consumption, investment and export on economic growth, and draw corresponding conclusions. Under the background of Moore's law and exponential growth of data, data and information technology become more and more important in social production. The advent of the big data era has brought about the overall rise of the data analysis industry. The development of digital information technology has brought innovation to data analysis methods. Traditional consumption,

Miao, P.
The Impact of China's Final Demand on GDP Formation and Growth in the Context of Big Data: An Empirical Study based on Input-output Models.
DOI: 10.5220/0011170100003440
In *Proceedings of the International Conference on Big Data Economy and Digital Management (BDEDM 2022)*, pages 185-189
ISBN: 978-989-758-593-7

investment and export will be based on accurate data analysis. This paper fully considers the impact of consumption, investment and export on economic growth, uses the input-output tables in 2012, 2015 and 2017, and uses the corresponding input-output data to calculate the contribution rate of consumption, investment and export to GDP formation and growth.

2 LITERATURE REVIEW

In recent years, many domestic and foreign economists have studied the relationship between final demand and economic growth. Most of them use input-output table, which can be used as a manifestation of big data. Firstly, some domestic economists have made outstanding contributions to the study of the relationship between final demand and economic growth. Zhang shaoxue and Jiang Xuemei (Zhang, Jiang, 2020) found that the contribution of China's final demand pull effect to the added value of global economies is increasing. Ji Ming and Liu Zhibiao (Ji, Liu, 2014) believes that the rationalization and upgrading of demand structure can affect economic growth. (Wu, 2002, Li, Yin, 2005, Wang, Gong, 2007, Guo, 2007, Tian, 2008, Jing, Wang, 2011, Zhou, 2019) mainly investigate the optimal consumption rate and reasonable range in China's economic growth. Ji Ming (Ji, 2010) believes that the total demand and demand structure will change in equilibrium with the path of balanced economic growth. Han Zhong et al (Han, et al, 2018) used the input-output table to study the impact of exports on China's economic growth and the exchange rate created by exports in different sectors. Lin Yifu established a macroeconomic model with four equations to calculate the contribution of exports to GDP growth. Wang Zhili et al (Wang, et al, 2015) investigated the relationship between China's export and GDP growth from 1978 to 1998 by using cointegration and Granger causality test, and considered that the contribution of export growth to economic growth was not significant. Liu Xuewu (Liu, 2000) studied the relationship between China's investment, consumption, import and export and economic growth from 1989 to 1999 by using the extended C-D production function and cointegration theory. He believed that export promoted China's GDP growth in both short and long term.

Secondly, some foreign economists have made outstanding contributions to the study of the relationship between final demand and economic growth. (Chenery, Syrquin, 1975, garegnani, Trezzini, 2010, garavaglia, 2012) believe that the imbalance of demand structure has an adverse impact on the long-term sustained and balanced economic growth. Buera & kaboski (Buera, kaboski 2008) believed that in the research on the relationship between structural change and economic growth in different stages of economic development, one direction in the future should be to combine demand factors and supply factors to understand the process of structural change and economic growth. Ghirmay (Ghirmay, 2001) used the time series data of 15 low-income developing countries and VECM model to study the relationship between export, investment and economic growth. Jordan Shan (Jordan, 1998) studied the relationship between export and China's economic growth by using the method of multiple causality test. Colm (Colm, 1962) believes that changes in demand will have a significant impact on supply factors, and paying too much attention to supply may lead to wrong conclusions.

To sum up, there are various studies on China's final demand by economists at home and abroad. Most economists study the impact of one aspect of final demand on economic growth. Few scholars study the impact of consumption, investment and export excluding import factors on economic growth. Firstly, this paper studies the impact of consumption, investment and export on the formation and growth of GDP. Then it is found that the contribution rate of export to GDP is gradually decreasing. This paper compares the contribution rate of consumption, investment and export of each department excluding the import factor with that of each department not excluding the import factor to explore the reasons for the decrease of the contribution rate of export to GDP.

3 METHODS AND DATA

3.1 Derivation of the Model of the Contribution of Final Demand to GDP Excluding Import Factors

In order to eliminate the influence of import factors on the added value of final demand, this paper divides the input-output table under the open economy into table 1. Using mathematical model and SPSS software to calculate based on the data from the input-output table.

Table 1: Input production table format after splitting.

		Intermediate use	Final demand				Import	Total output
		1 2…n	Consumption	Capital formation	Export	Total		
Domestic intermediate investment	1 2…n	x_{ij}^d	c_i^d	in_i^d	ex_i^d	y_i^d		x_i
Import intermediate input	1 2…n	x_{ij}^m	c_i^m	in_i^m	ex_i^m	y_i^m	im_i	
Added value		v_j						
Total input		x_j						

The split table satisfies the following relationship: $c_i = c_i^d + c_i^m \;\; in_i = in_i^d + in_i^m \;\; ex_i = ex_i^d + ex_i^m \;\; y_i = y_i^d + y_i^m$ and: $\sum_j^n x_{ij}^m + y_i^m = im_i$ (1)

In this type table, we first ask for x_{ij}^d can further calculate the added value brought by the final demand of the domestic part. First, we need to define the localization coefficient θ, Then the localization coefficient is diagonalized to obtain x_{ij}^d.

Order:

$$\hat{\theta} = \begin{bmatrix} 1-(im_1/(x_1-ex_1)) & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 1-(im_i/(x_i-ex_i)) \end{bmatrix} \quad (2)$$

Based on the localization coefficient and X given above x_{ij}^d, we can find x_{ij}^d is:

$$x_{ij}^d = x_{ij} * \hat{\theta} \quad (3)$$

Furthermore, we can also calculate the direct consumption coefficient $\widehat{a_{ij}}$ of the domestic part.

According to the row balance relation, we can find $y_i^m = im_i - \sum_j^n x_{ij}^m$, about how to find c_i^m, in_i^m and ex_i^m.

Firstly, we assume that imported products are homogeneous with domestic products. When using imported products, all departments treat them equally with domestic products, that is, imported products are split according to the same proportion. Using the method used by Shen Lisheng (Shen 2003), we can find out:

$$c_i^m = \frac{c_i}{y_i} * y_i^m, in_i^m = \frac{in_i}{y_i} * y_i^m, ex_i^m = \frac{ex_i}{y_i} * y_i^m \quad (4)$$

According to the calculation method above, we can conclude that the Leontief inverse of the domestic part is:

$$(I - A^D)^{-1} \quad (5)$$

According to the method of calculating added value above, we can calculate the contribution of final demand to GDP after excluding import factors:

$$\alpha_t^{\beta d} = {sum(\beta_t^{vd})}/{GDP_t}, (\beta = \mathrm{C, IN, EX, t} = 2012,2015,2017) \quad (6)$$

Contribution of a sector to GDP:

$$\alpha_{tj}^{\beta d} = {\beta_{tj}^{vd}}/{GDP_t} \quad (7)$$

According to the split input-output table, we can more intuitively see the impact of the import part on the final demand. By removing the import factor, we can more truly reflect the reasons for the decline of the contribution of exports to GDP. It can truly reflect the current development of our country.

3.2 Data Description

This paper uses the input-output tables of 2012, 2015 and 2017 as the research data. Since the input-output table of 2017 is newly released by the Bureau of statistics, we adjusted more than 100 departments to 42 departments according to the input-output table format of 12 and 15 years. In order to facilitate the research of the problem, we split the data of the three tables into domestic part and imported part in advance, and verified the correctness of the split accordingly. The input-output tables in 2012 and 2015 are interfered by other factors. In order to improve the accuracy of the data, we also included them in the calculation of the model, taking full account of the original information of the input-output table. Next, we bring all the data into the model to get the corresponding results.

4 RESULTS

4.1 Contribution of Final Demand to GDP Formation and Growth

By bringing the data into the model, we calculated the contribution rate of final demand to GDP formation in 2012, 2015 and 2017, as shown in table 2.

Table 2: Contribution rate of final demand to GDP formation.

Year	Consumption	Investment	Export
2012	50.62%	46.27%	25.46%
2015	53.37%	44.58%	21.82%
2017	53.96%	44.27%	19.90%

From table 2, we can see that consumption contributes the most to the formation of GDP, followed by investment and finally exports. In table 2, we can see that the contribution of consumption to GDP increases year by year, while the contribution of investment and export decreases year by year, and the decline of export is the largest. We will explain the specific reasons for this phenomenon later.

Next, we calculate the contribution of final demand to GDP growth. As shown in table 3.

Table 3: Contribution of final demand to GDP growth.

Year	Export	Investment	Consumption
2015	8.21%	38.26%	63.65%
2017	10.77%	42.80%	56.76%

It can be concluded from table 3 that the contribution rate of consumption, investment and export to GDP growth is very significant. Although the contribution rate of consumption has decreased, it is still the backbone to promote GDP growth. Among them, the pulling effect of investment on GDP growth is up to about 4.5%, which is related to the gradual increase of investment income in China in recent years.

4.2 Contribution of Final Demand Excluding Import Factors to GDP Formation

According to the above, the contribution of exports and investment to GDP formation has decreased year by year, we give a preliminary explanation. In order to further explore the causes, we exclude the influence of import factors. First, to avoid the decline of investment contribution rate caused by the decline of import reinvestment; Second, in order to avoid the decline of the contribution rate of entrepot trade resulting in the decline of the contribution rate of export.

Firstly, this paper calculates the contribution rate of final demand excluding import factors to GDP formation in 2012, 2015 and 2017, as shown in Figure 1.

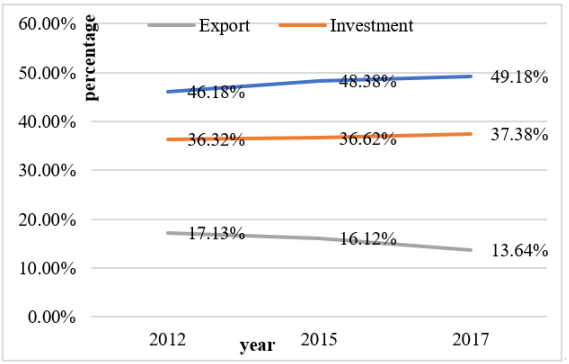

Figure 1: The contribution rate of final demand to GDP after excluding import factors.

It can be seen from figure 1 that after excluding the import factor, the contribution rate of consumption to GDP is still increasing and the contribution rate of export to GDP is still decreasing. Different from the above, the contribution rate of investment becomes increasing. This is consistent with our preliminary explanation. Due to the reduction of import reinvestment and the sudden increase of investment in some sectors, the overall investment contribution rate is decreasing, while China's internal investment contribution rate is still rising, which also shows that China's investment in some foreign advanced equipment and devices is getting lower and lower.

5 CONCLUSIONS

According to the big data analysis ability, this paper analyzes the contribution rate of final demand to GDP formation and growth by using the input-output tables in 2012, 2015 and 2017. We draw the following conclusions: in terms of consumption demand, consumption has the largest contribution to GDP formation. In terms of investment demand, the contribution rate of investment to GDP formation is also very obvious, and we also find that the contribution rate of investment to GDP continues to decline with economic growth. In terms of exports, the contribution rate of exports to GDP formation is relatively small compared with the first two. Moreover, we also find that the contribution rate of exports also continues to decrease with economic growth. In terms of the pull of final demand on GDP growth, the pull effect of final demand on economic growth is very large, in which the pull effect of consumption and investment is the most obvious, followed by that of export.

In order to explain why the contribution rate of investment and export to GDP decreases with economic growth. In this paper, we exclude the influence of import factors in order to prevent the re investment of import and the influence of entrepot trade. After excluding the import factor, we find that the contribution rate of investment continues to rise, while the contribution rate of export continues to decline. For the decline of investment contribution rate, this paper believes that it may be caused by the continuous decrease of added value brought by import reinvestment and the significant decrease of investment contribution rate of individual departments. For the decline of export contribution rate, by comparing the different contribution rates of consumption, investment and export in some different sectors, this paper concludes that the decline of export contribution rate may be caused by the transfer of export to domestic demand and the sudden increase of investment in individual sectors, resulting in the decline of growth value brought by export. In addition, the decline of export contribution rate may also be caused by the decline of growth value brought by unit products, which was proposed by Shen Lisheng (Shen 2003).

To sum up, through the application of big data information technology, we get the conclusion that the impact of final demand on economic growth is very important. We should rationally distribute consumption and investment and reasonably adjust the export structure, so as to promote the rapid development of China's economy. In addition, this paper also has some shortcomings. First, this paper does not calculate the input-output tables in 2013, 2014 and 2016, and then does not reflect the change of the contribution rate of final demand to GDP in detail every year. Second, this paper only analyzes the reasons for the decline of the contribution rate of export and investment with the help of the contribution rate of final demand to GDP, and does not take into account the factors such as the decline of growth value per unit product proposed by Shen Lisheng (Shen 2003). In addition, we must vigorously develop education, improve the quality of the whole people, and let the whole people better master modern information and networking means and the ability to obtain data and knowledge, so as to ensure that the economic growth in the big data era is supported by high-quality human resources and information technology, and promote the formation of a new growth model in the big data era.

REFERENCES

Buera, F. & J. Kaboski, 2008, "Can Traditional Theories of Structural Change Fit the Date", WorkingPaper, Presented at the 2008 Congress of the EEA, Milan, Italy.

Garavaglia, P.Malerba, F.Orsenigo, L.Pezzoni, M, 2012, "Technological Regimes and Demand Structure inthe Evolution of the Pharmaceutical Industry", Journal of Evolutionary Economics, 22(4), pp.677-709.

Han Zhong, Chen Yaohui, Shi Yun. Calculation and decomposition of consumption carbon emissions from the perspective of international final demand. Research on quantitative economy and technical economy, 2018 (7): 114-129.

Ji Ming, Liu Zhibiao. The impact of the evolution of China's demand structure on economic growth and economic fluctuations. Economic science, 2014 (1): 10-22.

Ji Ming. Demand change and economic growth: theoretical explanation and China's empirical. Economic science, 2010 (6): 18-29.

Liu Xuewu. Investment, consumption, international trade and China's economic growth: An Empirical Analysis from 1989 to 1999. World economy, 2000.

Shen Lisheng, Wu Zhenyu. Contribution of export to China's GDP growth -- An Empirical Analysis Based on input-output table. Economic research, 2003.

Teame Ghirmay, Richard Grabowski, and Subhash C. Sharma, 2001, "Export, Investment, Efficiency and Economic Growth in LDC: anEmpirical Investigation", Applied Economics, 33, pp.689-700.

Wang Dihai, Gong Liutang. Consumption and savings in growing economy. Financial research, 2007.

Wang Zhili, Zhuang ya'er, Yao Liang. Study on the employment pulling effect of China's regional final demand and export activities. Population journal, 2015:103-110.

Wu Zhongqun. Determination of consumption and investment in China's economic growth. Chinese Social Sciences, 2002.

Zhang shaoxue, Jiang Xuemei. Heterogeneity analysis of the pulling effect of China's final demand on the added value of different economies. Journal of Xi'an University of Finance and economics, 2020 (3): 62-70.

Zhou Wen. Reasons and Countermeasures for the decline of employment efficiency driven by final demand. Journal of Yunnan University of Finance and economics, 2019 (9): 41-54.