# The effects of Replacing Business Tax with VAT on China's economy

Chen,Li

Qing Zhu,Yin

## Abstract

The paper analyzes the effects of Replacing Business Tax(BT) with Value Added Tax (VAT) through a commutable general equilibrium model. The database of the model encompasses a social accounting matrix (SAM) for the year 2012. Simulation was performed by the policy of VAT reform until 2016. Our findings show that in the short run the GDP slightly decreases by 0.103%. And investment increases almost every sector in the tertiary industry, which means that VAT reform will have positive impact on industrial upgrading of tertiary industry. Compared with the year 2012, the government revenue and labor wage increased a lot.

Keywords: Value-added tax, CGE model, China, tertiary industry.

## I. Introduction

The replacement of BT with VAT has been hailed as a concrete step in deepening reform of China's taxation sector. And starting May 1st 2016, the Construction, Real Estate, Finance and Consumer Services sectors also had business tax replaced with VAT. This ensures that tax burdens for all tertiary industry sectors see business tax replaced by VAT.

VAT reform is one of the most important tax reforms in China in recent years and it is an important factor that affects the industrial upgrading and the transformation of the economic growth pattern. Besides, tertiary industry seems to be the most affected one in the VAT reform, since it accounted for main share in the business taxes (BT). Therefore, to ensure steady and rapid economic growth in China, the research on VAT reform in tertiary industry and it's impact on economy, especially in the industrial upgrading, has important theoretical significance as well as practical one.

However, there are only limited studies on the VAT rate in tertiary industry in China from the tax burden and economic effects view, by applying the CGE model. Most of the existing researches on VAT reforms in tertiary industry focus only on how to balance the tax burden of every tertiary industry sector in theory. Also, the design of VAT equations and macro closures in most of these models are deficient. Besides, simple tax rates in some of the tertiary industry sectors (mostly including finance inter-mediation and real estate) were researched，and the specific tax rate in every tertiary industry sector is still very rare and precious for research, for which more exploration is in need.

Therefore, a static CGE model is constructed to study the VAT reform of the Tertiary Industry of China. The model demonstrated in this paper is of the neoclassical class, where the wage rate is flexibly adjusted to achieve zero unemployment in the labor market. Firstly, we drew an assumption of tax reform plans about the transformation from business tax to VAT of every sector of Tertiary Industry. Then we analyzed the simulation results from the view of tax burden and economic effects, and examined whether the tax reform plan is suitable for Chinese economic or not. Finally we provide some political suggestions about the transfiguration form brassiness tax to VAT.

This article primarily does a simple summary about VAT reform. Then basing the theory of economic, the paper builds a tax CGE model, basing on the 2012 input-output table of data. Through the result from the model, it can be found the impacts of VAT reform will not only have influence on China's GDP but also affect the industrial upgrading and the transformation of the economic growth pattern.

## II. VAT overview and Literature Review

### 2.1 VAT reform overview

The history of VAT can be traced back to 1994 when China introduced the VAT as a part of general tax reforms, which can be viewed as one element of

China's Opening-door economic policy. Although China borrowed many basic principles from the European VAT, there are still some problems in domestic tax system.[1] For example, there are not all sales of goods and services subjected to the same tax. Only certain goods and services relating to the sale of goods are subjected to the VAT while most services are taxed by the BT. This situation cut off the input VAT deduction chain from the flows of services in the business cycle, and moreover reflected the value added processes in the cycle to a very limited extent. What' more, there are lots of enterprises engaging in diversified economic activities which supply goods and services across traditional industrial and commercial lines. In other words, double taxation happens in most cases. Therefore the VAT reform is necessary.

On the other hand, in recent years, the Chinese Government has indicated that its goal is to transform the nation from a production-based economy pattern into a more service-oriented one, and it has identified the VAT reform as one of the pathways to a successful transition. The reformation of replacing BT with VAT, which started in 2008 as a trial program, was also expected to expand to three crucial sectors 2015-real estate, finance, and consumer services. The targets for the future VAT reform in China are contained in the Twelfth Five Year Plan Period (2011-2015), which stipulates all sectors currently subjected to BT should be switched over to VAT by the end of 2015. [2]

The time-line of the reforms is as follows:

[1]Xu Yan ,Reforming Value Added Tax in Mainland China: A Comparison with the EU,Revenue Law Journal,2011,6
[2]Rainy Yao, China' s VAT Reform Moving Forward
http://www.china-briefing.com/news/2015/08/05/chinas-vat-reform-moving-forward.html

## Table 2.1 The Time-line of the Reforms

| Periods | Contents |
|---|---|
| 2008 | The Chinese National People's Congress (NPC) formally approved a five-year plan for reforms of the VAT Act.<br><br>The Chinese Government pledged to ensure the reforms are duly implemented in line with the country's overall policy objectives. |
| 2011 | The Chinese Ministry of Finance (MOF) introduced reform projects that would require selected regions and sectors of the domestic economy to shift from paying BT to VAT.<br><br>On 26 October 2011, Chinese Premier Wen Jiabao disclosed the new policy at the state Council Standing Committee meeting that would be exercised from 1st January 2012. |
| 2012 | In January, the reform was initially implemented in Shanghai for the transportation and certain modern services sectors.<br><br>On September, Chinese government extended the number of the polite cities to eight provinces/municipalities which included Beijing, Jiangsu, Anhui, Fujian, Guangdong, Tianjin, Zhejiang, and Hubei. |
| 2013 | Chinese government implemented the reformation into nationwide. |
| 2014 | In January, the wider areas were implemented. Which were extended to railway transportation industry and postal services<br><br>In June, The reform industries expanded to the telecommunications sector. |
| 2015 | VAT reformation was set to cover financial industries. |

And on May 18, the implementation of this policy continued with the State Council announcement that the VAT reform would be expanded to the industries as Construction, Real estate, Financial services and somewhat opaque 'life' services. Though no detailed plan has yet been released, a six percent tax rate is set to be imposed on the financial industry, likely starting from October 1, 2015. The new VAT rate would likely raise the tax rate applicable to Chinese financial firms currently; financial services companies are subjected to a BT of only five percent. Given the fact that taxpayers may offset their VAT paid with VAT received, the tax burden may be lower. Further, the risk of double taxation is eliminated, as the sale of goods and the provision of services will no longer be treated separately. Meanwhile, according to the policy, an 11 percent tax may be levied on property and construction companies, while a 6 percent rate may be applied to consumer service/life services industries, which also means the VAT reform of Tertiary Industry has been finished on some level. Therefore, we can conclude a table of the VAT rate of every sector in the Tertiary Industry (Table 2.2).

Table 2.2 VAT Rate of Every Sector in the Tertiary Industry

| Construction | 11% | Wholesale and retail | 6% | Transportation Storage postal service | 11% |
|---|---|---|---|---|---|
| Hotel and Catering industry | 6% | Information transmission、 software and information technology service | 6% | Finance | 6% |
| Real estate | 11% | Leasing and commerce service | 11% | Scientific research and technology service | 6% |
| Water conservancy、 environment and Public facilities management | 6% | Resident service、 repair and other service | 6% | Education | 0% |
| Hygienist and social work | 0% | Culture、 sports and entertainment | 6% | Comprehensive | 0% |

## 2.2 Literature Review

According to Sun & Yang (2015), VAT is a significant source of revenue for the government, and they argued that the VAT reform will help the improvement of the Chinese tax system, broaden the development of tertiary industry, stimulate the vitality of enterprises and promote specialization that has important practical significance, but also inevitably have a negative impact on a small number of companies. This was analyzed from both micro and macro-economic perspective. Guo (2016) estimated that VAT reforms effectively improve the industrial restructuring and upgrading, and play an especially positive role in helping tertiary industry to maintain the steady progress. The study discussed these three aspects: industrial structure, taxation and employment structures, in order to analyze the effects of VAT reforms on the tertiary industry, and further enhance the development of tertiary industry under these reforms. However, these studies were focused only on the theoretical research, and therefore the empirical analysis is absolutely necessary.

There are two types of models often used to estimate the effects of VAT reforms. First one is a general econometric model - for example, Wu, Ou & Duan used TRAMO / SEATS method to test the effects of VAT reforms on China's economy. Second one is commutable general equilibrium model - for example, Fan & Wang redefined the standard CGE model, accommodating the model to the study of VAT reform in China's economy. In an effort to reform the VAT in China, Hu & Tian conducted a dynamic CGE model to quantify the impact of implementing VAT on the financial economy. This modeling is very ambitious and complex. It consists of a number of models.

The CGE model seems to be the most potent model for VAT study. Since conventional econometric models take into account only the positive macro-economic variables of a small part of economy, they are ignoring other variables. It means that results can only reflect the local change of economy. On the other hand, CGE model is built on the basis of the whole national

economic system. It can also numerically depict a 'world' where a general equilibrium is attained by the price mechanism. Also, CGE model can depict numerically a 'world', where a general equilibrium is attained by the price mechanism. Also, these CGE models can easily incorporate dozens of industrial sectors with small data requirements, which would require large data-set in general econometric models[3]. According to Chinese government's statement, VAT reform is 'a slight move in one part that may affect the situation as a whole', and have broad and profound effects on China's economy. Therefore, CGE model seems to be more realistic for analysis of the economic effects.

## Ⅲ. The effects of VAT reforms on China's economy—By applying CGE model

### 3.1 The date construction (The Social Accounting Matrix)

CGE models are used to analyze economic activities, which are transactions involving goods and factors, and the concurrent flows of funds between agents in an economy. The knots of transactions can be categorized as 'Activity', 'Factor', 'Indirect Tax', 'Final Demand' and External. These knots are termed agents, and Social Accounting Matrix (SAM) describes transactions by these agents. Depending on the needs of the analysis, these agents can be merged into broader ones or divided into narrower ones[4].The entries in a SAM indicate flows of goods and services from the agents listed in the rows to the counterpart agents listed in the columns. The corresponding payments are made in the opposite direction.

In this paper we construct a SAM for China firstly. To simplify the model, we distinguish between3 production activities in general: Agriculture, Industry and Services, dividing the Services into 12 sectors( hereinafter, they are abbreviated as AFF,ND,CON,WAR,TSP,HCI,ISS,FIN,RLE,LCS,STS,WEP,RRO,EDU,HSW,CES,PSO);and two product factors: capital and labor. There is only one representative household and as well as the government, the investment and external sector. The base year is set at 2012. In addition to the IO tables, China Taxation Yearbook of 2013, China Statistical Yearbook of

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[3]Nobuhiro Hose&Kenji Gasawa&Hideo Hashimoto, Textbook of Computable General Equilibrium Modeling, Palgrave Macmillan, 2010 page4-5

[4]Nobuhiro Hose&Kenji Gasawa&Hideo Hashimoto, Textbook of Computable General Equilibrium Modeling, Palgrave Macmillan, 2010 page 42

2013 is also available. Among the IO tables with various sectoral aggregation levels, we use the 42-sector table in this paper.

The first task is to aggregate the 42-setor table into a 17-sector table for simplicity. The aggregation of the square part is straightforward, special care is needed for the overhang parts. The following items relate the adjustment of the overhang. (1) The 'operating surplus' and the 'depreciation of fixed capital are aggregated into one account as the payments for capital use. (2),The 'compensation of employees' ' the consumption expenditure outside households(row)' are aggregated into one account as payment for labor use.(3) The indirect taxes are divided into 4 parts, Value-added tax, Brassiness tax, value-added tax on import and other taxes. These are basing on China taxation Yearbook of 2013. (4) The consumption expenditure outside households column and the 'consumption expenditure (private)are aggregated into the household account.(5)The 'consumption' expenditure of general government is used as the government account.(6) The gross domestic fixed capital formation public ,the 'gross domestic fixed capital formation(private)'and the 'increase in stocks' are aggregated into the investment account.(7) The exports and imports account are used as 'exports' ,'imports'. And the error account is aggregated into export if is the date is positive, into imports if the data is negative. Care is needed for imports and exports traffics, but in this passage we haven't got the precise data so we would not extract the traffics from the imports and exports sectors.

The last task is to fill in the remaining blank cells, indicating the flow of funds from the household to the government and to the investment agent, and that from the government to the investment agent. As these cells cannot be filled in only by IO-data, we have to rely on other data. In the paper , which is basing on the China Statistical Yearbook of 2013.Finally, the SAM table is finished and presented as Table3.1. In the SAM, we can see The row-sum and column-sum equality, which means the markets are cleared, and receipts and payments of funds are balanced for every agent.

## 3.2 Model Structure

Different from the Hu Tian's approach, the goal of this paper is quite modest and much more focused: what is the short-run effect of a VAT reform policy in the tertiary industry adopted by the Chinese government? So a static rather than a dynamic model is developed. CGE modeling involves a

number of assumptions, the specification of supply and demand functions, the use of dis-aggregated data and behavioral-parameter values, and simulation shocks. This section considers each in turn. The model employs standard neoclassical economic assumptions: a perfectly competitive economy with constant returns to scale, cost minimization for industries and utility maximization for households, and continuous market clearance. In addition, zero profit conditions are assumed for all industries because of perfect competition in the economy. The Chinese economy is represented by 17 sectors which produce 17 goods and services, one representative investor, one household group, and one government. The final demand includes household, investment, government and exports. The structure of production function is shown in Fig. 1.

Fig.1 The structure of production function
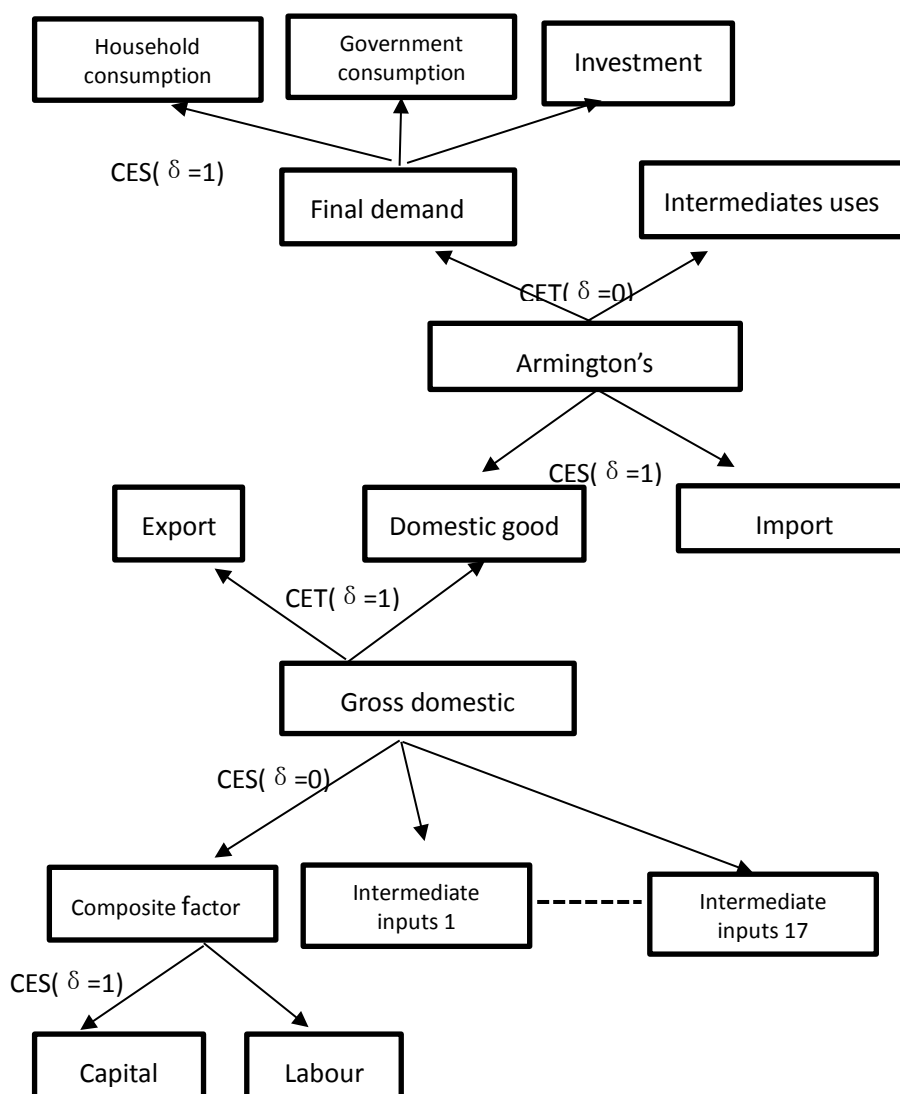
Now we explain the flows of goods and factors at each stage where they are combined for either production or consumption. All of the productions activities in the model are produce under the CES (Constant Elasticity of Substitution).On the other hand; the composite factors are distributed using the CET (Constant Elasticity of Transformation).The flows are explained from the bottom to the top in Fig.1.

(1)Capital and labour are aggregated into the composite factor determined by a CES function($\delta=1$).

(2) This composite factor is combined with the intermediate inputs of 17 sectors to produce the gross domestic output using CES function ($\delta=0$).

(3) The gross domestic output is transformed into the exports and domestic good using the CET function ($\delta=1$).

(4) The domestic good is combined with the imports to produce the Armington's assumption with the CES function ($\delta=1$).

(5) The Armington's assumption is distributed among final demand and intermediate use under the CET function ($\delta=0$).

(6) The Final demand is distributed among the household consumption, government consumption, investment using the CES function ($\delta=1$).

The consumption and domestic production has been determined as we stated above, in the closed economy model the investment agent collects funds from the household, the government and the external sector and spends them on purchases of investment goods. In addition, in realistic economy, since we need take the transactions between international into consideration, issue of the closure of the open economy models is existing. In this model, the exchange rate is taken as endogenous parameter.

In this paper , the main concern is the consequences of the government policy devices⋯VAT reform. Thus, it is necessary for us to discuss how to model government behavior in the model. In this CGE model, the government is supposed to collect taxes and consume goods. The model assume that the government levies a direct tax on capital and labour at the tax rate 'txk ' and 'txl' .An production tax (an indirect tax beside VAT and BUT) on gross domestic output at the tax rate 'txy'. The VAT and BT are defined as is 'txv', 'txb' respectively. Value added tax on import is 'txvm'. In the model, the tariff import is not considered. At the same time, we assume that the government spends all tax revenues on their consumption, and that the government consumes each good in fixed proportions in total

government expenditure. The VAT revenue is defined as 'VATA' and equation of VATA bases on Tan&Liang (2005) and Chen(2013). In addition, the equation of YG,VATM,BT base on Liu(2014).

$$YG = \sum_j txy*(PIV_j*QIV_j + PINT_j*QIINT_j) + \sum_j (BT_j + VATA_j + VATM_j) + txl*(WL*QL) + txk(WK*QK) + \sum_i tm_i*PMW_i*QM_i*EXR$$

(1-1)

$$VATA_j = \{txv_j*PDD_j*QDD_j - (PDD_j*QDD_j)*\sum_i ident_{ij}*Taxi_{(i)}\}$$  (1-2)

$$VATM_j = txvm_j*\sum_i ident_{ij}PM_i*QM_i$$  (1-3)

$$BT_j = txb*PDD_j*QDD_j$$  (1-4)

$$SG = YG - PGOV*QCG$$  (1-5)

Here, YG and SG are total government revenue and total government saving, respectively. Government obtains revenue from the taxation the government levies taxes on the consumption of commodities, on capital and labor use of firm and on the income of the household. In addition the government obtains revenue from traffic and Value added tax on import.

## IV. Policy Simulations Results

Table 2.2 represents policy simulations of several variables for this model. The variable selection is the data retrieved from the Chinese government website (www.gov.cn), summarized by the author. In order to solve the model for simulation, the GAMS (version 23.6) is used. This software is developed by the GAMS Corporation (www.gams.com).

To calibrate the parameters, we used the SAM data on Chinese economy in 2012, which is the latest data.

According to the results presented in the Fig.2 and Fig.3, there are some conclusions we can summarize as follows.

① It is evident from the macroeconomic results that VAT reforms increased the investment.

② VAT reforms mostly benefit the government revenue in the long run. Since VAT reform started in 2008, that is 4 years before 2012. Compared

with the reform before 2012, VAT reform of construction industry, modern services industry and finance industry were complemented in 2015. These 3 parts share the majority of the Tertiary industry.

③ VAT reforms hiked the labor wage and the price of private consumption increased too.

④ The effects of the shock indicate that Domestic consumption and Private utility decreased by 10.8% and 10.79% respectively.

⑤ The negative impact on the Export and Import decreased by 0.756% and 0.826% respectively.

⑥ The real GDP decreased slightly by 0.102%.

⑦ It is easy to see the positive impact on the investment, besides construction industry, transportation & postage industry, and information transmission and software information technology service.
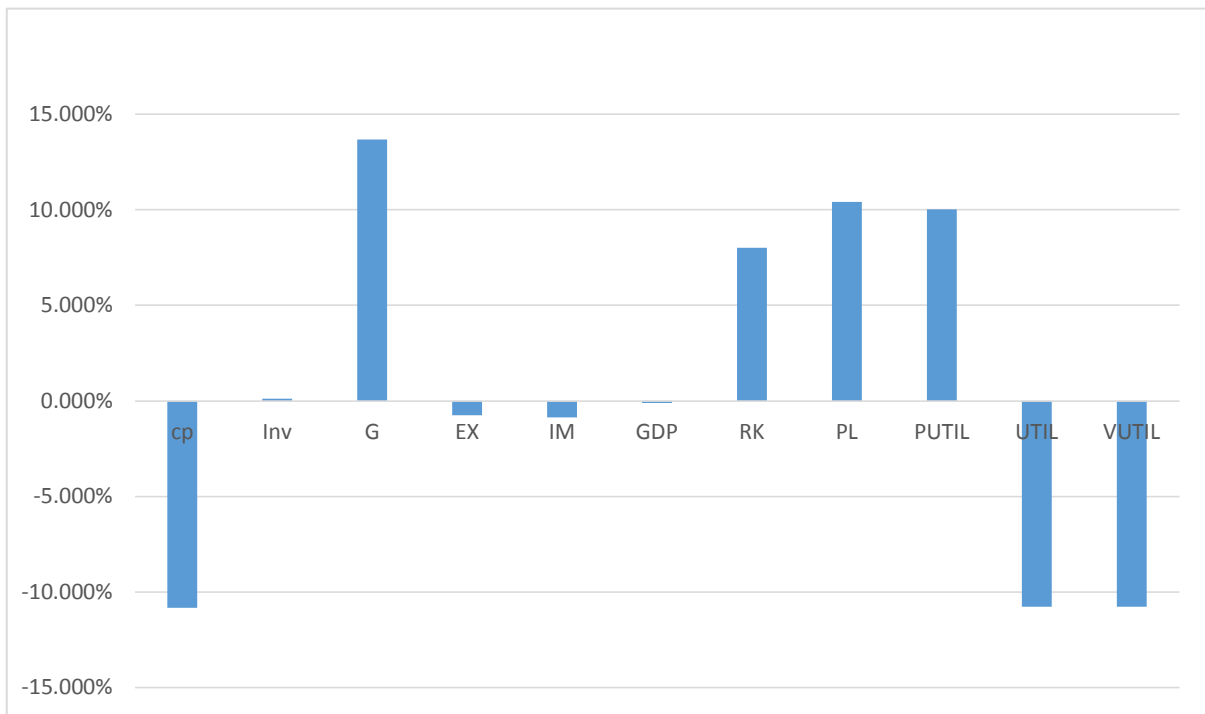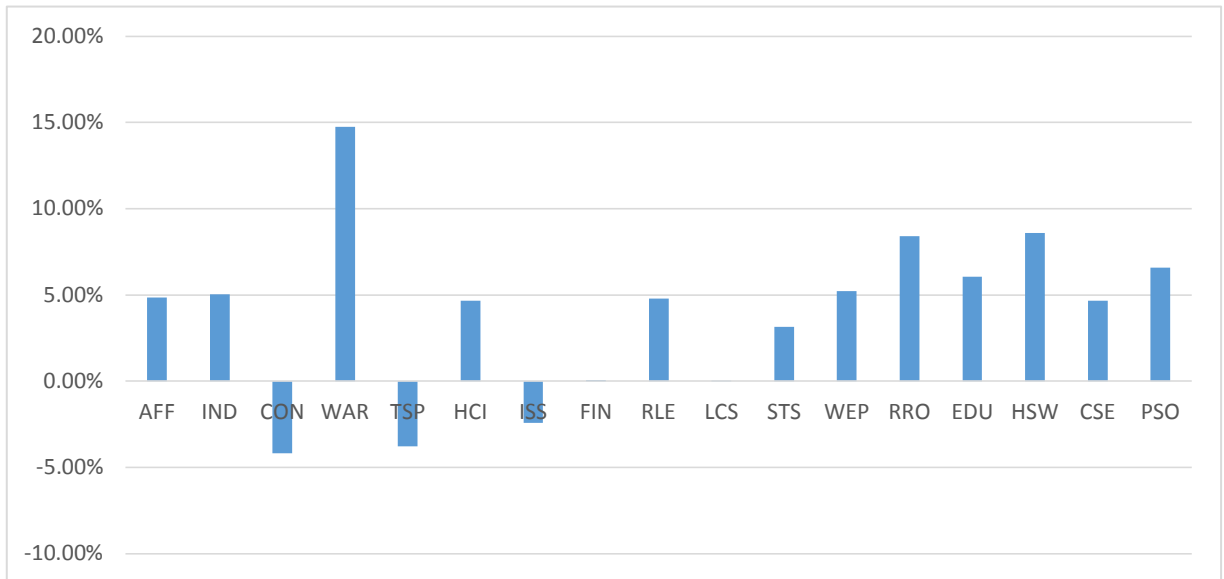
Fig.2  Macroeconomic results

Fig.3    Results of investment

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