EXPLAINING THE CHINA PUZZLE:
HIGH GROWTH AND LOW VOLATILITY IN THE ABSENCE OF HEALTHY FINANCIAL INSTITUTIONS

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ABSTRACT

This study is motivated by the China puzzle: the very impressive post-reform growth with relatively low aggregate volatility in the absence of healthy financial institutions by international standards. We argue that political economy constraints on the reform process have made China's policymakers adhere to administrative measures that they are familiar with and confident in. This adherence has obstructed the building of efficiency-enhancing market institutions, which in turn reinforces the government's reliance on administrative interventions to achieve high growth while keeping volatility low. We use the ARCH-M model and a reconstructed Chinese expenditure accounts data over the past 60 years to identify the role of the government in China's macroeconomic performance. Our findings show that the economy indeed exhibits a stronger inertia and is less sensitive to shocks, especially in the case of fixed capital investment, implying that investors are less risk-averse, which is atypical given China's weak institutional environment. The government intervention with fixed capital investment and export is further analyzed by a regression exercise. (JEL E32, G28, P24)

1. INTRODUCTION

The widely acknowledged relationship between (legal and) financial development, economic growth and stability in the literature is that the building of efficient financial intermediaries facilitates both growth and stability. Cross-country empirical studies on growth volatility have found that there is an evident negative relationship between volatility and growth (Ramey and Ramey, 1995) and that developing countries have a limited ability to cope with shocks (Aizenman and Pinto, 2005). That is, there is a higher persistence of shocks in these countries than in developed countries largely because of the absence of an efficient financial system that facilitating growth while maintaining stability.

However, this is not how things have been working in China. Political economy constraints on the reform have made China's policymakers adhere to administrative measures. This adherence has obstructed the effective building of market institutions, which in turn reinforces the government's reliance on administrative interventions to achieve the goals of high growth and low macroeconomic volatility.

Being the dominant component, China's banking system is still characterized by state-owned banks lending to state-owned enterprises, although some of these banks and enterprises have been listed on the stock markets locally and overseas. Many of such loans have been made on the basis of social policy principles instead of profitability (Nolan, 2010). Persistent weaknesses are widely acknowledged in capital adequacy, risk management and corporate governance plaguing the financial intermediation of Chinese banks. The problem with corporate governance is attributed at least partly to the government being both the regulator and principal shareholders, and its ability to appoint and remove senior managers on the basis of their political correctness or 'connectedness,' rather than purely on their managerial competence (Branstetter, 2007; Cousin, 2007). The prevailing close tie between banks and under-performing SOEs, low levels of competition among banks, and the failure of the regulatory authorities to bring necessary and timely changes in banking practices are all factors identified as obstacles to China's banking reform (Calomiris, 2007). After China's accession to WTO, many looked to the western banks' increasing cooperation with local banks as an impetus to improve corporate governance. However, it is reported that many western actors now believe the main reason Chinese banks sought

such cooperation was to enhance their legitimacy in the global financial environment rather than to improve their corporate governance (Nolan, 2010).

We argue that the evolving government institutions have to a large extent substituted desirable market institutions to promote growth and maintain stability in the reforming Chinese economy. This unique transition model gives rise to the great China puzzle: the very impressive post-reform growth with low aggregate volatility in the absence of healthy financial institutions. It is therefore policy-implication appealing to examine how the Chinese economy behaves in light of exogenous shocks and if its behavior is likely due to government intervention in the absence of desirable market institutions.

To structure this study, the next section reviews the literature on the relationship between the development of market institutions and the growth and volatility of an economy. Section 3 discusses the ARCH-M model that we use to investigate whether the Chinese economy is sensitive to abnormal volatilities or exogenous shocks, which is supplemented by a regression approach to analyze how the government, investors and consumers may behave in light of the shocks. Section 4 focuses on issues related to data construction. Based on the data work, Section 5 presents some descriptive statistics and measures of growth and volatility. Section 6 reports and discusses the results. The last section concludes the study.

2. LITERATURE REVIEW

There are ample of cross-country studies in the literature investigating the link between legal and financial development of a country and its growth and macroeconomic volatility. One strand of literature provides empirical evidence for the positive link among law, finance, and economic growth at the country level (e.g. La Porta, Lopez-de-Silanes, Andrei Shleifer and Vishny (LLSV), 1998; Levine and Zervos, 1998; Beck, Levine, and Loayza, 2000; Levine, Loayza, and Beck, 2000), and at the industry and firm level (e.g. Rajan and Zingales, 1998; Demirgüç-Kunt and Maksimovic, 1998; Beck and Levine, 2002). A related debate stemming from this strand is about the relative merits of bank-based versus market-based financial systems (see Allen and Gale (1999) for a comprehensive review). Recent empirical findings appear to show that while the legal system development determines whether banks or equity markets are better financial structure to promote growth, what matters

most is to create an environment in which intermediaries and markets provide sound financial services (Levine, 2002, p.400)."[1] In any case, there is no doubt that a country's economic growth hinges on its financial development.

Another strand of literature studies the link between the financial system development and business cycle volatility (Aizenman, 1997; Aizenman and Powell, 1997). Ferreira da Silva (2002) provides evidence that economic fluctuations in terms of output, investment and consumption volatility are smoother when the financial system is more developed.

A third strand of literature provides evidence of the negative relationship between macroeconomic volatility and long-run economic growth (e.g. Ramey and Ramey, 1995; Acemoglu et al., 2003). Hnatkovska and Loayza (2005) argue that their findings show an increasingly stronger, harmful effect from volatility to growth. In their study of 79 countries for the period 1960-2000, China is identified as one of the most volatile economies.[2]

All the above empirical studies require the measure of a country's level of financial development. While it is conceptually clear that the measure should be based on the efficiency of financial institutions in processing information, allocating the resources, and the regulatory framework in monitoring and managing risk, it is virtually impossible to obtain accurate measure. All studies have to employ crude proxies although they may fail to capture some important aspects of the modern financial system. The most commonly used proxies attempt to measure the size of the financial sector, the importance of specific financial institutions and how credit is allocated to the private sector (see King and Levine, 1993; Levine, 2002).[3]

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[1] It is believed that the appropriate financial structure varies with a country's development and its legal system. Therefore, bank-based systems will better promote growth in countries with weak shareholder protection codes and poorly enforced property rights, whereas more market-based systems will benefit those economies whose legal system is better developed (Rajan and Zingales, 1998).

[2] When volatility is measured in terms of standard deviation of output gap, China was the most volatile country in the sample. When volatility is measured in terms of standard deviation of GDP growth, China was the third most volatile, after Algeria and Syrian Arab Republic (Hnatkovska and Loayza, 2005, Appendix A).

[3] The most frequently used proxy for a country's financial development or the extent of financial depth is the ratio of private domestic credit to GDP (see Table 2 of Hnatkovska and Loayza, 2005). (For China, a better proxy of financial deepening would be the ratio based on the credit to non-state enterprises. With reference to the credit quota scheme that the Chinese government often used to smooth the economic cycle, Yao (2010) argues that the "indicators that are developed on the scale rather than the structure of the credit might reflect the strength of government credit regulation, rather than the

Earlier attempts of cross-country comparisons relating legal and financial developments to economic growth have produced some useful measures of the development of capital markets (La Porta et al., 1997a) and the banking sector (Levine, 2002) of selective developed and developing countries. Recent studies of the Chinese financial system adopt many of these measures to do comparison. Using measures from Levine (2002), Allen et al. (2005) produce a set of indicators for China's financial system in 2000 and compare them with the countries in La Porta et al. (1997a) grouped under different legal origins (English, French, German, and Scandinavian). The comparison leads to the conclusion that "China's financial system is dominated by a large but inefficient banking sector (p.72 and Table 3)." This result is consistent with the general belief shared by Chinese and overseas scholars. Yet there is no consensus as to the exact impacts of the various aspects of China's financial system development on different sectors of the economy and the overall growth.

Applying the cross-country empirical framework to a panel of Chinese provinces, Boyreau-Debray (2003) find that the apparent financial deepening does not contribute to local economic performance. The negative impact of bank loans on economic growth is attributed to the misallocation of financial resources to support the loss-making state firms. Examining three sectors of the Chinese economy, namely the state sector, the listed sector and the private sector, Allen et al. (2005) find that the private sector has been growing much faster than the other two sectors. To make sense of this "counterexample" of the findings in the law, finance, and growth literature, they propose an explanation by means of alternative financing channels and governance mechanisms other than formal external finance. Employing some detailed firm-level survey data and a more accurate measure of informal finance that treats retained earnings separately from other channels in the "informal finance" in China, Ayyagari et al. (2008) show that the formal financing channel, especially bank finance, contributes to higher growth and reinvestment. They disagree with the allegation of Allen et al. (2005) that alternative financial channels such as informal sources substitute for the formal sector.

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level of financial intermediation development." Yao rejects the use of the scale of credit to non-SOEs as the measure of China's financial intermediation and uses instead the ratio of loans of private enterprises and individuals to total loans.)

Drawing on the vast literature on comparative financial systems, these studies of the Chinese economy attempt to solve the China puzzle of high growth in the absence of a healthy financial system. Acknowledging the prevailing inefficiency in the state sector, which includes all the state-owned enterprises, they try to focus on the performance of the "private sector." Although different studies may adopt different definition, one thing in common is that their "private sector" also includes collectively owned companies such as the township and village enterprises that are often jointly owned by local government, communities and institutions. While we agree that the growth of the "private" sector, or more accurately the "non-state" sector, of the Chinese economy hinges on the development of the financial system, we argue that a most important key to solving the puzzle is missing from these studies because they exclude, or at least play down, the act of government from the so defined "private" sector.[4] The consideration of direct government intervention is crucial to resolving the China puzzle, especially regarding the significantly declined macro volatility in the post-reform period.

The cross-country study by Hnatkovska and Loayza (2005) that estimates volatility based on the average over the period 1960-2000 has concealed the much lower volatility in China since the mid-1990s. Relative to some former Eastern Bloc countries and some Asian countries of comparable development, China has recorded faster growth but lower volatility for the whole economy (see Wu and Shea, Figure 4 and Table 5, 2008). Given the well-acknowledged deficiency in China's legal and financial system, we argue that the impressive economic performance would not have been possible without the active intervention of the government to administratively promote growth and contain the macro volatility.

At the same time, one must also look at the consumption volatility to gauge the welfare impact on the whole economy.

3. METHODOLOGY

We first propose an ARCH-M model to investigate whether past shocks have a strong negative effect on growth and whether there is relatively strong inertia built into the

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[4] Allen et al. (2005) did mention that the government officials played an active supporting role in promoting growth of the "private" sector in ways that are different from the "grabbing hand" found in government officials of other countries (pp.98-99).

Chinese system. The advantage of using the ARCH-M model is that, in addition to assuming conditional heteroskedasticity, it also assumes that the growth rate depends on the standard deviation of the process. We assume that there is a concave relationship between growth and shocks due to the authorities' inability to implement effective counter-cyclical policies and the constraints imposed by financial market imperfections on private agents' decisions. The ARCH-M model is specified as follows.

(1) $$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 \sigma_t + \varepsilon_t, \quad \varepsilon_t \equiv h_t \sigma_t; \text{var}(h_t) = 1; E(h_t) = 0$$

(2) $$\sigma_t^2 = \gamma_0 + \gamma_1 \varepsilon_{t-1}^2 + \gamma_1 \varepsilon_{t-2}^2$$

where y_t is the output (GDP) growth rate measured as log difference, σ_t is the conditional standard deviation to capture shocks, and ε_t is the innovation to the stochastic process. Of the parameters α_i and γ_i to be estimated, α_2 captures the effect of volatility on growth, and α_1 and γ_i represent the degree of persistence of shocks. Based on the above discussion, we expect that in the Chinese case, α_2 should still be negative but may not be to the degree found in the typical (market-based) developing country cases. As for α_1 and γ_i, we expect stronger positive results compared with the typical developing country cases.

We estimate the ARCH-M model for GDP, GCE (government consumption expenditure) and FCF (fixed capital formation).

To further substantiate our argument about the role of government in the Chinese economy, we propose an output volatility model to explain China's output volatility, measured by the HP-filter derived GDP cycles developed by Hodrick and Prescott (1997), by the volatility of major expenditure accounts items, also measured by the HP-filter derived cycles.[5] Some of these macro indicators are expected to capture the role of government.

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[5] The HP filter is suggested by Hodrick and Prescott (1997) designed to remove the cyclical components, which takes the following form:

$$\min_{\{g^t\}} \{\sum_{t=1}^{T}(x_t - g_t)^2 + \lambda \sum_{t=1}^{T}[(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2\}$$

where x_t represents the series and g_t the growth component. The first part of the equation is therefore the cyclical component of the series x_t. In this minimization problem, the parameter λ is a positive number that reflects the "cost" or penalty of incorporating fluctuations in the growth component series. If $\lambda = 0$, the sum of squares of the equation is minimized when $x_t = g_t$; the trend is equal to the series

$$(3) \quad GDP_t = \beta_0 + \beta_{FCF}FCF_t + \beta_{GCE}GCE_t + \beta_{HCE}HCE_t + \beta_{EX}EX_t + \beta_D D_t$$
$$+ \beta_{FCF}DFCF_t + \beta_{GCE}DGCE_t + \beta_{HCE}DHCE_t + \beta_{EX}DEX_t + u_t$$

where *FCF* stands for fixed capital formation volatility, *GCE* for government consumption expenditure volatility, *HCE* for household consumption expenditure volatility, and *EX* for export volatility. *D* is a policy dummy variable designed to capture the significant regime shift in China. We have two alternative dummies: D_{78}, which distinguishes the period beginning in 1978 that is widely regarded as the beginning of China's economic reform; D_{85}, which distinguishes the period beginning in 1985 when China implemented industrial reforms and began a period in which local governments were encouraged to influence local industrial development in the best of their fiscal interests, and D_{98}, which distinguishes the period beginning in 1998 when China was hit by the Asian Financial Crisis and both the central and local authorities were required to maintain macroeconomic stability while pursuing strong growth, which also began a new era for the central authorities to use modern monetary policy instruments to manage macroeconomic volatility in addition to the traditional administrative measures.

Besides, to test the policy effect on output volatility through individual variables, in Equation (2) we have also specified interactive terms between an alternative dummy variable and each independent variable.

FCF is expected to be pro-cyclical; that is, it will have comovement with output volatility. Besides, there is no reason for a significant change of the direction of the relationship in the post-reform period. Therefore, the interactive terms of *DFCF* may not be significant. In China, fixed capital investment has always been affected by the government, directly or indirectly, either in the planning or reform period. What has been changed is that in the planning era the central authorities played the sole role, whereas during the reform period it was the local governments that influenced the investment decisions. However, *DFCF* may show some degree of increasing significance since the late 1990s when China became more exposed to external shocks, especially after its WTO entry and the central government was under an increasing

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x_t itself. As λ goes to infinity, the equation converges to a linear time trend. We have followed the suggestion by Hodrick and Prescott (1997) to set $\lambda = 100$ for the annual data.

pressure to maintain high growth and sound stability. Unfortunately, the aggregate measure that we use cannot separate the two levels of government behaviors.

As we have discussed, *GCE* under central planning mainly served the bureaucratic needs of industrialization rather than smoothing consumption. It is expected to be pro-cyclical. The interactive term *DGCE* should capture the post-reform change in the opposite direction if the government consumption expenditure became significantly counter cyclical. *HCE* is expected to be pro-cyclical under central planning because household consumption was controlled by the national rationing system that was subject to the performance of the output growth. We expect a strong correction (negative) effect following the reform that should be captured by the interactive term *DHCE*.

Since the country was rather closed under central planning and limited exports only served the needs of import substitution strategy, *EX* is expected to be pro-cyclical but may not be very significant. For the reform period, given the importance of exports to the government in terms of growth and stability (providing jobs), we expect the interactive term *DEX* to exhibit a stronger effect since the reform.

4. DATA CONSTRUCTION

Data are a major challenge. National accounts data are the basic data required in this study. However, the China official GDP statistics have long been criticized for inaccuracy due to methodological problems and for serious fabrications because of political reasons, both tending to exaggerate the real growth performance (Maddison, 1998; Rowski, 1993 and 2001; Ren, 1997; Wu, 2002). The Chinese statistical system began a transition from the Soviet-style Material Product System (MPS), adapted in the early 1950s, to the United Nations System of National Accounts (SNA) in the early 1990s. There are still problems yet to be solved (see Xu, 2002 and 2009). Studies using alternative approaches to re-estimate China's real GDP growth performance have found slower but more volatile growth than official estimates (Wu, 2002 and 2011). Studies making better use of the official expenditure accounts estimates also suggest slower growth but greater volatility (see Adams and Chen, 1996; Keidel, 2001; Shiau, 2005).

The nature of this study requires time series data on the aggregate income and major expenditure items, namely, household consumption, government consumption,

investment, exports and imports for the period 1952-2009. However, there are no studies that provide alternative estimates of all these indicators for the entire period. Maddison and Wu (2008), which updated Maddison's earlier work (1998), have provided alternative estimates for China's aggregate and per capita income for the period 1952-2003, but their work does not include the expenditure accounts. For our purpose in this study, we choose to use the official expenditure accounts with no attempt to revise the basic data. To maintain consistency between output and expenditure, we assume per capital income equal to per capita expenditure.

The basic expenditure data used in this study are estimated by the Department of National Accounts (DNA) of NBS,[6] which appeared in two volumes on the historical GDP estimates (see DNEA, 1997; DNA, 2004), as well as in the NBS Statistical Yearbooks. Data since 1992 are compiled literally with the SNA concepts, while data prior to 1992 compiled under MPS are reconstructed according to the SNA concepts. Like GDP estimates using the production approach, data on expenditures are only available at nominal prices and in real growth indices. DNA has made several adjustments to the previous figures since the first publication of the data in 1997. We have checked and ensured that only the most updated data are used.

To prepare the data for this study we take the following steps to cross check the official data with difference sources, adjust for any inconsistencies, fill gaps and finally derive the major expenditure items in 2000 RMB yuan.

Step 1: This step aims to prepare a full expenditure accounts at nominal prices with consistent data. A significant inconsistency is found with the "net export value" (i.e. export of goods and services minus import of goods and services) for which the expenditure accounts and the balance of payments tables give different figures. The problem appears in 1997 and continued. We assume that the BOP data compiled by the Central Bank are more accurate than the data in the expenditure accounts and have adjusted the latter with the former. The results allow us to derive 2000-based nominal index for each expenditure item, denoted as $VX_{i,t}^{2000}$.

Step 2: In this step, we deal with the price problem. As already mentioned, there are no constant-price expenditure accounts. The available data are at nominal prices and in volume indices for which the main part is constructed using the Chinese

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[6] The former name of this department is Department of National Economic Accounts (DNEA).

"comparable prices", a concept that is used in MPS. The concept is incompatible with the concept of "constant price" used in SNA. The main difference is that the former uses segmented weights for different sub-periods,[7] and the latter employs only one set of weights for the whole period. Wu (2011) shows that segmented weights can introduce a strong Gerschenkron effect that exaggerates the real growth rate (Gerschenkron, 1951). While the latter is not problem free (i.e. the usual Laspeyres index number problem), the former cannot be directly used to derive constant price measures over time. Although the "comparable price" based volume index approach is heavily criticized by national accounts experts (see Maddison, 1998), we have two reasons to accept the official volume indices. First, compared with the output volume indices, the expenditure volume indices are less affected by the "comparable price" index (CPPI) approach because unlike industrial and agricultural products, there are no pre-set "constant price" (for different periods) for services. Most service prices that are used for constructing urban living expenses index are obtained from annual price surveys (Dong and Zhang, 1997). Second, after checking through the annual and 1952-based indices we have not found any break in the indices and hence believed that NBS has already "linked" (not chained) the segmented price indices to "increase" the compatibility over the periods for which different "constant prices" were used, even though the linking approach is not disclosed and can be quite rough. Finally, we can re-base the volume index for each expenditure item on 2000, denoted as $QX_{i,t}^{2000}$, except for exports and imports because there are no volume indices available. We need more work on trade prices which will be carried out separately.

Step 3: In the last step of this exercise we can re-construct the expenditure accounts in 2000 yuan by deflating each of the nominal value item with a derived price deflator $PX_{i,t}^{2000}$, that is, $V_{i,t}^{2000} = V_{i,t} / PX_{i,t}^{2000}$, except for trade. However, bearing the above discussion in mind, the "constant price indices" used in this study are somewhat pseudo in nature.

The last question is what deflator should be used to deflate the trade balance. As explained in the 1993 version of SNA, the change of terms of trade can cause a significant divergence between the movement in GDP at constant prices and real

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[7] The statistical authorities have introduced six sets of "constant prices" between 1952 and 2002 to construct "comparable price indices" (CPPI) (see Wu, 2011), but they have not disclosed detailed information on how sample products and services are selected and constructed to obtain these indices.

income, which is generally described as the "trading gain (or loss)". If imports and exports are large relative to GDP, and if the commodity composition of the goods and services which make up imports and exports are very different, the scope for potential trading gains and losses may be large. Thus there is one important choice to be made in the measurement of trading gains or losses, i.e. the selection of price deflator with which to deflate the current trade balance. However, since the measurement of real income can sometimes be sensitive to the choice of price deflator, it has prevented a consensus being reached on this issue. The 1993 SNA recommends that the purchasing power of flows between resident and non-resident institutional units, namely, primary incomes and current transfers received from abroad and paid to abroad should be expressed in terms of a broadly based numeraire, i.e. the set of goods and services that make up gross domestic final expenditure. In other words, primary incomes and current transfers should both be deflated by a price index for domestic final expenditure. Our exercise using different deflators have indeed found that the results are very sensitive to the choice of deflator. Finally, we choose to use of the price deflator that is derived from the "domestic absorption" to deflate the trade balance which gives the most acceptable results.

5. DESCRIPTIVE STATISTICS

This section is to measure growth and aggregate volatility of the economy and its macro indicators. It is to be completed by updating the following tables and discussions…

TABLE 1: CHINA'S LONG-RUN KEY INDICATORS: GROWTH AND OPENNESS

	Average Per Capita GDP Growth Rate[1] (% p.a.)	Average Population Growth Rate (% p.a.)	Average Degree of Openness[2] (%)	Average Exports (Annual 1990US$) (100 ml.)	Average Trade Balance (Annual 1990US$) (100 ml.)	Average Capital Account Balance/ Exports[3] (%)	Average Capital Account Balance/ GDP[3] (%)
Pre-reform:							
1952-1957	5.7	2.2	5.0	22	9	16.8	0.7
1958-1965	1.8	1.5	4.0	34	0	-10.2	-0.4
1966-1977	2.9	2.3	3.7	50	-21	-5.0	-0.1
Post-reform:							
1978-1993	8.2	1.4	10.4	383	-58	7.9	0.8
1994-2004	8.4	0.9	24.1	5135	236	12.3	3.1
Pre-reform	3.1	2.0	4.1	39	-8	-1.6	0.0
Post-reform	8.2	1.2	16.0	2319	62	9.6	1.8
Overall	5.8	1.6	10.1	1200	28	4.2	0.9

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TABLE 2: CHINA'S LONG-RUN KEY INDICATORS: VOLATILITY AND CRISES
(Based on Per Capita Real GDP)

	Average Rolling Standard Deviation[1] (%)	Frequency of Recessions[2] (%)	Average Duration of Recessions[3] (Years)	Average Depth of Recessions[4] (%)	Frequency of Abnormal falls[5] (%)	Frequency of Exceptional Growth[6] (%)
Pre-reform:						
1952-1957	3.8	0.0	0.0	0.0	0.0	0.0
1958-1965	12.7	37.5	3.0	39.4	25.0	25.0
1966-1977	5.6	25.0	1.5	17.6	8.3	8.3
Post-reform:						
1978-1993	3.6	6.3	1.0	8.0	6.3	18.8
1994-2004	2.4	0.0	0.0	0.0	9.1	9.1
Pre-reform	8.0	23.1	2.0	28.5	11.5	11.5
Post-reform	3.2	3.7	1.0	8.0	7.4	14.8
Overall	5.5	13.2	1.6	21.7	9.4	13.2

Sources: See Table 1.

Notes:
1) Calculated as 7-year centered window rolling s.d. However, due to data limitation, the average of 1956-57 is used for 1952-57 and the average of 1994-2001 for 1994-2004.
2) Proportion of years in which the per capita GDP growth rate was negative.
3) The average number of years in each recession.
4) The average accumulated fall in the per capita GDP growth rate from the pre-recession level in each recession.
5) Proportion of years in which per capital GDP growth rate was negative or lower than the mean (μ) growth rate (as given by the HP trend) minus one standard deviation (σ). (μ = 3.76 and 8.19, σ = 7.87 and 2.94 for the pre-reform and post-reform periods, respectively.)
6) Similar to Note 5, but changed to per capital GDP growth rate higher than the mean growth rate plus one standard deviation.

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TABLE 3: CHINA'S LONG-RUN KEY INDICATORS: EXPENDITURE PERSPECTIVE
(Annual average growth rate & the period mean of rolling standard deviation in percentage)

Period/ Regime	GDE (GDP)	Consumption			Investment		Trade	
		FCE	HCE	GCE	GCF	FCF	Exports	Imports
Pre-reform:								
1952-57	8.1	6.5	6.9	4.3	14.7	23.0	13.5	5.8
	(4.2)	(5.3)	(5.8)	(10.6)	(21.4)	(31.3)	(12.4)	(18.6)
1958-65	4.4	3.1	2.8	6.0	14.2	14.1	2.2	2.8
	(14.1)	(7.8)	(7.1)	(18.7)	(39.6)	(37.4)	(18.7)	(23.7)
1966-77	5.5	4.7	4.4	5.9	9.1	9.7	7.4	9.3
	(5.7)	(3.0)	(2.7)	(8.7)	(18.2)	(14.4)	(14.0)	(23.2)
Post-reform:								
1978-93	9.7	8.9	8.8	9.4	12.2	11.0	19.0	21.1
	(3.6)	(3.3)	(3.5)	(6.4)	(9.7)	(10.2)	(17.2)	(22.3)
1994-04	9.3	7.4	7.3	7.5	11.0	12.4	20.7	18.0
	(2.4)	(1.9)	(2.1)	(2.3)	(6.1)	(5.2)	(17.6)	(13.4)
Pre-reform	5.6	4.5	4.4	5.6	11.8	13.8	7.0	6.5
	(8.6)	(4.9)	(4.6)	(12.5)	(26.3)	(24.3)	(15.6)	(23.0)
Post-reform	9.6	8.3	8.2	8.6	11.7	11.6	19.7	19.8
	(3.2)	(2.8)	(3.0)	(5.0)	(8.5)	(8.5)	(17.4)	(19.3)
Overall	7.7	6.5	6.4	7.2	11.8	12.6	13.6	13.4
	(5.8)	(3.8)	(3.8)	(8.6)	(17.0)	(16.1)	(16.5)	(21.1)

Source: Basic output and price data are from DNEA (1997) and DNA (2004), updated using national accounts data from recent issues of the *China Statistical Yearbook* (NBS, 2003, 2004, 2005).

Note:

1) Real growth rates are estimated using 1990 based deflators constructed by the authors.
2) Trade data have been reconciled with China's Balance of Payment and deflated to the 1990 yuan.
3) Figures in parentheses are the mean 7-year centered window rolling standard deviations in percentage for specified periods. Thus, we have lost three observations each at the beginning and the end of the series when calculating the period mean.

discussions…

6. RESULTS AND DISCUSSION

The basic results of the ARCH-M model in Table 4 are significant and consistent with our hypotheses that past shocks do not have strong negative effect on growth and there is relatively strong inertia built into the system. Relative to (market-based) developing country cases, e.g. the case of Argentina (Fanelli, 2008, pp. 228-9), the value of α_1 in the case of China appears to be large (0.59 compared with 0.22), which reflects a higher degree of persistence that the economy exhibits following shocks. The value of α_2 in the case of China is negative as expected but rather small (-0.41 compared with -2.15 in the case of Argentina), which suggests that volatility does affect growth but in a much smaller magnitude. This reflects that the Chinese economy is indeed less sensitive to volatility apparently due to a strong inertia in the system, which is consistent with our postulation made on the heavy government involvement in investment. On the other hand, despite the growth appears to be less

sensitive to shocks, the estimated coefficients of γ_i indicate that the economy has a long "memory" of shocks. Both ARCH terms are positive as expected and the second one (γ_2) appears to have a dominant role in the GARCH process, suggesting that the system does have a strong inertia.

TABLE 4: ARCH-M MODEL RESULTS FOR GDP

	Dlog(GDP)
$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \varepsilon_t$	*Mean Equation*
C (α_0)	0.0804***
	(0.0068)
AR(1) (y_{t-1}) (α_1)	0.5902***
	(0.0572)
Conditional S.D. (GARCH) (α_2)	-0.4076***
	(0.1316)
$\sigma^2 = \gamma_0 + \gamma_1 \varepsilon^2_{t-1} + \gamma_1 \varepsilon^2_{t-2}$	*Variance Equation*
C (γ_0)	0.0001***
	(0.0001)
RESID(-1)^2 (ARCH1) (γ_1)	0.0545
	(0.0688)
RESID(-2)^2 (ARCH2) (γ_2)	1.1116***
	(0.0572)
Mean of dependent variable	0.0697
S.D. of dependent variable	0.0575
Durbin-Watson statistic	1.6549
Sample period (adjusted)	1954-2009
No. of Iterations to converge	35
Inverted AR roots	0.59

Source: Authors' estimation.
Note: Standard errors are in parentheses with the application of Bollerslev-Wooldridge robust standard errors & covariance. Level of significance used in the hypothesis testing is based on z-statistic and indicated by *** for 1%, ** for 5% and * for 10 level of significance, respectively. Note that the result of R-squared is not reported as it is irrelevant in the absence of regressors in the mean equation.

Aizenman and Marion (1999) have found that volatility is negatively related to private investment and positively related to public investment, as opposed to Ramey and Ramey's (1995) conclusion that there is a lack of clear correlation between volatility and investment. We may infer that the small value of α_2 is likely a result of the dominance of public investment in total investment, as well as local governments' influence on private investment in China. All these make investment less risk-averse. The investors' expectation to pass onto the state any risk resulting from bad decision-making will lower the risk-consciousness of investment decisions. However, despite inefficient investment, its growth is highly correlated with that of GDP. If volatility does not dampen investment growth (an issue that will be empirically investigated in

the next section), it will not dampen output growth, which may well explain the relatively small negative value of α_2.

To empirically substantiate our argument about the important role of the government in maintaining strong growth and low volatility in China, next we carry out two more exercises, one on excessive volatility and the other on aggregate volatility. First, we repeat the ARCH-M model exercise for government consumption expenditure (GCE) and for fixed capital formation (FCF) in China to capture excess volatility that are likely caused by the government's consumption behavior and influence on investment. Second, we estimate an output volatility model to see how the volatility of private and public consumption and investment behaviors has affected output volatility in China.

TABLE 5: ARCH-M MODEL RESULTS FOR GOVERNMENT CONSUMPTION EXPENDITURE AND FIXED CAPITAL FORMATION

Dependent Variable	Dlog(GCE)	Dlog(FCF)
$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 y_{t-2} + \varepsilon_t$	*Mean Equation*	
C (α_0)	0.2181*** (0.0423)	0.0755*** (0.0235)
AR(1) (y_{t-1}) (α_1)	0.0913 (0.1413)	0.3544*** (0.0854)
AR(2) (y_{t-2}) (α_1)	-0.4121*** (0.1199)	
Conditional S.D. (GARCH) (α_2)	-1.9338*** (0.6120)	0.6532*** (0.1561)
$\sigma^2 = \gamma_0 + \gamma_1 \varepsilon^2_{t-1} + \gamma_1 \varepsilon^2_{t-2}$	*Variance Equation*	
C (γ_0)	0.0038*** (0.0012)	0.0035*** (0.0012)
RESID(-1)^2 (ARCH1) (γ_1)	0.2538** (0.1310)	0.0450 (0.0526)
RESID(-2)^2 (ARCH2) (γ_1)	0.0354 (0.0702)	1.2431*** (0.4675)
Mean of dependent variable	0.0778	0.0993
S.D. of dependent variable	0.0862	0.1790
Durbin-Watson statistic	2.3054	1.6827
Sample period (adjusted)	1955-2009	1954-2008
No. of Iterations to converge	69	67
Inverted AR roots	0.05+/-0.64i	0.35

Source: Authors' estimation.
Note: See Table 4.

In the further ARCH-M model exercise, due to strong government involvement in the economy we expect that GCE will not behave counter cyclically as expected in a typical market economy and negatively response to excessive volatility, while FCF will be very insensitive to shocks because the majority of investment is heavily influenced by government agencies both directly and indirectly and hence, not so risk-averse as observed in private investment in typical market settings. The estimated results are reported in Table 5, which can be compared with the same exercise in the case of GDP as presented in Table 4.

The empirical findings strongly support our postulations. Similar to the behavior of GDP, government consumption expenditure also has a negative relationship with abnormal shocks, but in a much larger magnitude. Compared with GDP, it exhibits a much more significant decline in growth rate when there is a shock. However, it lacks persistence, shown by a very small insignificant α_1. In particular, there appears to be a clear self-correcting effect as captured by the negative coefficient of α_1 with two lagging periods, AR(2), [8] which may to some extent reflect the effect of the government's counter-cyclical policy. The fact that such an effect is only captured by the AR term with two time lags may well indicate that there is a lack of mechanism to timely handle the shocks. This suggests that the shocks are often too profound and they are difficult to correct in a shorter period because most shocks are policy-driven or politically motivated and usually take a longer time to change.

In the case of fixed capital formation, the results show clear evidence that Chinese investors respond to shocks by increasing instead of decreasing investment. Such a non-risk-averse behavior is virtually not market-based and not typical of private decisions in the typical market settings. It appears that those policy-driven or politically motivated projects cannot be easily reversed. Indeed a very strong inertia is identified by the ARCH terms. Following our political economy argument, the findings also suggest that China's rapid growth with stability has been achieved at the expense of a healthy development of market (behavior)-conforming institutions. Although the nature of the basic data does not allow us to separate private and state investments in FCF, the fact that almost the entire fixed capital investment was conducted by the state prior to the 1980s and the state share remained dominant until

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[8] Different from the specification of Equation (1), here AR(2) is introduced into the mean equation to clear autoregressive roots.

the beginning of the 2000s (Everhart and Sumlinski, 2002) clearly substantiates our political economy argument and lends strong support to the findings by Aizenman and Marion (1999) that volatility is negatively related to private investment and positively related to public investment.

Turning to the estimated coefficients of Equation (3) reported in Table 6, Model I, II and III specifies D_{78}, D_{85} and D_{98} as their respective policy dummy. In all the three models we have to introduce AR(1) to tackle the serial correlation problem, which may also indicate high degree of similarity in the HP-filtered cycles, suggesting there may be strong inertias built into the macroeconomic indicators that cannot be cleared by the filter (a tentative point). Its coefficient is negative which means that the AR process captures the mean-reversing effect. We find that, in general, the intercept dummy has no effect in any of the models, suggesting that the policy regime shift did not induce a significant shift in the whole function, which is reasonable and supports the strong inertia argument. The investment volatility in China (*FCF*) exhibits a significant pro-cyclicality, with a small but positive regime shift effect found after 1998 ($D_{98}FCF$).

The results show that government consumption expenditure volatility (*GCE*) is strong pro-cyclical, which is also as expected and consistent with what we have observed (Table 5). However, a large positive regime shift effect appears after 1998 ($D_{98}GCE$) which is highly significant and strong in magnitude, suggesting that the government spending behavior tends to be more pro-cyclical following the Asian Financial Crisis and China's access to WTO rather than focusing on maintaining stability. By a closer look, however, this may also suggest a "compensation" for the declining role of household consumption in the reform era, a finding that is well in line with the lack of strong private consumption especially observed in the post-WTO export-oriented industrial growth (a finding that deserves a further examination!).

Next, without introducing the interaction term with the policy dummy, household consumption expenditure volatility (*HCE*) exhibits the strongest pro-cyclicality in the regression. However, after adding *DHCE* to the model, we find a significant counter-cyclical or correction effect to *HCE* in the reform period, which eliminates about 80 percent of the pro-cyclical effect in Model I and 70 percent in Model II. The household consumption expenditure becomes much smaller in Model III and insensitive to the post-1998 regime shift effect.

TABLE 6: ESTIMATED COEFFICIENTS OF THE OUTPUT VOLATILITY MODEL
(Dependent Variable: GDP)

	Model I	Model II	Model III
C	0.0004 (0.0024)	0.0002 (0.0022)	0.0006 (0.0019)
FCF	0.1910*** (0.0221)	0.1880*** (0.0210)	0.1998*** (0.0206)
GCE	0.0510 (0.0388)	0.0611 (0.0358)	0.0425 (0.0349)
HCE	0.8439*** (0.1071)	0.8254*** (0.1065)	0.5991*** (0.0852)
EX	-0.0032 (0.0329)	0.0035 (0.0304)	0.0531** (0.0211)
D_{78}	-0.0005 (0.0032)		
$D_{78}FCF$	0.0035 (0.0528)		
$D_{78}GCE$	0.0479 (0.0839)		
$D_{78}HCE$	-0.6135** (0.1869)		
$D_{78}EX$	0.0839*** (0.0402)		
D_{85}		-0.0002 (0.0033)	
$D_{85}FCF$		-0.0041 (0.0659)	
$D_{85}GCE$		-0.0023 (0.1316)	
$D_{85}HCE$		-0.5598** (0.2505)	
$D_{85}EX$		0.0811** (0.0409)	
D_{98}			-0.0024 (0.0043)
$D_{98}FCF$			0.3539* (0.2140)
$D_{98}GCE$			0.6389** (0.2717)
$D_{98}HCE$			-0.3746 (0.6193)
$D_{98}EX$			0.0608 (0.0505)
AR(1)	-0.3959** (0.1501)	-0.3864** (0.1499)	-0.4156*** (0.1463)
Adjusted R-squared	0.9097	0.9078	0.9175
Durbin-Watson statistic	1.9232	1.9411	1.9810
No. of iterations to converge	23	18	23
Sample period	1954-2009	1954-2009	1954-2009

Source: Authors' estimation.
Note: GDP is measured by the expenditure approach. All variables are measured in HP-filter generated cycles with λ=100. Dummy variables are defined as: D_{78} =1 for the period since 1978 or 0 otherwise; D_{85} =1 for the period since 1985 or 0 otherwise; D_{98} =1 for the period since 1998 or 0 otherwise.

The results for export volatility variable (*EX*) show significant policy regime shifts over time as suggested by significant effect with the interactive term (*DEX*). However, in Model III export exhibits a significant pro-cyclical effect in the basic function not in the interactive term with the policy dummy. This finding fits well with the government-driven, export-led growth story.

In sum, it is clear that the key factor behind China's idiosyncratic structural problems is the role of government, including both central and local authorities, which often play different roles in achieving growth and maintaining stability, but are both politically and economically vital. After all, the "China miracle" is not an archetypal market fairytale but a story of how the government has successfully manipulated various policy instruments to make the market serve its best interests, though it sometimes abuses its administrative power and, apparently, never abides by "reform instructions" from the West.

7. CONCLUDING REMARKS

In this study, we use the ARCH-M model and a reconstructed Chinese expenditure accounts data over the past 60 years to identify the role of the government in China's macroeconomic performance. Our findings show that the economy indeed exhibits a stronger inertia and is less sensitive to shocks, especially in the case of fixed capital investment, implying that investors are less risk-averse, which is atypical given China's weak institutional environment. The government intervention with fixed capital investment and export is further analyzed by a regression exercise.

We believe China's model of transition has to a great extent blurred the relationship between volatility and institution. The government intervention through administrative measures has so far successfully kept macro volatility under control despite the many weaknesses in China's DFA.

As opposed to the "big bang" approach of the former Soviet Union and Eastern European countries, China's transition to a market economy is "incremental" or "piecemeal" in nature and therefore very much path-dependent. It began with the sanctioning of the spontaneous agricultural reform in 1978 when the policymakers saw the impressive effects on productivity. To promote economic growth, they

extended the market-oriented reforms to other sectors of the economy to improve incentives and efficiency. The reform path known as "crossing the river by groping the stones" has been constantly revised and fine-tuned according to the outcomes and feedback from within the government.

Subject to the lack of market experience and the resistance from the old orthodox and vested interest groups against marketization, the reformers have been extremely cautious about loosening their grip on the economy lest instability emerging from market liberalization would jeopardize their political legitimacy. The reforms in different sectors would only allow the market to grow "at the margin", which entailed liberalizing some economic activities that were previously prohibited because they were not planned. A market liberalizing and growth-promoting reform measure would be established only if it did not cause unacceptable instability to the economy. Otherwise, it would end up with policy retrenchment when the government tightened its control again.

There are several problems with China's reform model, which might have amplified the macro volatility had there not been constant government interventions. We will discuss the problems here and illustrate them in the individual sections on banking, stock market, and the macroeconomic policy. First, until the late 1990s, the socialist ideology had made the government reluctant to relinquish ownership and control of the state firms and state banks. The adverse impacts of state ownership and control on corporate governance and efficiency are well documented in the literature (Che and Qian, 1998; Shleifer and Vishny, 1998; Qian, 2001; Levine, 2004). In the case of China, it results in ambiguous property rights and the government's reliance on administrative measures to maintain growth and stability. However, such government interventions perpetuate the problems of soft budget constraint and poor corporate governance of the state firms and state banks.

Second, the building of institutions to facilitate market creation in China has not kept pace with the market liberalization. One reason is that private property is not something to be promoted under the socialist ideology. Therefore, the creation and strengthening of institutions for safeguarding the security of private property and contract-based market transactions had received little attention until the late 1990s when the impending WTO accession weakened the ideological constraint. Another reason is the political evaluation criteria that reward short-term results in the

administrative accomplishments, which might have made the time horizon of China's policymakers shorter than what is expected of officials in the authoritarian political system (Shih, 2004). It tends to enhance their incentive to deal with politically pressing issues using short-term administrative measures and discourage their endeavors to attempt longer-term DFA building.

Third, to promote growth under state ownership, the central government has adopted two types of decentralization since the mid-1980s, namely, economic decentralization and fiscal decentralization. However, both of them tend to amplify macro volatility under weak DFA. The economic decentralization adopted in the SOE reform, which aimed to improve the incentives of managers by granting them more autonomy in decision-making and allowing them to share the profits, ended up enabling the state firms to "privatize their profits" and "socialize their losses" (Zhang, 1999, p.235; Yi, 2004, p.184; Liew et al., 2005). Without increasing the managers' accountability for the losses of mismanagement, this decentralization measure encouraged them to pursue higher rates of return by taking more risks and pass them on to the state.

The fiscal decentralization that aimed to reduce the administrative and fiscal burden on the central government and to encourage local governments to promote growth in their localities has resulted in the interlocked interests of local governments, state firms and state banks in their jurisdiction. This has become a major source of volatility in the reform period. To generate growth through fixed capital formation, the local governments pressure the local branches of the state banks to make loans to the state firms in their localities.[9] The central government would tolerate their heavy involvement in local investment projects until the economy was overheated due to excessive credit expansion. Then, the central government would intervene with an austerity program. The fiscal decentralization and the resulting accommodative credit policy have been widely acknowledged by Chinese and Western scholars as the cause of the boom-bust cycles in the post-reform China (Lou, 1997; Yu, 1997; Brandt and Zhu, 2000; Feltenstein and Iwata, 2005). We believe our findings in Section III only

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[9] Local governments in the rural areas would do the same for their township and village enterprises (TVEs), which are collectively owned by the governments and the residents. In this project we will not discuss TVE separately.

show a disguised picture of China's macro volatility after the government has suppressed it with administrative intervention.

Fourth, to promote growth and safeguard its increasingly open economy from external shocks, China has adopted fiscal policies to promote exports and attract FDI, and maintained a closed capital account and a rigid exchange rate of RMB. While these interventionist policies appear to have achieved the intended outcome of stable growth, we argue that they have distorted resource allocation and hindered the strengthening of China's financial institutions.

As it is unfeasible to perform empirical tests of our central hypotheses regarding the weaknesses of China's DFA, we conduct policy investigation to examine how the key reform policies adopted in the banking sector, the stock market, and the external sector have created problems that obstruct the progress of DFA building in China.

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