MODELLING THE POTENTIAL IMPACTS OF FINANCIAL LIBERALIZATION IN CHINA

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China has experienced exceptional economic growth in the past three decades driven by policy reforms and economic liberalization. However, reforms in financial sectors have been lagging behind real sectors and there are still extensive regulations repressing the financial system. This paper reviews the theories of financial development and economic growth, and examines the facts and consequences of financial repressive policies undertaken in China. Then several simulations are performed to project the potential impacts of financial market liberalization reforms. The simulations found China could remarkably increase its national output and capital accumulation due to such reforms, and most regions in the world would benefit as well. However, financial liberalization should be undertaken prudently together with risk management to mitigate possibly disruptive short-run fluctuations in the Chinese economy.

I. Introduction

China has experienced exceptional economic growth in the past three decades driven by massive policy reforms and economic liberalization. However, liberalization in China's financial sectors has lagged the pace of change compared to real sectors such as manufacturing, construction, and technology. Despite rapidly growing demands for financial services, the financial system remains highly restricted. Restrictive financial policies are usually justified to maintain stability of the economy. However, such policies inhibit the proper functioning of the markets, which inevitably causes inefficiency and resource mismatches. To show the importance and urgency of financial reforms, it is necessary to review the theories of financial development and economic growth, and examine China's prevailing economic conditions.

Economists' have different views on the importance of financial systems to economic growth. Classical school economists, though agree on the functions of the financial system to facilitate transactions, generally do not adopt the idea that the financial system plays a key role to economic success, since economic growth essentially takes place in real sectors (for example, money is neutral). But, modern economists have increasingly unraveled the importance of the financial system for economic growth (Boyd and Prescott, 1986; Levine, 1991; Bekaert and Harvey, 2001). To briefly summarize, financial markets and intermediaries

have been identified as functioning to mobilize savings, allocate resources, and reduce transaction and information costs, while facilitating liquidity, ameliorating risk, and exerting corporate controls. While a well-functioning financial system could allocate resources efficiently and promotes capital accumulation and potentially technological innovation, a mal-functioning financial system undermines these channels and hinders economic growth.

However, most developing countries tends to place restrictions on their financial systems, such as imposing tariffs to protect infant industries, and artificially lowering interest rates to provide cheap capital to nascent enterprises. China is a good example of such restrictive policies: state-owned banking system used to channel the government's industrial policies, highly regulated capital accounts to mitigate fluctuations of the exchange rates caused by cross-border capital flows, and various industry entry barriers to unduly reduce competition. These policies could be helpful with maintaining the stability of the economy in countries with fragile financial systems. But as many researchers have pointed out, as developing economies mature, these repressive policies can be more prohibitive than productive. For example, state-owned banks and controlled interest rates have caused significant mismatches in resource allocation and imbalances in development among economic sectors. Industry entrance barriers stifle competition in some industries, resulting in inefficiency and inequality. Thus, the consensus in China is to further liberalize the financial system and with this improve efficiency of the economy.

To estimate the potential impacts of financial liberalization on China, several simulations are carried out using the GTAP general equilibrium model of the global economy. In the model, policy reforms are modelled as "shocks". We simulate three scenarios in this paper: a reduction in required rate of return on capital, an increase in productivity of financial services, and an increase in productivity of capital. This scenario conjectures that productivity improvements in the use of capital are possible for those sectors dominated by state-owned enterprises. The simulations project a remarkable increase in China's real GDP – almost 5% and an even larger increase in the total capital accumulation – nearly 12%. Other countries, such as Australia and the United States, are projected to benefit from China's reform as well.

China is now in a critical transition from a middle-income to a higher-income economy. To sustain growth and improve efficiency, it is essential for the government to further financial reform and liberalization. But to push forward such reform also poses challenges to Chinese policy makers – to push forward financial liberalization while managing to control the potential risk that might be induced by such policies. Therefore, it is suggested in this paper that financial liberalization be undertaken together with proper risk management. The remainder of this paper is organized o address these issues in more depth. Section II reviews the theories of financial development and economic growth. Section III examines the

financial repression situations in China and points out the necessity of financial liberalization. Section IV uses GTAP model to simulate the potential impact of financial liberalization in China. Section V addresses some policy concerns, alerts the potential risks and concludes the essay.

II. Finance and Economic Growth

The relationship of financial development and economic growth has been intensively studied by economists in the past few decades. Financial markets and intermediaries have been identified helping to mobilize savings and allocate resources to productive usage, improving access to capital and lowering transaction and information cost, facilitating market liquidity and risk management, which all promotes capital accumulation and speed up productivity improvements. Though there are economists against the over-stress of the role of finance in economic development (Lucas, 1998) and some address the instability and fragility of immature financial systems (Stiglitz, 2000), the basic arguments for financial development and economic growth widely accepted.

The function of financial intermediaries to reduce transaction costs was uncovered back in Adam Smith's time. Smith conceived the idea that money was preferred over barter because the use of money would reduce transaction costs, while a reduction of transaction costs would encourage a greater scale of specialization because specialization requires more transactions than autarkic-style production, and finally productivity would be promoted with more specialized labor.

Widespread financial institutions, including but not limited to monetary institutions, all help to reduce transaction costs some ways or other. For example, banking systems reduce the transaction costs of cross-region payments. Without proper financial intermediation, cross-industry or cross-region transactions would be prohibitively costly, which would impede greater specialization and stifle productivity growth.

Joseph Schumpeter expounded the role of financial intermediaries to economic development in his book *The theory of economic development* (Schumpeter, 1961). Schumpeter viewed economic development, in a capitalism economy, as the process of continuously adopting newly created kinds of goods and new combinations of means of production. Innovative entrepreneurs play a central role in this process, and so do bankers and other financiers. Bankers facilitate entrepreneurs' innovation activity by issuing credit to them. In this process, bankers are not simply playing an intermediation role, but they are as creative as entrepreneurs, for they bid for higher returns on capital and strive to find out the most productive businesses. Bankers are themselves a kind of innovative entrepreneurs, for they innovate to channel the resources of a society to the most productive use. Thus, the development of financial systems facilitates efficient investment

and promotes technological innovation. The function is not limited to banks, other financial intermediaries as well as financial markets also support economic development in either direct or indirect ways.

Modern researchers have developed more comprehensive theories on how financial system facilitates economic growth. Boyd and Prescott (1986) addressed that the cost of information acquisition necessitates the emergence of financial intermediaries. The reasoning is, without proper financial intermediaries, everyone has to pay the cost of acquiring information about investment opportunities. The emergence of financial intermediaries economize the information acquisition process and improve the efficiency of resource allocation. This view augments Schumpeter's financial innovation argument with both putting an emphasis on the information discovery role of financial system, that is discovering the most promising firms and managers and channeling capital to the most productive use.

Multiple researchers, Diamond and Dybvig (1983), Levine (1991), Bencivenga and Smith (1991) addressed the liquidity facilitating role of financial institutions in promoting economic growth. The connection between liquidity and economic growth is due to the tension between the long-run commitment of capital required by some investment and the reluctance of savers to relinquish their capital for a long time. For instance, if each saver were to invest on their own, they would have to make long-run investment very cautiously and have to at least reserve a proportion of their savings in liquid form. With well-functioned financial markets and intermediaries facilitating liquidity, more capital can be directed to long-run investment than it would have been otherwise. For example, in liquid stock markets where shareholders can readily sell their shares, investors would be more likely to invest in firms' equity for not being worried about reclaiming their purchasing power when they need it. Banks that offer demand deposits to their savers could hold mixed-term portfolios which meet the savers' demand for liquidity on the one hand, and optimally invest in long-run projects on the other. In this way, financial institutions that facilitate liquidity promote long-run investment in an economy and therefore contribute to long-run economic growth.

Financial systems are also well-known for their function of mobilizing savings, that is pooling capital from disparate savers for investment. By effectively pooling capital, financial systems not only facilitate large investment and capital accumulation, but also promote the use of costly technologies which could potentially raise economic growth (McKinnon, 1973).

While free trade in goods across border is well known to promote global labour specialization and raise economic development, free flow of capital optimizes capital allocation in a global scale. As Bekaert and Harvey (2001) and Henry (2000) showed in their research, capital account liberalization has a significant impact on the reduction of the cost of capital, closing the wedge between external and

internal capital, and thereby inducing more investment. A freely opened capital account has also been identified to promote domestic financial development (Love, 2003), for it promotes competition among financial institutions. An opened capital account also imposes "discipline" and forces good economic policies domestically, to avoid capital flight and attract foreign investment. However, it must also be noted that, free flow of capital is not without defects. As Stiglitz (2000) pointed out, freely opened capital account "exposes countries to vicissitudes associated with changes in economic circumstances outside the country". It could be detrimental especially to countries with a fragile financial system, because pro-cyclical capital flows would exacerbate economic fluctuations.

Despite the multiple benefits of an efficient financial system to economic growth, restrictions on financial system functioning are commonplace in developing economics including through interest rate controls, capital flow controls, and government designating investments. While the merits of these restrictions are questionable, the hindrance they place on the well-functioning of capital markets is certain. As McKinnon (1973) pointed out, the fragmentation in the capital market as the result of repressive financial policies "causes the misuse of labor and land, suppresses entrepreneurial development, and condemns important sectors of the economy to inferior technologies". The specific example of China in this concern is discussed in detail in the following section.

III. Financial Repression in China

A. Overall financial development

It is not easy to measure the overall financial development of a country, given the complexity of financial system. Traditional measures make use of ratios like total credit to GDP, or stock market capitalization to GDP. However, these measures only address certain aspects of a financial system, and inevitably overlook other dimensions. To help fill this gap, an IMF working paper, constructed a comprehensive index for financial system development worldwide, which sheds light on the relative financial development of China compared to other countries in the world (Svirydzenka, 2016) .

The index is constructed using 33 years of annual data between 1980 and 2013 for 183 countries worldwide by measuring three dimensions – depth, access and efficiency – of both financial institutions and financial markets.

Figure 1 shows the Financial Development Index together with two sub-indices – Financial Institution Index and Financial Market Index for a selected list of countries. China scores 0.572 for overall financial development, which is approximately equivalent to only 65% of the financial development level of Australia or the United States. China not only falls behind developed countries, but even

behind other developing countries such as Malaysia and Thailand. Figure 1 also shows that China's financial market development scores higher than its financial institutions, which is a reflection of China's sluggish financial institution reform relative to its financial market reform.

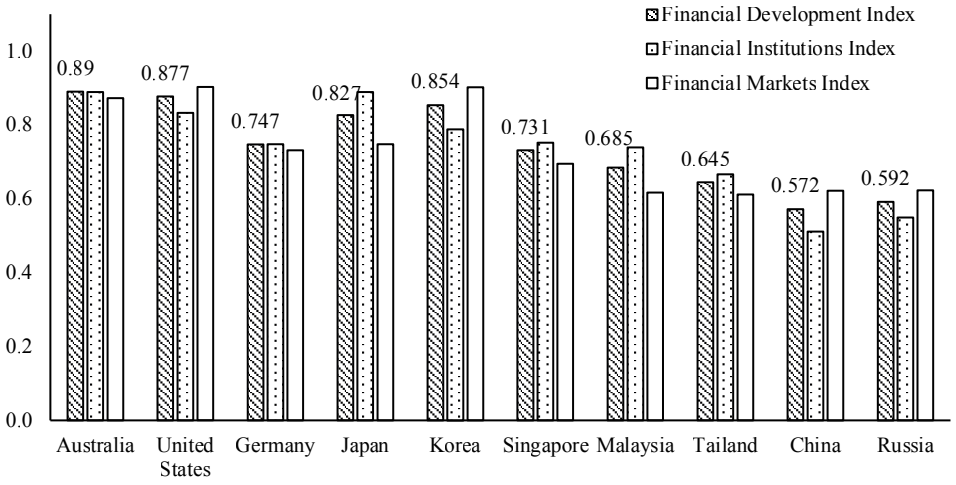
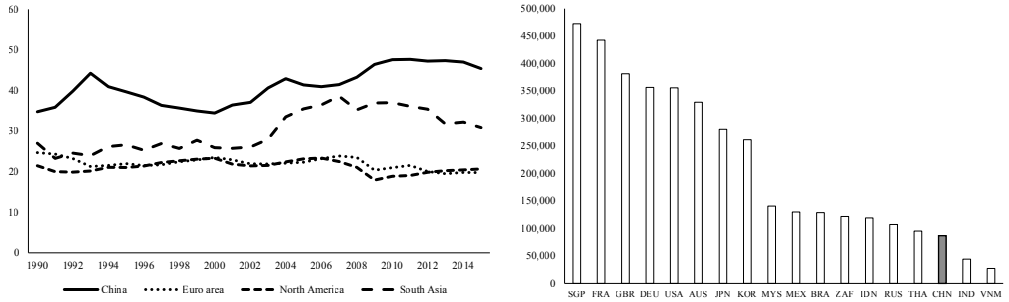


Figure 1. Financial Development Index for Selected Countries

Source: Based on *2013 Country Rankings on Financial Development* by Svirydzenka (2016).



(a) Gross capital formation (% of GDP) (b) Capital stock per worker (2014)

Figure 2. Investment and Capital per Worker

Note: Capital values are converted using purchasing power parity, and shown in 2011 US$.
Source: The World Bank, Penn World Table Version 8.0.

During the past decades, China has been heavily relying on government-led investment and infrastructure building. As shown in Figure 2a, China has a higher investment to GDP ratio than other regions, but the ratio has been declining in

recent years. The combined financial market restrictions and high investment has resulted in large amount of inefficient investment in government favoring sectors, while many private enterprises and especially small businesses have been suffering from insufficient funding. To further increase overall capital per worker in competitive actives and improve productive efficiency, China needs to transform its policy-oriented investment strategy to a profit-oriented one. This would require further financial reform and liberalization in the economy to achieve more efficient allocation of resources.

B. Repressive financial institutions

To drill down into the financial repression status in China, this section takes a close look at China's domestic banking system, because banks almost dominate the financial system in China.

The state-owned banks are arguably the most entrenched and criticized segment of China's banking system. The state controls almost 70% of all the assets through state-owned commercial banks and policy banks (Table 1).

Table 1. China's Banking Institutions (2009)

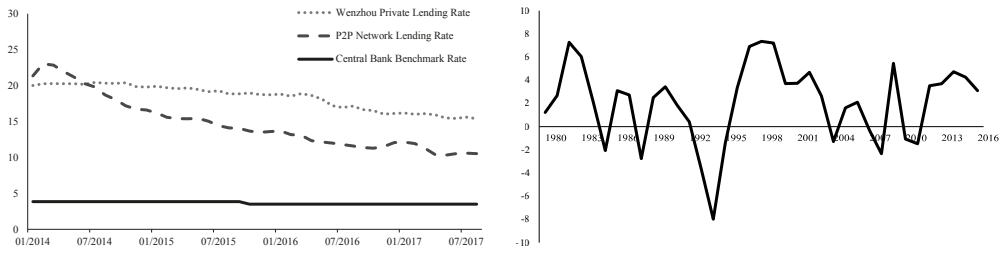
			Asset (RMB trillion)	
	Number	Share (%)	Amount	Share (%)
Policy banks	3	0.05	6.95	8.63
State-owned commercial banks	4	0.07	39.04	48.47
Joint-stock commercial banks, State as largest shareholder	11	0.20	12.59	15.63
Others	2	0.04	2.01	2.50
Other banks				
City commercial banks and credit unions	158	2.80	5.71	7.09
Rural commercial banks and credit unions	5241	93.02	8.64	10.73
Postal savings bank	1	0.02	2.70	3.35
Foreign banks	32	0.57	1.35	1.68
Non-bank institutions	182	3.23	1.55	1.92
Total	5634	100.00	80.53	100.00

Source: Data from Deng et al. (2011).

For decades, China's government has taken advantage of the state-owned banking segment to channel financial resources to its preferred sectors. With the central bank (PBoC) controlling interest rates (until 2015), the state-owned banks can acquire savings at an artificial low cost on the one hand, and lend the capital cheaply to government designated projects on the other. Instead of being a competitive industry seeking best return on investment, the banking system in China

is more like a proxy for the government's industry policies. The major beneficiaries of such policies are the state-owned enterprises (SOE), which receive nearly 60% of all the loans. Loans to private enterprises only account for 30%, and foreign enterprises for the remaining 10%.

The result is the excess investment in SOEs, often in low quality investments, on the one hand, and the inadequate funding and higher cost of capital for private enterprises on the other. Private enterprises, especially small ones, that cannot obtain loans from formal commercial banks, go to local private lending companies, where a much higher interest rate is charged than available from formal banks. This results in a fragmentation of interest rates as shown in Figure 3a. While the official benchmark interest rate stays as low as 4%, the private lending rate has never been below 15%. The P2P network lending rate has declined significantly, but is still above 10%. As a comparison, the P2P network lending rate of major platforms in the United States is only 6%. In addition, the inflexible official rate often results in negative real interest rate (Figure 3b), which impairs the interest of savers.



(a) Various interest rates (b) Real interest rate

Figure 3. Fragmentation of Interest Rates

Note: Wenzhou private lending rate is based on the Wenzhou composite lending rate index, which is the private lending rate in Wenzhou and is published officially by the government of Wenzhou. P2P network lending rate is the average lending rate of online P2P platforms. China's central bank directly controls commercial banks' lending rate, which is shown as the benchmark rate.
Source: CEIC, People's Bank of China, The World Bank.

The fragmentation of interest rates, and especially the high lending interest rate for small enterprises, is hindering the development of small businesses, while the artificially lowered formal rate channels more resources to SOEs and results in excess capital investment and low efficiency in industries dominated by SOEs. Figure 4 calculates the average return on asset (ROA) of 10 major sectors listed on China's stock market and shows the imbalance of returns among them. Sectors that are dominated by SOEs such as energy, materials, industries, telecom, financials, and utilities generally average to much lower returns; and the returns have experienced sharp decline over the last decade. While the sectors mainly dominated by private enterprises such as consumer goods and technology providing

much higher and relatively stable returns over time are in evidence.

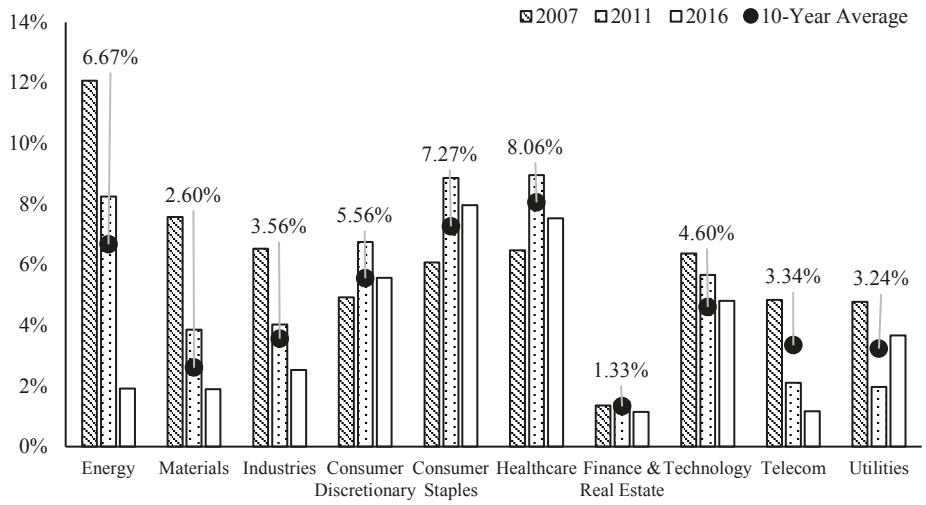


FIGURE 4. RETURN ON ASSET BY SECTORS

Note: The values reported here are calculated from the data of the companies listed on the stock market. The number of companies consisted in each sector are also meaningful, and are thus reported here: energy (84), materials (537), industries (810), consumer discretionary (534), consumer staples (211), health care (226), finance and real estate (224), technology (464), telecom (94), and utilities (96).
Source: Constructed by the author, based on data from *lixinger.com*.

The repressive financial policies not only result in imbalances between industries, but also generate tremendous inequalities in the society. The market access control that has been practiced for many years by China's government and that grants only "qualified investors" the permission to access alternative investment instruments, was originally proposed to protect investors, but it also has the tendency to make rich people even richer, but poor people even poorer because only affluent people have access to those often high-risk but also high-return investments. The limited licences designed to protect some industries stifle competition and condone monopolistic and excessive profits.

C. Capital account openness

China achieved fully convertible current account in 1996, accompanied by policies to liberalize the capital account as well. However, the capital account liberalization process was suspended due to the Asian Financial Crisis in 1997 and the Global Financial Crisis in 2008, and was not resumed until recently.

China has been remarkably successful in attracting foreign direct investment (FDI) in the past two decades, and corresponding policy reforms has taken place

to open the related channels. However, cross-border portfolio investment is still high restricted. Restrictions include limited licensing, quota management for capital flow, limited access to financial instruments. Chen and Qian (2015) indexed China's capital account controls and its reduction progress as shown in Figure 5.

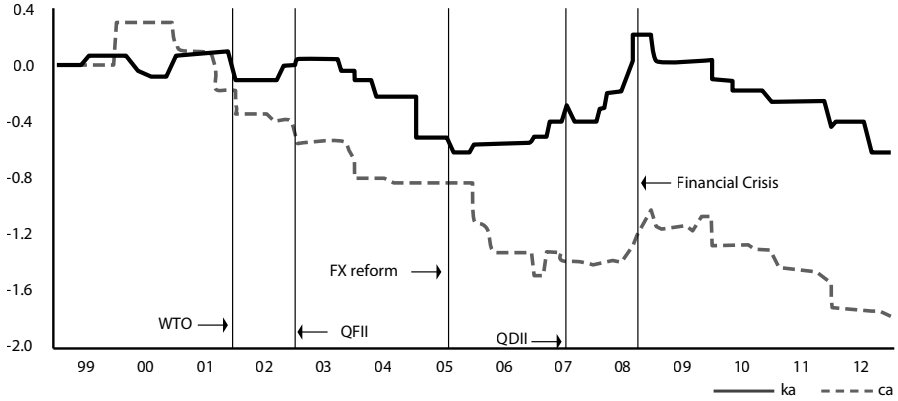


Figure 5. Index of Controls on China's Capital Account and Current Account

Note: 'ka' stands for capital account, and 'ca' for current account. QFII refers to Qualified Foreign Institutional Investor program launched in 2002, and QDII refers to Qualified Domestic Institutional Investor program launched in 2007.
Source: Chen and Qian (2015).

China started the Qualified Foreign Institutional Investor (QFII) program in 2002, which opened the channels for foreign institutional investors to access China's domestic capital market, however the access quota was extremely limited. In 2007, the counterpart of QFII – the Qualified Domestic Institutional Investor (QDII) program was launched for a selective domestic institutional investors to allow them investing in foreign equity or bond markets. All cross-border portfolio investment has been regulated under QFII and QDII programs until the establish of Shanghai-Hong Kong Stock Connect in 2014, which opened another channel for foreign investors to access domestic stock market via Hong Kong Stock Exchange. The connect was furthered by Shenzhen-Hong Kong Stock Connect in late 2016. In 2016, China's central bank PBoC made a broad move to open the domestic inter-bank bond market to foreign investors. Besides, China initiated to experiment free capital account in Shanghai Free-Trade Zone in 2015.

A cross-country comparison of capital account openness is illustrated by the KAOPEN index proposed by Chinn and Ito (2008). The index codifies the capital account restrictions documented by IMFs *Annual Report on Exchange Arrangements and Exchange Restrictions* (which monitors restrictions for approximately 40 transactions under capital account). The indices measured in 2015 for a selected list of countries are shown in Figure 6. The index indicates that China's

financial openness is much lower than developed countries and even some developing countries in Asia. Figure 6 also shows the gross asset plus liability to GDP ratio for each country as a *de facto* measure of financial openness. The ratio indicates the financial openness in China may actually be better than what the KAOPEN index shows. But it is still far behind compared to high-income countries.

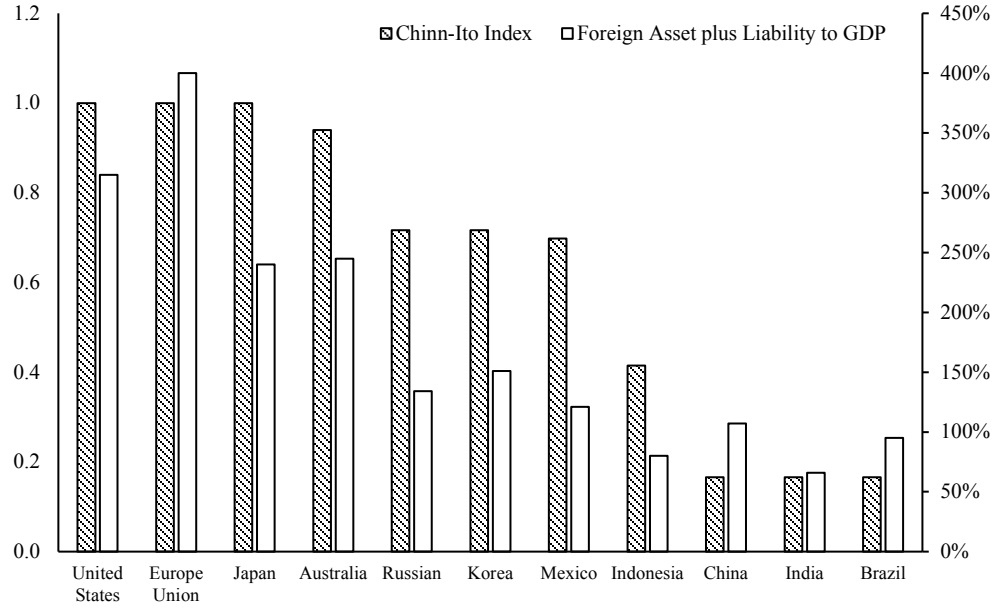


FIGURE 6. CHINN-ITO INDEX FOR SELECTED COUNTRIES

Note: The primary axix is the Chinn-Ito financial openness index for 2015; the secondary axis shows foreign asset plus liability to GDP ratio for 2013. The foreign asset plus liability to GDP ratio combines the scales of both assets and liabilities. The ratio of each individual country is therefore contributed by both inward and outward investment.
Source: Chinn-Ito website, IMF, CICC Research.

Despite various liberalization reforms has been taken, China's capital account is still under relatively heavy regulations compared with its current account. There are quota management for almost all the available channels. There is still a long way to go to achieve fully convertible capital account.

D. Productive or prohibitive

The controversy regarding financial liberalization and economic growth discussed in Section II extends to the financial policy issues in China as well. It would be improper to say the various financial regulations undertaken by the Chinese

government have made no positive impact at all. For example, the regulations on capital account protected the unfledged financial sector and prevented China from being adversely affected by the Asian Financial Crises as other South Asian countries. But as the domestic financial institutions becoming mature, the negative effects of restrictive policies are predominating.

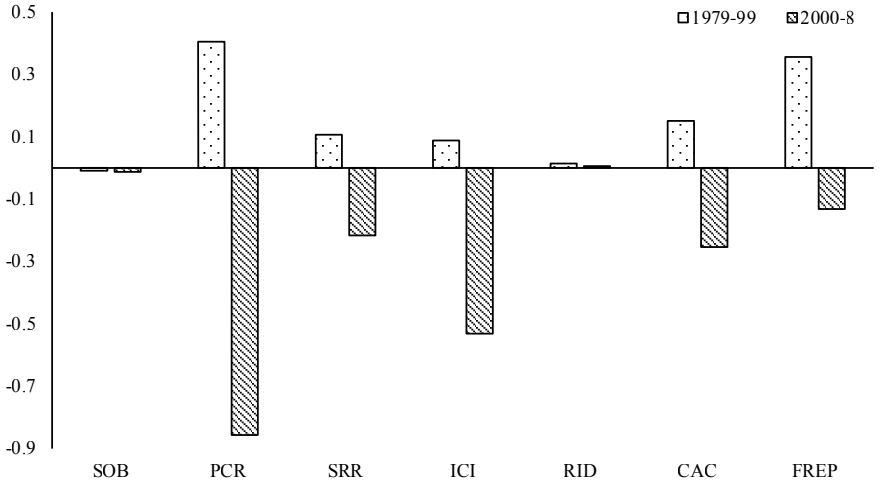


Figure 7. Financial Repressive Policies and Economic Growth

Note: This figure shows the coefficients estimated by Huang and Wang (2011) of the effects of each repressive policy on economic growth. These repressive policies are state-owned banks in total bank loans (SOB), the share of the state sector in total outstanding loans (PCR), reserve requirement ratio (SRR), interest rate control (ICI), real deposit rate (RID) and capital account control (CAC). FREP is the overall financial repression index that constructed from the above six variables. Among the result, the coefficients of SOB and CAC for 1979-99, SOB and RID for 2000-8 are statistically insignificant; other coefficients are significant for at least 5% significance level.
Source: Based on estimations by Huang and Wang (2011).

This is illustrated by Huang and Wang (2011) who estimates the effects of various repressive financial policies undertaken in China – deposit and interest rate control, capital account control, reserve requirement ratio control and state-owned banks – on economic growth (Figure 7). Their findings suggest that the repressive policies exerted positive effects on economic growth in the early phase of development, but these positive effects mostly turned negative after 2000s. For example, they found interest rate controls initially prevented competition among banks and enhanced financial stability, but the negative effects such as reducing efficiency and hindering price discovery gradually dominated the benefits. Capital account restrictions that once protected the economy from international financial storms subsequently turned into the main obstacle for domestic investors accessing international capital markets to optimize their investment returns.

China is now in a critical moment of its economic reform as the economy's growth

is slowing after three decades of rapid expansion. It is also a critical time to rethink the past financial policies, as old policies may appear no longer suitable to tackle current problems. Though restrictive policies secured economic stability in the past, financial liberalization is becoming more relevant to improve efficiency and open new investment opportunities. Efficient financial intuitions and markets will help ensure the quality of future investment, and facilitate the transformation from the current middle-income to a higher-income economy.

IV. Modelling Financial Reform

To project the potential impact of financial reform, we use a general equilibrium model to simulate the financial reform scenarios. The general equilibrium model used in this paper is based on the Global Trade Analysis Project (GTAP, 2016), which is multi-region and multi-sector modelling project that has been widely used in global trade analysis. The latest version of GTAP database is Version 9a, which contains micro- and macro-economic data for 2004, 2007, 2011. In this paper, 2011 is taken as the reference year because it incorporates the economic adjustment after the GFC, although data for that year is influenced by the terms of trade boom in mining products such as iron ore and coal.

In terms of the general assumptions in GTAP, the model assumes regional households maximizing their Cobb-Douglas utility functions, and regional firms minimizing their cost subject to constant returns to scale. Regional households are also assumed to have constant average propensity to save. In terms of global capital allocation, the model assumes that all savings are pooled into a "global bank" which "allocates international capital flows in response to changes in regional rates of return" (GTAP, 2016). Besides, agricultural land, natural resources and labour endowment are assumed fixed in the model, while labour and capital are mobile across regional industries. The structure of the key elements of the GTAP model are briefly described in Figure 8 and Figure 9.

The GTAP model used in this paper takes a comparative-static approach, where policy changes or productivity improvements are modelled as "shocks". The model takes a long-run perspective. Results are generated by comparing the economy before and after shocks, assuming full adjustment in the global economy. Under the long-run assumption, capital stocks are assumed to adjust to maintain the required rate of return on capital fixed. The comparative-static model does not report any adjustment path after the shocks.

For the purpose of this paper, all countries in the database are classified into five regions compring countries or country groups – China (CHN), Australia (AUS), the United States (USA), European countries (EU), and the rest of the world (ROW). Industries are classified into 13 sectors. The aggregation details can be found in Appendix A.

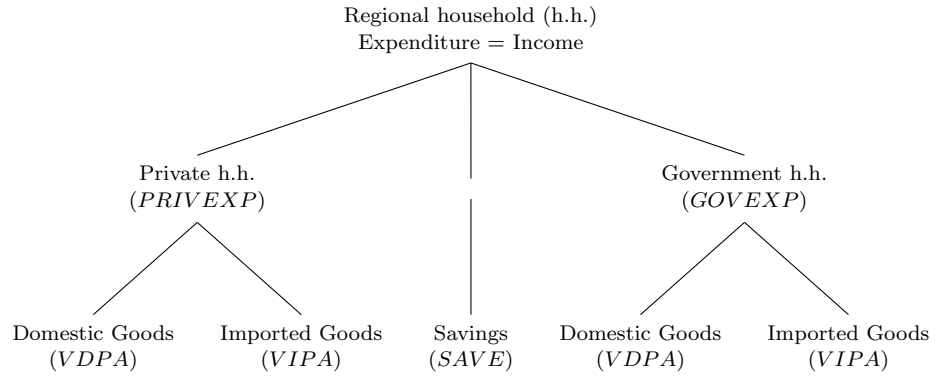


FIGURE 8. REGIONAL EXPENDITURE AND INCOME

Source: The GTAP Modeling Framework, GTAP (2016)

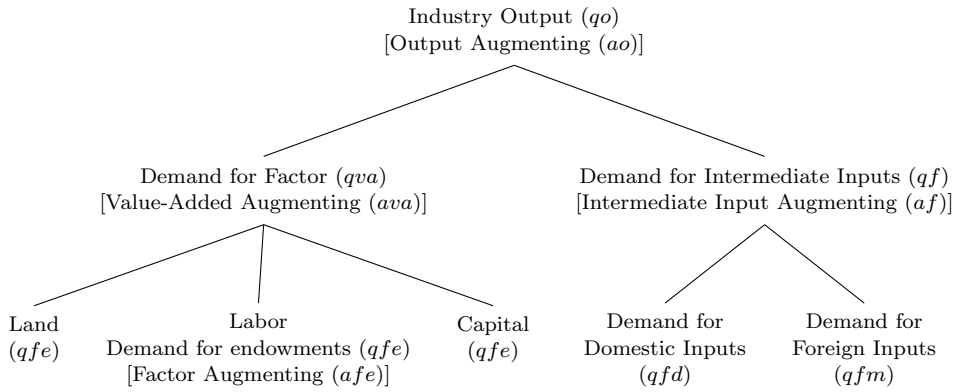


FIGURE 9. FIRMS PRODUCTION STRUCTURE

Source: The GTAP Modeling Framework, GTAP (2016)

For the model being theoretical based, it is impossible to model every policy reform in real world directly. Instead several shocks to the model variables are simulated as proxies for the impacts of policy reforms. The shocks being simulated in this paper are: an increase in productivity of financial services, an increase in productivity of capital, and a reduction in required rate of return on capital.

A. Simulation of an increase in productivity of finance service

As discussed in Section II, financial reforms that reduce restrictions on the financial system could improve the productivity of financial services. The productivity improvement of the financial sector is simulated by an incremental shock to the value-added augmenting technology and the intermediate input augmenting tech-

nology of financial service providers.

In the language of GTAP, the shock is done by

(1) **Shock** $avaall(\text{“}Fin\text{”}, \text{“CHN”})$ = **uniform** 1.0[1]

(2) **Shock** $afall(trad\_comm, \text{“}Fin\text{”}, \text{“CHN”})$ = **uniform** 1.0[2]

Table 2 summarizes the simulation results for three key variables: real GDP, capital accumulation and trade balance to national income ratio.

TABLE 2. SIMULATION RESULT OF AN INCREASE IN PRODUCTIVITY OF FINANCE SERVICE IN CHINA

	Read GDP *% change*	Capital accumulation *% change*	Trade balance to income ratio
CHN	4.392	11.130	0.018
AUS	0.132	0.256	-0.003
USA	0.022	0.053	-0.002
EU	0.000	0.015	-0.002
ROW	0.033	0.041	-0.002

Note: Modelled as a uniform 1% increase in value-added augmenting technology and a uniform 1% increase in intermediate input augmenting technology in the financial sector. The model is solved using Gragg's method; the accuracy requirement is set to that at least 99% of the variables are accurate to at least 4 figures. The extrapolation accuracy shows that we can be confident for 6 figure accuracy for most variables.
Source: Author estimated.

China is projected to increase its real GDP by 4.4%, Australia by 0.13%, USA by 0.02%, while the impact of European countries as a whole is very small. Capital accumulation in China is projected to increase by 11.1%. Because a productivity improvement in financial services lowers the cost of financial resources of other industries, increasing industry competitiveness and demand for both labour and

[1] The variable $avaall(j,r)$ is the value-added augmenting technical change in sector j of region r. While the variable $ava(j,r)$ illustrated in Figure 9 stands for the average rate of value-added augmenting technical change in sector j of region r. The relationship between $avaall(j,r)$ and $ava(j,r)$ is given by:

$$ava(j,r) = avasec(j) + avareg(r) + avaall(j,r)$$

where $avasec(j)$ is the value-added technical change of sector j worldwide, $avareg(r)$ is the overall value-added technical change in region r. The parameter "Fin" represents the financial sector and "CHN" is the country code for China.

[2] The variable $afall(i,j,r)$ stands for intermediate input i augmenting technical change by sector j in region r. The relationship between $afall(i,j,r)$ and $af(i,j,r)$ in Figure 9 is defined in a similar way:

$$af(i,j,r) = afcom(i) + afsec(j) + afreg(r) + afall(i,j,r)$$

where $afcom(i)$ and $afsec(j)$ are the worldwide intermediate technical change of input i and of sector j respectively, $afreg(r)$ is a regional shifter. $trad\_comm$ stands for all traded commodities.

capital. Higher demand for capital raises investment above the level that would otherwise prevail. The model also projects an increase in trade balance to national income ratio for China, because improved competitiveness of the industries raises the volume of net exports.

B. Simulation of an increase in productivity of capital

A well-functioning financial system allocates capital to the most productive and profitable firms. Therefore, financial reforms that remove restrictions on financial system could, all else being equal, improve the productivity of capital in the Chinese economy.

The simulation is done by shocking capital augmenting technological change for all sectors in China by a uniform 1.0% increment.

(3) **Shock** $afeall(\text{“}Capital\text{”}, prod\_comm, \text{“CHN”}) = \textbf{uniform}\ 1.0$[3]

The simulation result is shown in Table 3.

Table 3. Simulation Result of an Increase in Productivity of Capital in China

	Read GDP *% change*	Capital accumulation *% change*	Trade balance to income ratio
CHN	4.807	11.624	0.018
AUS	0.142	0.279	-0.003
USA	0.021	0.048	-0.002
EU	-0.005	0.005	-0.002
ROW	0.030	0.036	-0.002

Note: Modelled as a uniform 1% increase in capital augmenting technology for all sectors. The model is solved using Gragg's method; the accuracy requirement is set to that at least 99% of the variables are accurate to at least 4 figures. The extrapolation accuracy shows that we can be confident for 6 figure accuracy for most variables.
Source: Author estimated.

The projected impacts of an overall improvement in the productivity of capital in China are similar to the result in Table 2 but the magnitude is even larger.

[3] The variable $afeall(i,j,r)$ is the factor i augmenting technical change in sector j in region r. The relationship between $afeall(i,j,r)$ and $afe(i,j,r)$ in Figure 9 is defined as:

$$afe(i,j,r) = afecom(i) + afesec(j) + afereg(r) + afeall(i,j,r)$$

where $afecom(i)$ and $afesec(j)$ represent the worldwide technical change for input i and sector j respectively, $afereg(r)$ is a regional shifter. $prod\_comm$ stands for all traded commodities plus all capital goods.

China's real GDP is projected to increase by 4.8% and overall capital accumulation to increase by 11.6%. Australia is also projected to have a larger increase in its real GDP (0.14%) and capital accumulation (0.28%). The impacts for all listed five countries and regions are overall positive except for Europe which is projected to have a slight decline in its real GDP (0.005%) as its export competitiveness declines relative to that of China.

C. Simulation of a reduction in required rate of return on capital

As discussed in Section II and Section III, various restrictions on financial system raise the overall cost of capital in the economy and the overall required rate of return on capital. Financial liberalization would potentially improve the efficiency of financial system in channelling funds to the most productive uses, lowering risk and reducing the required return on capital relative to other economies. This would induce more domestic investment from both local and oversea sourced funds, and boost economic growth in the long-run.

The simulation applies a 10% reduction to the required rate of return on capital in China.

$$\textbf{Shock } f\_rorc(\text{“CHN”}) = -10.0 \tag{4}$$

The simulation result is shown in Table 4.

The real GDP are projected to increase for all five regions, with China as the largest beneficiary – 4.1% increase in real GDP, and Australia the second – 0.13% increase in real GDP. The simulation also projects a 10.8% increase in capital accumulation in China, in line with the classical theory. As to the trade balance, China is projected to have a larger trade surplus due to an increase in output induced by a reduction in required rate of return on capital.

Compared with a similar simulation by Gretton (2015) using 2004 data, which projected a 5.7% increase in real GDP for China, and a 0.06% increase in real GDP for Australia, the result in Table 4 shows a smaller magnitude of projected increase in real GDP for China, but a doubled magnitude for Australia. The difference mainly arises from the difference in the reference years used in the simulations. During the years from 2004 to 2011, several financial reforms were undertaken in China (Section III) and the footprint of China in the global economy

[4] In the GTAP model used in this paper, the modelling of the rate of return on capital is modified to incorporated regional risk premium.

$$rorc(r) = rorc\_r + f\_rorc(r)$$

where $rorc(r)$ stands for the percentage change of the required rate of return on capital in region r, $rorc\_r$ is the percentage change in the world average rate, and $f\_rorc(r)$ is the regional shifter (risk premium) for region r.

Table 4. Simulation Result of a Reduction in Required Rate of Return on Capital in China

	Read GDP *% change*	Capital accumulation *% change*	Trade balance to income ratio
CHN	4.088	10.824	0.018
AUS	0.127	0.245	-0.003
USA	0.023	0.056	-0.002
EU	0.003	0.022	-0.002
ROW	0.035	0.046	-0.002

Note: Modelled as a 10% reduction in overall required rate of capital in China. The model is solved using Gragg's method; the accuracy requirement is set to that at least 99% of the variables are accurate to at least 4 figures. The extrapolation accuracy shows that we can be confident for 6 figure accuracy for most variables.
Source: Author estimated.

increased. For terms of trade reasons, the potential impact of further liberalizing the financial system on the level of economic activity should be less in 2011 than 2004. The larger magnitude of GDP growth of Australia is even more notable. One conjecture for the reason would be Australia's export to China increased dramatically during the years. An increasing in investment in China induced by the reduction of required rate of return on capital would therefore have a larger effect for Australia in 2011 than 2004.

D. Simulation of overall impact

In the reality, the impacts of financial reforms are unlike to be singular, but usually manifold – a reduction in cost of capital, an increase in productivity of financial sectors, or an increase in productivity of financial service or capital inputs, usually take place at the same time. A simulation that takes into account all the three potential impacts described in Section IV.A-IV.C is reported in Table 5.

China is projected to increase its real GDP by 5.1% and capital accumulation by 11.9 percent. This total is not the simple aggregation of the individual shocks because the assumption that the policies do not change the supply of labour limits the expansion effect of improvements in the efficiency of financial markets and productivity in capital in production. Australia is projected to increase its real GDP by 0.15% and capital accumulation by 0.29%. The impacts for the USA is less prominent, with a slightly 0.02 increase in real GDP and 0.05 in capital accumulation. European countries as a whole are projected to have a decline in both real GDP level and capital accumulation as the competitiveness of China increases relative to those economies. China is also projected to gain a trade surplus against other four countries or regions, because the productivity shocks would potentially improve the competitiveness of all its industries and thus increase net exports.

Table 5. Simulation Result of Overall Impact

	Read GDP *% change*	Capital accumulation *% change*	Trade balance to income ratio
CHN	5.112	11.932	0.018
AUS	0.147	0.290	-0.003
USA	0.020	0.045	-0.002
EU	-0.008	-0.002	-0.002
ROW	0.028	0.031	-0.002

Note: Modelled by applying all shocks defined in eqs. (1) to (4). The model is solved using Gragg's method; the accuracy requirement is set to that at least 99% of the variables are accurate to at least 4 figures. The extrapolation accuracy shows that we can be confident for 6 figure accuracy for most variables.
Source: Author estimated.

An interesting finding is that the result projected by our GTAP general equilibrium model coincides with the result estimated by Huang and Wang's econometric model. According to Huang and Wang (2011), the financial repression index (FREP) for China is estimated to 0.6 in 2008, and the semi-elasticity of GDP per capita to FREP is estimated to be 0.085. If China were to fully liberalize its financial system – reducing the FREP to zero, the estimated GDP growth would be 5.1%, which is of the same magnitude as projected in this paper.

Further more, if China were to remove its restrictions interest rate, capital flows, and regulations favouring government designated projects, there would be redistributional effects of resources across different sectors in the economy. The sector imbalance described in Section III would be mitigated, and those repressed sectors would be expected to expand. The projected sector performance is shown in Table 6.

China is projected to have an increase in output levels for all sectors. It is worth noticing that the sectors that have been dominated by state-owned enterprises, such as manufacturing, utilities, transport, telecommunication and financial services are projected to increase more than others. This result is in line with the arguments posted in Section III that government designating resource allocation to state-owned enterprises reduces the efficiency and competitiveness of these sectors. Improved efficiency in these sectors is projected to lead to lower service prices and increases in demand for their outputs. Other sectors also benefit as financial liberalization improves their accessibility to financial resources and reduces the overall cost of capital. Australia is projected to benefit overall and especially in its mining, livestock and fishing sectors. While the US is expected a gain in its construction, grains and crops sectors. The overall impact on Europe is projected to be negative, because its textile and manufacturing sectors would face more competition from Chinese imports and its exporters would face more competition in global markets.

Table 6. Simulation Result of Sector Output in China (% Change)

	CHN	AUS	USA	EU	ROW
Grains & Crops	2.702	-0.011	0.554	0.238	0.243
Livestock & Fishing	3.124	0.716	0.127	0.205	0.093
Mining	4.188	0.717	0.328	0.692	0.502
Processed Food	2.934	-0.401	0.018	0.071	0.050
Textiles	5.619	-2.558	-0.976	-1.175	-1.413
Light Manufacturing	7.477	-1.111	-0.544	-0.773	-0.863
Heavy Manufacturing	7.477	-1.903	-0.493	-0.359	-0.813
Construction	2.734	0.980	0.783	0.813	0.760
Utilities	5.841	-0.277	-0.062	-0.117	-0.185
Transport & Communication	5.467	0.013	0.040	0.038	0.053
Financial Services	5.807	0.182	0.026	0.066	-0.003
Dwellings	6.307	0.392	0.075	-0.006	0.161
Other Services	3.215	0.192	0.040	0.022	0.132

Note: Modelled by applying all shocks defined in eqs. (1) to (4). The model is solved using Gragg's method; the accuracy requirement is set to that at least 99% of the variables are accurate to at least 4 figures. The extrapolation accuracy shows that we can be confident for 6 figure accuracy for most variables.
Source: Author estimated.

It must be noted that these simulated results are projected to be the long-run equilibrium states. The adjustment path of each shock is not simulated in this model, and in reality, it depends on the specific reform agenda and the pace of the economy to adapt to the specific policy change. As pointed out in Section II, financial liberalization could exacerbate fluctuations or instability in an economy, which are not projected by this model. Further discussions on short-run instability issues will be considered in the following section.

V. Policy Concerns

In awareness of the importance of a liberalized financial system for better allocating resources to facilitate economic growth, the Chinese government has committed to further financial reforms in its 13th Five-Year Plan. More specifically, the Chinese government pledged to "improve financial institutions and market systems, promote the healthy development of capital markets, improve monetary policy mechanisms, deepen reform of the financial regulatory system, and refine our modern financial systems, thereby improving the efficiency of the financial sector in serving the real economy as well as the financial sector s ability to support the transformation of Chinas economy"[5].

Undoubtedly, in recent years China has achieved remarkable progress liberaliz-

[5] 13th Five-Year Plan for Economic and Social Development, Chapter 16.

ing its financial system to freeing up bank deposits and lending interest rates (though the central bank still sets a reference rate), build up channels for cross-border portfolio investment through the Shanghai/Shenzhen-Hong Kong Stock Connects, open up the domestic bond market for foreign investors. But more reforms have yet to resolve the country's financial repression syndrome. Though banks can float their interest rate freely, the monopoly of state-owned banks still stand in the way of a fully efficient allocation of financial resources, and the fragmentation of interest rates around institutional and regulatory constraints rather than commercial considerations in the economy remains. Even though restrictions on foreign portfolio investment were loosened, it did not meet the ever growing demands of domestic investors to diversify their portfolios. The stock market has yet to grow out of its cradle and still only plays a subsidiary role in financing new businesses. Though a registration-based initial offering system for the stock market has been on the agenda for many years, the reform is help up and currently IPOs still require regulatory approval. Besides, the operating of pension funds is still in the nascent stages, and insurance industries are far from penetrating the economy to play a larger role in the management of risk from casualty events.

While there are always tensions between financial liberalization and stability, in China the tension is even notable in its current financial situations. As economic growth is slowing, lower domestic investment returns and growing demand for foreign investment opportunities are raising concerns of capital flight if the capital account is freed up. As Stiglitz (2000) points out, pro-cyclical capital flows tend to exacerbate short-run fluctuations and destabilize the economy. Many developing countries have faced balance of payment crises when they liberalize their capital account (for example, the Asian crisis in 1997). For China, the exceptional volatility of the 2016 RMB exchange rate shows that the economy is still vulnerable during downturns. Although the central bank holds over $3 trillion in foreign reserves, it would not counter massive capital transfers abroad ($3 trillion foreign reserves only accounts for 15% of total national deposits).

A more serious concern is raised on China's debt level – the total debt to GDP ratio is estimated in 2016 to be almost 250%, among which a large proportion is the lending to SOEs. When the economy is slowing, rising nonperforming assets (NPA) could erode banks' balance sheet and threaten a banking system collapse. The situation is even more severe if considering the fast growing shadow banking sector. The shadow banking services are provided by some financial intermediaries to circumvent the prudential regulations imposed on formal banks, adding more elements of risk into the financial system, with total assets estimated to approximately 65% of China's GDP. In the context of the fragile banking system, a liberalization process must be undertaken deliberately but with caution to avoid the breakout of systematic risks in the banking system that transfer to the broader economy.

Yet, the short-run concerns of fluctuations should not impede the long-run effort to liberalize the financial system to realize the potential economic gains indicated by the projections above. The question is how to gain the benefit of financial liberalization while limiting potential risks: it will require the intelligence and artistry of Chinese policy markers. As McKibbin (1999) suggested, instead of imposing restrictions and controls on the system, risk management is likely a better approach: "The alternative which is more likely to succeed is to allow reasonable mobility of financial capital but to improve the way in which domestic financial systems allocate capital within the economy. This includes improving systems of accountability, transparency in accounting systems, and monitoring the financial systems so a better evaluation of risk can be formulated". McKibbin's argument coincides with China's central bank governor's notion of macro-prudential regulations on foreign debts and cross-border transactions (Zhou, 2012).

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Appendix: Aggregation Schemes

Table A1. Regional Classification

Code	Countries
CHN	China
AUS	Australia
USA	United States of America
EU	Austria Belgium Cyprus Czech Republic Denmark Estonia Finland France Germany Greece Ireland Italy Latvia Lithuania Luxembourg Netherlands Poland Portugal Slovakia Spain Sweden Britain Bulgaria Croatia Romania Hungary Malta Slovenia
ROW	Other 108 countries in the world

Table A2. Industry Classification

Sector Code	Industries
Grains & Crops	Paddy rice, Wheat, Cereal grain, Vegetables, fruit, nuts, Oil seeds, Sugar cane, sugar beet, Plant-based fibers, Crops, Forestry
Livestock & Fishing	Cattle,sheep,goats,horses, Animal products, Raw milk,Wool, silk-worm cocoons,Fishing
Mining	Coal, Oil, Gas, Minerals
Processed food	Meat (cattle,sheep,goats,horse), Meat products,Dairy products, Vegetable oils and fats, Processed rice, Sugar, Food products, Beverages and tobacco products
Textiles	Textiles, Wearing apparel
Light Manufacturing	Leather products, Wood products, Paper products, publishing, Manufactures
Heavy Manufacturing	Petroleum, coal products, Chemical, rubber, plastic prods, Mineral products, Metals, Metal products, Motor vehicles and parts, Transport equipment, Electronic equipment, Ferrous metals, Machinery and equipment
Construction	Construction
Utilities	Electricity, Gas manufacture, distribution, Water
Transport & Communication	Trade, Transport, Sea transport, Air transport, Communication
Financial Services	Financial services, Insurance, Business services
Dwellings	Dwellings
Other Services	Recreation and other services, PubAdmin/Defence/Health/Educat

Appendix: CMF Code used in Simulations

```
!   SHOCK_ALL.CMF
!   ===============
!
!   Initial run for GTAP model:
!   *   define standard closure
!   *   perform price homogeneity test

auxiliary files = gtap_fin;

!  Solution method, accuracy
!  -------------------------
!  PC modelling set up
!  Using default method

Automatic accuracy = yes;
Accuracy percent = 99;
Subintervals = 4;

check-on-read all = no;
iz1 = yes;              ! Ignore zeros at step 1.
nds = yes;              ! Do no displays.
nrp = yes;              ! Don't reuse pivots.

!   base data
!   ---------

file gtapsets = GSETS.har;
file gtapparm = GPARAMS_std.har;
file gtapdata = GBASEDATA.har ; !2011 DB, Latest from GTAP

Identifier = gtap_fin.tab condensed using gtap_fin.sti ;

!   closure
!   -------

exogenous
    afall
    afcom
    afeall
    afecom
    afereg
    afesec
    afreg
    afsec
    ams
    aoall
    aoreg
    aosec
    atd
    atf
    atm
    ats
    au
    avaall
    avareg
    avasec
    cgdslack
    endwslack
    incomeslack
    profitslack
  ! regional saving equals investment by E_SAVEPRICE
    psaveslack
    tradslack
    pcgdswld
    dpgov
    dppriv
    dpsave
    pop
    qo(ENDW_COMM,REG)
    tm
    tms
    to
    tp
    tx
    txs
;

Rest Endogenous ;

!  Exogenous variables for new equations
!  -------------------------------------

Exogenous
    rorc_r;      ! E_rorc2; global shift on ror;

!  Numeraire
!  ---------
!  en=ex change numeraire from pcgdswld to pfactwld

Swap pcgdswld = pfactwld;

!  Closures
!  --------
!  Longer-run closure with national capital variable and rorc fixed.

Swap qo("capital",reg) = f_rorc(reg) ;  !en=ex


!   Policy scenerios
!   ----------------

!  Scenario 1
!  ----------
!  Policy induced change in required rate of return on capital

Shock f_rorc("CHN") =  -10.0;

!  Scenario 2
!  ----------
!  Technological change for the financial sector

! value added factor augmenting technological change to
! the finance industry

Shock avaall("FinBus","CHN")  = uniform 1.0 ;

! intermediate input augmenting technological change to
! the finance industry

Shock afall(trad_comm,"FinBus","CHN") = uniform 1.0 ;

!  Scenario 3
!  ----------
!  Capital augmenting technological change for all industries

Shock afeall("capital",prod_comm,"CHN") = uniform 1.0 ;


!   verbal description
!   ------------------

model               = WASTE ;
version             = 0     ;
identifier          = TIME  ;
verbal description  = ON
                      THIS. ;

!   outputs
!   -------
equations file = standard;
extrapolation accuracy file = yes;
updated file gtapdata = <cmf>_data.har;

!
Solution         File = <cmf>.sl4 ;
Log              File = <cmf>.LOG ;

! Option is
CPU = YES ;
!

!   end of commands
!   ---------------
```