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Energy Procedia 5 (2011) 1388–1393

Energy

**Procedia**

IACEED2010

# A comparative analysis on the factors promoting China's economic growth based on demand

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## Abstract

By applying co-integration test and variance decomposition to the quarterly data from Q1 2000 to Q3 2010, this paper conducts an empirical study on the demand factors that promote the economic growth of China. The conclusions are as follows: consumption, investment and net exports all have influence on China's actual output, among which, consumption makes a greater contribution to the economic growth than investment and net exports. In addition, by studying the time-varying effectiveness, we also notice that consumption has the most effectiveness on stimulating economic growth, while investment is the less and net exports is the least. Based on the above two theories, we put forward some suggestions how to promote China's economic growth continually.

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Selection and peer-review under responsibility of RIUDS

*Key words:* economic growth; investment; consumption; net exports;

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## 1. Introduction

Ever since the reform and opening policy, China has maintained an annual economic growth of 10% for 30 years. There are many factors contributing to this miraculous growth. To analyze it from demand, consumption, investment and net exports are the "three carriages" promoting China's economic growth. In recent years, China has actively propelled investment as a way of boosting economic growth, so the economic growth is highly dependent upon investment, especially the government investment. High investment growth is mainly affected by the current moderately loose monetary policy and the positive fiscal policy support, however, if it can continue to promote economic growth is questioned. As a result, a study on how the three factors affect Chinese GDP has an operational significance in choosing a workable economic growth pattern and pursuing a sustainable, high-speed and steady economic development of China.

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## 2. Literature review

The factors that promote economic growth should theoretically be analyzed from three aspects, that is, consumption, investment and net exports. As the main factor for macroeconomic growth, consumption is the motive force of the economic growth; it directly stimulates economic growth through increasing more consumer goods production as well as promoting economic growth by stimulating investment and other factors. As one of the influential factors on economic growth, investment has attracted many researchers' attention and been studied more and more. Investment has double effects on economic growth by providing supply and causing demand. On one hand, it can increase production capacity to pull the total economic growth; on the other hand, it also cause demand for production because the expansion of the investment scale needs the increase of material technology and capital accumulation as guarantee. According to Keynes' "investment multiplier" theory and Samuelson's "multiplier-accelerating" model, income will increase in multiples because of the multiplier effect when investment is expanded. With the continuous development of international trade, the import and export have become more and more significant influence on economic growth. As a result, a lot of research has been made by scholars on it, yet there is much controversy about the degree to which it can boost the economic growth.

In recent years, the relationship between demand factor and economic growth in China has been studied by Chinese scholars. Based on the monthly data of GDP, fixed investment, import-export trade from 1982 to 1994, Qiaoyu<sup>[1]</sup> adopted the co-integration analysis, Granger Causality Test and Error Correction Model (ECM), and concluded that fixed investment and merchandise exports were the main factors affecting economic growth from 1980s to 1990s in China, whereas imports didn't have any significant effect on it. Besides, Liu Xuewu<sup>[2]</sup> (2000) also did a similar analysis with an added parameter like retail total of consumption goods compared with Qiao on the monthly data from 1989 to 1999 and came to the conclusion that it exists a long-term equilibrium relationship between economic growth and investment, consumption, imports and exports; moreover, investment and final consumption had great contribution to economic growth. Wu Xuliang and Xie Guobin<sup>[3]</sup> (2002) analyzed the data of GDP, final consumption and fixed investment from 1953 to 2000, and asserted that there is bidirectional Granger cause between investment and consumption, but investment had less significance than consumption on driving China's economic growth. With research on data from 1952 to 2002, Su Sheng'an and Zhao Fumin<sup>[4]</sup> (2005) figured out investment-driven growth was the main economic form of China, whereas consumption and import-export hasn't become the main driving factors. Zhou Yang<sup>[5]</sup> (2006) proposed a linear model based on the export trade data from 1978 to 2005, and drew a conclusion that exportation is important to economic growth with positive but time-lag effect. Recently, based on the SVECM model, Qin Daoai<sup>[6]</sup> studied the dynamic economic growth and indicated that consumption had a more significant impact on both short-term and long-term economic growth than that of investment or imports and exports, furthermore economic fluctuation mainly depended on consumption and the impact of world economic fluctuations on Chinese economic fluctuation grew significantly.

To sum up, it can be found that the previous research mainly focuses on co-integration analysis, causality test and error correction model, and the conclusions are different to some extent due to the various data and methodologies. This paper tries to study the respective contribution and effect of consumption, investment and net export on China's economic growth by using variance decomposition and state space model

## 3. Empirical analysis

### 3.1. Data selection and pretreatment

As the most effective variable to reflect one nation's economic output, the actual GDP is chosen in this paper as an index of domestic economic growth, and at the same time, social retail goods, fixed assets investment and the balance of exports and imports as proxy variable for consumption, investment and net export. To eliminate the influence of price, GDP and social retail goods are converted into comparable data with CPI, the fixed assets investment is converted comparable through the price index of fixed asset investment and the balance of exports and imports through the price index of retail goods price. The above indexes are respectively expressed with GDP, C, I and NX. All these variables are quarterly data from Q1 2000 to Q3 2010, collected from CCER and CEInet Industrial database.

All of the original data is seasonally adjusted using Census X12, then processed into natural logarithms in order to avoid data volatility and eliminate potential heteroscedasticity. The number of net exports is replaced in modeling by the ratio of exports and imports in that it is usually negative, then we get  $\ln GDP$ ,  $\ln C$ ,  $\ln I$  and  $\ln NX$ .

Stationary test is respectively made on the  $\ln GDP$ ,  $\ln C$ ,  $\ln I$  and  $\ln NX$  with the method of ADF, with the result that the variables are like I (1) sequences in 5% significant levels.

### 3.2. Co-integration Test

Johansen co-integration test is done to  $\ln GDP$ ,  $\ln C$ ,  $\ln I$  and  $\ln NX$  based on VAR model to find out whether there is a co-integration relationship among them, and the result is shown in table 1.

Table 1. Co-integration test results among  $\ln GDP$ ,  $\ln C$ ,  $\ln I$  and  $\ln NX$

	<b>Eigenvalue</b>	<b>Trace Statistic</b>	<b>0.05Critical Value</b>	<b>Prob</b>
None*	0.830275	121.6592	47.85613	0.0000
At most 1*	0.636324	52.48975	29.79707	0.0000
At most 2*	0.194561	13.04161	15.49471	0.1133

The results of co-integration test show that GDP, consumption, investment and net exports have a co-integration relationship in 5% significant levels. In other words, there is a long-term stable equilibrium relationship among them

### 3.3. Analysis on the contribution of consumption, investment and net exports to economic growth

The system mean-square error can be decomposed into contribution of each variables through variance decomposition of predicting error. The mean square error of GDP is decomposed, and the result is showed in table 2.

Table 2. Variance decomposition of GDP

Period	<b>Consumption</b>	<b>Investment</b>	<b>Net export</b>	<b>GDP</b>
1	20.63709	5.334757	0.00000	74.02815
2	22.56439	5.311148	0.614984	71.50948
3	22.10253	5.501227	3.012972	69.38327
4	21.90591	5.558133	3.003036	69.53292
5	22.14855	5.579596	2.994567	69.27729
6	22.16677	5.570574	3.104239	69.15842
7	22.17414	5.569843	3.113965	69.14205
8	22.17548	5.570999	3.113879	69.13964
9	22.17543	5.570934	3.114101	69.13954
10	22.17551	5.570973	3.114090	69.13942

The variance decomposition result shows that in the long time, domestic economic fluctuation is affected 69% by itself, 22% by consumption shock, around 5.5% by the contribution of investment impact, and only 3% by net exports, which indicates clearly that consumption has great influence on the GDP fluctuation in China, whereas investment and net exports have less effect.

### 3.4. Comparison of the function effectiveness of consumption, investment and net exports to economic growth

According to the above result, we know that consumption, investment and net exports all affect GDP fluctuation to a certain extent, and consumption has the most prominent contribution. And next their effect on GDP is studied based on State Space Model (SSM) with the result in table 3.

Table 3. SSM estimated result among  $\ln GDP$ ,  $\ln C$ ,  $\ln I$  and  $\ln NX$

	<b>Coefficient</b>	<b>Std.Error</b>	<b>Z-Statistic</b>	<b>Prob</b>
C(1)	-6.67126	0.290857	-22.9365	0.0000
State vector	<b>Final State</b>	<b>Root MSE</b>	<b>Z-Statistic</b>	<b>Prob</b>
C	0.625956	0.011666	53.65744	0.0000
I	0.450346	0.011381	39.5688	0.0000
NX	0.299202	0.083025	3.603751	0.0003

With the estimation result of measurement equation, time-varying efficiency running trajectory of consumption, investment and net exports to GDP is generated by using status switch. It shows as follows:

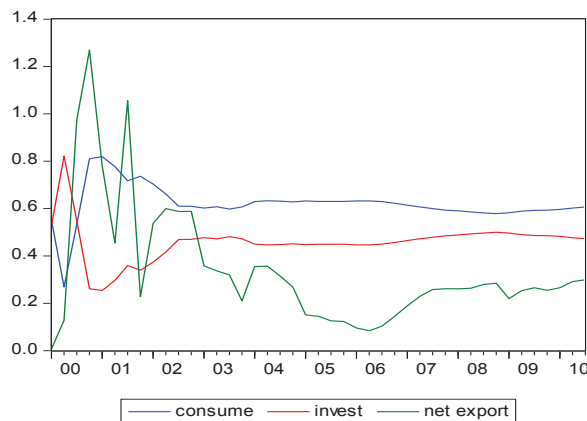


Fig 1. Time-varying efficiency running track of consumption, investment and net exports to GDP

From the Figure 1 we know, from year 2000-2001, each variable elasticity coefficient fluctuated abnormally mainly because that domestic economy was not recovered at that time, under the state of excess capacity and currency deflation due to the financial crisis of Asia. Since 2002, the flexibility of consumption is the largest and its overall fluctuation is small with fluctuating range from 0.5784 to 0.6330, average elastic 0.5961. The figure indicates that consumption has a strong effect on the actual economic growth in a long time. And the flexibility of investment is also relatively stable after the rise in 2001, which fluctuates from 0.3738 to 0.4998. In addition, the flexibility of net exports fluctuates greatly, ranging from 0.0840 to 0.5999. Its efficacy decreased since 2002, but gradually strengthened after 2006. Comparatively speaking, consumption has the greatest and relatively stable effectiveness on economic growth, investment is next to consumption, and net export is the least.

#### 4. Conclusions and suggestions

First, the empirical demonstration leads to the following conclusion: In general, consumption, investment and net exports all have effect on the economic growth of China at different degree. Consumption plays a dominant role. Investment boosts consumption and then in this way stimulates economic growth. The effect import and export trade has on economic growth is weak

Second, the variance decomposition results of GDP show that the economy grows stably in China with consumption the main factor of economic growth, while the contribution of investment and net export trade are relatively small. In recent years, China has actively propelled investment as a way of boosting economic growth and the effect is for certain, but it also cause a large number of excess capacity, suggesting that high investment growth cannot be sustainable for long. Even because of the low investment efficiency and incomplete investment patterns, huge investment has not become the first power of the economic growth of China, and the sustained economic growth must rely on consumption. That the domestic industrial structure has been adjusted, consumption structure has been upgraded, and also the rapid development of automobiles, real estate, communications and the tourism industry have become an important force to support consumption growth since 2000. Since its entrance to WTO in 2001, the import and export trade has greatly promoted the economic growth of China. But there are always difficulties in China's international trade such as the antidumping measures from its foreign trade partners and also the pressure of RMB appreciation. As a result, compared to domestic consumption, import and export trade contributes far less to China's economic growth.

Third, the comparison of the effectiveness of consumption, investment, import and export on economic growth demonstrates the following: Consumption ranks the first in terms of its effect on economic growth, while investment ranks the second and net export trade the third, which means consumption is the ultimate power of China's economic growth. Nevertheless, domestic consumption is still inadequate. In order to pursue a sustainable, healthy and stable economic growth, it is need to focus on consumption, actively adjust income distribution structure, establish and perfect the social security system, enhance residents' disposable income, continuously optimize consumption environment, expand consumption scope, promote consumption upgrade, perfect the consumption system and improve the effective consumer demand. On this basis, it is also need to optimize the investment structure, increase investment efficiency and correctly guide the stimulative effect of investment on economic growth. Meanwhile, the importance of import and export can't be ignored, the structure of foreign trade need to be improved constantly in contrast. Actually, export growth will be a very influential factor to economic development in the situation of inadequate domestic demand.

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