The Impact of SARS Epidemic and Financial Crisis on China's Economy Structure Referenced to the Potential Impact of COVID-19

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Abstract

This empirical study employs regression models to investigate some deep economic determinants, such as human capital, business environment, to investigate what extent China's economy structure is likely hit by SARS epidemic in 2003 and global financial crisis in 2008. It finds that China's economy structure is unchanged after the hits, the deep economy determinants and GDP remain upward. Human capital accumulation is the significant deep factor, and both SARS epidemic and financial crisis have no impact on the long-run factor, accordingly, China's economy growth is sustainable. It suggests further human capital including labor quantity and education is currently the most significant determinants for China's economy sustainability, followed by the upgrading business environment. The evidence based on SARS and financial crisis may have certain reference value to estimate the potential impact of COVID-19 on China's economy structure in the future.

1 Introduction

The outbreak of the novel coronavirus (COVID-19) is for the time being the most significant black swan of 2020, and a wide range of media coverage reports that this pandemic has affected not only the Chinese but the global economy as well. While a year late, some reports reveal that China's economy keeps booming after COVID-19[3]. Professor Hans Hendrischke, from China Studies Centre of the University of Sydney Business School, suggests that China is achieving the V shaped economic recovery from the COVID-19 pandemic[4]. These points of view are demonstrated by some latest research (Pan et al.,2021; Liu, 2021;Liu et al., 2020).

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[3] https://www.weforum.org/agenda/2020/07/chinas-economy-rebounds-after-steep-slump-u-s-tensions-weak-consumption-raise-challenges/

[4] https://sbi.sydney.edu.au/chinas-economic-recovery-from-the-covid-19-pandemic/

Some reasons have been uncovered. Liu (2021) attributes it to Chinese government policy measurements. Mckibbin and Fernando (2020) documents that economic costs could be significantly avoided with greater investment in public health systems in all economics, where health systems are less developed and population density is high, such as China. As the second largest economy, China is one of the countries that has experienced three disasters (SARS, global financial crisis and COVID-19). Although both SARS and COVID-19 out-broke and spread from China, they were under control and China's economy recovered quickly. Thus, China's experience has reference value to other countries and should be able to revitalize other economies.

However, how is COVID-19 potentially going to impact China's economy in the long run? Which has not been answered so far, because there is few post-COVID data of macro-economy available to study it. One year only of economy data available since COVID-19 outbreak, it is insufficient to examine the pandemic's long-run impact on economy, while the lasted COVID-19-related research mainly focuses on the pandemic impact on financial markets (Papadamou et al., 2021; Papadamou et al., 2020; Liu,2021; Liu et al., 2020).

The purpose of this study is to examine the impact of both SARS epidemic in 2003 and global financial crisis in 2008 on deep economic determinants. As such, evidence from SARS and financial crisis has certain reference value for us to well understand how COVID-19 is possibly going to impact on China's economy development in the future, and is expected to facilitate decision makers, such as governors and investors, to estimate the potential impact of COVID-19 on China's economy development.

This paper follows an analysis framework from Chen and Feng (2000), and investigates the impact of both SARS epidemic and global financial crisis on China's economy structure from a deep determinant perspective, such as labor quality, business environment, and economy integration. Based on economy data of 1978-2020, this study employs regression models to identify the steady-going factors, namely deep determinants (Bhattacharyya,2004; Glawe &Wagner, 2019) driving China's economy in the long run. This study suggests that this pandemic is unlikely to hit Chinese deep economy determinants, such as political stability, human capital, economy integration. Thus, China's economy is influenced in the short term but will be recovering.

Therefore the Chinese government conducted variety of measurements to overcome the SARS and financial crisis and mitigated their economic impact as low as possible, and China remains its economy sustainability. Accordingly, this successful experience may have reference value to deal with COVID-19 and China's economy is expected to recover soon because its policy responses protect its economy structure from significant impact.

The rest of the paper is organized as: Section 2 reviews literature and develops a hypothesis; Section 3 describes data; Section 4 outlines the methodology and variables; Section 5 shows some results and discussion; Section 6 concludes this paper.

2 Literature Review and Hypothesis

Although a wide range of literature documents that COVID-19 beats global economy remarkably, majority of research investigates COVID-19 impact on financial markets, (Papadamou et al.,2021; Papadamou et al., 2020; Liu et al.,2021; Zhang and Hamori, 2021). For instance, Papadamou et al., (2021) collecting daily data on bond and stock returns investigate the impact of COVD-19 on time-varying correlation between stocks and returns. Liu et al. (2021) conduct a time-frequency analysis of the macro-financial variables, such as total credit, house prices and equity prices to assess their resilience. In addition, Zhang and Hamori (2021) analyze the return and volatility spillover between crude oil market and the stock market during the pandemic period.

In fact, a national economy performance is determined by various factors, which can be included into two groups: adjustable factors and steady-going ones, so-called deep determinants (Bhattacharyya, 2004). The former one includes capital flows (Sui, 2019), government expenditure (Ghosh & Gregorious, 2008), and inflation (Fischer, 1992; De Gregorio, 1993), which are usually revised in short run by the government to stimulate economy growth rates. The steady-going ones refer to those, such as political stability (Jong-A-Pin, 2009), human capital (Chen and Feng, 2000), economy integration (Bhattacharyya, 2004). These deep determinants are unlikely to be changed frequently in short time, and drive economy growth in a sustainable rate.

Studies show these deep determinants associate with the adjusted ones. Abramovitz (1986) and Borensztein et al. (1998) institutional factors have a strong positive relationship with capital flows. Verdia-Jerez and Chascp (2016) argues that openness indicators are directly related to foreign direct investment. Anyanwu (2014) based on the Chinese evidence documents that domestic consumption is significantly associated with economic growth, while official development aid, population growth, inflation, credit to the private sector, agricultural material price, and oil price indices were negatively and significantly associated with economic growth.

Chen and Feng (2000) demonstrate that human capital is critical for less developed provinces to achieve high economic growth, which documents further that private and semi-private enterprises, higher education and international trade all lead to an increase in economic growth in China. This finding is supported by Vedia-Jerez (2016), which suggests that economic growth is driven strongly by human capital accumulation in south America.

On the contrary, Fischer (1992) documents some uncertainty variables to economic growth, such as inflation rates, government spending, real exchange rates and interest rates, which are really determined by government policies. In addition, these factors have a negative influence on the future economy growth. Feng et al. (2000) shows that the government can promote long-term development through implementing a population policy that favors economic growth.

Based on survey data, Hai et al.(2004) documents the short-term impact of SARS on China's economy, which is supported by Zeng et al. (2005). Haan (2010) shows financial crisis has few effect on China's

economy, by contrast, the Chinese government views the crisis as an opportunity to upgrade its export-led economy development. None of the research from the perspective of China's economy structure investigates this question. This study examines these deep determinants affected by SARS and financial crisis to provide evidence to estimate the potential impact of COVID-19 pandemic on China's economy sustainability, because these factors are relatively steady-going compared to others, they are unlikely to change during a short period. Therefore, the hypothesis is developed below.

Hypothesis: These deep economy factors are unlikely to be impacted by SARS and financial crisis within the short period, thus China's economy structure is unchanged.

3   Data

The time-series raw data was mainly collected from the NBSC website (http://www.stats.gov. cn/tjsj/ndsj/ 2018/indexeh.htm), some of them were hand collected in different ways. The time rage covers from years of 1978-2020, since China's openness reform gets started. Data on variable of business environment was collected from the annual reports conducted by the Word Bank from years of 2005 to 2019.

4   Methodology and Variables

GDP is mainly determined by four core factors, which are consumption, investment, government expenditure and international trade. They are theoretically expressed as GDP=f (investment, international trade, consumption, government expenditure). As such, this study develops a basic regression model to analyze China's economy structure, and then compare the pre- and post-figures of SARS epidemic in 2003 and global financial crisis in 2008 respectively. Consequently, what China's economy has changed after each impact should be apparently shown.

In general, GDP can basically be expressed as

$$GDP_t = \alpha + \beta_1 Consp._t + \beta_2 Invest._t + \beta_3 Intl.Trade_t + \beta_4 Gov._t + \varepsilon_t \tag{1}$$

This study initially investigates China's economy structure using this basic model.

There are various indicators to measure economy performance. These factors may be divided into two categories: adjustable factors, such as inflation (Stockman, 1981; De Gregorio and Guidotti, 1995), government debts (Checcherita-Westphal and Rother, 2012), and capital flows (Sui,2019).The other one is long-run factors including human capital (Romer, 1990; Barro, 1991), firm quantity (Chen & Feng, 2000), political stability (Jong-A-Pin, 2009), fertility rate, the rule of law, and the terms of trade (e.g., Barro,1997; Barro & Lee, 1993; Chen & Feng, 1996; Feng, 1997; Persson & Tabellini, 1992). The adjustable factors are defined here as those which are more likely to be changed in a short period by the government policies. The long-run ones refer to the counterparts that are unable to be changed in short time.

To examine China's economy sustainability, this paper mainly investigates these deep determinants to see whether they are possible to be impact by this disease. According to Chen and Feng (2000), this paper includes firm quantity (FQT) and education (EDU) into our model. Following Glawe &Wagner (2019) and Bhattacharyya (2014), both variables of labor quantity (LQT) and integration (INTG) are deep determinants for economy development. Fertility rate (FERT) is suggested as a deep determinant (Becker et al., 2010; Chen and Feng, 2000; Barro, 1991).

This paper initially includes business environment (BEVR) to account for our research question. It is supposed that high quality business environment should be beneficial for economy development. Current account can be viewed as an index measuring national capability of capital management.

Based on the above discussion and the principle of Chen and Feng (2000), a regression model accordingly is built as below.

$$lnGDP_t = \alpha + \beta_1 LQT_t + \beta_2 EDU_t + \beta_3 FERT_t + \beta_4 FQT_t + \beta_5 BEVR_t + \beta_6 INTG_t + \varepsilon_t \qquad (2)$$

LQT is measured by employee quantity per year in China; EDU is measured by tertiary graduations per year; FERT is computed by the quantity of new-born babies every year, denoted by $\Delta population = population_t - population_{t-1}$; FQT is calculated by the quantity of firms each year in China; BEVR is scored by easy-to-do-business-ranking in China conducted by World Bank per year; INTG refers to the proportion of China's GDP divided by world GDP per year, denoted by $GDP^{china}_t / GDP^{world}_t$. In Addition, all data are taken in detrended form to assure stationarity of the variables. In order to investigate any differences between the two sample periods we used the following cross dummies D*X+(1-D)*X, for all X variables of interest.

5 Results and Discussions

5.1 Results of China's Economy Structure

According to the basic model 1, an overview of China's economy is initially presented. As table 1 shows, R^2=.811, this model has high goodness of fit to explain China's economy, the three factors (Consumption, Investment, International Trade) have very significant Sig. value, saying they are completely able to account for China's GDP.

The most prominent result is consumption has the most significant contribution to China's economy with a coefficient beta 0.571 and t value 13.75, followed by investment with beta 0.371, while international trade has less contribution.

Table 1: China's Economy Structure Test

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-253.100	88.997		-2.844	.007
Consumption	1.504	.109	**.571**	13.750	.000
Gov.expenditure	.299	.283	.041	1.054	.299
Investment	.832	.060	**.371**	13.977	.000
International Trade	.780	.138	**.023**	5.667	.000
R Square	.811				

*. Dependent Variable: GDP, Predictors: (Constant), International Trade, Consumption, Investment, Government expenditure.

**. Year range: 1978-2020

SARS, a kind of epidemic out-broke in 2003 in China. How did it impact on China's economy? This study tests the two groups of data prior to the year of 2003 and post-years, table 2 shows the differences. It accounts for the Chinese economy policies changing from export-oriented to supply-side structural reform. Consumption coefficient before 2003 was 0.525 and increased into 0.615. On the contrary, both variables investment and international trade decreased from 0.428 to 0.312, and 0.045 to 0.015 respectively.

These stimulus policies are successful in sustaining China's economic growth and mitigated the impact of SARS epidemic.

Table 2: Variations of China's Economy Structure Prior and Post-SARS

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)**	149.375	954.564		.156	.879
***	-35.294	17.048		-2.070	.050
Consumption**	1.528	.337	**.615**	4.540	.001
***	1.267	.032	**.525**	39.817	.000
Gov. expenditure**	.561	.956	.079	.587	**.572**
***	.077	.046	.011	1.674	.108
Investment**	.722	.129	**.312**	5.616	.000
***	1.054	.033	**.428**	31.972	.000
International Trade**	.676	.428	**.015**	1.581	.148

***	1.065	.106	**.045**	10.065	.000
R Square**	.782				
R Square***	.774				

*. Dependent Variable: GDP, Predictors: (Constant), Government expenditure, Investment, Consumption, International trade.

**. Selecting only cases for which Years >= 2003

***. Selecting only cases for which Years <= 2003

Table 3 presents the differences of China's economy structure before and after the global financial crisis in 2008. The above Chinese economy structure was enhanced, consumption with 0.666 has become more powerful to GDP. However, international trade has very limited contributions to GDP. This policy reform prevents China's economy from the brunt of financial crisis.

Table 3: Variations of China's Economy Structure Prior and Post-Financial Crisis

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)**	1530.932	3412.074		.449	.672
***	-35.009	15.634		-2.239	.034
Consumption**	1.578	.607	**.666**	2.601	.048
***	1.270	.026	**.469**	48.706	.000
Gov. Expenditure**	.660	1.236	.096	.534	**.616**
***	.078	.043	.011	1.797	.084
Investment**	.627	.406	**.239**	1.544	.183
***	1.049	.027	**.446**	38.739	.000
International Trade**	.146	.761	**.003**	.192	**.855**
***	1.084	.053	**.084**	20.333	.000
R Square**	.699				
R Square***	.742				

*. Dependent Variable: GDP, Predictors: (Constant), Consumption, Government expenditure, Investment, International Trade.

**. Selecting only cases for which Years > 2008

***. Selecting only cases for which Years <= 2008

Table 4 indicates the China's GDP growth from 2002-2009. As it shows, China's economy maintained the same growth rate of 10% in 2004, saying a limited impact from SARS-COV epidemic. While the growth rate increased little bit to 9.4% in 2009 after the global financial crisis, it was very high level of growth.

Table 4: China's GDP Growth Rates during 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009
GDP Growth	9.1%	10%	10%	11.4%	12.7%	14.2%	9.7%	9.4%

Source: National Bureau of Statistics of China

Therefore, facing these two impacts on China's economy, the Chinese government updated national economy structures and actively conducted a range of economy policies to relieve the outside impacts. Both SARS-COV and financial crisis did not interrupt China's economy sustainability, and China's economy developed in the fastest rate so far.

5.2 Results of China Economy Sustainability

Fig. 1 outlines the relationship between the long-term determinants and GDP. The most determinants show upward trends in the last years, except FERT that has been suggested by Chen and Feng (2000), showing high fertility rate reduces economy growth in China. There has no any evidence to show these trends are likely to go down much synchronously in the future.
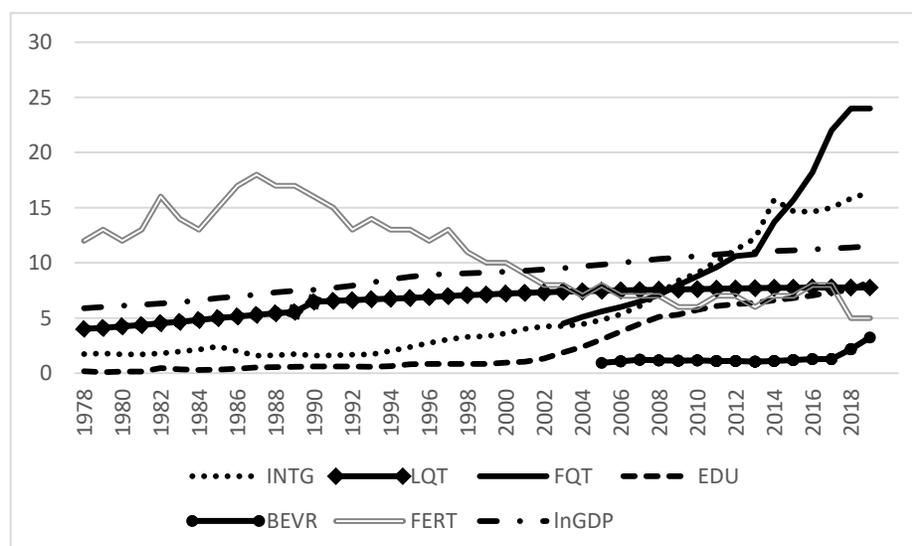

Fig. 1: Development Trends of The Deep Economic Determinants and GDP from 1978-2020

Based on the above analysis and China's economy structure, China's economy growth will be ongoing if its long-run determinants are not be destroyed significantly by outside powers. The Chinese government is able to stimulate economy growth at a proper rate by driving some volatile factors, such as investment, industry production, monetary policies.

To test whether COVID-19 potentially impact on economy sustainability, this study investigates these long-run determinants. Following model 2 above, table 5 apparently shows that this model has quite

significant value with 0.695 of R^2, and significant value of each variable are under 0.05 for EDU, BEVR and LQT which means the proposed model and the three variables well account for the research question of this study.

Both LQT and EDU variables have significant contributions to economy sustainability, that says human capital is vital for GDP. This result is consistent with Chen and Feng (2000), which documents that human capital drives economy development in the long run. There were over 8 billion tertiary graduations from the Chinese universities, these high-quality labors certainly drive China's economy development for longer.

Table 5: Contributions of Deep Economic Determinants to GDP

Model 2	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	-9.207	4.165		-2.210	.069
INTG	-.005	.844	**.000**	-.006	.995
FQT	.006	.004	.068	1.588	.163
EDU	.169	.030	**.456**	5.633	.001
BEVR	.003	.001	.057	3.069	.022
LQT	.024	.006	**.523**	4.210	.006
FERT	-.003	.013	**-.005**	-.240	.818
R Square	.695[b]				

a.   Dependent Variable: lnGDP.

b.   Predictors: (Constant), LQT, BEVR, FQT, FERT, INTG, EDU.

Followed by FQT and BEVR factors with coefficient 0.068 and 0.057 respectively, this means more firms produce more working opportunity and thereby push economy growth. Additionally, the upgrade business environment supports sustainable economy. According to reports by World Bank, China's ranking of easy doing business has stood at the 31 in 2019. While FERT has negatively association to economy at less significant level, which is consistent with the result by Chen and Feng (2000). Lastly, there is no evidence of INTG promoting economy development.

Therefore, these results respond to the hypothesis. These deep economy factors are not impacted by SARS and financial crisis, and China's economy structure is unchanged and China's economy remain sustainable because of these sustainable deep economic determinants. The investment increase in both table 2 and 3 means that this short run brunt on economy can be recovered by some stimulative policies, and China's economy is going to grow in a sustainable rate. As such, it is predictable that the effect of COVID-19 on China's economy should be short-term.

In addition, China has successful experiences of conquering SARS in 2003 and global financial crisis in 2008. The slowdown in the consumption sector should not attribute to the disasters, partially due to the fact that the Chinese economy is shifting from high- speed development to quality growth after these disasters. Thus, the Chinese government takes each significant opportunity to upgrade its economy.This point of view is in line with Haan (2010).

6 Conclusions

Based on the analysis above, China's economy structure is unlikely impacted by SARS epidemic in 2003 and global financial crisis in 2008. China's economy structure is unchanged after the hits, because the deep economy determinants and GDP remain upward. Meanwhile, it suggests that human capital including labor quantity and education is currently the most significant determinants for China's economy sustainability, followed by the upgrading business environment. Firm quantity and national current account have also contribution to national economy sustainability, but there is no evidence for economy integration accounting for GDP growth. All these steady-going variables are unlikely to be changed with short period. Therefore, china's economy sustainability is ongoing.

In conclusion, COVID-19 has led to China's economy slowdown in the short run, it is important to evaluate its potential impact in the long run. Although it is hard to do it due to lack of long-term macro-economic data after COVID-19, evidence from SARS and financial crisis may have certain reference value for us to well estimate COVID-19 potential impact on China's economy in the future. With the Chinese government's measurements protecting China's economy from impact, China's economy sustainability is ongoing because its economy structure is unchanged. Both SARS and global crisis have no essential impact on its economic deep determinants, such as high-quality human capital, business environment, and firm quantity, which are impossible to be changed dramatically due to the government's policy responses. These findings are expected to facilitate decision makers, such as governors and investors, to estimate the potential impact of COVID-19 on China's economy development. Meanwhile, China's successful experience of overcoming SARS and financial crisis has also reference value to other countries.

Research limitation: Due to time-series limitation, there are no sufficient observations for the regression model 2, to test the research question prior/post SARS in 2003, and prior/post financial crisis in 2008. Further research is expected to bridge this gap in the future.

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